WE GIVE AWAY COMPONENT KITS—See Page 56

PRACTICAL POINTS ON TUNING ALL SETS

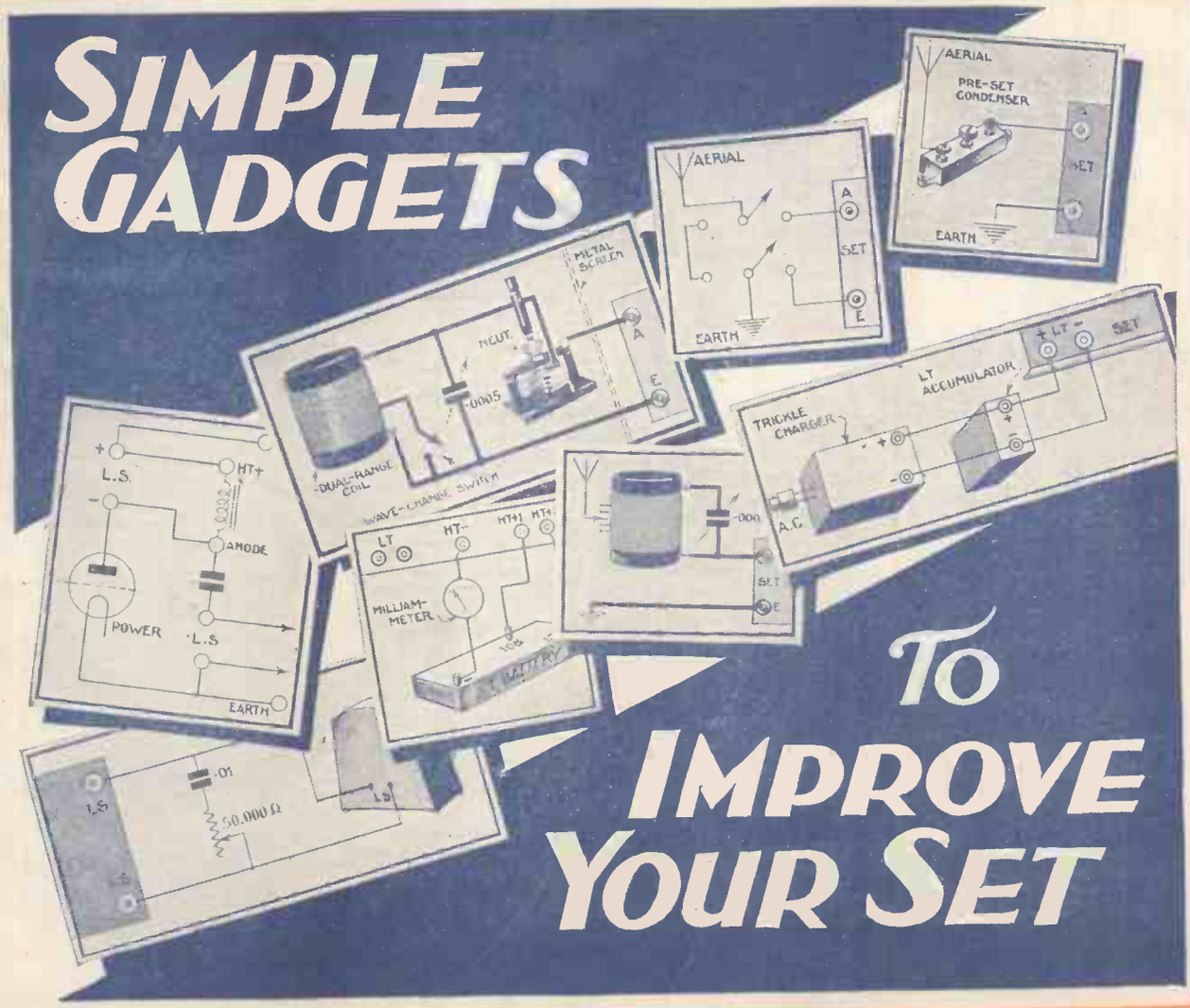
Amateur Wireless and Radiovision

"WIRELESS MADE EASY" 8 page SUPPLEMENT

Every Wednesday 3d

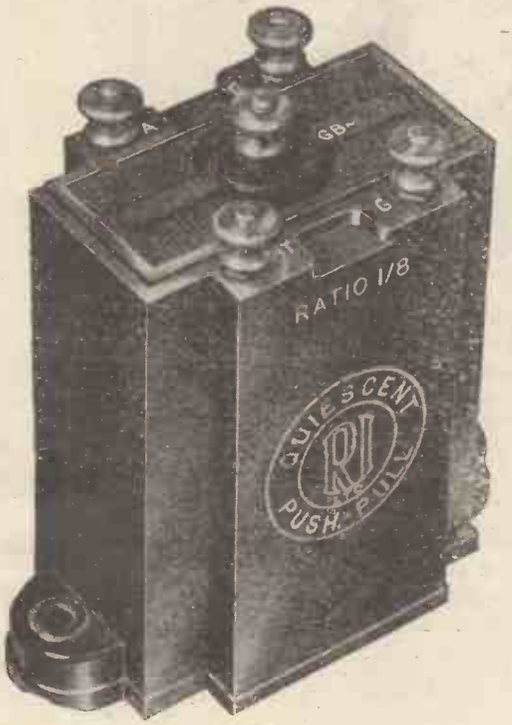
Vol. XXII. No. 553 Saturday, January 14, 1933

SIMPLE GADGETS TO IMPROVE YOUR SET



Registered at the G.P.O. as a newspaper

THE QUIESCENT PUSH PULL TRANSFORMER!



RI with their accustomed foresight, and by means of their intensive research into and experience of L.F. amplification, again contribute the latest transformer, this time in conformity with the outstanding radio developments for 1933—"Quiescent" push-pull or push-push amplification.

A SENSATIONAL AND REVOLUTIONARY BATTERY SET AMPLIFICATION SYSTEM

"Quiescent" Push-pull, the system which has been the subject of preliminary articles in the technical press, will undoubtedly affect all battery set circuit designs and construction from now on, and *in effect gives to all battery receivers an extraordinary increase in audible power output whilst simultaneously lowering H.T. battery costs to less than one-half. This is effective by means of suitable coupling of any triode output or pentode valves, when used with the new R.I. "Quiescent" Push-pull transformer, which has been specially designed for the system.*

ENTIRELY DEPENDENT UPON THE DESIGN & EFFICIENCY of the TRANSFORMER

As in practically all radio developments, particularly those associated with valves, the efficiency of the L.F. transformer design is of the highest importance because it governs the ultimate performance of the valve in the coupling method devised. *R.I. have therefore concentrated on the design of the new "Quiescent" Push-pull transformer, which will definitely give the full economic and efficiency advantages to be gained by the new system.*

THE RI Q TYPE TRANSFORMER

It is important to note that despite the short time that has elapsed since the introduction of the "Quiescent" system, the *new R.I. "Quiescent" type transformers are already available to the public.*

COMPLETE EXPLANATION AND CIRCUIT DIAGRAMS AVAILABLE IN FREE BROCHURE

Constructors may now obtain from their dealers, or from R.I. direct, an explanatory brochure dealing with "Quiescent" push-pull amplification which is demonstrated by technical diagrams showing direct and parallel feed methods of coupling.

RI

"Q" TYPE TRANSFORMER

Distinctive Features:

- High ratio of 1-8 provides ample gain and grid swing for the output valves, this high gain being maintained over the whole range of audio frequencies.
- The windings are sectionalised and carefully matched to provide absolute balance of secondary audio voltages without which fidelity of reproduction would not be possible, in this system.
- The core of the transformer is built of the new high permeability nickel-iron alloy and is internally fitted with a complete and efficient iron screen so that it can be placed in any position without fear of inter-action with other components.
- Anode current up to 2 or 3 M.A. may be passed through the primary of the transformer in direct coupling, or alternatively the transformer can be parallel fed.

Primary D.C. Resistance 900 *ohms. Total Secondary D.C. resistance* 9500 *ohms. Primary Inductance :* 30 *Henrys without D.C.,* 20 *Henrys with* 1 *M.A.,* 16 *Henrys with* 2 *M.A.*

15/-

Royalty for Licence additional 1/-

ALWAYS AHEAD IN TRANSFORMER DESIGN

RI LTD.

FOR EVERY SET — *there's a*
PILOT AUTHOR KIT
CASH — C.O.D — or H.P.

EVERYTHING RADIO
IMMEDIATE DELIVERY—
CASH, C.O.D. or H.P.

CARRIAGE PAID TO YOUR DOOR

BLUE SPOT SPEAKER UNIT AND CHASSIS. TYPE 100U. Cash Price £1/12/6. Carriage Paid.
Balance in 6 monthly payments of 5/2.
Send 5/2 only.

EPOCH "20 C" PERMANENT MAGNET MOVING-COIL SPEAKER. With 3-ratio input transformer. Cash Price £1/15/0. Carriage Paid.
Balance in 5 monthly payments of 6/6.
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R & A "CHALLENGER" PERMANENT MAGNET MOVING-COIL SPEAKER. With special Ferranti multi-ratio input transformer. Cash Price, Carriage Paid, £1/15/0.
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LISSEN "SKYSCRAPER"
Complete with Valves **S.G.3**

Chassis kit with (Lissen) S.G., Detector and Pentode valves. Cash Price, Carriage Paid, £4/9/6. Delivered, carriage paid, on first payment of *Balance in 11 monthly payments of 8/3.* **8/3**

Cabinet kit with (Lissan) valves, walnut cabinet and special balanced armature loudspeaker. Cash Price, Carriage Paid, £6/5/0. Delivered, carriage paid, on first payment of *Balance in 11 monthly payments of 11/6.* **11/6**

ROLA PERMANENT MAGNET MOVING-COIL SPEAKER F.6. With Universal tapped input transformer. Cash Price £2/3/6. Carriage Paid.
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ATLAS ELIMINATOR. Type A.C.244. Three tappings. S.G., Detector and Power. Output: 120 volts at 20 m/A. Cash Price £2/19/6. Carriage Paid.
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Send 5/6 only

HEAYBERD HOME BATTERY CHARGER. Model A.C.3. For A.C. mains only. Charges 2-, 4- or 6-volt accumulators at 1 amp. Cash or C.O.D., Carriage Paid, £2/2/6.
Balance in 8 monthly payments of 5/3.
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GARRARD INDUCTION GRAMOPHONE MOTOR. For A.C. mains. Model 202. Mounted on 12-inch nickel motor plate with fully automatic electric starting and stopping switch. Cash Price £2/10/0. Carriage Paid.
Balance in 11 monthly payments of 4/7.
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GARRARD JUNIOR "B" SPRING MOTOR. Complete with turntable. Cash Price £1/13/0. Carriage Paid.
Balance in 5 monthly payments of 6/1.
Send 6/1 only

W.B. PERMANENT MAGNET MOVING-COIL SPEAKER. Type PM4. Complete with transformer. Cash Price £2/2/0. Carriage Paid.
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COMPLETE KIT
Containing all specified parts, including oak consolette cabinet, valves and energised moving-coil speaker.
CASH or C.O.D. Carriage Paid
£13 - 17 - 3
Or 12 monthly payments of 25/6.
Build it yourself with Pilot Radio envelope No. 2, containing full assembly, wiring and operating instructions, photographs and **2 FULL SIZE BLUEPRINTS 1/-.** *Post free.*

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(Battery Model)
KIT "A"
Complete Author's Kit of specified parts, excluding panel, baseboard, valves and cabinet.
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£7 - 0 - 0
or 12 monthly payments of 12/9.
Six specified valves, £4/1/0.

NEW CENTURY SUPER STRUCTAKIT
Containing RED TRIANGLE, 16 in. by 8 in. ready-drilled ebonite panel, Peto Scott foil-covered non-warping ply baseboard, necessary fixing screws, insulated connecting wire and twin flex for building panel assembly for New Century Super. CASH OR C.O.D. **7/6** *Postage 6d.*

A. C. CENTURY SUPER
KIT "A"
Author's Kit of specified components, including eliminator parts and two baseboards, but less panel, valves, speaker and cabinet.
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Set of specified valves, £5/16/6.

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Containing two laminated non-warping baseboards (one foil-covered, 18 in. by 12 in., and one 14 in. by 8 in.), RED TRIANGLE ebonite terminal strip, ready-drilled, 8 in. by 2 in., 1 Peto-Scott aluminium bracket, wire, screws, flex, sleeving, 6 terminals and oak-faced plywood panel, ready-drilled for this set. Cash or C.O.D. **10/6**

2 GUINEA FAMILY 3
KIT "A"
Author's Kit of specified parts, less panel, baseboard, valves and cabinet.
CASH or C.O.D. Carriage Paid
42/-
or 8 monthly payments of 5/9.
Specified valves, £1/6/0; Peto-Scott cabinet, 11/6.

PILOT STRUCTAKIT, *comprising ready-drilled oak-faced ply panel, 10 in. by 7 in., baseboard, 10 in. by 10 in. necessary fixing screws, insulated connecting wire and flex for* **TWO GUINEA TWO.** **5/-**

PETO-SCOTT WALNUT CONSOLE
Constructed in Walnut with contrasting Inlaid Walnut Veneers.

Comes to you with vignetted front, as illustrated, ready to take your own set. No skill or expensive tools are required to transform your radio into a beautiful console instrument, presenting the professionally finished appearance of the most luxurious radio receiver money can buy. Cash or C.O.D.
62/- *Carriage and packing 2/6 extra in England and Wales.*
Or 8/2 deposit and 11 monthly payments of 5/8.
Baffle Board, if desired, 3/6 extra.
Dimensions: 36 in. high, 21¾ in. wide, 15¼ in. deep. Panel, 18 in. by 8 in.; baseboard, 14 in. deep.

PETO-SCOTT 1933 WALNUT ADAPTAGRAM. Constructed of walnut with contrasting inlaid walnut veneers. Ready to take your own set and gramophone equipment. Cash or C.O.D., £3/3/0. Carriage 2/6 extra.
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This handsome walnut cabinet with contrasting inlaid veneers is fitted with the Peto-Scott Permanent Magnet Moving-coil Speaker.

CASH OR C.O.D. CARR. PAID
47/6
Send 4/6 Only
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A wonderful speaker, rendering speech and music with amazing realism. Sensitive to very small inputs and is therefore entirely satisfactory for battery operated sets, as well as all-mains sets, and can be used with normal or Pentode valve.

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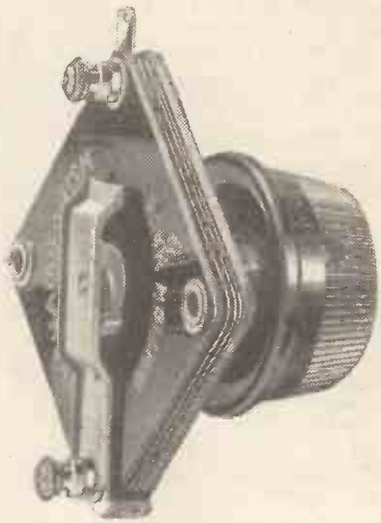
"MAKE IT RIGHT"

Graham Farish set a very high standard for his components when he began business in the earliest days of wireless.

Since then firms have come and gone. Graham Farish goes from strength to strength on the quality and efficiency of his products. Year after year the Bromley factory sees some new addition — to cope with the constant increase of demand.

Graham Farish components are now specified by every wireless expert and journal. Follow the experts.

Graham Farish LIT-LOS SOLID DIELECTRIC DIFFERENTIAL CONDENSERS



2/- EACH

A very carefully constructed instrument, compact in size and efficient in design, with accurately gauged bakelite dielectrics and solid brass pigtail connection to moving vanes. Made in all capacities up to .0005 mfd. in tuning, straight line capacity and differential types. Used by many leading manufacturers and specified in sets by famous designers. One hole fixing; supplied complete with terminals.

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The popular and efficient resistances for all general purposes. All values 300 ohms to 5 megohms. 1/6d. each.

Also in Heavy Duty for use where the load is high. All values 300 ohms to 100,000 ohms 2/3d. each.

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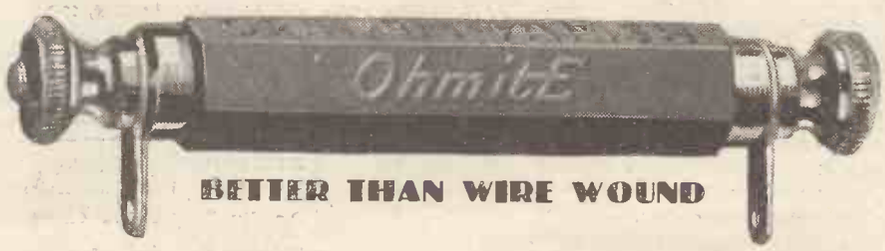

BETTER THAN WIRE WOUND

Graham Farish Holders for all resistances, upright or horizontal mounting. Single screw fixing, 6d. each.

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No. 573. Vol. XXII. JANUARY 14, 1933

Amateur Wireless & Radiovision

BRITAIN'S LEADING RADIO WEEKLY FOR CONSTRUCTOR, LISTENER & EXPERIMENTER

EDITOR: BERNARD E. JONES. TECHNICAL EDITOR: J. H. REYNER, B.Sc., A.M.I.E.E. RESEARCH CONSULTANT: W. JAMES. ASSISTANT EDITOR: H. CORBISHLEY.

NEWS & GOSSIP OF THE WEEK

A SENSATIONAL NEW RECEIVER

ON page 48 of this issue are given first particulars of a nation-wide tour which is being made with "A.W.'s" sensational new receiver. This is a home-constructed set breaking entirely new ground. Nothing like it has ever been produced before. The name of this new set is . . .

"THE MELODY RANGER."

HAVE YOU ENTERED?

THIS week's issue contains the third instalment of our simple and fascinating competition. Picture clues are given and when you decipher these you will find that they give the fine features of the "Melody Ranger." This is a competition which everybody can enter. Everyone stands an equal chance and there is no entrance fee. Prizes are being given of kits of parts for the set itself. Don't delay. Enter the competition now.

HOT NUMBERS FROM HENRY HALL!

B.B.C. Band Arranges with America

AT last Henry Hall, the leader of the B.B.C. Dance Band, seems to have succumbed to the craze for "hot" numbers. He has just completed an arrangement with Irving Mills, the American producer, for an up-to-the-minute supply of hot dance numbers as they come out in America. Included will be all the arrangements of Duke Ellington—probably the finest exponent of the hot school of dance music in the world.

VAUDEVILLE WAR—THE LATEST!

What Will Happen After The Truce Ends?

WE must congratulate Major Gladstone Murray on his diplomacy in bringing a temporary peace in the threatened vaudeville war between the B.B.C. and the entertainment interests covered by General Theatres Corporation. No doubt each side has its grievances. The G.T.C., for example, can point to conclusive harm being done by the B.B.C. during its Birthday Week, when the exceptional number of variety acts broadcast caused a great drop in the music halls' receipts. Even well-informed observers are at a loss to know what will happen when the truce comes to an end

Also in this Issue—

FEATURES YOU SHOULD NOT MISS

Practical Points on Tuning for ALL Sets.

Building the "Home-station Two."

First Particulars of "A.W.'s" Sensational New Receiver.

A Simple Competition in which Kits of Parts are Being Given Away!

AND EIGHT-PAGE SUPPLEMENT "WIRELESS FOR BEGINNERS."

TWO WEEKS WITHOUT G.T.C. ARTISTES

ALL broadcast listeners interested in this dispute will watch with great interest the two weeks' programmes beginning January 22 and 29, for during those periods there will be no G.T.C. artistes in the B.B.C. variety or vaudeville hours. This is more or less a precautionary measure on the part of the B.B.C., which does not want to announce artistes under G.T.C. contract if, when the truce ends, there is any breakdown in the ensuing negotiations between the B.B.C. programme chiefs and the heads of G.T.C.

MAKE THEIR NAMES!

ON the day of the decision to make a temporary truce between the B.B.C. and G.T.C., a man walked into the B.B.C. with an offer to provide 500 artistes outside the G.T.C. octopus. He maintained that these artistes were every bit as good as those well known to listeners, and all they needed was publicity—via the microphone!

A NOVEL HOUR FOR THE KIDDIES

An outside broadcast was made in the children's hour in the National programme recently, when a relay was taken from one of the wards of the Princess Louise Hospital for Children, in Kensington. Leonard Henry (centre) and Johnson-Clarke took part.

An announcement of Special Importance to every reader appears on page 48

NEWS & GOSSIP OF THE WEEK —*Continued*

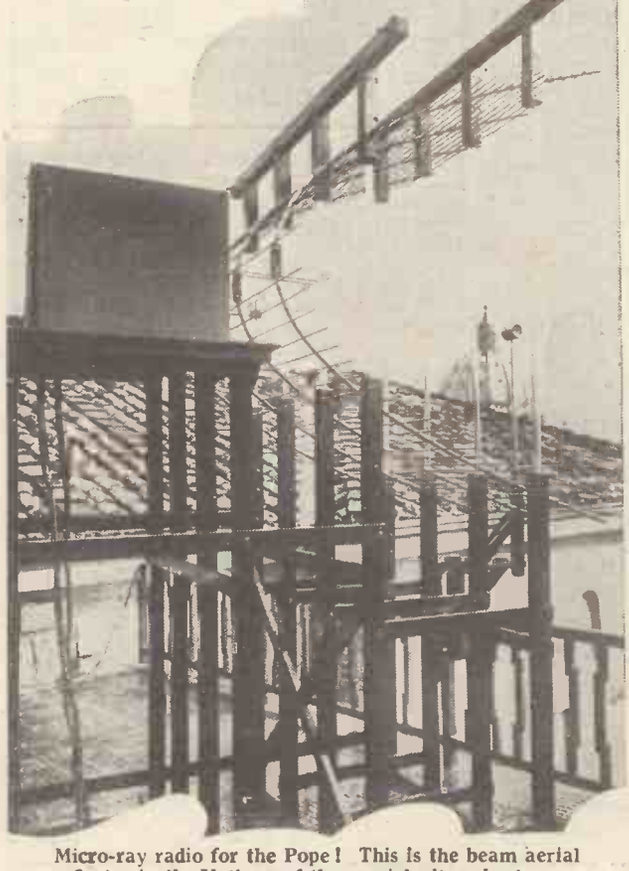
PATHOS IN A POST-BAG

Response to Premier's Appeal for the Blind

MANY touching acts of generosity have helped to swell the post-bag of the British "Wireless for the Blind" Fund, for which the Prime Minister broadcast an appeal on Christmas Day. During the first week a sum of £3,000 has been received, but it is hoped that the New Year's mail will soon bring the total to the £5,300 required. The offices of the Fund are at 226 Great Portland Street, London. The donations for the blind range in value from threepence to fifty pounds. An impressive feature of the list is the number of donations from unemployed persons and old age pensioners. A chauffeur, who "as a result of hard times" had just lost his job after thirty years' service, sent a pound from his final week's pay! The blind themselves have also contributed generously.

THOSE RELAY EXCHANGES

A DEPUTATION from the Newspaper Proprietors Association will shortly present itself to the Postmaster General to point out how the wireless exchanges throughout the country are interfering with the legitimate business of the newspapers by relaying to subscribers the Test Match results as picked up from Radio Paris and Poste Parisien. It will be contended that this development is not only robbing the newspapers of the sales of newspapers with the results, but is also robbing them of the advertising money that goes to sponsor these results.



Micro-ray radio for the Pope! This is the beam aerial reflector in the Vatican of the special ultra-short-wave transmitter which is used for communication with the Pope's Palace, eighteen miles away.

CUE LIGHTS IN THE B.B.C. CAFETERIA

YOU may have heard of the B.B.C.'s cafeteria down in the basement of Broadcasting House. An innovation is the fitting up of cue lights in the glass pillars that abound there. These warn artistes who have lingered too long over their buns, by flashing the number of the studio in which they are wanted.

AMERICAN RADIO ADVERTISING

THAT they had "sold their birthright for a mess of pottage" was the warning given by the Chairman at the Federal Radio Commission in the States to broadcasting officials. There seems to be a strong opinion that some of the stations are getting too commercialised. It is thought that many of the stations are operating mainly by the profits they get through excessive advertising which is really uninteresting to listeners. Strange, is it not, that while the British radio advertising through stations like Radio Paris and Normandy is extending day by day, the turn of the tide appears to have come in the very country which gave birth to sponsored programmes.

FILMING THE B.B.C.

A VERY clever scenario writer is at work preparing a story *with a love interest* featuring the activities of the B.B.C., including the studios at Broadcasting House and the regional stations. It is thought that to make a box-office "draw" of the film a love interest is essential. We take leave to suggest that there is enough dynamic interest in the theme of broadcasting itself without bringing it down to the level of a cheap American film.

NO MARRIAGES BY REQUEST!

SWEEPING changes of clerical staff at the B.B.C. will be made in the near future as a result of the latest edict to dispense with the services of all the married women members. Exceptions will be made where it is known that the husband of the married member of staff is out of work, or where great hardship would be imposed by the woman's loss of her job.

B.B.C. FIGHTING 'FLU

TWICE daily the B.B.C. matron goes round the staff offices with pills of calcium lactate—the B.B.C.'s cure, or rather preventative, for the 'flu germs that are now so prevalent!

NEW POPULAR MUSIC MASTER

HAVE you by chance listened to the interesting talks by Mr. J. D. M. Rorke? Author of "A Musical Pilgrim's Progress," Mr. Rorke has been giving a series of three experimental talks on music for amateurs. The B.B.C. is highly pleased with the results of the series, and in the future it is likely that Mr. Rorke will give a weekly talk on music, somewhat after the style of Sir Walford Davies' talks.

MECHANICAL HA HA'S!

SURELY the limit in the bizarre is the broadcasting of mechanical laughter in the B.B.C.'s studio vaudeville shows? Such is the idea of one of the B.B.C.'s producers, who proposes to use records not only for laughter, but for hand-clapping at the end of each item. This mechanical applause has the merit of being under control, but lacks, surely, that spontaneity that makes applause worth having. By the way, the studio claques, as we forecast recently, are now back in full cry.

TOO GOOD TO MISS!

This week we make two special announcements which are literally too good to miss! On page 48 there is a first description of a nation-wide tour being made with "A.W.'s" sensational new receiver—a set quite unlike anything you have ever seen before. And on page 56 there is the third section of a simple and fascinating competition, which everyone may enter, and in connection with which kits of parts for the new "mystery" set are being given as prizes.

EXPERIMENTING WITH CANADA'S WAVELENGTH

New Wavelengths Prove Better

AS the Canadian reports on reception of the B.B.C.'s Empire signals are not very favourable, the engineers have been trying out other wavelengths. At the conclusion of the Indian programme, at 4.30 in the afternoon, tests to Canada now start on wavelengths of 25 and 32 metres, from 4.45 to 5.30 p.m. Then after the West African programme ends the wavelengths of 32 and 49 metres are used to reach Canada from 10.45 to 1 a.m. On these wavelengths and at these times, which do not, of course, correspond to Canada's evening entertainment period, good reception is being obtained. Although it is known that a wavelength longer than 50 metres is needed at proper Canadian zone time to ensure good reception, there are, unfortunately, no channels available between 50 and 100 metres, owing to the demands of commercial services.

FIRST EMPIRE BREAKDOWN

THE first serious breakdown of the Empire service occurred the other morning, when from 11.8 to 11.30 the signals on the GSD wavelength of 25.5 metres to Australia were reduced in strength owing to a water leak. This trouble was soon put right and the next programme went out at full strength.

NORTH REGIONAL CHANGES

VICTOR SMYTHE, who has been looking after productions at North Regional station, is now on "O.B." work, which is likely to develop considerably in the North in the near future. Wyndham Goodden, lately an announcer at Manchester, is to take over the work of studio productions.

DULCIMA GLASBY AGAIN

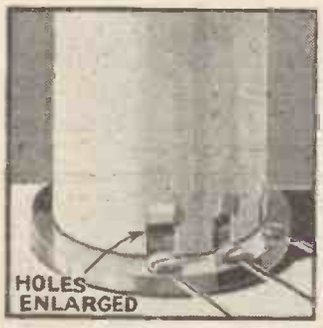
TOWARDS the end of the month there is to be a broadcast adaption by Dulcima Glasby of "The School for Scandal" on the National wavelength. As the production is in the hands of Howard Rose, its success is assured. It is hoped to secure the services of an eminent actor for the character of Sir Peter Teazle.

PRACTICAL POINTS on TUNING
For ALL SETS

HINTS FOR IMPROVING SET CONTROL

A COIL SCREEN POINT

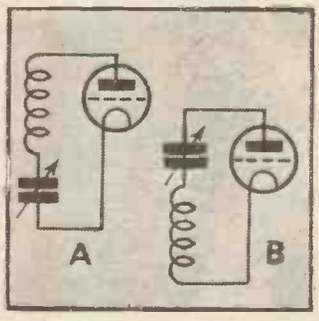
A CAPACITY loss and even a short circuit which will upset the tuning can result if the metal can of a coil accidentally touches one of the wires. If the holes at the base of the screening can are not large enough to clear the



wire, or if the wire at this point is not covered with insulating tubing, you may get a "short." The best plan, if you think that this is the cause of a tuning trouble, is to cut larger nicks in the metal (soft aluminium screening cans can be cut with an old pair of scissors) and bend them back as shown in the accompanying diagram. Neat and larger U-shaped holes can be cut later.

REACTION CONDENSER POSITION

DON'T forget that there are two ways of connecting a reaction condenser. If the reaction winding in the coil is split (and thus is separated from negative low-tension), you can connect the reaction condenser



as at A in the accompanying diagram. If not, then you will have to connect it as at B. The A arrangement means one set of vanes is at earth potential, which is an advantage in metal panel sets. The B arrangement is more usual, though.

UPSETTING GANGING

IN a band-pass set the series aerial condenser makes a big difference to the ganging. It is, in fact, advisable to have the series aerial condenser mounted on the panel, so that you can alter the aerial capacity, as the set is tuned over the whole wave range. When first ganging up a new band-pass set, do not touch the series aerial condenser or you will get misleading results When the set is correctly ganged, you will find that over part of its range the series condenser increases selectivity (as is naturally to be expected), while over the rest of the range the set may double hump and the tuning may actually be broadened. This is owing to the incorrect ganging which gives the effect of double humping and broad tuning.

REPAIRING LEAF SPRINGS

THE flat leaf springs used for wave-changing in some commercial coils lose their resiliency after a time, and may not make proper contact when shorting the long-wave windings. There is no

need to scrap the coil. Just unbolt the fixings of the wave-change switch and fit another flat leaf spring (a piece of an old clock spring will do) over the coil switch leaf. The contacts of the original leaf will thus be used, but the pressure of the flat spring above will ensure a good contact.

SUPER-HET ADJUSTMENT

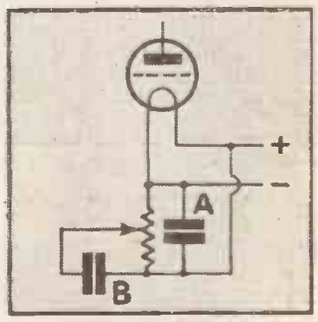
DON'T forget that certain types of super-het intermediate frequency coils and transformers have a small balancing control to correct for circuit and valve capacity. Don't neglect this control when setting up your new super-het if coils of this type are used. You will lose signal strength if the I.F. stages do not match up properly, and it is a simple matter to adjust these trimming condensers to counteract for any stray capacity in the circuit.

PRE-SET TUNING

THE method of pre-set tuning used in the "Home-Station A.C. Two" described this week enables a choice of stations to be obtained at the touch of a switch. In very simple sets a different type of switching can be used. An ordinary on-off switch is fitted, in series with an additional variable condenser, across the main tuning condenser. The idea works in this way. The lower wave station of the alternatives is tuned in in the normal way. Then the new condenser is switched in parallel and (without upsetting the previous adjustment) the second condenser is used to tune in the higher-wave station. The switch, you see, simply puts the new condenser in parallel with the old one.

FOR SMOOTH REACTION

PROBABLY you know the old tip of fitting a potentiometer across the low-tension wiring and taking the grid return end of the detector circuit to the slider. This is a good scheme in any sensitive set such as a short-waver, where a slight alteration



of the bias on the detector grid makes for easy reaction. It is not so well known, however, that a condenser across the "pot" winding is sometimes needed to prevent motor-boating. This condenser is shown at A in the accompanying diagram. An alternative position for the condenser is at B, where it is between the slider and one end of the potentiometer.

BAND-PASS SUPER-HETS

THE style of band-pass tuning used in the "New Century Super" is worth noting if you are modifying an old super-het for use with an outdoor aerial. The special type of ganged oscillator and band-pass coils used work best with a .0003-microfarad series aerial condenser and with a .02-microfarad coupling condenser shunted by a 50,000-ohms resistance.

H.F. VOLUME CONTROL

ONE of the many useful ways in which volume can be controlled on the H.F. side without affecting tuning is by means of a potentiometer in the aerial circuit. The arrangement is shown by the accompanying

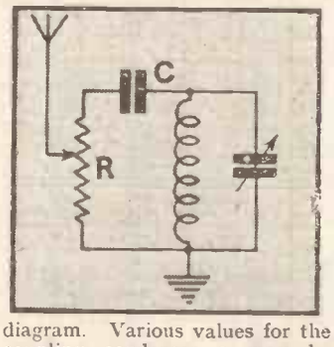
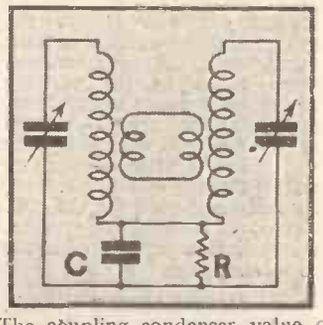


diagram. Various values for the coupling condenser C may be tried; but, generally speaking, a value of .0001 microfarad is satisfactory. A 50,000-ohm potentiometer will do with the slider connected to the aerial. Preferably use a potentiometer which is not too compact and which has not too much metal in its construction. In the diagram the coupling condenser is shown at C and the potentiometer winding at R.

BAND-PASS VALUES

A POPULAR link-type band-pass circuit is shown by the accompanying diagram, in which are shown the coupling condenser and the grid resistance at the bottom of the circuit arrangement.



The coupling condenser value C depends upon the type of coil used, but an average value is .05 microfarad. The grid resistance R, the purpose of which is only to complete the grid circuit, can generally be of 1,000 ohms.

(*Continued at foot of next page*)

DESIGNERS OF FAMOUS "A.W." SETS

(II) PERCY W. HARRIS, M.I.R.E.

Percy W. Harris, M.I.R.E.

MR. PERCY W. HARRIS, who was born in Croydon in 1889, began experimenting in radio just twenty-five years ago, owning both transmitting and receiving apparatus at that time. A little later, seeing the possibilities of the new science, he studied telegraphy and became a wireless operator, being, incidentally, the first man to receive the Postmaster-General's certificate in three different wireless systems.

After a good deal of experience on large lesigns, Mr. Harris took up a position in the Egyptian Government service serving as chief radio telegraphist to the Khedive of Egypt on board the royal yacht.

Returning to England, he was promoted inspector and later held a number of executive positions at Marconi House, including that of chief technical instructor in the company's school for operators.

His experience in the training of operators led to his being placed in charge during the war of a large scheme for the training of wireless operators all over the country. When peace was declared, Mr. Harris became the first technical editor of the *Wireless World* and later originated the type of constructional article universally adopted nowadays for the simple construction of sets. Among the numerous innovations introduced by Mr. Harris were the scale practical wireless diagram, close-up photographs of back-of panel wiring, the fitting of all components with terminals to avoid soldering, and many similar aids to simple construction.

On leaving Wireless Press, Ltd., Mr. Harris joined Radio Press, Ltd., and was editorial manager of that company for some time, being editor and assistant editor of several radio publications. On the winding up of this organisation he continued to edit the *Wireless Constructor* until 1930, when he temporarily abandoned his literary work in order to assist Dr. Robinson, the inventor of the Stenode, in developing that invention, the first model of which was evolved in Mr. Harris's laboratory.

Returning to technical journalism in 1932, Mr. Harris joined the staff of AMATEUR WIRELESS and the *Wireless Magazine*, thus following the example of Mr. J. H. Reyner, with whom he had been associated previously.

Although he has produced a very large number of set designs, Mr. Harris has never departed from his practice of making every model from beginning to end with his own hands, thus placing himself in exactly the same position as the reader who has to build from the description. In this way he has been able to find numerous ways of saving time, space, and labour for the benefit of the home constructor.

"PRACTICAL POINTS ON TUNING"

(*Continued from preceding page*)

GANGED COIL SWITCHES

WHEN rotary coil switches are ganged by ordinary anions with set screws, it is possible for the switches to work loose if the set screws aren't tight. This also applies to some types of push-pull wave-change switch. With ganged coils only very poor reception will be obtained, of course, if all the sets of wave-change switches do not open and close together at the same time. If there is any doubt about the positive connection of rotary switches, slot the ends of the rods and insert a flat link-piece.

S.G. VOLTAGE

IN many sets the voltage on the screening grid of the S.G. stage makes a difference not only to volume, but to stability and smoothness of reaction. In the old days it was always the detector voltage which was most critical, and the detector was always taken to the variable tapping on a mains unit. Nowadays, with ordinary S.G. valves, the screening-grid voltage is more critical, and if there is only one variable tapping on an H.T. unit, this should be used for the S.G. tapping, the detector being taken, as a rule, to a tapping of about 100 volts.

INCREASING H.F. SELECTIVITY

IF your set is worked in the "shadow" of a powerful station and you want to get the most selectivity out of the high-frequency stages, why not try transformer coupling, instead of plain tuned anode coupling? In practice an H.F. transformer is just as easy to use, and although one does not get the big step-up which, from theory, is to be expected, the actual selectivity is better. There is no need to tune both sides of the H.F. transformer, for that would mean two tuning condensers in addition to the aerial tuning condenser. If the coupling between the primary and secondary of the transformer is fairly close, only one winding need be tuned, and this condenser can be ganged with the aerial tuning as usual. Transformer coupling is used in all B.B.C. receivers for the medium wavelengths.

SHORT-WAVE CONDENSERS

YOU will find it very difficult to tune a short-wave set with the ordinary .0005-microfarad condensers used for medium-band working. If you are trying out a short-wave "hook-up" and do not want to buy special condensers for the job, use the standard .0005-microfarad condensers in series with a .0005-microfarad fixed condenser. This will cut down the effective capacity and will enable the tuning condenser to be used over its entire range. If there were no series condenser only the first 45 degrees or so of the condenser movement would be really effective.

DETECTOR BY-PASS

WHEN a set is prone to fierce reaction, a detector by-pass condenser will generally cure matters. Here is a good tip. Use a pre-set condenser as a bypass, so that you can find just the best value for your reaction system. Use a .0003-microfarad maximum pre-set condenser connected directly between the detector anode socket and low-tension negative. As the knob of this condenser is screwed down, increasing the capacity, the by-pass effect will be heightened. At the maximum value it will probably be found that the set does not oscillate over the whole tuning range. Slack off the by-pass condenser knob until you find the right value.

A pioneer of wireless, Mr. G. S. Kemp, who died recently, was Marconi's first assistant and was with him when the first signals were sent across the Atlantic

58,163 HOURS OF BROADCAST -IN 1932

Henry Hall and the new B.B.C. Dance Orchestra (above) took over in March of last year. Below: "Miss Amy" Mollison broadcasting in November after her record-breaking flight

Sir Kingsley Wood, the Postmaster-General, has given every possible assistance to the B.B.C. during the past year

H.R.H. the Prince of Wales broadcast several times during the year and paid an official visit to Broadcasting House in November

John Watt's popular "Songs from the Shows" were a distinct hit in the light entertainment side of the programmes. This photograph was taken in the studio during a broadcast

One of the notable dance band changes of the year was that of Roy Fox, who started a new broadcasting band at the Café Anglais. He is seen here (right) with Mrs. Fox and the band's mascot

The change over from Savoy Hill in May, to Broadcasting House (above) was one of the most notable events of 1932, and one which resulted in a great improvement in studio technique

The commencement of the Empire service was a new B.B.C. milestone during the past year. Malcolm Frost is here seen starting his Empire Tour in connection with recorded programmes for the Empire

The building of the new Empire transmitters at Daventry. First Empire transmissions began here on December 19

Running commentaries and outside broadcasts of all kinds, from the Grand National, the Derby, and the Boat Race, to the nightingale relays from Berkshire were features of the year. The O.B. engineers are here arranging a nightingale broadcast

Scottish Regional which opened in May, is the fourth step in the B.B.C. regional scheme. This photograph shows the transmitter hall

A RESUMÉ OF 1932 BROADCASTING APPEARS ON PAGE 60

CHARGING ACCUMULATORS FROM D.C. MAINS

By S. R. RAFFAN, B.Sc.

Owners of battery-run sets who are on a D.C. mains lighting supply have available a very convenient and economical method of charging their accumulators

THE apparatus required for charging accumulators when D.C. mains are available is practically nothing, and the cost of current for charging is, in a sense, a minus quantity! All that is necessary is to connect the accumulator in series with one or more lamps of the lighting system, so that when a light is being used the current also passes through the accumulator and charges it.

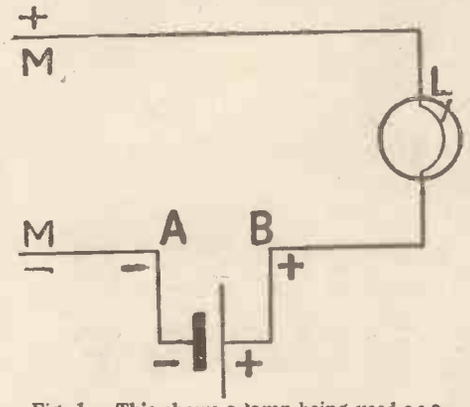


Fig. 1. This shows a lamp being used as a resistance

The method is illustrated diagrammatically in Fig. 1, in which a lamp L is shown connected to the mains M. If a break is made in one of the leads at A, B, and the accumulator connected in the break (the right way round, of course) the accumulator is being charged at any time that the lamp is being used. Now the voltage applied to the lamp is reduced by that of the accumulator, so that assuming a 2-volt accumulator is being charged by the current passing through a 240-volt lamp, you are actually saving about 2d. in every £1 of the electric light bill, instead of paying to have the accumulator charged.

A SIMPLE SYSTEM

Let us consider the details with an actual example. A simple arrangement is shown in Fig. 2 in which the accumulator is standing near a reading lamp and is wired up to it for charging. First of all, for safety's sake, it is advisable to have the accumulator in the earthed wire of the mains supply. This can be found as follows. Bare one of the two wires in the flex leading to the lamp ready for making a break at this point and then switch on the lamp. Now connect another lamp between the bared wire and an earth connection such as a waterpipe or a metal electric light casing. If this second lamp lights up you have got the wrong wire, but this can be easily rectified by reversing the bayonet or other plug of the reading lamp in its socket. If the second lamp does not light up no change is necessary, but to make sure it is advisable to try both ways round to ascertain that it actually does light up in one case but not in the other. Now switch off the reading lamp and make a break in the wire where you have bared it and then join a short length of flex to the two ends so formed, so that the accumulator can be more conveniently connected. Wrap some insulating tape around and between the bared ends so that they are carefully insulated from each other and are held in position.

It is now necessary to discover which way round to join the accumulator. To do this, dip the two free ends of the short length of flex into a glass of water and switch on the lamp. It will glow rather dimly, and bubbles will come off rapidly from one wire (the negative) and hardly at all from the other (the positive). Switch off, and connect these wires to the corresponding terminals on the accumulator, negative to negative, and positive to positive, and the job is done. When it is desired to use the lamp without having an accumulator on charge, it will be necessary to twist the ends of the short length of flex together, or to join them in some other way.

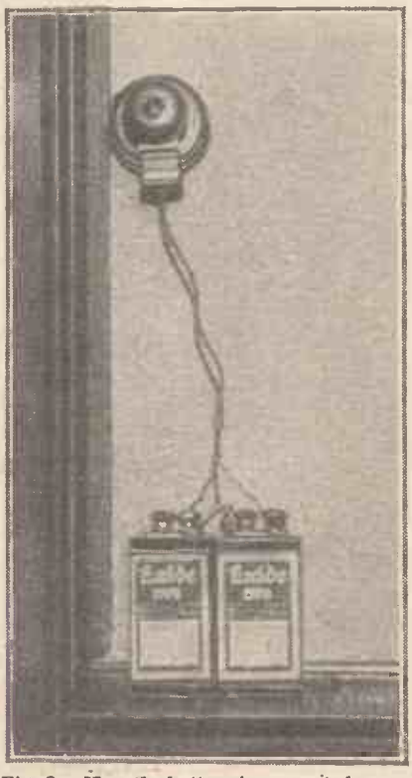


Fig. 3. Here the battery is connected across a switch so that the current used to light the lamp is passed through the accumulator

Fig. 2. One of the simplest charging arrangements is to use a reading lamp connected as shown in Fig. 1

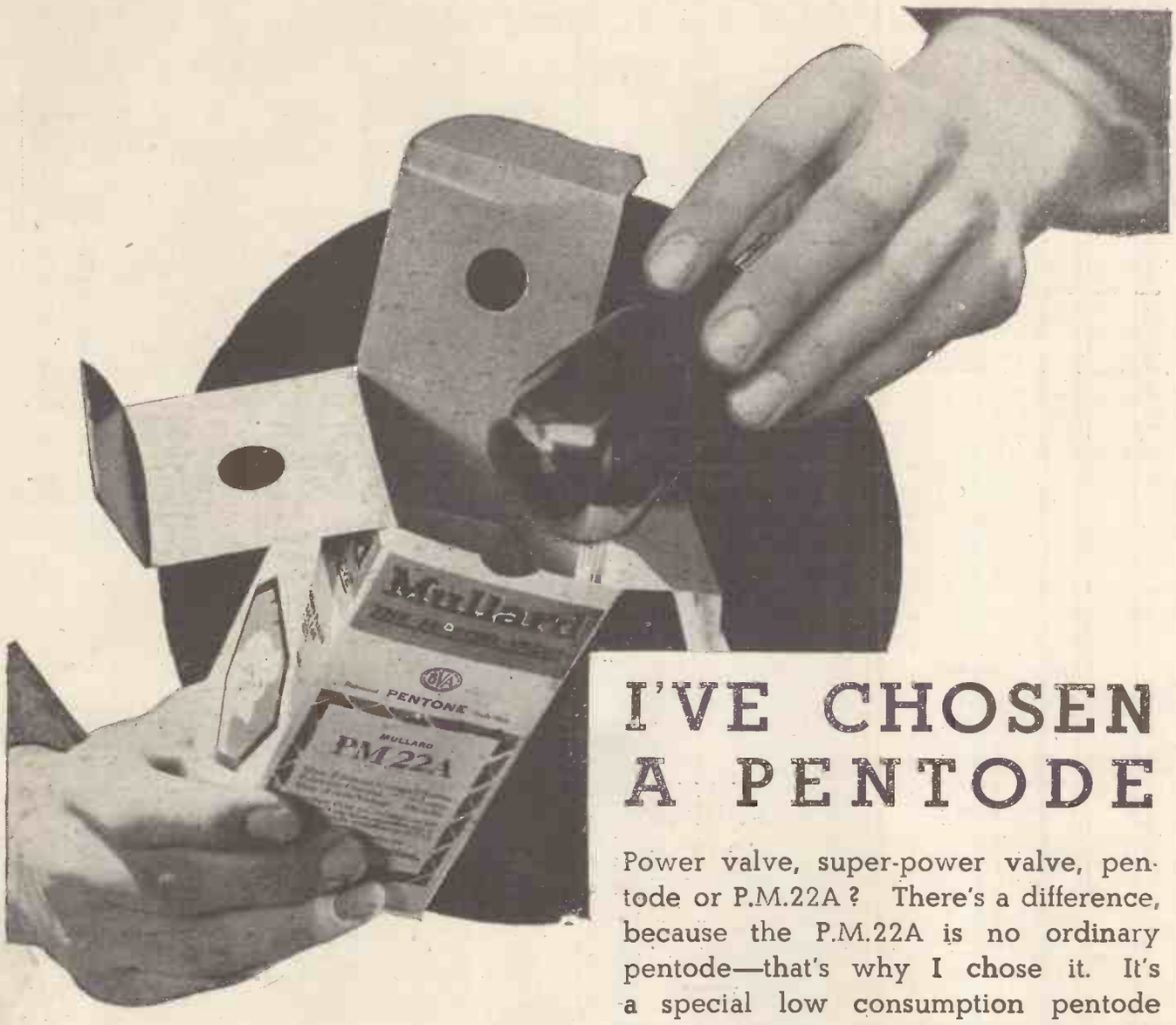
It is not always convenient to have the accumulator standing about in this way. A rather neater way is to "tap" a light at the wall switch, and this can be done as shown in Fig. 3. This method can be applied to the switch of any ordinary room light. It will be necessary to remove the existing switch, and replace it by one of the type shown having a socket to receive a two-pin plug such as is usually connected to a portable heating stove or other apparatus. A switch of this type can be bought quite cheaply, and an extra plug should be obtained at the same time to fit it. You will find that this switch has two positions in which to secure the wires which were connected to the original switch, and so it can easily be fixed in its place. The lamp will only now light up if the socket is shorted across, and so for ordinary use the spare plug is to be used as a shorting plug by connecting the contacts of its pins together with a wire which can be accommodated out of sight within the plug. With this shorting plug in the socket of the switch, it can be used in the usual way for controlling the light.

The other plug is to be used for charging, and should have a piece of flex connected to it. If this plug is substituted for the shorting plug, the free ends of the flex can be joined to the accumulator as shown, and they will then be connected across the break in the circuit for charging. You will have to find out the negative and positive wires as before, of course, and, having made sure of these, the plug should be marked so that it will be inserted the right way round on future occasions. Instead of mounting the accumulator on a shelf beneath the switch, it can conveniently be housed within the wireless set cabinet and the flex led in to it.

A QUICKER METHOD

It will probably occur to you that a fuseboard is one place at which a break can be made in the lighting circuit, and in Fig. 4 a rather more elaborate system is shown in which this is done. By this

(*Continued at foot of page* 50)



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1 T.C.C. .01-mfd. fixed condenser, type 34	3 0
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1 Dubilier .1-.1 fixed condenser, type BE256, 1,000-volt A.C. test	3 0
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S.T.400.—Complete kit, £4 17s. 6d., or deposit of 9/6 and 11 monthly payments of 9/9.

Model A.—Complete kit, with four specified valves and beautiful walnut cabinet, fitted with moving-coil speaker, £10 10s. or deposit of 20/- and 11 monthly payments of 21/-.

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Or twelve monthly payments of 13/-

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(Complete kit as specified with "159" Consolette cabinet, valves, and Epoch Twentieth Century Moving Coil Speaker)
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(Complete kit with valves, special Consolette cabinet and Epoch A3 permanent-magnet moving-coil speaker with multi-ratio input transformer)
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On Your Wavelength!

RESPONSE TESTS

A GOOD many of us, I expect, tried out our sets on that recent evening when Mr. Watson Watt and Mr. Brown conducted the transmission of musical frequencies ranging from 35 to 6,000. I was luckily able to make one set of tests myself and to have two others made for me. Careful records were kept and they are rather interesting. The three sets were of entirely different types. The first was a transportable of good make, which incorporates one of the best balanced armature loud-speakers that I know. Set number two was a super-heterodyne with a small moving-coil loud-speaker, whose reproduction did not quite satisfy my ear. The third set was one specially built for fine quality and having in the output stage two super-power valves in push-pull feeding a large-sized moving-coil loud-speaker.

HOW RECORDS WERE KEPT

THERE is a very simple way of keeping a record of tests like these. Take a piece of paper, squared for choice, and rule out on it a rectangle with its long side horizontal. Rule vertical lines to represent frequencies from 35 to 6,000 and then make equally spaced horizontal lines marked (at the bottom) "Inaudible," "Very Faint," "Faint," "Moderate," "Good," and (at the top) "Very Loud." Now, suppose that you hear, as you ought to, the 250-cycle note loudly and strongly, you make a dot where the "Good" line crosses that corresponding to 250 cycles. Treat all the other transmitted frequencies in the same way. You then obtain a row of dots, and by joining these with a continuous line you have a curve which gives you a pretty fair idea of the performances of the set and its loud-speaker.

MOVING-IRON VERSUS MOVING-COIL

THE results obtained on the three sets tested were very different and they show how deceptive the ear can be if you judge the performance of receiving equipment merely by listening to music. For instance, I knew that the balanced-armature could not deal with anything very low-pitched, but I would certainly have said that its range extended a good deal beyond the C one octave below the Middle. The frequency of Middle C is 256 and that of the next one below 128. To my surprise, I found that there was practically no response to anything below 150. From that point the response was almost level up to about 3,500, when it tailed off appreciably. A 4,000-cycle note came through, but one of 6,000 was barely audible. I had previously criticised the small moving-coil used with the super-het. as being good in "top" and "bottom" but rather lacking in "middle." The curve confirmed this diagnosis to some extent, but showed that there were good spots as well as bad ones in the middle. There was a just audible response from the 50-cyc'e note and then a very rapid rise to about 200. From that point to rather over 1,000 the curve was a waggly one, sagging generally downwards, but having a few upward peaks. There was another dip between 2,000 and 3,000, a peak at 3,000, and then a sharp tail off above 4,000.

THE STAR PERFORMER

THE star performer was, of course, the "quality" set with its big loud-speaker, though even here the curve showed that things might have been rather better, on paper at any rate. The 35-cycle note was heard, and from 50 cycles upwards a really good response was obtained. The middle portion was, on the whole, pretty regular, though a little peaking could be noticed. The note came through strongly up to about 5,000-cycles, when it began to tail off. At 6,000 it was only moderate. This is a set about which really musical people are most enthusiastic. Its reproduction of music is definitely pleasing to critical ears, though the test shows that it is by no means level.

WHAT DO WE WANT ?

MYSELF, I don't believe that we do want from the receiving set and the loud-speaker a perfectly level response to all frequencies between, say, 35 and 6,000. The task of the wireless set is not just to produce the studio transmission: it must produce a miniature version of it. What I am driving at is that in the average living-room you could not possibly stand the same volume of sound as occurs in the studio. You need an all-round reduction, but it must be in due proportion. Probably the most pleasing results are obtained from apparatus which tails off distinctly towards the bass end in its response; otherwise, the bass is apt to be rather overwhelming. As regards the higher frequencies, from about 4,500 upwards, music seems to lose very little of its brilliance so long as you have a good response up to 4,500, even if there is a pretty sharp cut-off from that point. Such a cut-off is worth while from another point of view, since it greatly reduces the effects of heterodyne whistles and background mush. I very much hope that the B.B.C. will give us more of these frequency transmissions at intervals. They have got the apparatus and I am sure that listeners would welcome such a feature.

FREEZING THE VOLTS

SO far, we haven't had much really cold weather this winter—though there's plenty of time yet—which reminds me that one should not leave the H.T. battery exposed to semi-arctic conditions. If the temperature stays too low, or if there are too many cold draughts about, the de-polarizer in the cells tends to "freeze up" and the voltage drops. It is difficult to say exactly what happens, except that a dry-cell battery is a bit of a sensitive plant to extremes of temperature. For this reason don't house it in too warm a place—e.g., not too near the fire—because then the moisture inside the cell is likely to dry up, and with it the output of "juice." On the whole, if you want it to have as long a life as possible, you should treat the H.T. battery on much the same lines as you would an aspidistra, especially during the winter months.

A PIONEER

WITH the death of Mr. G. S. Kemp, one of the pioneers of wireless has passed away. Mr. Kemp was Marconi's first assistant when the latter came to England in 1896 with the crude apparatus that was to have such wonderful results in years to come. Mr. Kemp began his career in the Navy, but later joined the research staff of the General Post Office, whose chief engineer was then Sir William Preece. Preece took the greatest interest in Marconi's early experiments, and it was through him that Kemp was associated with them. On the formation of the Marconi Company, Kemp joined the research staff, and from that

THE NEW "A.W." RECEIVER—SEE PAGE 48

OVER 90 STATIONS IN BIRMINGHAM!

On Your Wavelength! (continued)

time onwards he played a leading part both in experimental work and in those early transmissions over rapidly increasing distances which stand out as landmarks in the history of wireless. In 1901 he went with Marconi to Newfoundland and together they heard those epoch-making repetitions of three dots transmitted across the Atlantic from Poldhu in Cornwall. Kemp lived to see the triumph of wireless in the great Empire broadcast made on Christmas Day, 1932.

EMPIRE RESULTS

REPORTS so far received show that the Empire short-wave station is already surpassing expectations. It was hardly hoped that success would come from the very first, for it was expected that a good deal of experimental work would still be required before the optimum wavelengths could be determined. It is true that there is still a good deal of work to be done, but already good reports have come from most parts of the Empire, with the exception of Canada. As I was bold enough to predict, the maximum wavelength available—49.58 metres—is too short for night-time transmissions to the Western World at the present time. I expect that the range will have to be extended up to at least 70 or 80 metres, for it seems likely that during the next year or two not short shorts, but long shorts, if I may so put it, will be needed for the Canadian service.

A BLOW

FATHERS are apt to receive shocks to their nerves in these days, when the young know so much about wireless. Some days ago my youngest young hopeful and I each embarked upon the construction of super-hets. He chose the "New Century Super" whilst I undertook something more ambitious—eight valves, no less—of my own design. He finished first and I was called in to admire the excellent performances of his set. It works admirably—but mine doesn't. It is no good my explaining that it is only just this or that that requires attention and then all will be well. The cold, hard fact remains that the youngster with his "New Century Super" can get stations that I can't!

A GOOD 'UN

I TAKE off my hat to the designers of the "New Century Super." When I saw the circuit I realised that it was something pretty good, but now that the set is working in my own home I can tell you, from first-hand experience, that it is something quite out of the ordinary in the way of battery-operated super-hets. It is very simple to make up and delightfully easy to operate. You can also turn it into a jolly good radiogram with small alterations in the wiring.

WAVELENGTH WARFARE

SEVERAL little skirmishes are going on just now between European broadcasting stations. One of the most interesting is the combat centred around Luxembourg. If you remember, this 200-kilowatt transmitter has been erected mainly as a money-maker from advertising revenue. It wants a wavelength in the neighbourhood of 1,250 metres, but its application was, I understand, definitely turned down by the recent Madrid Conference. Further, an output rating of 200 kilowatts exceeds, I believe, the figure agreed upon as the limit by European broadcasting authorities.

SIDEBAND SPLASH

WHAT is going to happen I do not know, but I do hope that this monster station will not be allowed to cause terrific interference on the already overcrowded long-wave band. Owing to the geographical position of the station and to the enormous wipe-out that it would cause, it would probably play havoc if allowed to use its full power. On the medium waves there is still a spot of bother between Breslau, the Poste Parisien, and Milan. Breslau and the Poste Parisien are 60-kilowatters and Milan is just a size smaller with 50 kilowatts. With only a 9-kilocycle separation between them, they are causing considerable mutual interference, particularly as regards sideband splash—that horrible spluttering noise which occurs when the unwanted station is transmitting speech.

Actually it won't be long before we have a good many other small bands of wavelengths containing three, four, or five super-power stations on adjacent channels. As I have often said, if something is not done to limit the output rating of stations to reasonable figures there will be appalling chaos on the broadcast band before so very long.

SETTING THE TRIMMERS

Use a pair of insulated-handle pliers when adjusting metal-ended trimmers on ganged condensers. This cuts out any possibility of hand capacity. In the same way, you should use an insulated-handle screwdriver when adjusting trimmers fitted on top of a condenser

THE TROUBLE

UNFORTUNATELY, it is no good saying that receiving sets can keep pace with increased power on the part of transmitters by becoming more and more selective. It has been proved, both mathematically and experimentally, that high selectivity cannot get rid of this kind of interference. One trouble is that stations habitually modulate very deeply or even over-modulate when they are sending out speech—hence the horrible spluttering break-through that occurs. Sideband splash is one of the most serious problems of the day, and it will have to be tackled thoroughly by broadcasting authorities if the high-powered transmitter is not to defeat its own ends.

VALVE STANDARDS

CONSIDERING the prices charged for valves, the "tolerances" allowed in the tests made before they are passed on to the shelves for sale are still far too wide. When you buy a valve with a rated mutual conductance of, say, 2.5 you ought to be sure of getting something whose actual performance is pretty close to this figure. As it is, the odds are that the real mutual conductance and the stated one will differ very considerably. This means that you can never be quite sure that a new valve will give quite the same results as the one which it replaces; it means, too, that results may be disappointing in places where you want trios or pairs of valves fairly closely matched, as you do in I.F. amplifiers or in push-pull output valves. To show how big the discrepancies often are, I quote the figures obtained during a test by a trade paper of the highest standing on a batch of six screen-grid valves sent in for trial. The rated mutual conductance was .75 milliampere per volt. The figures obtained were: No. 1, .75; No. 2, .6; No. 3, .6; No. 4, .85; No. 5, .7; No. 6, .6; If you care to calculate the percentages of deviation from standard, you will, I think, be rather surprised.

MORE WIRELESS OPERATORS

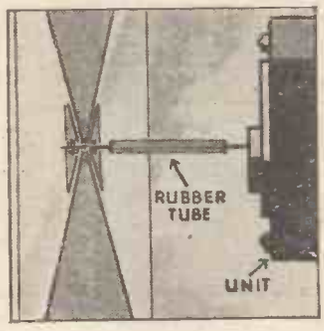
THE new regulations which make it compulsory for all passenger ships of over 5,000 tons to carry direction-finding equipment, as well as the ordinary wireless gear, should create a lot of new vacancies for young wireless enthusiasts who may have a fancy to combine the lure of the open sea with that of their favourite hobby. The regulations set a time limit of two years for the scheme to be brought into operation, so that everything must be in full swing by January 1, 1935—which gives plenty of time to go into training. In addition, passenger ships of 3,000 tons and upwards, as well as cargo ships of over 5,300 tons, must now keep continuous watch, and carry at least one qualified operator. If they are not also fitted with automatic "calling apparatus" set to give an alarm on the receipt of an S O S, they must, of course, have extra operators to keep a twenty-four-hour watch.

THERMION.

That Radio Dodge

PREVENTING RESONANCE

IN linen-diaphragm speakers, and others where there is often a considerable length of threaded rod from the unit to the dia-



phragms, you sometimes notice a rattle on loud notes. This is due to resonance of the long rod. It is easily cured by slipping a length of valve rubber tubing over the rod.

MOUNTING ON METAL

WHEN fixing H.F. chokes, pre-set condensers, valve-holders, etc., to metal baseboards, a little inspection sometimes saves a great deal of elusive trouble. Manufacturers sometimes overlook the fact that their components may have to be screwed on a metal surface, and allow screw-heads to protrude so that they short circuit. To avoid this put a small piece of card, cut to shape, under each component.

PREVENTING SQUEAKS

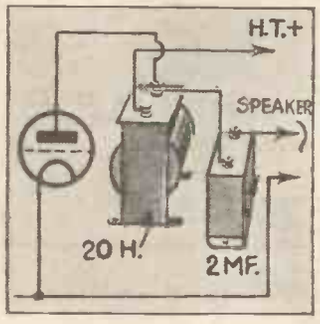
THE special fine machine oil which is sold in small cans for motoring jobs is handy in lubricating certain small parts in a set. You should never get a film of oil on switch contacts or on condenser bearings which are intended to carry current, but the fine oil can safely be used on rotary parts which do not have to make electrical continuity. Slow-motion dials work more smoothly if an occasional drop of oil is applied to the gearing; but do not put oil on friction drives as it may cause slip.

KEEP OUT THE DUST

NO matter what type of speaker you have, you will find it important to keep dust out of the movement. Metal dust covers are not always sufficiently protective. A good plan is to stretch oiled cloth (a piece of a tobacco pouch, for instance) over the movement, tieing it at the back.

OUTPUT CIRCUIT VALUES

IF you are in doubt about the correct values of condenser and choke in an output circuit, study the accompanying dia-



gram. This shows typical values for the average power valve output, and used with a normal speaker. A centre-tapped choke must be used with a pentode, in order to secure proper impedance matching.

STARTING SCREWS

WHEN it is necessary to insert a screw or nut into an awkward position between two components a very useful tip is to use a piece of soap. By rubbing a little soap into the head of the screw it can be made to stick to the screwdriver and then be pushed down between the various components actually on the end of the screwdriver. The hole should have been made first with a bradawl and the screw is then ready for screwing in.

Again, where a nut has to be inserted on a bolt or a terminal shank the nut may be caused to stick to the end of a pencil by the use of a little soap.

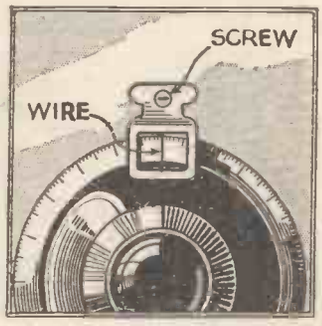
Still another use for soap is to grease brass screws which are being inserted in oak or other hard wood. There is a great danger in such cases that the screw will break off, particularly if the hole made with the bradawl is not quite large enough. If they are well lubricated with soap before commencing operations they will be found to go in quite easily without breaking.

EFFECTIVE BAFFLE

CABINET baffle fronts are available in various sizes from wood stores. You must take care to use a baffle of the right size for the speaker. If there is even a small gap around the diaphragm, there will be a leakage of bass.

A DIAL HINT

THE sketch shows a simple device to secure an accurate tuning indication on dials where a hair-line is not fitted. A fine



wire is stretched, as shown, across the opening.

A TAG TIP

MOST battery-driven sets are provided with spade tags. These are usually nickel-plated brass and suffer in time from corrosion, due to the acid fumes from the accumulator. Even greasing with vaseline does not overcome this difficulty although it helps matters.

A simple and effective cure can be obtained by cleaning the tags thoroughly and then applying a coating of solder from a hot iron on both sides, taking care that every part of the tag is covered. The tinned tag is quite effective and no further trouble from corrosion will be experienced.

CONNECTIONS TO SCREENS

WHEN it is necessary to connect a wire to a metal screen or chassis, the surface of the metal should be thoroughly "clean" and bright at the points of contact, otherwise a poor connection will result. Scrape the screen with a knife or rub it with emery paper around the hole for the screw or bolt to which the wire is to be connected. This precaution is especially necessary if, as is often the case, the metal has been coated with lacquer before being sold.

DAMP TRANSFORMERS

THE windings of a transformer fitted to a speaker chassis must not become damp. The windings are generally impregnated, but if you have any doubt about the possibility of the ingress of moisture, bind empire tape around the outside of the transformer.

BUZZING TRANSFORMERS

IT is most important to keep the laminations tight on a transformer. A buzzing will be heard if there is any looseness.

The diagram shows this detail on the input transformer fitted to a moving-coil speaker.

CHANGING THE TONE

HAVE you ever tried doping the cone of an ordinary speaker with the cellulose-type dope used on linen speakers? Cones treated in this way can often be improved. Not only are they made impervious to moisture, but the tone is changed.

DO YOU KNOW—

THAT you should never alter the grid bias while a set is switched on? Switch off before moving the plug for otherwise, for an appreciable period of time, the power valve will be without grid bias while the plug is being moved. This may cause the anode current to rise to such an extent that the valve may be damaged.

THAT hum isn't always cured by earthing the core of a transformer? In fact, in many sets interaction is caused by earthing the cores. A transformer having a separate earthing terminal is always an advantage, but you should follow the published set design with regard to whether or not the terminal is used.

THAT if you suspect mains hum is being picked up by a transformer in a set it should temporarily be wired up with long leads so that it may be turned round and the position of its core with respect to other parts changed? A position may be found where there is no mains pick-up.

"A.W.'S SENSATIONAL NEW RECEIVER

WORLD-WIDE RECEPTION FOR ALL :: THE AMAZING NEW "A.W." RECEIVER NOW BEING GIVEN A NATION-WIDE TEST :: TRAVELLING FROM LONDON TO EDINBURGH AND BACK TO EXETER :: RECEPTION REPORTS FROM ALL OVER THE COUNTRY :: A DEPARTURE FROM CONVENTIONAL DESIGN

WHAT is the best way to find out whether a set is good or bad?

In these days of difficult reception, ether congestion and station-jamming, there is only one way.

It must be rigidly tested.

As regular readers will know from previous announcements and from the competition now running, "A.W." is shortly producing an **entirely new type of receiver for universal reception under all conditions.** It is a distinct breakaway from conventional design. Nothing like it has ever been done before. When the full details are announced, set builders will be amazed that anything so ingenious and so practical could be produced for home construction from a simple kit of parts.

It is something so outstanding in the way of sets that there is only one way in which to prove it practical.

THE SET IS BEING TESTED IN THE MOST THOROUGH FASHION. IT IS BEING TAKEN ON TOUR ALL OVER THE COUNTRY AND IS BEING REGIONALLY TESTED IN ALL THE IMPORTANT CENTRES.

The map shows the main Regional centres which are covered by the B.B.C. Regional transmitters, and the "A.W." tour with the new set is worked in conjunction with current Regional reception so that readers can know just how the new set operates under present-day conditions.

THE TOUR, STARTING FROM LONDON, EMBRACES CLACTON, KING'S LYNN, BIRMINGHAM, MANCHESTER, GLASGOW, EDINBURGH, BLACKPOOL, CARDIFF AND EXETER.

The trip, you see, covers not only the areas in which good strength is always obtained, and in which extreme selectivity is the greatest need.

It also covers the alleged "blind-spot" areas where reception with normal sets is bad. *"A.W." will thus be able to prove that the new set is ideal for nation-wide reception.*

The big points of the new set cover range, selectivity, wide wavelength coverage, amazing purity of reproduction, and a host of other good features.

Each of these capabilities is being put to the test in the leading towns, so that when first constructional details are given, "A.W." will be able to assure in absolute confidence the worthiness of this amazing new receiver for home construction.

The tour is creating immense interest in technical circles, for not only is the receiver itself unique, but it is being put to the test in the most thorough way, under night and day conditions.

Owing to the nation-wide reception test we can guarantee that the new set justifies its name.

And the name is . . .

THE "MELODY RANGER."

It is a set which will entirely revolutionise your ideas of what a receiver ought to do.

It is worth waiting for!

EXPERTS ARE AGREED THAT THE "MELODY RANGER" IS *THE* SET FOR PRESENT-DAY CONDITIONS, AND A SELECTION OF OPINIONS FROM NOTABLE PEOPLE IN THE INDUSTRY ARE PRINTED ON THE OPPOSITE PAGE.

In next week's issue full details will be published of the tour, and reception reports will be published, proving without a shadow of doubt that the new receiver is all we claim it to be.

The tour was arranged so that tests could be conducted on the east coast, in the midlands and north, in Scotland, in a difficult part of Wales for reception, and down in the west country, where reception is proverbially bad.

The report will convince you that the **"Melody Ranger" is the modern solution to the modern problem of difficult reception.**

REGIONALLY TESTED!

This map shows the regional centres and the towns included in the test tour of the "Melody Ranger"

CAN YOU FORECAST THE DESIGN? SEE THE ANNOUNCEMENT ON PAGE 56

WORLD-WIDE RECEPTION FOR ALL

THE "MELODY RANGER" AND SOME EXPERT OPINIONS

Direct Radio
159 BOROUGH HIGH STREET
LONDON BRIDGE S.E.1

Our Ref. DPM/AS Your Ref.

2nd January, 1933.

The Editor,
Amateur Wireless,
58 Fetter Lane,
LONDON, E.C.4.

Dear Sir,

Your new "Melody Ranger" will be the outstanding set for 1933. This is the opinion I have formed after personally making exhaustive tests, covering all wavebands. To design a set which gives perfect reception on four wavebands without cumbersome coil changing is an achievement; but to keep the cost within the limits of a five-pound note is doubly so. My warmest congratulations to all concerned who have so successfully brought worldwide radio within the reach of Britons at home and overseas.

With all best wishes for the New Year,

I am,

Yours very sincerely,

(Donald P. Marcus)

Donald P. Marcus (of Direct Radio) says : " Your new 'Melody Ranger' will be the outstanding set for 1933 "

W. Scott Worthington (of the Peto-Scott Co., Ltd.), says : "Both the designer, and your paper, are to be congratulated upon such an achievement "

G. P. Kendall (of Ready Radio, Ltd.), says : " Selectivity is adequate, range and sensitivity are quite outstanding. Altogether, a very fine broadcast receiver "

J. H. REYNER
B.Sc. A.C.G.I. D.I.C. A.M.I.E.E. M.I.R.E.
CONSULTING RADIO ENGINEER

The Editor,
AMATEUR WIRELESS,
58-61, Fetter Lane
E.C.4.

Dear Sir,

The achievement of the "A.W." Technical Staff in producing a satisfactory receiver covering, in a self-contained manner, two of the short-wave ranges in addition to the usual broadcast bands, is a veritable triumph. The principal drawback of short-wave listening is that it usually requires a separate receiver and, as often as not, this is not in commission at the particular time when one wants to hear a programme. This difficulty is now overcome since the "Melody Ranger", one's ordinary receiver, is immediately available for short-wave reception whenever required.

One might be prepared to pay quite handsomely for such a useful effort, but it seems that now the design has been worked out the cost is in the neighbourhood of £5. only for the complete receiver. One is tempted to prophesy unusual popularity for this set

Yours truly.

J. Reyner

J. H. Reyner, B.Sc., A.M.I.E.E. says : " The achievement of the 'A.W.' Technical Staff . . . is a veritable triumph "

A. GODCHAUX ABRAHAMS
("JAY COOTE")

70 CLIFTON HILL,
LONDON, N.W.8.

January 3rd, 1933.

The Editor,
AMATEUR WIRELESS,
58-61, Fetter Lane,
LONDON, E.C. 4.

Dear Sir,

My visualisation of an ideal wireless receiver has always been an instrument which would permit me to listen to broadcasts on long, medium and short wavelengths without having to change coils - a set which would give me good production of wireless entertainments from a number of home or foreign stations or, if I so desired, from gramophone records. It should be easy to construct and its cost and upkeep should be such that it should be within the reach of the majority of listeners. In addition, it should be battery operated in view of the fact that electric mains are not yet - and not likely to be for some time - available to all households in the British Isles.

The "Melody Ranger" appears to fulfil all these conditions to an extent far beyond this dream conception and is presenting such a receiver to your readers you have, at least, anticipated 1934.

Heartiest congratulations on a bold but successful venture; carry on with the good work.

Sincerely yours

J. Godchaux Abrahams

J. Godchaux Abrahams ("Jay Coote"), the well-known European Broadcasting expert, says : " In presenting such a receiver . . . you have, at least, anticipated 1934 "

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The Editor.
AMATEUR WIRELESS,
58/61 Fetter Lane,
LONDON. E.C.4.

Tuesday,
3rd January,
1933.

Dear Sir,

I thank you for the advance information you have so kindly supplied me with concerning the "MELODY RANGER".

It is with regret that the tremendous rush of Christmas orders prevented me from availing myself of your kind invitation to personally test this set out before Mr. Rutherford Wilkins took it upon his west tour.

Now that Short-Wave fever is showing signs of increasing, this set has come at an opportune moment as something which the Constructor is waiting for. I feel confident that Mr. Wilkins will justify his claims, as both the Designer and your Paper are to be congratulated upon such an achievement as 13-2000 metres without changing coils.

If this set is anything like past WINNERS, such as the "ETHER SEARCHER", and "CENTURY SUPER", then the "MELODY RANGER", is (in your own words) a "GEM".

Wishing you and your readers all the best for 1933,

Believe me,

Yours sincerely,
For and on behalf of
THE PETO-SCOTT COMPANY LIMITED
W. Scott Worthington
MANAGING DIRECTOR.

WSW/CS.

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Eastnor House · Blackheath · London · S E 3

Directors: IVOR M. S. MUSTELIN · G. P. KENDALL

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GPK/LS

Monday, 2nd January 1933

Bernard Jones, Esq.,
c/o, Bernard Jones Publications Ld.,
58-61, Fetter Lane,
E.C. 4.

Dear Mr. Bernard Jones,

I have made careful tests on the extremely interesting 4-valve receiver lent to me by Mr. Wilkins, and I think you may be interested to hear my conclusions.

On the medium and long wave-bands I was definitely impressed. Selectivity is adequate, range and sensitivity are quite outstanding. Altogether, a very fine broadcast receiver.

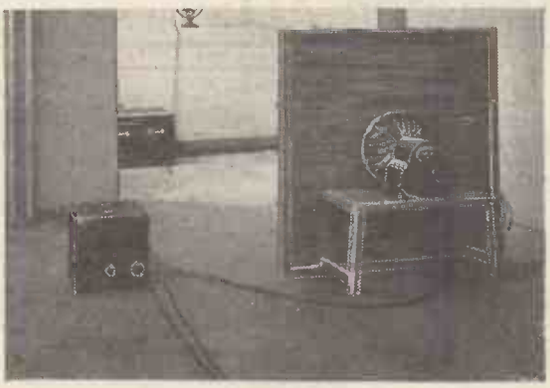
On the two shorter wave-ranges I must confess I received a surprise, for I expected the usual kind of performance one gets from "compromise" sets with multi-range switching, and actually got very fine results indeed.

The new receiver is undoubtedly a notable achievement, fully worthy to take its place in the long line of successful "A.W." "Boom" sets, and I congratulate its designers on their fine work.

Yours sincerely,

G. P. Kendall.

THE "MELODY RANGER" is a DISTINCT DEPARTURE from CONVENTIONAL DESIGN



One of the two-stage amplifiers feeding the echo-room loud-speaker

AT THE B.B.C.

FEEDING *the* LOUD-SPEAKERS!

WHILE most of the B.B.C. apparatus is quite different from amateur gear, there are one or two things which would find place in a good-quality amateur-built receiver.

To take just one example, there are the mains-operated amplifiers, of which there is one in every listening room at Broadcasting House.

These are used to supply the speakers fitted in the well-known "Broadcasting House"-type speaker baffles. If the programme director or producer wants to know how a production will sound when broadcast, or if he wants to hear an item which is actually being broadcast, without having to go to the press listening room, he has only to switch on the box baffle speaker. These speakers throughout the building are normally connected to a check receiver tuned to the National programme, but they can also be switched on to any studio.

It is the amplifier section of these amplifiers which is interesting, for in the top part of the box is an energised speaker fitted with a baffle.

Beneath is an amplifier and it is an outfit which would be very suitable for amateur gramo-radio work. It would, of course, be possible for all the amplification to be done in the control room and for the programmes to be transmitted at a high level on the speaker wires throughout the building. There are obvious objections to this, and so the amplification in the control room is comparatively small and the power amplification is done by the mains-fed amplifier in the speaker box.

Actually, the level of the programme or of any music transmitted throughout the building on the loud-speaker wire is no higher than it is on the ordinary house 'phones.

The construction of one of the studio amplifiers can be seen from an accompanying photograph. Each amplifier is in a small box, absolutely self-contained and working from 240-volts 50-cycles A.C. mains. The amplifier is a two-stage job, with the output going direct to the energised moving-coil speaker above. The "gain" or total amplification is 40 decibels and the quality of the output is up to B.B.C. standard.

A B.B.C. speaker amplifier removed from its cabinet to show the construction

"CHARGING ACCUMULATORS FROM D.C. MAINS"

(*Continued from page 42*)

method, all the current used at any time in the house is utilized for charging purposes, or with a subsidiary fuseboard the current in any particular set of lamps can be employed. The wiring diagram is shown in Fig. 5 and should be easily followed.

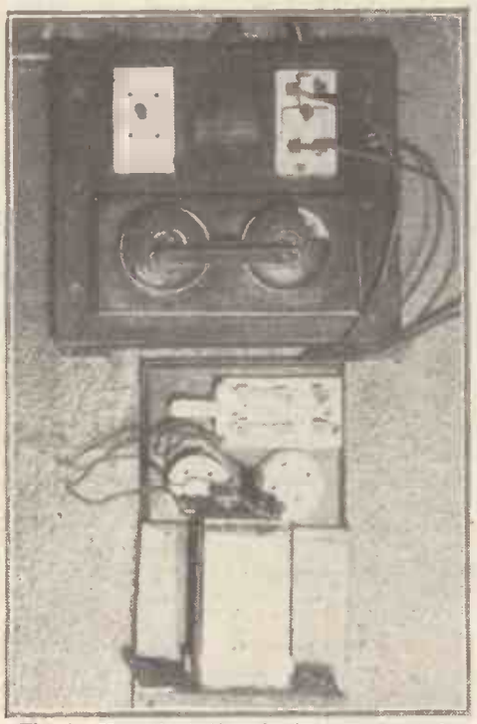


Fig. 4. Here the battery is shown connected near the meter so that all the current used in the house passes through it

The two original fuses F (in the rectangular holders) are tested as already described to find out which one is in the earthed lead. On the board shown this was found to be the right-hand one. This fuse is then removed and two wires are connected to the terminals in the holder. Below this board is mounted a second board, and on this are secured a double-pole double-throw porcelain mounted switch and two fuse-holders F (the circular ones). The two wires which have been connected to the upper fuse holder are now connected to the two fuses F, which in turn are connected to the two centre contacts of the switch. The two right-hand contacts are shorted across by a piece of wire so that when the switch is in the right-hand position the circuit is merely completed through the fuses f instead of the right-hand fuse F. To the left-hand contacts of the switch there are connected a pair of wires which after being tested for polarity with the switch in the left-hand position, and at least one light in the system switched on, are ready to be connected to the accumulator to be charged. Any connecting or disconnecting of accumulators can be done with the switch in the right-hand position, and it can then be moved to the left of charging position with only a momentary interference with any lights that are being used. It may be as well to say here that before making any alterations to the wiring such as just described the main switch should always be turned off first.

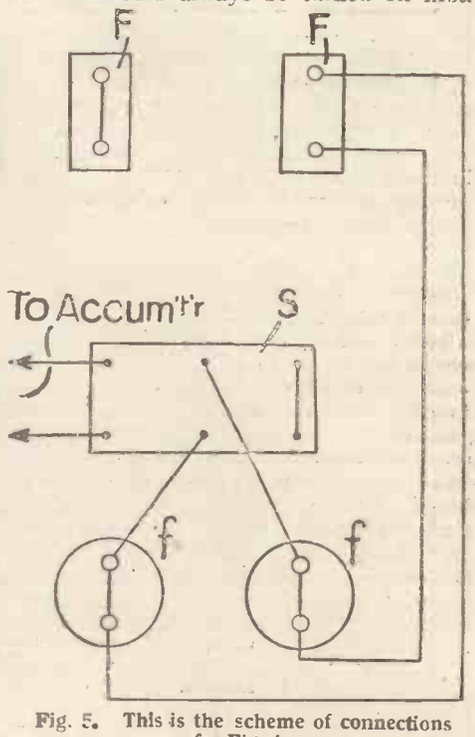


Fig. 5. This is the scheme of connections for Fig. 4

Finally, whichever method is used, make sure that the light or lights in the circuit do not pass more current than is safe for the accumulator.

OUR BROADCAST CRITIC ON MELODRAMA

I MUST own to a vulgar taste for a good melodrama. The term "melodramatic" is often used (by those who presumably do not understand its meaning) to indicate something undesirable. Not a bit of it! A good melodrama is good stuff—and good broadcasting stuff at that.

In my view *The Green Goddess* is one of the best melodramas ever put on the stage. Its atmosphere is so strong that you cannot possibly lose yourself so long as you listen with reasonable intelligence. Therefore it makes good broadcasting.

One or two lines might perhaps have been omitted. Without being in the least prudish, the objection I raise (less on my own behalf than on the behalf of listeners who are more particular than I am in these things) is that "strong" lines spoken on the stage, when you can see what is going on, seem quite mild; or, if they do not, you somehow excuse them. When they come floating out of the ether into your drawing-room they give you a bit of a shock.

This play has brought much correspondence to Broadcasting House—but there you are! People will always cry out at the slightest departure from the strictly decorous. At all events, nobody could quarrel with the *production*. Howard Rose handled the play perfectly. I thought Mr. Lion, in his intensity, cuddled the microphone a little too much; he "blasted" badly once or twice. Isobel Elsom and Frederick Lloyd roused my admiration for the way they delivered some of their lines. A very good entertainment.

◆ ◆ ◆

I was intensely amused when the "Chairman" of the Variety Show said that Nora Savage was a soprano, not a contralto as billed in the programme. Miss Savage proved the point by soaring to the E flat *in alt*. Did I not hear the good Tommy Handley down on the low E flat? I congratulate him sincerely; I had no idea he possessed that note. He, by the way, said some funny things, but only *some* funny things. He seems to have a mis-conception of what is expected of him. He must *never cease* saying funny things. Will he please do something about it for next time?

◆ ◆ ◆

Kenneth Blain was described in the same programme as an Intelligent Fool. My natural reticence deters me from offering comment on this description, but I will say I did not like his song. This, according to the programme, was his maiden broadcast. If he will try again with some better material he will probably be a great success.

◆ ◆ ◆

There was a mid-week recital in which Esther Coleman and John Morel took part.

LEONARD HENRY

Who featured in the recent Children's Hour from the Princess Louise Hospital

Miss Coleman has a voice to which the microphone is very kind. That is her good fortune because it is not so with everyone. Mr. Morel pleased me immensely because he pronounced his words clearly, but I want him to leave out the sob in the pathetic parts. Baritones should not sob. They can leave it to tenors. In any case, a sob by microphone often sounds like a hiccough.

◆ ◆ ◆

So the theatre people let Gracie Fields come to the microphone after all! She was very good—as she always is, in her way. If you like her way you think there is nobody like her; if you don't like her way, you hope there is nobody else like her! I am getting to like her way, by the way.

◆ ◆ ◆

Muriel George and Ernest Butcher are fast becoming very successful broadcasters. Mr. Butcher's humour is not too broad He has "twigged" the fact that a little delicacy in humour can go a long way by wireless.

◆ ◆ ◆

Another successful comedian is Max Miller. He ought to develop his own style until he becomes a real microphone personality. It *has* been done and can be done again. The successful broadcaster, after all, is the broadcaster whose personality is quickly recognised.

◆ ◆ ◆

Concerning those Foundations ... *Should* we include Liszt's pianoforte compositions amongst them? I wonder.

◆ ◆ ◆

THE WINTER PROMS

The first Prom went off with a bang. I was disappointed because Evelyn Scotney was too ill to go to Queen's Hall and sing the Verdi aria. I like Evelyn Scotney and I like that particular aria. However, I was much comforted when Elsie Suddaby sang "Let the Bright Seraphim" which she did amazingly well. A word of thanks to the good trumpeter, Ernest Hall, who blew some really telling notes. Handel for me every time!

◆ ◆ ◆

Solomon played the *Wanderer Fantasia* with all the necessary fire. What "tripe" it is! I wonder what Schubert would have thought of Liszt's arrangement of his own favourite song. I think he would have called it "tripe," but have owned that some of it was very lovely. Anyhow, excellent for a Saturday night Prom.

◆ ◆ ◆

Of course, Moussorgsky's "Song of the Flea" went down; it always does. I do not know that I have ever heard it *better* sung than by Harold Williams. He snarled—as indeed he should—but his snarls were musical snarls. That is everything when you are singing the part of Mephistopheles.

◆ ◆ ◆

The New Year broadcast from all over Europe was a distinct disappointment after the thrill of the Christmas afternoon transmission. Nothing but bad orchestras playing worse music. The worst of all was "Midnight in Holland" with that awful organ-playing. Is that the best they can do in Rotterdam?

◆ ◆ ◆

The Virtuoso Quartet always appeals to me; Marjorie Hayward's tone is so pleasant. I consider these players—the other three are Edwin Virgo, Raymond Jeremy and Cedric Sharpe—have formed one of the best-balanced quartets in London. And that is saying something!

WHITAKER-WILSON.

PROGRAMME POINTERS

Those who can accept in any degree the general form of the Sunday programmes may not have been displeased with the broadcasting on New Year's Day. It began at 12.30 with a violin recital. From one o'clock until 2.15 there was a quintet with a baritone. Then followed half an hour of gramophone records devoted to Viennese music and an hour's light classical music, after which the programmes divided. One side gave a children's service, while the military band occupied the other. What I thought generous was the recital by Beatrice Harrison at 5 in the Regional and another at 5.30 by Isobel Baillie in the National. Thus the hour from 5 to 6 has at last become the personal hour for which I have asked so many times. The evening service was from Canterbury Cathedral, with a beautiful Gibbons anthem and the Archbishop as preacher. At 9.5 there was a choice between a light programme by the Theatre Orchestra (with two singers) and a chamber music concert by the Virtuoso Quartet with Eric Greene singing Elgar and Delius. All we now need to complete the Sunday programmes are two Epilogues—one definitely religious, the other aesthetic and definitely English. Is there any chance of our getting them?

The HOME-STATIO WITH NORM

By JOHN B. CROFTS

This helpful article tells yo driven two-valver, construct Instructions are also given f can be used to cover the whc pre-set t

LAST week constructional details were given of the novel set appropriately known as the "Home-Station A.C. Two."

This is a self-contained receiver incorporating a mains unit and permanent magnet moving-coil speaker, all in the one cabinet. It is fitted with a pre-set type of tuning, so that a choice of stations can be obtained at the flick of a switch.

It is a no-trouble set, requiring no tuning after preliminary adjustment, and having no batteries to be charged.

The various units are built up separately and are connected by flexes, so that the assembly can be completed when the major parts of the set and mains unit have been wired up.

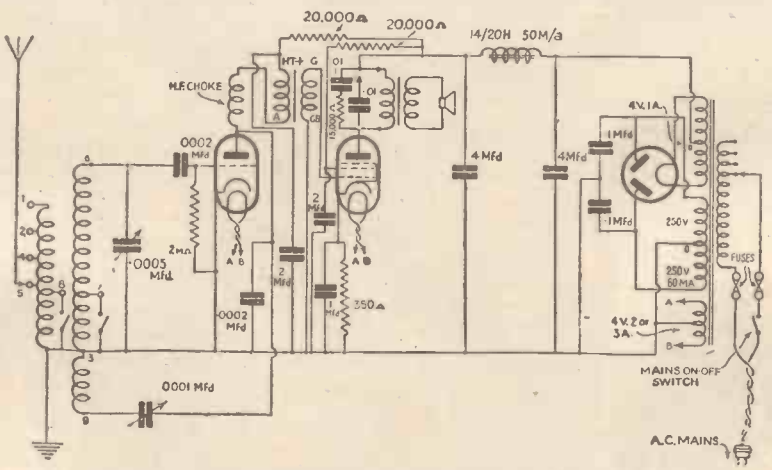
In last week's issue the main constructional details were given, together with helpful photographs. It now remains only to test out the set and make the preliminary tuning adjustment, so that the pre-set tuning switch can be brought into use.

TESTING IT OUT

The main part of the receiver and mains unit wiring is carried out on the square-corner system, and flexes connect between the receiver baseboard and the mains unit baseboard above.

Check over the square-corner wiring of the receiver before the mains unit is mounted in place on its plywood legs. The wiring of the set itself is not very complicated, and if you follow the blueprint you can check each wire in turn. It is best to follow the numerical order for then you will be sure that no wires have been omitted or left unchecked.

When you are sure that the wiring of the receiver section has been carried out accurately, the mains unit can be mounted in place and the wiring of this section checked. This is very straightforward, and except for the terminal connections of the mains transformer, there is no difficulty about it.



This is the modified circuit which will allow the "Home-station A.C. Two" being tuned on the medium- and long-wave bands

It works entirely from A.C. mains and is self-contained, as all the mains apparatus is in the cabinet.

It is quite a simple set to build, although from the photographs it may appear complicated. The simplicity is obvious when it is remembered that the set includes mains unit and speaker in addition to the receiver section.

MAINS WIRING

Just a word about this transformer wiring. The low-tension supply is taken from the top row and the right-hand row of terminals. The high-tension supply is taken from the terminals 250—0—250 on the left-hand side. All these terminals are on one face of the transformer, while on the other face are the input transformers.

In the transformer specified there are five input tappings, ranging from 200 to 250 volts in 10-volt steps. Choose the correct tapping for your supply, the marked brackets on the terminal strips showing which pairs of terminals are to be used for each voltage.

The mains wires to the transformer to the fuse block and to the panel switch

The constructional difference in providing conde

ON A·C· TWO
MAL TUNING

u how to test and operate the novel mains-ional details of which were given last week. for fitting separate tuning, so that the receiver le of the medium- and long-wave bands, the uning being dispensed with

can be twisted for neatness. You will see that the mains input flex is taken to two terminals of the fuse block, and the other two terminals of the block are connected one to the transformer and one to the mains switch.

An additional wire is taken from the other side of the mains switch to the second transformer terminal.

When you are satisfied that the wiring is O.K., the valves can be plugged in and a first test made.

Mains valves must, of course, be used, a detector, pentode and full-wave rectifier being needed. Mullard A.C. valves were used in the preliminary tests.

Plug in all three valves (there is room for the receiver valves to be inserted without lifting the mains unit) and switch on.

If one of the fuses blows, then check over the wiring and make sure that you have no possible short-circuit in the mains input side before replacing the fuse and switching on again.

enser tuning will be clear from this photograph

If the construction has been properly carried out, the valves should warm up in ten seconds or so, and then the set will be ready for working.

PRE-SETTING TUNING

A feature of the set, as standard, is its pre-set tuning device which enables a choice of two stations to be obtained simply by switching and without any knob turning.

There are two .0005-microfarad variable condensers, each of which must be individually tuned so that the two positions of the change-over switch give a choice of programmes.

Connect up aerial and earth and see that the station selector switch (left-hand) is clicked into one position. One of the two tuning condensers on the little bracket will then be found to be operative, while the other is "dead."

Tune in one of the local stations, using the reaction condenser on the front of the set as an aid to tuning.

When this one station has been tuned in as accurately as possible, click the station selector switch over to the other side and, taking care not to upset the tuning condenser just adjusted, tune in another station with the second condenser.

It must be understood that with the pre-set tuning, the Home-Station set is confined only to medium-band working, and so alternative stations which are both on the medium-wave band must be chosen when pre-setting the tuning.

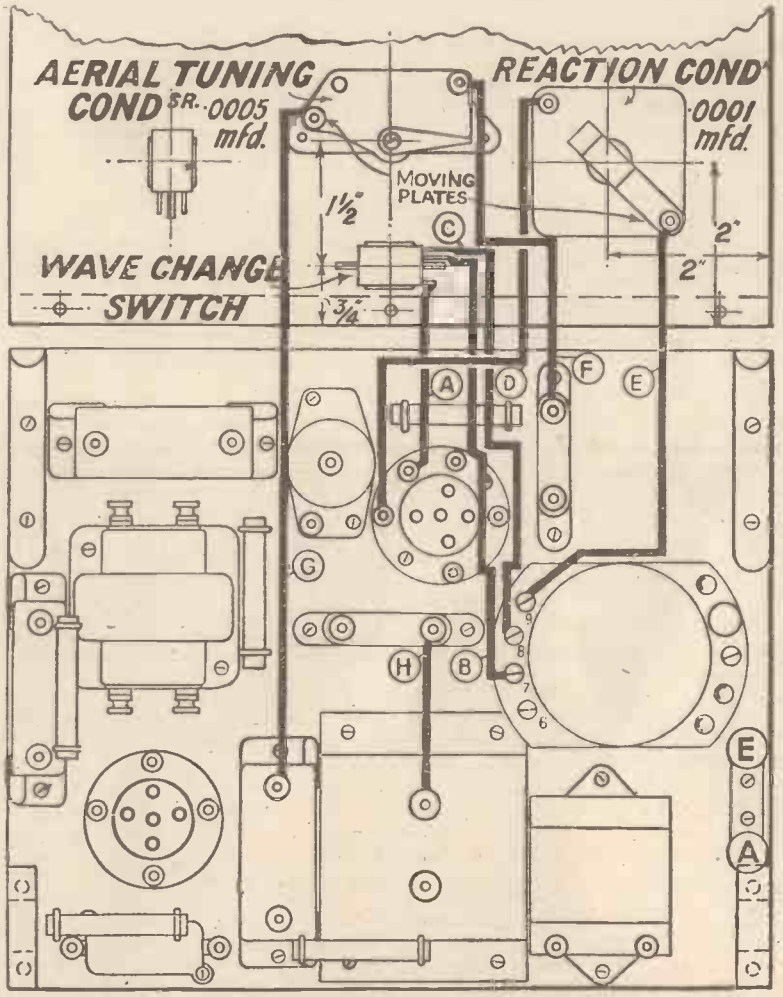
If both the tuning operations have been carried out accurately, you will find that it is only necessary to click the switch from one side to the other to get a choice of programmes.

There is no adjustment which needs to be made to the set, for all the voltage tappings are fixed and the only control which need be operating is the reaction knob on the panel front. This, in effect, is a volume control.

FITTING STANDARD TUNING

It is quite possible to fit a standard tuning arrangement to the "Home-Station A.C. Two," so that full use can be made of the set's station-getting properties.

When a standard tuning system is fitted, the operation of the set is conventional,



The modified layout and wiring diagram. Wires numbered 1, 2, 4, 5, 6, 37, 38, 39, 40 and 41 shown on the blueprint published last week are omitted and the additional wires, lettered in alphabetical sequence and shown above, added

MODIFYING THE "HOME-STATION A.C. TWO" FOR NORMAL TUNING

(Continued from preceding page)

there being the usual aerial-tuning and reaction condensers with, in addition, a wavechange switch.

This modification is easily carried out. The additional components required are given in an accompanying panel.

The main tuning condenser is in the centre of the panel, while the reaction condenser is on the left. The position of the on-off switch remains unchanged, while the wavechange switch is fitted in the centre, beneath the main tuning control.

A section of the wiring diagram showing the slight alteration necessary in the connections is given here. You will see that apart from the scrapping of the condenser bracket which supports the two condensers for the pre-set tuning, there is in addition a slight alteration to the coil wiring, so that the set can be used both on the medium and long wavebands.

The coil is tapped in four sections enabling the selectivity to be varied, and while this adjustment cannot easily be used on the pre-set tuning without independent adjustment, it is an aid in sharpening up the tuning when a standard condenser tuning system is fitted.

No matter whether you have the pre-set tuning or the standard tuning fitted to your "Home-Station A.C. Two," you will find that it is a very nice little set to handle and one which is of outstanding value in ordinary family reception.

It is easy to operate, gives good tone and eliminates for ever the bugbear of battery charging.

SUITABLE VALVES FOR THE "HOME STATION TWO"

Make	*Detector*	*Pentode*	*Rectifier*
Mullard ...	**354V**	**Pen/4V**	**DW2**
Six Sixty	**4GP/AC**	**4Pen/AC**	**W462**
Cossor ...	**41MHF**	**MP/Pen**	**506BU**
Marconi ...	**MH4**	**MPT4**	**U10**
Osram ...	**MH4**	**MPT4**	**U10**
Mazda ...	**AC/HL**	**AC/Pen**	**UU2**
Lissen ...	**AC/HL**	**AC/PT**	**UU41**

This photograph of the complete receiver shows the tuning controls of the modified "Home-station Two"

THE COMPONENTS USED IN THE "HOME-STATION A.C. TWO" WHICH HAS CONDENSER TUNING

COILS
1—Colvern, type TD, screened aerial, with reaction.

CHOKES, HIGH-FREQUENCY
1—Peto-Scott (or Lissen, Telsen, Wearite, Varley, Igranic, Ready Radio, Goltone).

CHOKES, LOW-FREQUENCY
1—Varley "Nichoke II" (or Lewcos, Wearite, Bulgin, R.I.).

CONDENSERS, FIXED
2—T.C.C. .0002-mfd., type 34 (or Dubilier, Lissen, Telsen, Graham Farish, Formo, Goltone, Sovereign).
1—T.C.C. .01-mfd. type 34 (or Dubilier, Lissen, Telsen, Graham Farish, Formo, Ormond, Sovereign).
1—Dubilier .01-mfd., type 670 (or T.C.C., Formo, Ormond, Graham Farish).
1—Dubilier .2-mfd. centre-tapped, type BE250, 1,000-volt A.C. test (or T.C.C.).
1—Telsen 1-mfd. (500-volt D.C. test) (or Lissen, Dubilier, T.C.C., Ferranti).
2—Telsen 2-mfd. (500-volt D.C. test) (or Lissen, Dubilier, T.C.C., Ferranti).
2—Dubilier 2-mfd., type LSB (800-volt D.C. test) (or T.C.C., Ferranti, Telsen).
1—Dubilier 4-mfd., type LSB (800-volt D.C. test) (or T.C.C., Ferranti).

CONDENSER, VARIABLE
1—Solid di-electric variable condenser, .0005 mfd. (Lissen, Telsen, Polar, Ormond, Lotus, Graham-Farish or Magnum).

FUSE
1—Belling Lee baseboard-mounting twin type (or Bulgin).

HOLDERS, VALVE
2—Telsen five-pin, and one four-pin (or Lissen, Lotus, W.B., Igranic, Benjamin, Bulgin, Ready Radio).

RESISTANCES, FIXED
1—Erie 350-ohm (or Dubilier, Goltone).
1—Erie 15,000-ohm (or Dubilier, Goltone).
2—Erie 20,000-ohm (or Dubilier, Goltone).
1—Erie 2-megohm (or Dubilier, Goltone).

SWITCHES
1—Three-point-shorting Toggle switch (Bulgin type S87, or Claude Lyons, Igranic, Ormond or Utility).
1—Bulgin single-pole on-off type S80 (or Claude Lyons, Igranic, Ormond, Utility).

SUNDRIES
1—Two-pin mains plug.
Glazite connecting wire.
2—Telsen terminal blocks.
4 yards thin Lewcoflex.
Pair of Bulgin panel brackets.
Length of mains flex.

TRANSFORMER, LOW-FREQUENCY
1—Lissen "Hypernik" (or Lewcos, Lotus, Telsen, Siektun, R.I., Igranic, Ferranti, Multitone).

TRANSFORMER, MAINS
1—Igranic with 250-0-250-volt 60-m/a 4-volt 1-amp. and 4-volt 2- or 3-amp. secondary winding (or Wearite, Varley, Heayberd).

ACCESSORIES

CABINET
1—(Direct Radio), complete with panel, baseboards and supports.

LOUD-SPEAKER
1—Rola, type F5PMP, permanent-magnet with pentode matching transformer.

OUR LISTENING POST

By JAY COOTE

WHETHER the rumour current in Paris to the effect that the Eiffel Tower will shortly suspend its broadcasts of radio entertainments is a forecast of the truth I am not able to say, but I for one shall not be sorry to see—or hear—that station close down. You will seldom find that the concerts are worth listening to and most certainly with the majority of receivers these transmissions interfere greatly with those of Warsaw, which on most evenings one cannot afford to miss.

The closing down of Eiffel Tower would release the 1,445-metre channel, a step which might assist Radio Luxembourg in securing that wavelength. By the way, although the latter has not yet obtained authority to transmit, you may hear this giant almost daily at lunch time and again between 6.15 and 8.30 p.m. G.M.T. It cannot, for the reason stated, give out its call or make any announcements between items, but you will find no difficulty in identifying the transmission. It opens with a series of blasts reminiscent of a liner's fog-horn and reels off one gramophone record after another. Apparently there are twin turntables, and the second is sometimes started off before the first one has reached the last bar of music.

The Hilversum and Huizen broadcasters have again carried out their exchange of wavelengths, and the V.A.R.A. and A.V.R.O. entertainments will now be heard on 1,875 metres until the end of March next. Note that the studios make the change and not the transmitters, which continue to operate on the channels respectively allotted to them. The Hilversum station is the coveted one owing to its power of 20 kilowatts, but steps are being taken to boost up the energy of Huizen to the same extent.

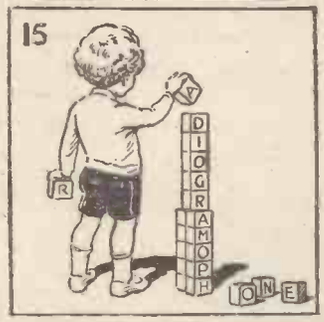
Mysterious Chimes

With regard to the chimes recently referred to by correspondents, they are not relayed, but produced by a carillon privately owned by one of the Dutch programme organisers; in the case of the A.V.R.O., they emanate actually from a studio clock. In respect to the "Internationale," which the V.A.R.A. broadcasts at the end of its entertainments, it is, of course, the same melody as you may pick up from either Leningrad or Moscow daily. V.A.R.A., or Vereeniging Algemeene Radio Arbeiders, is, as its name indicates, an association of Labour workers.

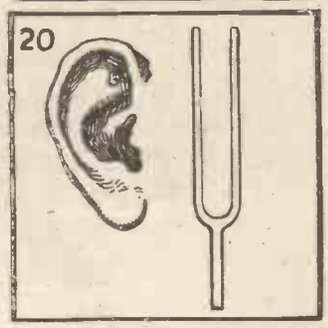
Of late the Germans have been very active in their endeavour to develop the "International" interchange feature of their programmes, and listeners to a recent Berlin broadcast were surprised to hear Arab music relayed from Egypt. This was made possible through the Nauen station, which in its turn had picked up the transmission from SUZ (Abu Zabal, Cairo). More tests in this direction are to be carried out, and, in addition to the regular relays from New York, we may be given shortly entertainments from Buenos Aires and from Rio de Janeiro. Further, similar to Radio Nations (Geneva), Zeesen has also been experimenting with Tokio; so a Japanese broadcast in the near future may also reach us.

Some weeks ago I mentioned the reception of signals from WKAQ (San Juan, Porto Rico). The exact wavelength on which this station operates is 241.8 metres and not 236 metres, as previously stated. Since I wrote about it, transmissions have been received by quite a number of listeners in the British Isles, and as the channel almost corresponds with that of Belfast, it should not be a very difficult matter to make a search. The station works from 6 p.m. to 2 a.m. G.M.T., but, from the reports, the best time to try for its capture is between 12.45 and 1.45 a.m. Another station which may be heard working between 1 and 2 a.m. is VAS (Glace Bay, Nova Scotia) on 438 metres (685 kilocycles). The call emanates from Halifax; it is the Marconi transmitter of the Atlantic Broadcasting Company.

TRY TO FORECAST THE DESIGN OF OUR NEW RECEIVER



THE THIRD AND LAST GROUP OF PICTURE CLUES TO OUR GREAT SET



AND WIN A KIT OF COMPONENTS FOR OUR NEW SET

HERE are the final six clues (each of them numbered) to **features of the great set** *which, as announced last week, we shall shortly introduce to our readers. Each picture conveys in veiled form information about some particular feature of our new set which is of outstanding design.*

Send all your solutions **on the form published below.**

We offer a kit of components of our remarkable new receiver, yet to be announced, to each of twenty successful solvers or **competitors who are nearest to the correct solutions.** *In the event of more than twenty competitors being correct, then we shall put all the correct solutions in a heap and an independent person will choose the twenty prize-winners from them.*

The Editor's decision on every point connected with this competition is final, and every competitor by the mere act of competing acquiesces in that rule.

Here is some fun for any evening when there is nothing else to do. Get all your wireless friends round you and hammer out the clues one by one. It is good fun and **the prizes will be kits of components of one of the finest sets which it has ever been our pleasure to introduce to the constructor public.**

TWENTY KITS OF COMPONENTS GIVEN AWAY!

Entry Form for the "A.W." Picture Clue Competition

	SOLUTION		SOLUTION
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

NAME.....

ADDRESS.....

This is the form on which you must send in your solutions to the Picture Clues published this week and in the two preceding issues. Write legibly in block letters and post your form to "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4, marking the envelope "Competition" in the top left-hand corner.

ALL COMPETITION ENTRIES MUST REACH THESE OFFICES BY FIRST POST, MONDAY, JAN. 23.

The Most Talked About Set of the Season

"SKYSCRAPER" RADIO

Its builders are its best Salesmen

Never before was there such a set within the reach of the home constructor. Never before such power from a battery set. Never before so many enthusiastic letters from constructors or so much talk about any radio set as this Lissen "Skyscraper" Kit has elicited. 50—60—70 loud-speaker stations—everybody who builds a "Skyscraper" gets results like that!

THE ONLY KIT YOU CAN BUILD YOURSELF EMPLOYING METALLISED S.G. HIGH MU DETECTOR AND ECONOMY POWER PENTODE VALVES

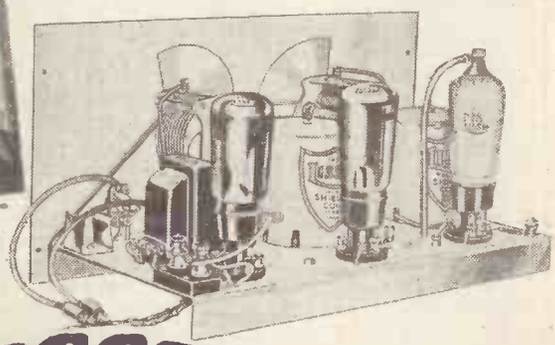
This new Lissen "SKYSCRAPER" Kit Set is the only one on the market that you can build yourself employing a Metallised Screened Grid Valve, High Mu Detector and Economy Power Pentode. Around these three valves Lissen have designed a home constructor's kit the equal of which there has never been before. Why be satisfied with whispering foreign stations when you can BUILD WITH YOUR OWN HANDS this Lissen "SKYSCRAPER" that will bring in loudly and clearly distant stations in a profusion that will add largely to your enjoyment of radio?

GREAT LISSEN CHART FREE!

You can get the Lissen "Skyscraper" Chart FREE from any radio dealer, or by posting the COUPON below direct to factory.

Lissen have published a 1/- Constructional Chart, giving the most detailed instructions ever printed for the building of a wireless set. You can't go wrong—every part, every wire, every terminal is identified by photographs. Everybody, without any technical knowledge or skill, can safely and with COMPLETE CERTAINTY OF SUCCESS undertake to build this most modern of radio receivers from the instructions given and the parts Lissen have supplied.

YOURS FOR ONLY 8/6 DOWN



To-day you can buy the LISSEN "SKYSCRAPER" KIT on Gradual Payment Terms. "Skyscraper" Chassis Kit, complete with Valves. CASH PRICE 89/6. Or 8/6 down and twelve monthly payments of 7/6. "Skyscraper" Kit complete with Walnut Cabinet and inbuilt Loudspeaker, as illustrated, £6 5s. Cash. Or 11/6 down and twelve monthly payments of 10/6.

COUPON

To LISSEN Ltd., Dept. A.W.32, Worple Road, Isleworth, Middlesex.

Please send me FREE copy of your 1/- Skyscraper Chart.

Name.....

Address.....

.....

.....

LISSEN "SKYSCRAPER" KIT 3

—SETS OF THE SEASON—

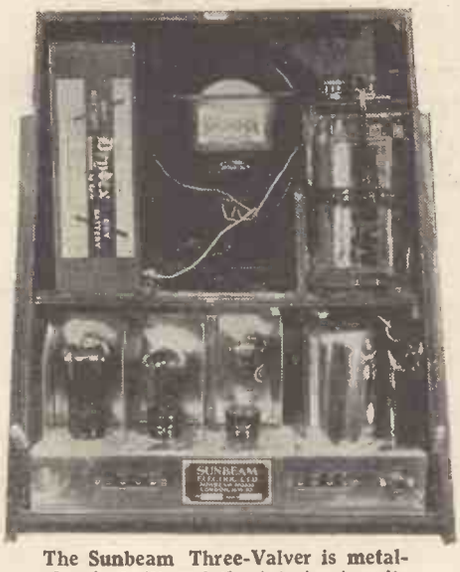
SUNBEAM B33 BATTERY THREE-VALVER

HERE is a battery set that gives really fine quality of reproduction. The set is the "Sunbeam B33," and I think it deserves the widest commendation. It is a three-valver designed for quality first, last, and all the time.

Without doubt, the B33 set I have been trying out gives as good quality as most mains sets, and I am prepared to say that in some ways the quality of this set is definitely superior to some mains sets.

Frankly, I did not think such excellent reproduction could be done with a small power valve, a 120-volt high-tension battery and any loud-speaker on the market. Perhaps I had reckoned without the Sonochorde moving-coil. That is the make of speaker incorporated in the "Sunbeam" set.

It is, of course, a permanent-magnet type, but with this set it gives amazingly



The Sunbeam Three-Valver is metal-chassis built and the interior is quite accessible

faithful reproduction with a sensitivity well above the average.

Present battery-set technique demands that to attain anything like faithful reproduction of the bass notes you simply must have a very sensitive speaker, because it is quite impracticable to supply much power to an insensitive reproducer, no matter how good may be its frequency response.

Small Current Demands

This being so, I congratulate the makers of the "Sunbeam B33" on discovering a loud-speaker that so wonderfully fulfils requirements.

Driving the Sonochorde is a Mullard PM202 (a power valve I have always liked) and the resulting output is remarkable for its fine balance. There are good strong bass notes and crisp top notes.

Orchestral music has a timbre I have seldom if ever heard on a battery-operated set. Speech, thanks to the retention of the upper frequencies, is clean cut and entirely free from that muffled effect so frequently found in badly designed sets working from batteries.

Considering the quality performance the B33 does not take an excessive amount of current from the high-tension battery. My measurements, taken while the set was working, proved that with the maximum high-tension of 120 volts and the full negative bias permissible on the low-frequency and power valves, the total anode-current consumption was only 12 milliamperes.

While this definitely over-runs the high-tension battery it is quite possible to effect an appreciable saving in the battery output simply by reducing the maximum high-tension to 108 volts. The total current is then only 9 milliamperes. The quality remains just as good but, of course, overloading sets in with slightly less volume.

The makers suggest that when the battery is new you should use the 108-volt tapping and then maintain this when the bulk of the battery has dropped in voltage by plugging into the 120-volt tapping.

Band-pass Tuning

The general conception of this set is somewhat out of the ordinary run. The three valves are arranged as detector and two low-frequency stages. How, then, you may ask, is the selectivity made good enough for modern requirements?

The answer is that band-pass aerial tuning is employed. This system, as most readers know, enables selective tuning to be obtained without losing the high notes. It is probably the most satisfactory system for a detector set designed to cope with present conditions.

The makers have wisely provided three alternative aerial tappings to the band-pass, so that all types of aerial can be worked satisfactorily. Once you have adjusted the aerial load properly on a band-pass, as in this set, there is no difficulty in obtaining station separation, nor in restricting the locals to a very small wave-band.

From the circuit sequence you will appreciate that this set is primarily designed to give really good reproduction of the home stations. But since the power of many foreigners is now so great it was not surprising to find on testing this set that some dozen foreigners came in at full strength without unduly forcing reaction.

The control generally is simple, as would be expected. Apart from the knob working the two-gang condenser of the band-pass tuning circuit, there is the reaction on the left and a wave-change and on-off switch on the right.

The tuning scale is calibrated quite accurately in wavelengths, long waves going from the unusually low minimum of 700 metres to nearly 2,000 metres, in steps of 100 metres, and medium waves from 200 to 550 metres in steps of 20 metres.

Another unusual point is that the tuning scale is illuminated by a low-consumption bulb mounted behind the tuning scale and wired across the accumulator leads.

A Good Three

Inside the quietly finished walnut cabinet we find a modern metal chassis, with the two-gang condenser and two screened coils of the band-pass forming the nucleus of a neat upper deck, the three valves being mounted inside a sectionalised metal screen near the back.

Provision is made for the external connection of another loud-speaker and for a gramophone pick-up. In view of the exceptional quality I should say the pick-up facility will be greatly appreciated. Apart from these socket connections there is, of course, the earth sockets and the three aerial sockets.

The batteries are easily wired up inside the set which, when its back is clipped into place, is as neat an installation as you could wish for.

Altogether, I consider this is a notable addition to the battery-set market, and at its very reasonable price it is assured of a wide demand when its good points become more widely known. SET TESTER.

BRIEF SPECIFICATION:

Makers : Sunbeam Electric, Ltd.

Price : 8 guineas.

Valve Combination : Detector (Osram HL210), first low-frequency stage (Osram L2), power output (Mullard PM202).

Power Supply : Self-contained batteries, consisting of 120-volt high-tension of standard capacity, 2-volt accumulator and 9-volt grid bias battery.

Power Consumption : Measured anode current with maximum high-tension 12 milliamperes.

Type : Table-cabinet set with self-contained moving-coil loud-speaker.

Remarks : An exceptionally good battery set for those wanting really faithful quality of reproduction from the home stations.

Of particular importance is the programme of Cheshire folk songs on January 20, because it is the first of a series of interest to Northern listeners. The Northern counties will be taken one by one and the best of their folk tunes broadcast, with appropriate explanation and notes.

The fourth of Robert Tredinnick's series of light entertainments by gramophone records—"Recdinradio"—will be heard by Midland listeners on February 4.

1932—THE YEAR'S BROADCASTING

A record of B.B.C. progress and of the outstanding broadcasts of last year.

Sir John Reith broadcasting at the inauguration of the Empire Service—an outstanding event of last year

ANOTHER YEAR'S BROADCASTING!

1932 HAS seen some important programme changes and station developments.

The three outstanding events were the completion and placing into service of Broadcasting House, the Scottish Regional station at Westerglen, near Falkirk, and the Empire station at Daventry.

BROADCASTING HOUSE

Broadcasting House was brought into full use in May and the old headquarters at Savoy Hill were then closed down. Broadcasting House, during its design and construction, provided many unique problems; for example, the ventilating and soundproofing from each other and from outside noises of a large number of studios situated close together in one building. The design of the Control Room in Broadcasting House was carried out entirely by B.B.C. engineers.

The Scottish Regional station is similar in general design to the London and North Regional stations and provides an alternative programme service to Edinburgh, Glasgow and the most densely populated parts of Scotland. It represents the fourth step in the scheme of high-power twin-wave stations to serve the British Isles.

THE EMPIRE

The inauguration of the Empire broadcasting service from the new Empire short-wave station at Daventry was a new and important activity of the B.B.C. The station is equipped with two transmitters, both of which can radiate to any of five different zones. Programmes, therefore, can be transmitted with a view to their reception during the evening in the zone to which they are directed. The station opened on December 19 with a regular daily service of programmes to all the dominions and colonies.

DROITWICH

Much experimental work was done in finding a suitable site for the new high-power National programme transmitter which is to replace Daventry 5XX. This work entailed the erection of a mobile transmitter on many projected sites and the taking of a large number of measurements before any definite choice of site could be made. The site finally chosen is near Droitwich.

Useful work was accomplished during the year in connection with the suppression of interference from electrical apparatus, oscillating receivers, tramways, and so on, which is done in co-operation with the Engineering Branch of the General Post Office.

The Outside Broadcast Department showed characteristic enterprise, both in the number and the nature of the important events relayed during 1932. A special programme entitled "Communications," which concluded the birthday week celebrations in November, attracted world-wide attention. The outstanding event of the department's activities in 1932 was the relay from Sandringham of the King's message to the Empire on Christmas Day, at the conclusion of a programme consisting of short messages from "All the World Over." The unstinting co-operation of the Post Office made it possible for listeners to hear speakers in Australia and New Zealand, India, Africa, Canada, ships at sea, and so on, describe how Christmas was being spent in their particular corner of the British Commonwealth, while many parts of the Empire in their turn heard His Majesty's memorable message.

The Prince of Wales was heard several times during the year, notably on the occasion of the opening by His Royal Highness of the Shakespeare Memorial Theatre at Stratford-upon-Avon, and at the B.B.C. Birthday Week celebrations.

SPORT

Running commentaries were broadcast on all the Rugby football internationals and on the Oxford *v.* Cambridge match at Twickenham. Association football broadcasts took place on the England *v.* Scotland international, the final tie of the Football Association Cup and the match between England and Austria at Stamford Bridge. Commentaries were also relayed in connection with important motor races—the Senior T.T. in the Isle of Man, the hill-climbing test at Shelsley Walsh, the Ulster T.T. race and the Grand Prix. The Grand National, the Derby and St. Leger were described in running commentaries, as well as the Boat Race, the All-England Lawn Tennis Championship, the King's Prize shoot at Bisley and the Speedway Test between England and Australia at Wembley.

THEATRE RELAYS

Among the theatre relays, one which calls for special mention was the transmission for the first time of a complete Gilbert and Sullivan comic opera, namely *The Yeomen of the Guard*. As in previous years, excerpts from various Gilbert and Sullivan works were permitted, but the privilege of giving a full play had never been secured prior to December of last year.

In March the B.B.C. selected Mr. Henry Hall to fill the position vacated by Mr. Jack Payne, upon the latter's retirement from the service of the corporation. During the nine months which have since elapsed, the B.B.C. Dance Orchestra, directed by Henry Hall, has broadcast four hundred hours of dance music, involving over one thousand hours of rehearsal, and has maintained an individual style.

AT THE QUEEN'S HALL

Twenty-three concerts were given by the B.B.C. Symphony Orchestra in Queen's Hall during 1932. Among the conductors have been Ernest Ansermet, Adrian Boult, Sir Edward Elgar, Nikolai Malko, Sir Landon Ronald, Bruno Walter, Felix Weingartner and Sir Henry Wood. The list of soloists includes the first broadcast appearances of Casals, Cortot, Elman, Huberman and Bruno Walter.

Sir Henry Wood has given his thirty-eighth season of Promenade Concerts, at which the soloists have included Adolf Busch, Myra Hess, Lamond, Egon Petri, Solomon, Florence Austral, and Maria Basilides. Twenty-nine Sunday orchestral concerts have been given and also a series of six public chamber concerts in the Concert Hall at Broadcasting House.

TALKS

Among the many series of talks which broke new ground were the informal discussions of questions of the day conducted in a railway carriage, "On the 9.20"; the series in which listeners heard the closing speeches and the summing up of imaginary trials and were asked to "Consider Your Verdict"; Mr. Vernon Bartlett's talks from foreign capitals on "The World and Ourselves"; the practical series of health talks in which "The Doctor and the Public" were brought into close touch by means of the microphone; and a series of political debates and talks in which issues of current interest and importance were dealt with.

The news service was further developed in the autumn by the addition to the Second General News Bulletin of five-minute topical talks.

VAUDEVILLE

Vaudeville programmes were broadcast fairly regularly twice a week, and on three or four occasions the ordinary studio vaudeville gave place to a "Music Hall" programme broadcast from No. 10, the studio under Waterloo Bridge. This type of programme differs from a regular studio vaudeville, inasmuch as only definite music-hall acts are used. A platform is erected in the studio, and whilst the artistes are performing to the microphone, they are confronted with an audience of about four hundred.

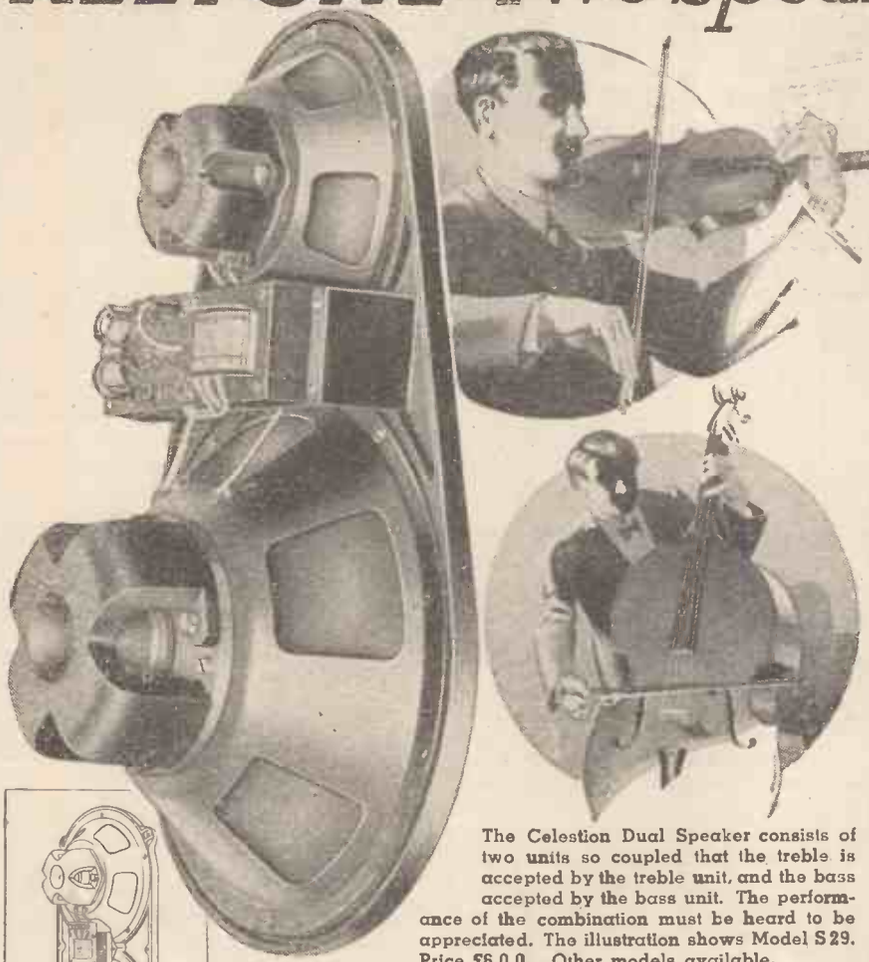
During Birthday Week a special radio vaudeville programme was broadcast at which the Prince of Wales was present, and in which well-known radio stars took part.

TELEVISION

From August 22 television programmes have been broadcast on Mondays, Tuesdays, Wednesdays and Fridays of each week from 11 to 11.30 p.m., sound being transmitted on 398.9 metres and vision on 261.3 metres. The programmes, which have been remarkable for a variety of talent that has been seen and heard included Mr. and Mrs. Mollison, an exhibition of art treasures opened by Lord Lee of Fareham, a display of exclusive fashions by a leading London modiste, ju jitsu and fencing, ventriloquists, Carl Brisson, Erik Bertner, a performing seal, a selection of Christmas toys, a music-hall programme reminiscent of the nineties, and Delysia.

For his gramophone recital from Midland Regional on January 27, Robert Tredinnick has chosen a Rhythm programme.

REETONE-Two Speakers as one



The Celestion Dual Speaker consists of two units so coupled that the treble is accepted by the treble unit, and the bass accepted by the bass unit. The performance of the combination must be heard to be appreciated. The illustration shows Model S29. Price £6.0.0. Other models available.

For the very first time — sound reproduced Naturally

When Celestion announce a new speaker the great listening public expects a definite advance in sound reproduction. In introducing the Reetone Range of Dual and Matched Speakers, Celestion are confident that nothing finer has ever been offered to discriminating listeners. Tonal quality far superior to anything previously imagined, yet alone heard; a rich beauty of reproduction never previously associated with anything but the actual performance. These are the qualities that stamp the Reetone Range of Speakers vastly superior instruments.

CELESTION "REETONE" MATCHED SPEAKER

Whereas the Dual Speaker has differently sized diaphragms, the Matched units are nearly similar in all respects, except that the mechanical resonances in the lower register are "staggered." This "staggering" eliminates the tendency to "boom" evidenced in all small moving coil speakers in which the bass has not been suppressed and generally augments the output below 150 cycles.

The following models are available:—

TYPE NO.	MATCHED	LIST PRICE
99	Two Perm. Magnets	£4.5
88	Two Energised	£4.5
93	One Perm. Magnet One Energised	£4.5

CELESTION

The Very Soul of Music

To CELESTION LTD.,
London Rd., Kingston-on-Thames.

Please send me illustrated folder giving full details of "Reetone" Speakers, together with constructional details and data.

Name _____

Address _____

_____ A.W.

FOREMOST NAME IN SOUND REPRODUCTION

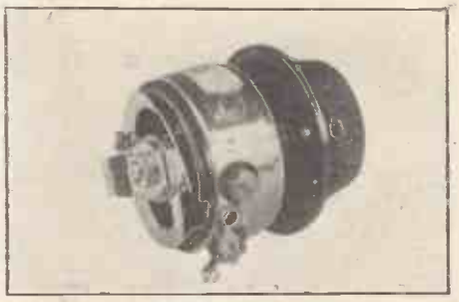
CELESTION LTD., LONDON ROAD, KINGSTON-ON-THAMES. London Showrooms: 106 Victoria St., S.W.1

A weekly review of new components and tests of apparatus conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

PREH POTENTIOMETER

THERE is considerable demand to-day for potentiometers for use with variable-mu valves and for volume control across the aerial, and so on. A very neat component of this type is the "Multiohm-Luxus." This is one of the well-known Preh components which is now made in this country.

The resistance element is carried on a small fibre strip as usual, this being housed inside a metal cup. A flexible contact plate is employed, this being pressed down



The Preh Multiohm-Luxus potentiometer

by an insulated finger carried on the end of the rotating member. The action is smooth and sweet and an interesting feature is that of the very small overall size. The diameter of the cup is less than 1¼ in. and the length of the back of the panel is only ¾-in.

The particular sample tested was a 10,000-ohm model, rated to carry 14 milliamperes, and we found that it handled this current quite successfully. The actual sample gave a uniform resistance variation, but graded types are available if required. It is a very neat little component, and can be recommended.

HANDY GOLTONE PLUG

HOW often have you found that your set soldering-iron or other gadget has the customary bayonet fitting whereas the only power point available is a 2-pin socket. This necessitates changing over to a 2-pin plug and if the connection is only temporary all work has to be undone again afterwards.

Messrs. Ward & Goldstone have been marketing for some time the well-known device for doing the opposite to this—i.e., an adaptor for converting the 2-pin fitting into the bayonet fitting—but they have now followed this with an ingenious adaptor for converting a bayonet fitting into the 2-pin connection.

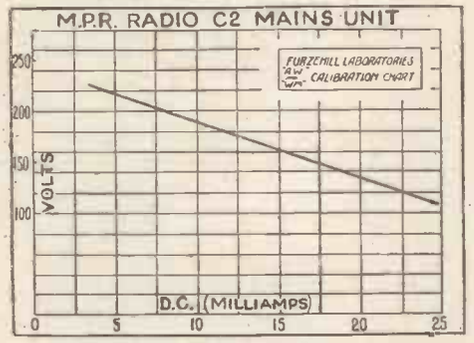
The device is simple. There is a socket at one end into which the bayonet fitting is inserted and two pins at the other end which fit the ordinary 5-ampere size of power plug. This gadget in connection with the other adaptor made by this firm will prove of great use to the experimenter, and we strongly recommend him to have one or two on hand.

This new gadget sells at 7½d.

NEW MAINS POWER RADIO UNIT

AN interesting power unit for use on alternating-current mains, which we have tested this week, is that made by Messrs. Mains Power Radio. This unit has been designed for supplying simple receivers employing two or three valves only and not requiring more than 120-150 volts H.T. Two separate 4-volt tappings are provided, one giving up to 2 amperes and the other up to 0.25 amperes for a directly heated small power or pentode valve.

The eliminator, which is housed in an all-metal case having a dark blue crackle



This curve shows the H.T. output obtained from the Mains Power Radio unit tested

finish, is suitable for use on input voltages varying from 200-250 at 50 cycles.

The eliminator was tested with a 2-valve receiver employing an ACHL-type valve as detector with a PM24 in the output stage. The pentode was, of course, automatically biased, the necessary resistance and condenser being included in the eliminator itself. The eliminator was found to be perfectly satisfactory with the receiver described, the output voltage being approximately 120 with a load current of 22 milliamperes.

This eliminator can be recommended to anyone having a receiver of the type indicated and who desires to supply it with all voltages from the power mains.

LOTUS THREE-GANG CONDENSER

A THREE-GANG condenser of unusual interest is that recently placed on the market by Messrs. Lotus Radio, Ltd., of Liverpool. The condenser is conventional in appearance, the fixed vanes being mounted in a channel-section framework with metal plates at the end and between the three sections. The main feature is that both sets of vanes are die-cast in position. The moving plates are assembled in a jig with the spindle through the centre and molten metal is then forced around the assembly which thus becomes very rigid. A similar method is used for the fixed plates, these being held at the edges by a wedge of solid metal.

A slow-motion friction-drive dial is included, and this is arranged to drive on to either end of the condenser shaft as may be desired. The scale provided is of white ivorine and is sufficiently translucent to enable it to be illuminated from the rear. Mica-dielectric compression-type trimmers are provided on each section, these being operated by three small hexagonal-headed nuts, while an aluminium dust cover completes a neat-looking job.

The condenser was tested for high-frequency resistance and at 400 metres the value obtained was 1.2 ohms. This value is quite good and the condenser will give efficient service. The three sections were tested for capacity matching and found to be well up to standard. The maximum capacity in all three cases, with the

A new Lotus three-gang condenser embodying many fine features

trimmers in the minimum position, was found to be .00055 microfarad and the minimum approximately 40 micro-microfarads.

The condenser is well made and can be recommended.

A programme of seafaring life afloat and ashore will be given from Swansea in the West Regional programme on January 24.

What Our Readers Think

The Editor does not necessarily agree with the views expressed by readers and does not accept responsibility for the letters published. Letters cannot be published which do not bear the sender's full name and address

Cut-price Components

SIR,—With reference to the letter headed "Cut-price Components" published in your issue of December 31, I should like to let your readers know of an experience of mine.

Not so long ago I was building one of your sets which necessitated the purchase of three valves of well-known make. These I bought at one of the cut-price shops down here, and after seeing them tested (across the filament pins) took them home and proceeded with the good work. Having completed the wiring I switched on and heard—nothing! Well, after exhaustive tests I found that the emission of two of the valves had gone. The cut-price merchant advised me to send them back to the makers, which I duly did.

They replied to the effect that the emission had been destroyed through excessive voltage, and could therefore do nothing for me. Now, I was only testing with a 60-volt block battery, and have had sufficient experience with wireless sets to switch off before altering the grid-bias, so that I naturally came to the conclusion that the valves were dud when bought.

I had to fork out 19s. 6d. for two more valves, and I need hardly add that that is my first and last transaction in cut-price components. W. M. (Portsmouth).

Reception of Bournemouth

SIR,—I read with interest R. W.'s (Blandford) remarks regarding the above.

The Editor invites letters from readers on all interesting radio subjects. For the most interesting letter published each week a general-purpose valve or other component to the same value will be given.

He will be interested to know that until recently Swansea listeners had similar experiences with Scottish National.

Now (after a "storm" in the local Press) Swansea has been moved from 288.5 metres to 245.9 metres, but we are "out of the fat into the fire," and *now* have a heterodyne with an Italian station (Trieste, I presume).

The strangest feature of the Swansea-Westerglen jamming was a violent "tremulant" making an orchestra sound like a mouth-organ solo, and the news announcer as though he had a severe attack of shivering! This wobbling varied from time to time, sometimes very quick, and others more like ordinary fading.

J. E. B. (Swansea).

Selectivity and the Aerial Tapping

SIR,—I have been interested in the comments made by J. B. W. on my recent article. I am afraid I must plead guilty to a certain looseness of wording. I did not mean to imply that the use of a

tapped or coupled aerial was not desirable in a receiver with a high-frequency stage, but that an increase in the tapping-down process beyond the customary optimum point did not result in a marked improvement in selectivity.

My measurements were made on tapping points above and below the usual value of about 25 per cent., and the maximum tap shown was 50 per cent., so that there was no intention of suggesting that the aerial should be connected direct to the grid. Even a 50 per cent. tap would be impracticable because of the restriction of the tuning range, as your correspondent points out.

The article was actually written as a result of some tests on a four-valve receiver, with two high-frequency stages, which was not giving adequate selectivity. One of the first lines of attack was the reduction of the aerial tap and the complete failure of this remedy led to the investigation in question. I would point out that the effect is often masked because a smaller input to the detector, coupled with the use of reaction, on the detector circuit will usually give better selectivity.

My receiver has no reaction, nor was it unstable in the position of full volume, in which circumstances the effect described in my article was unfortunately only too apparent both by measurements and on actual signals.

J. H. REYNER (Boreham Wood).

Slack Methods

SIR,—In connection with your correspondence on "Slack Methods," you might be interested to hear my own experience that occurred earlier in the year.

I decided to construct the James Short-wave Superhet. I sent an order for a complete set of parts, enclosing my cheque at the same time.

At the end of five weeks I was still awaiting delivery, so made inquiries. A week later the kit arrived minus the cabinet and variable condenser. Ten days later the cabinet arrived. After two months I gave up all hope of obtaining the condenser, so requested a refund and bought it locally.

But my troubles did not end there. The set, when finally assembled, was not exactly a success, and investigation brought to light the following technical faults in the manufacturing of the components :—

(1) There were two broken connections inside the oscillator unit.
(2) The spindle of the potentiometer was so loose a fit that it created crackles when it was rotated, and I had to discard the component.
(3) The variable condenser (one of those specified) had to be changed twice because there was so much back-lash in the vernier drive that it was impossible to register a station twice with the same reading of the dial.
(4) And, lastly, the cabinet was so badly finished that even the lid would not close.

I offer no comment on the above, beyond stating that until I read some of the correspondence on the subject in your columns, I felt mine was an exceptional experience.

I enclose my card and sign myself,

BADLY TREATED (Bournemouth).

Weekly Notes : Theoretical and Practical

STRAY H.F.

A FREQUENT cause of howling and squeaking is high-frequency current entering the power valve and so reaching the speaker.

You can often prove this quickly by connecting a condenser between the anode of the power valve and earth. This may not be the best cure for the trouble, however, as the high-frequency currents are still in the power valve.

It is better to stop them from reaching the power valve by connecting a filter in the anode circuit of the detector. A test may show that a small condenser joined between the anode of the detector and earth is all that is needed. But, on the other hand, the condenser may have to be of such a capacity that the quality is spoilt.

It will then be necessary to use a rather better filter than the condenser and transformer primary or whatever else there may be in the circuit. This usually comprises a high-frequency choke with a condenser from the anode side to earth and another from the other end of the choke to earth.

It is sometimes an advantage to take one condenser to low-tension negative and the other to positive instead of taking both to earth.

A further help is a resistance in the grid circuit of the power valve. This resistance acts as a stopper to high-frequency currents. It is important to remember that the by-pass condenser will tend to weaken the higher audio-frequency notes and should normally be no larger than necessary for dealing with high-frequency currents.

A MATTER OF TUNING

THE circuit of a receiver having a gang condenser for tuning must be correctly proportioned or the tuning will not be accurate over the whole wavelength range.

As the result of testing various receivers, I have been stirred by the way in which the aerial circuit is sometimes allowed to run out of tune with the other circuits.

I have noticed that if the circuit is correctly adjusted on, say, London Regional, the trimmer of the aerial tuning section must be readjusted for the best results on the London National. In most cases, the tuning can be set accurately when a condenser of .0001 microfarad is connected in the aerial lead to the first coil.

Sometimes a .00005-microfarad condenser is needed before the tuning can be said to be accurate at all tuning points.

It depends upon how the aerial is joined. If, for example, the aerial is taken through a condenser to the grid of the first valve, then the condenser must have little capacity. When a tapped coil is used, however, the condenser may not have so little capacity.

The strength of the signals may be reduced over part of the tuning range by fitting the aerial condenser, but the selectivity is usually improved.

KEEPING IT SILENT

A NOISY volume control is not necessarily a faulty one. In many instances the noise will disappear if a condenser of 1 or 2 microfarads is joined between the sliding contact and the end going to the battery.

This condenser acts to hold the voltage steady, so that the changes in voltage which were causing the noise do not occur.

Wire-wound volume controls are often noisy if used without the condenser. Some enclosed patterns, I notice, have a liberal dressing of vaseline to give a smooth action, but this does not cure the noise. Increasing the pressure of the contact arm upon the resistnace element does not help matters.

SHORT-WAVE NEWS

By "SHORT-WAVER"

JUST recently the experimental station W3XAL at Boundbrook, New Jersey, has been coming in very well on a wavelength of 16.87 metres, four afternoons out of five. This frequency of 17,780 is particularly suited to daylight reception in this country, consequently I can strongly advise listeners to search for this station in preference to all others between the hours of 1 and 4 p.m.

Although it is not scheduled to radiate on Saturdays or Sundays, it has been doing so for the last few weeks. W3XAL closes down about 9 p.m., but you will find that after 4 p.m. fading will begin with general reduction in signal strength.

A little after 5.30 p.m. W2XAD commences its evening programme. This enables one to switch over from W3XAL when the signal strength decreases too much.

On Saturday afternoon I had word-perfect reception from W2XAD between 6 and 7 p.m. The programme consisted of a running commentary on a Ball game between Princetown and Yale. This broadcast was the most humorous I have heard for some months, the remarks of the commentator causing endless amusement.

Reviewing the past week, reception has been good only during the day and after 11 p.m. The period between 6 and 11 p.m. has been really bad, and the only stations worth listening to have been Zeesen, Moscow, etc. As this is the time when the majority of readers listen-in, it is easily understandable why one hears so many adverse reports on short-wave receivers.

I wonder how many people heard Mr. Baldwin's speech via one or more of the American short-wave stations. He was apparently re-broadcast throughout the whole of the National Broadcasting Company's network. The Atlantic 'phone was utilised for this transmission, and I heard this transmission through at least six different stations. On Sunday afternoon, Buenos Aires, LSY on 14.47, was heard calling CGA, Drummondville, on 16.50 LSY was R6 and CGA R4. LSY can very easily be identified by an interval signal of three musical notes.

The conditions on Sunday afternoon appeared to be unusually good.

XDA in Mexico City on 15.85 metres was giving a test transmission which was received about R3. The star station was certainly W3XAL, which was R8 until a quarter to five. The programme was worth listening to, consisting mainly of pianoforte, violin and saxophone solos. The pianoforte solos were rendered by Henrietta Schumann, and were particularly good and completely free from fading and static.

Later in the evening, PRBA (Rio de Janeiro) on 31.58 metres came through quite well, but the transmission was mainly speech and had little interest. CGA (Drummondville) can easily be heard testing on a wavelength of 21.83 metres usually about 7 p.m. These tests consist of speech intermingled with a few gramophone records, and usually come over at excellent strength.

During his long service with the Salvation Army, extending back to the days of the first General, William Booth, Commissioner D. C. Lamb has come in contact with every grade of society, and is fully qualified to discuss the evolution that he has witnessed. On January 13 he will broadcast in the National programme a talk on "Forty Years of Social Change." He will have something to say about the part that the Salvation Army has played in that time.

"HOOK-UP" MOUNTING

Here is a good tip for testing out a big set before putting it in its cabinet. Mount all the condensers on the baseboard and

use L-shaped brackets for the tuning escutcheons if necessary. Try out the set in its hook-up form before fitting the panel and enclosing the set

POST CARD

POSTCARD RADIO LITERATURE

GET THESE CATALOGUES *FREE*

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58/61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

Blue Spot Sets

BLUE SPOT have some fine table and pedestal type sets and a folder just issued describes these in an interesting fashion. If you are thinking of buying a new set, I advise you to get a copy of this folder, for it gives the salient points of the set's specifications. **922**

Trix Mains Parts

Here's something which is of value to every amateur who builds or improves mains gear. It is a folder from Trix, giving full details of the new mains transformers and chokes. There are special transformers for valve and metal rectifiers, and this folder gives the outputs of each transformer winding so that you can be sure of getting the right component for any particular job. **923**

Micromesh Valves

In case you haven't yet had details of the new Micromesh valves, made by Standard Telephones & Cables, Ltd., I would bring to your attention the Micromesh folder, copies of which are obtainable free through my Catalogue Service. A folder I have just received describes the new detector, power output valve, and rectifiers. **924**

Formo Colour Scheme

It is a novel idea to issue the coils of tuning units with distinctive coloured screens, so that any component can be at once distinguished in a set by its colour. Formo have done this with their new screened coil and a Formo booklet, just issued, shows how the colour scheme works. Helpful circuits are given in the book, so you can't go wrong. **925**

The Model 66

I have just received details from Marconiphone of the Model 66 four-valve battery-operated portable. This represents economy in the extreme, as the total H.T. consumption is only 7 milliamperes, and the L.T. current of the order of ½-ampere. In spite of this economy, the performance is exceptional, as you would expect from a Marconiphone designed outfit having four valves, including ganged tuning and pentode output. Other details are given in this new leaflet.—OBSERVER. **926**

BROADCASTING STATIONS

Broadcasting Stations classified in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
13.97	21,470	Daventry (GSH)	15.0
16.88	17,770	Daventry (GSG)	15.0
19.737	15,200	Zeesen (DJB) ...	8.0
19.82	15,140	Daventry (G5F)	15.0
25.28	11,865	Daventry (GSE)	20.0
25.4	11,810	Rome (2RO) ...	15.0
25.53	11,750	Daventry (GSD)	20.0
31.25	9,598	Lisbon (CTIAA)	2.0
31.3	9,585	Daventry (GSC)	20.0
31.31	9,580	Radio Nations ...	20.0
31.38	9,560	Zeesen (DJA) ...	8.0
31.51	9,520	Skamleback	0.5
31.55	9,510	Daventry (GSB)	20.0
32.26	9,300	Rabat	0.5
40.3	7,464	Radio Nations ...	20.0
43.75	6,865	Vitus/Paris	0.3
46.6	6,438	Moscow	12.0
48.2	6,202	Rome (tests).....	15.0
49.4	6,070	Vienna (UOR2)	2.0
49.59	6,050	Daventry (GSA)	20.0
50.0	6,000	Moscow	20.0
58	5,172	Prague	0.5
206	1,460	Antwerp	0.4
207	1,450	Plymouth(shortly)	0.12
207.3	1,447	Seraing	0.2
207.5	1,445	Pecz	3.0
209.7	1,430	Magyarovar	3.0
211.3	1,420	Newcastle	1.0
214.3	1,400	Aberdeen	1.0
214.3	1,400	Warsaw (2)	1.9
215.4	1,392.5	Brussels (Conf.)	.025
217.1	1,382	Konigsberg	0.9
218	1,373	Salzburg.....	0.5
219.6	1,364.5	Binche	0.3
219.9	1,364	Beziers	0.5
224.4	1,337	Cork (6CK)	1.2
252.2	1,331.7	Fecamp	10.0
227.4	1,319	Flensburg	0.5
230.6	1,301	Malmo	1.2
232.2	1,293	Kiel	0.25
233.4	1,285	Lodz	2.2
236	1,270.9	Kristianssand ...	0.5
236.2	1,270	Bordeaux (S.O.)	2.0
237.8	1,260.9	Nimes	0.6
238.9	1,256	Nurnberg	2.0
240.1	1,249	Stavanger	0.5
241.3	1,243	Liege	0.3
242	1,238	Belfast	1.0
244.1	1,229	Basle	0.5
245.9	1,220	Berne	0.5
245.9	1,220	Cassel.....	0.25
245.9	1,220	Linz	0.5
245.9	1,220	Swansea	0.12
247.7	1,211	Trieste	10.0
249	1,205	Prague (Strasnice)	5.0
249.6	1,200	Juan-les-Pins ...	1.0
250	1,200	Radio Schaerbeek	0.3
250.4	1,198.1	Barcelona (EAJ15)	6.0
253.4	1,184	Gleiwitz	5.0
254.9	1,176	Toulouse (PTT)	1.0
256.7	1,168	Horby	10.0
259	1,157	Frankfurt-a-M. ...	17.0
261.6	1,147	London National	50.0
263.8	1,137	Moravska-Ostrava	11.0
265.4	1,130	Lille (PTT)	1.3
267.1	1,123	Valencia	8.0
267.8	1,120	Nyiregyhaza	6.0
268.6	1,116.8	Bremen	0.3
269.4	1,112	Bari	20.0
270	1,112	Salonica	1.0
271.4	1,105	Rennes	1.3
271.9	1,103	Cointe-Leige.....	0.3
273.7	1,096	Turin (Torino)	7.0
276.5	1,085	Heilsberg	60.0
279.7	1,072.4	Bratislava	14.0
281	1,067	Copenhagen	0.75
282.2	1,063	Lisbon (CTIAA)	2.0
283	1,058	Innsbruck	0.5
283	1,058	Berlin (E)	0.5
283	1,058	Magdeburg	0.5
283	1,058	Stettin	0.5
284.9	1,052.8	Radio Lyons	1.0
286	1,049	Montpellier	0.8
288.5	1,040	Bournemouth ...	1.0
288.5	1,040	Plymouth	0.12
288.5	1,040	Scottish National	50.0
291	1,031	Viipuri	13.0
293	1,022	Kosice	2.5
293.7	1,021.5	Limoges (PTT)	1.0
296.1	1,013	Hulzen	20.0
298.8	1,004	Tallin	11.0
301.5	995	North National...	50.0
304.9	984	Bordeaux (PTT)	130
307	977	Zagreb (Agram)	0.75
307.5	975.8	Falun	0.5
308.1	973.4	Vitus-Paris.....	1.0
309.9	968	Cardiff	1.0
212.8	959	Cracow	1.5
313.9	955.6	Genoa (Genova)	10.0
315	952.5	Marseilles	1.6
318.8	941	Naples (Napoli)	1.5
318.8	941	Sofia (Radno Radio)	1.0
319.7	935	Dresden.....	0.25
321.9	932	Goteborg	10.0
325	923	Breslau	60.0
328.2	914	Poste Parisien ...	60.0
331.4	906	Milan	50.0
334.8	897	Poznan	1.9
338.2	887	Brussels (No. 2)	15.0
341.7	878	Brunn (Brno) ...	35.0
345.2	869	Strasbourg (PTT)	11.5
348.2	861.5	Leningrad (RV/O)	15.0
348.6	860.5	Barcelona (EAJI)	8.0
352.1	852	Graz	7.0
355.8	843	London Regional	50.0
357.9	838	Tiraspol.....	10.0
360.5	832	Muhlacker.....	60.0
363.4	825.5	Algiers (PTT) ...	16.0
365.5	820.7	Bergen	1.0
366.3	819	Fredriksstad	0.7
368.1	815	Bolzano	1.0
368.1	815	Helsinki	13.2
368.3	813	Seville (EAJ5) ...	1.5
369.3	812.1	Radio LL (Paris)	1.0
372.2	806	Hamburg	1.5
376.4	797	Scottish Regional	50.0
380.7	788	Lvov	16.0
385	779	Radio Toulouse	60.0
385	779	Stalino (RV26)...	10.0
383.5	772	Archangel	10.0
389.6	770	Leipzig	75.0
394	761	Bucharest	12.0
398.9	752	Midland Regional	25.0
403	743	Sottens	25.0
408	734	Katowice	12.0
413.8	725	Athlone.....	80.0
416.4	720.5	Radio Maroc (Rabat)	6.0
419.5	715	Berlin.....	1.5
425.5	705	Madrid (Espan.)	2.0
425.5	705	Madrid (EAJ7)...	3.0
424.3	707	Moscow (RV39)	50.0
429	698	Belgrade	2.8
431	695	Paredе (CTIGL)	1.5
435.4	689	Stockholm.....	55.0
441.2	680	Rome (Roma) ...	60.0
447.1	671	Paris (PTT)	7.0
449.7	667	Danzig	0.5
450	666.5	Odessa (RW37)	20.0
453.2	662	Klagenfurt.....	0.5
456.7	657	San Sebastian (EAJ8)	3.0
459.6	652.7	Beromuenster ...	60.0
465.8	644	Lyons (PTT)	1.6
472.4	635	Langenberg	60.0
480	625	North Regional...	50.0
483	621.1	Ivanovo-Vosnesensk	20.0
488.6	614	Prague	120.0
496	604.8	Trondheim	1.2
500.8	599	Madona	35.0
501.7	598	Florence.....	20.0
508.4	590	Tartu	0.5
509	590	Brussels (No. 1)	15.0
518.6	578.5	Vienna	15.0
525	572	Riga	15.0
532.9	563	Munich	60.0
537.8	558	Palermo	3.0
542	554	Sundsvall	10.0
550	545	Budapest (1)	18.5
559.7	536	Kaiserslautern ...	1.5
559.7	536	Augsburg	0.3
559.7	536	Tampere	1.0
563	533	Wilno.....	16.0
566	530	Hanover.....	0.3
572.4	524	Grenoble (PTT)	2.0
574.7	522	Ljubljana	5.2
575.2	521.4	Freiburg.....	0.25
675	444	Oufa (RV22).....	10.0
678.7	442	Lausanne	0.6
720	416.6	Moscow (RV2) ...	20.0
742.6	404	Novosibizsk	6.0
748	401	Ostersund	0.6
759.5	395	Geneva	1.25
825	363.6	Sverdlovsk.....	36.0
833	360.1	Heston Airport...	5.0
845	355	Budapest (2).....	3.0
848.7	353.4	Rostov (RV12) ...	20.0
857.1	350	Leningrad	100.0
882	340	Saratov (RV3) ...	20.0
937.5	320	Kharkov (RV4)...	20.0
967.9	310	Alma Ata (RV60)	10.0
1,000	300	Moscow (Old Kom.)	100.0
1,034.5	290	Kiev (RV9)	100.0
1,071.4	280	Tiflis (RV7)	100.0
1,071.4	280	Scheveningen-Haven	10.0
1,083	277	Oslo	60.0
1,106	271.2	Minsk (RV10) ...	35.0
1,153.8	260	Kalundborg	7.5
1,168	257	Taschkent (RV11)	25.0
1,191	252	Luxemburg	5.0
1,200	250	Istanbul	5.0
1,200	250	Reyjavik.....	16.0
1,229.5	244	Boden.....	0.6
1,237	242.5	Vienna Exp.....	3.0
1,260.5	238	Bakou	35.0
1,304	230	Moscow (T.U.)...	165.0
1,348	222.5	Motala	30.0
1,380	217.4	Novosibirsk (RV6)	100.0
1,411.8	212.5	Warsaw.....	120.0
1,445.7	207.5	Eiffel Tower	13.5
1,481.5	202.5	Moscow (RV1)...	500.0
1,538	195	Ankara	7.0
1,554.4	193	Daventry (Nat.)	30.0
1,600	187.5	Irkutsk (RV14) ..	10.0
1,620	185	Norddeich (KVA)	10.0
1,634.9	183.5	Zeesen	60.0
1,675	179	Kharkov.....	25.0
1,725	174	Radio Paris.....	75.0
1,796	167	Lahti	54.0
1,875	160	Hilversum	8.5
1,935	155	Kaunas	7.0
2,000	150	Craciunelu	1.0
2,625	119	Konigswuster-Hausen (press)	20.0
2,650	113	Eiffel Tower	15.0
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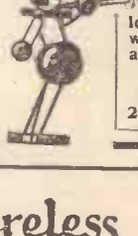

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WIRELESS MADE EASY

New Valves for Old!

HOW long should your valves last? A question often asked but seldom answered very conclusively. The trouble is that valves will go on giving some sort of service long after they ought really to be consigned to the scrap heap.

Only ignorance of what is happening inside the valve can excuse anyone using a valve when its working life is over.

It is rather like those clever people who point with pride to the two-year-old electric bulbs in their lampshades. They do not seem to realise that the old bulb's filament is using an excessive amount of current to produce a greatly reduced amount of illumination.

Importance of the Filament

There is much in common between bulbs and valves. Both have filaments, and both have lives determined by these filaments. When the filament is new it emits the maximum possible amount of light in the bulb, and the maximum amount of electrons in the valve.

The thing that wears out in a valve is the filament. This consists, in most valves, of a centre core of tungsten with a coating rich in electron-emitting properties. In course of time this coating is used up.

When Heating Is Useless

The result is that though the filament continues to be heated, thus taking current from the filament accumulator battery, it no longer emits enough electrons.

The whole action of the valve depends on the electron emission. If this emission is in any way impaired, as with age, the valve will not function properly, though it will work after a fashion for some time after its maximum performance has fallen off.

Various computations have been made as to the useful length of life of the normal valve, but experience seems to indicate that 1,000 hours is a good round figure, beyond which results are in the nature of a compromise.

Now if you care to work the matter out you will find that 1,000 hours means about a year's service from a valve, which we consider is as much as anyone could ask, especially in view of the moderate price of many of the valves of to-day as compared with the exorbitant prices of a few years ago.

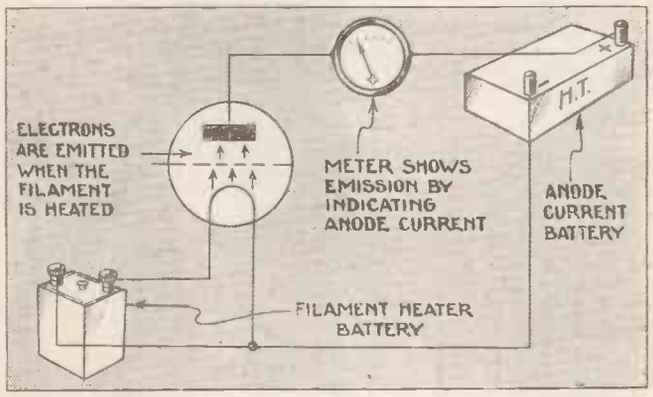
Then there may have been some excuse for making a valve last until the last electron had been emitted from the poor over-worked filament! But now you are simply inviting inefficiency for the sake of saving a few shillings on valve replacements.

Another point to bear in mind is that valves of to-day are very much more efficient than valves of even two years ago. If you are boasting of the fact that you have the same valves in your set as when you bought the set two years ago, just remember that the price you are paying for your "economy" is a performance vastly inferior to that possible with the latest types.

All valves have undergone a striking improvement. The screen-grid valves used for high-frequency amplification have been modified.

On the one hand you can get much greater amplification than before, and on the other hand you can get a much better control of the amplification than usual, with some slight reduction in the maximum amplification.

This means, briefly, that if you have a set with one screen-grid stage, the addition of one of the latest types will give louder signals from foreign stations. And if you have a set with two high-frequency stages, the use of two of the other type of screen-grid—the variable-mu—will give you a very much improved control of the volume.



Old valves are expensive to run because, although the filament is heated and therefore draws current from the accumulator, the electron emission from the filament falls off, and so does the overall efficiency of the valve

More Sensitive Detectors

Similarly, other valve types have been improved. The sensitivity of detector valves has been increased, which means that if you use one of the latest types you will probably get not only better signal strength from foreigners, but better quality from all signals.

In the power-valve group very considerable improvements have been made in all types. Perhaps the most useful improvement from the battery set owner's point of view is the economy pentode, which is a valve that gives the maximum power output for the minimum expenditure of anode current.

Increased Amplification

Small power valves now have greatly increased amplification factors, so that in addition to their main function of converting the amplified signal voltage into current variations to work the loud-speaker, these new power valves also add appreciably to the overall amplification.

Before changing over to new valve types it is important to obtain advice as to their suitability in the existing set. Most sets are designed around valves of a certain efficiency, and if this efficiency is greatly increased it is possible that all sorts of minor troubles may arise.

Alterations Needed

This applies more particularly to the high-frequency side of the set. If, for example, you go in for a variable-mu valve in place of an ordinary screen-grid, you will have to make structural alterations to the set.

In spite of this there is no doubt that it is a wise plan to keep up with valve technique by replacing your valves at least once a year. Quite apart from the improved performance you will often economise in running costs by going to the trouble of adding the new valves, even if the additions mean slight alterations to the inside of the set.

THIS WEEK'S ARTICLES FOR BEGINNERS

ELEMENTARY WIRELESS COURSE FOR BEGINNERS

Just as a cyclist or hiker will consult a road map to show at a glance the contours of the ground ahead of him, so we look at the 'characteristic curves' of valves to gain a ready reference of their capabilities

In this week's instalment of the beginner's complete wireless course J. H. REYNER and the "A.W." STAFF explain in simple language why grid bias is needed in valve working and how it is applied

My set has three batteries. What is the smallest one for?

We use that to provide what we call *grid bias*. It is one of the devices we have to adopt in order to avoid distortion.

What do you mean by distortion?

When we have tuned in our signal and rectified the current with a detector we are left with telephonic currents. If we pass these through a telephone we shall hear speech or music, as the case may be.

The practice of listening on telephones is not adopted much to-day. We prefer to amplify these telephone currents and to apply them to a loud-speaker, which is a sort of large-scale telephone.

In this amplifying process we may, and often do, fail to reproduce the current exactly. We must arrange that each and every vibration of the original current is exactly reproduced on a magnified scale.

What happens if you do not do so?

The speech or music will not sound natural. There are, as a matter of fact, many sources of distortion. It does not follow that the currents in the detector circuit are faithful copies of the original sound waves picked up by the broadcasting microphone, nor that the loud-speaker will radiate sound waves in exact accordance with the current we supply to it. We shall consider these points later.

For the present we are only concerned with the amplification of the currents after the detector, and we must, therefore, assume that the currents are correct to start with, and concentrate our attention on the problem of amplifying these currents with as little distortion as possible.

Is that difficult, then?

There are several unsuspected sources of error which have to be allowed for. So far we have assumed that any variation in the grid voltage of a valve produces an exactly corresponding variation in the anode current. This is only true within certain narrow limits.

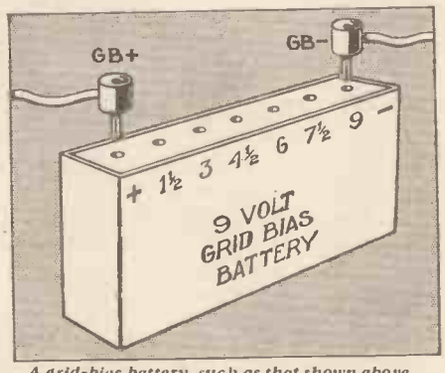
Let us draw what we call the *characteristic* of the valve, which is a graph or curve connecting the anode current and the grid voltage.

I don't understand graphs

Then you may as well start now, because curves will often say at a glance what it takes five minutes to explain otherwise. Actually graphs are quite simple devices.

Imagine a man wearily cycling up a hill. He gets to the top and mops his brow. "How much more of this sort of thing?" he mutters to himself, and drawing from his pocket a small book he examines it carefully, heaving a sigh of relief to find that he has only one more hill to climb before reaching his destination.

How does he know? Because his



A grid-bias battery, such as that shown above, consists of a number of 1½-volt cells connected in series and provided with tapping points. Into these tappings, which are in the form of sockets, we insert the grid-bias leads connected to plugs. Grid bias is varied by changing the negative socket connections of the plugs

book shows the graph of the height of the road. It is as if we had taken a slice through the road and looked at it sideways. Horizontally we represent the distance on a suitable scale—so many inches to each mile, while at each point the vertical height of the curve indicates the actual height of the road at that point, again, of course, to a suitable scale.

What a cunning idea!

Quite so. It tells the whole story at a glance. But we can apply this principle to all sorts of things. We know, for instance, that altering the grid voltage alters the anode current, but we want to know just how the two quantities are connected. Let us make a graph. We will represent grid volts on the horizontal scale, for which purpose we divide it into a number of equal divisions, each one of which represents one volt. We mark one point near the middle 0, and figure the other divisions 1, 2, 3, 4, etc., in either direction representing positive or negative voltage on the grid.

Now for any particular valve with a given high-tension voltage there is some particular value of anode current corresponding to each of these grid voltages. With no volts on the grid, for example, it might be 5 milliamps. We represent this by a vertical line of suitable length. Suppose we say that one inch vertically represents 1 milliamp. Then our line would be 5 inches high.

Let us repeat the process for various other values of grid voltage. At −1 volt the anode current is 3½ milliamps. This we represent by measuring off a length of 3½ in. at the −1 point. At −2 volts the anode current is 2 milliamps., while when we reach −5 volts we find that the anode current has been practically reduced to zero.

If we join up all these points we obtain what we call a graph or curve showing the variation of anode current with grid voltage, and we know that if we measure any distance horizontally along the grid voltage scale, then by measuring vertically from this point until we reach the curve we obtain the anode current for this particular grid voltage. Is that clear?

Yes, I think I see that

Now you can see straight away the advantage of representing matters like this. If you consider the condition of affairs around zero grid voltage you will see that the curve is practically straight. A change of 1 volt either way on the grid causes a change of anode current of 1½ milliamps.

As long as this is true we have one of the conditions we require for distortion less working, since the change in anode current is directly proportional to the change in grid voltage. We say that the valve is working on the straight part of the characteristic.

What happens when it is not straight?

Let us look and see. Suppose we consider the characteristic around −3 volts. You note that here the anode current is 1 milliamp. If we reduce the

Why We Use "Grid Bias"

grid voltage from −3 to −2 the anode current increases to 2 milliamps. Notice that we now only have a change of 1 milliamp. per volt instead of 1½, as we had farther up the scale.

Secondly, if we increase the grid bias from −3 to −4 the anode current is reduced to a half. In other words we have only obtained a change of *half* a milliamp. per volt. The change is *not* the same on either side of the 3-volt line.

Consequently if we have, for example, a fixed grid bias voltage of −3 and we have, in addition, an alternating or oscillating voltage of 1 volt causing the grid voltage to vary between −2 and −4, the change in the anode current would not be a faithful copy of the grid voltage. When the voltage makes the grid more positive, there would be greater relative change of anode current than if we make it more negative.

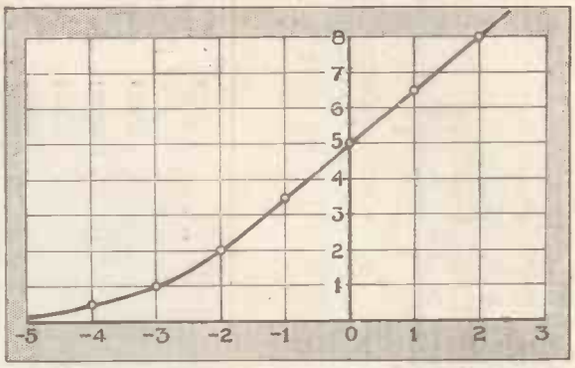
I seem to remember something like that before

Quite correct. You are thinking of the valve used as a rectifier. One of the methods is to put a negative bias on and reduce the anode current practically to nothing, so that a change of voltage in one direction produces a greater variation in anode current than it does in the other direction which gives us the rectification we want.

Then we don't want any bias for amplifying?

It seems so at first, but there is another effect to consider. Suppose we consider an L.F. transformer supplying voltage to the valve. The winding of the transformer has quite a considerable resistance, and any current which flows in the winding must flow through this resistance. Let us consider this resistance, for convenience, quite separately. Normally there is no current between the grid and filament. We control the anode current simply by altering the *voltage* on the grid. Therefore the grid receives the full voltage developed by the transformer. If we make the grid positive, however, current flows from the filament to the grid, returning through the transformer. You will see that this current has to travel through the resistance, and in the process some of the voltage will be wasted. Therefore the voltage on the grid will *not* be the full voltage.

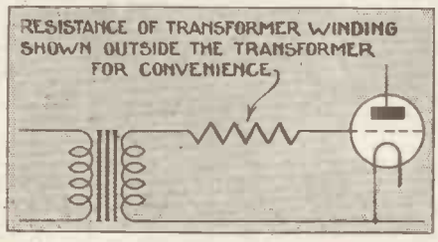
This is a serious source of distortion. The voltage developed by the transformer is alternately positive and negative. On the negative side the anode current is reduced in the correct proportions. When the voltage is positive, however, the valve does not receive the full voltage because of this voltage loss in the resistance, so that the anode current does not increase as much as it should do. Consequently, even though the valve may amplify faithfully, it has been given a false start, and the reproduction must be distorted.



Here is a characteristic curve of a valve that shows you at a glance important features of the valve, as we clearly explain in this week's article

How can you get over that?

By arranging that the voltage applied to the valve *never becomes positive*. We use a grid-bias battery which causes us to work at, say, −1 volt. Then if the oscillating voltage which we are applying to the valve does not exceed 1 volt itself, we get a variation in voltage between 0 to −2. You will see that this is still on the straight-line part of



For convenience, the resistance of the low-frequency transformer is shown above as a separate resistance in the grid circuit of the valve following the transformer

the characteristic, so that our amplification is distortion-less. At the same time the grid voltage is never positive, so that we do not "run into grid current," as we say.

It sounds rather critical to me

It is. If we make the bias too large then we run on to the curved part of the characteristic and introduce distortion in that way. If we make it too small we run into grid current on the top part of the wave, and again we meet distortion. Finally, even with the correct bias we have to make sure that the maximum value of the voltage does not exceed that of the grid-bias battery.

What do you mean by the top part of the wave?

We often speak of an oscillating voltage as a "wave" because the strength is varying up and down rather like the waves of the sea. The top part of the wave, therefore, is the part at which the voltage is strongest, and you will see that near the maximum strength the voltage may exceed the steady voltage of the grid-bias battery, giving us an effective positive voltage in the circuit.

It seems surprising to me that you can ever get distortion-less amplification

The problem is simplified slightly because we can afford a little distortion. The ear cannot always detect small variations from the ideal. To be on the safe side, however, we always endeavour to use valves which have a factor of safety. The valve we have just considered, for example, will only take a peak swing of 1 volt in either direction. We should only use such a valve in a circuit which never develops more than about half a volt under normal conditions.

How do you know what grid bias to use?

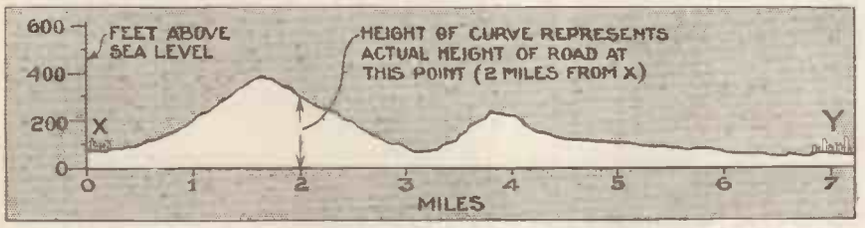
You can work it out from the characteristic, but more usually one uses the data supplied with the valve by the makers. For each value of anode voltage there is a correct value of grid bias when the valve is to be used as an amplifier, and the manufacturers usually specify this on a leaflet supplied with the valve itself.

I see. Then how do you apply the grid bias?

By employing a small battery for the purpose. This is connected with the positive end to the filament of the valve, while the negative end is connected to the circuit. The battery is provided with sockets every 1½ volts, so that we can choose the voltage we require by simply inserting a wander plug into the correct socket. The usual size of battery gives 9 volts total, with seven tapping points. It is only in special cases that we want more than 9 volts bias.

Do different valves have different bias?

Certainly. The larger the amplification factor and internal resistance of the valve the less the grid bias necessary.



There is no need to be scared of graphs, as we prove to you this week. This graph links road height with distance along the road. A valve graph is just as easy to follow

PERCY W. HARRIS'S "BUILD AS YOU LEARN

As an introduction to the use of a variable-mu type of screen-grid valve PERCY W. HARRIS this week provides you with some interesting experiments with volume controls. Next week he will show how a variable-mu valve acts as one of the most efficient volume controls in use to-day

AS soon as we get settled down to one technique, one component or one special valve, along comes something entirely new to disturb our equanimity. Actually, of course, if we were prepared to confess it, this is one of the greatest charms of wireless as a hobby, and incidentally is one of the reasons why the home constructor has the advantage over the man who buys his set ready made—he can incorporate the latest improvements almost as soon as they come out.

About The Screen-grid Valve

When talking about high-frequency amplification, I explained some of the reasons why the screen-grid valve is made as it is and its advantages in radio reception. We have built up in our series a receiver which will magnify the feeble currents induced in our aerial, will detect them and after detection will magnify them again so as to hand out to our loud-speaker sufficient energy for comfortable entertainment.

We have seen, too, in the last lessons, how the pentode, by its much higher efficiency, enables us to get still louder signals without making a heavy drain upon our high-tension battery. We have had wave-change switching explained and we have seen how, by reaction, the volume can be increased up to the maximum possible with this receiver.

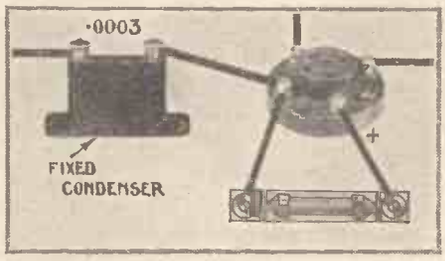
There is however, still one matter we have not discussed, i.e., how to control the volume when, *without* reaction, we are getting a stronger signal than we want, which of course is often the case on local-station reception.

There are two reasons why we do not want too strong a signal. The first is that too loud reception is unpleasant in the average living-room, and secondly if the signal is too strong we shall get distortion due to overloading. Actually many people complain about a signal being too loud when really what they mean is that it is too distorted. In other words, it is not the actual *strength* that worries them, but the distortion that in their experience of wireless invariably accompanies such strength.

Such people, when they hear the signal just as loudly from a set which has ample power-handling capacities and without overloading, do not notice any irritation. Indeed, it is astounding how loud a signal can be made and still be comfortable to listen to if there is no distortion involved.

Types of Distortion

Now, distortion in a receiver can arise in several places. We can have valve distortion, due to the strength of the signal at a particular stage being outside the power handling capacity of the valve concerned, and a further kind of distortion due to overloading of certain components in the set.



The normal connections for a power valve connected to a low-frequency transformer without a volume control

It would take too long to explain this latter form of distortion and its most likely sources, but as it is much less frequent than valve distortion I propose to consider the latter.

Let us now consider how volume can be controlled in a set and what is bound to occur when the volume control is placed in different parts of the receiver.

Let us imagine that we are very close to a powerful station and that, without reaction, and with the set tuned accurately to this station, horrible distortion arises. We will suppose that in the output valve of our three-valve receiver we have built, we have one of the ordinary power type which with 120-volt battery takes 3 or 4½-volts grid bias.

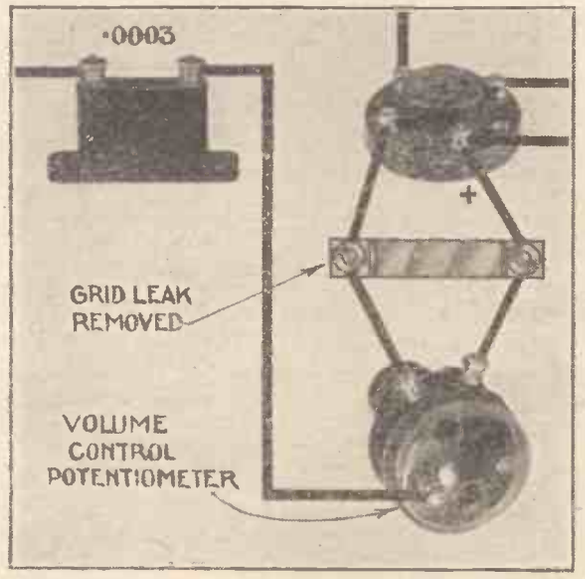
This means, in effect, that if the strength of the signal applied to the grid of this output valve is such that it brings about a "swing" of not greater than 3½- to 4-volts rise and fall, the valve will not overload. If however, we put more than that on to the valve, it will not be able to handle it and distortion will arise (all these matters are being discussed in their proper places in this supplement).

Our local-station signal will obviously be placing on the output valve a higher voltage than comes within the limit of this valve, and therefore we may experiment and see what is the effect of changing this output valve for one of the super-power type, consuming more high-tension current, and requiring about 9 volts grid bias for the same high-tension voltage.

The improvement will be immediately apparent, the quality will sound very much better because a much more powerful signal can be handled without distortion.

Introducing A Volume Control

However, this will not by any means cure our trouble and we may not want to have as loud a signal as this valve will handle without distortion, so we can introduce a volume control to cut down the voltage applied to the output valve. There is quite a simple device called a volume control potentiometer which can be connected across the secondary of our transformer.

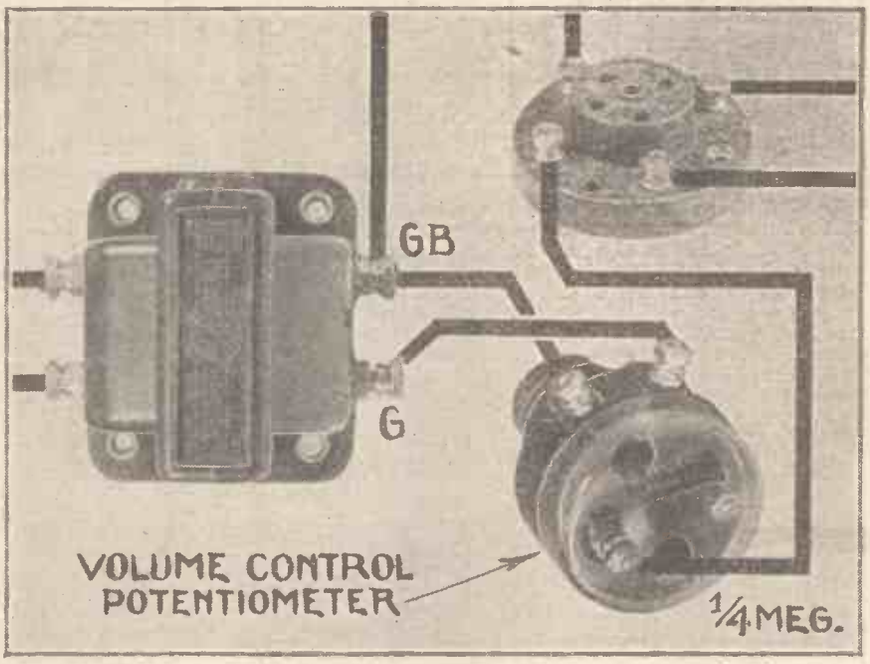


With the aid of a potentiometer volume control you can control the volume by varying the input to the grid of the detector valve, as shown by the above pictorial diagram

It is so arranged that the two ends of a very high resistance are connected to the two ends of the transformer and a third terminal is connected to a slider which runs along the resistance. If the slider is at the top, or nearest the grid terminal of the transformer, the volume will be practically the same as without the volume control potentiometer, but when it is at the other end, you will get no signal at all.

The variation of strength when moving the slider will depend upon the proportion of resistance included, half way up the slider giving half the signal. With this we can thus adjust the signal not to overload the particular kind of output valve we are using, whether it is the ordinary power or super-power type.

We shall still find, nevertheless, that this will not cure our trouble completely. When the set is tuned fully to the local station the signal may be distorted badly whatever strength we arrange to apply to the output valve.

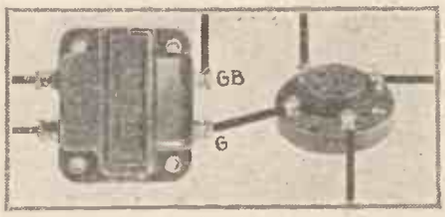


This pictorial diagram shows very clearly how you can fit up a potentiometer between the transformer and the power valve to act as an efficient volume control

Disadvantage of De-tuning

We could of course, detune to decrease the strength but with a sensitive receiver such as this and the large number of stations now broadcasting, we should in many cases, simply run off one into the other. It is essential, then, for proper volume control not to detune.

Further examination of our problem will show that while there is detector overload which can only be fully overcome by using a detector valve with a very high voltage on its plate and a suitably arranged grid circuit, or else by



These are the normal grid-leak and condenser connections of a detector valve, which can be altered as shown at the top of this page to take in a volume control

controlling the strength applied to the detector grid.

For an interesting form of detector volume control we can use a similar principle to that I have already indicated for the low-frequency transformer, i.e., progressively reducing the voltage applied to the detector by means of a slider on the potentiometer.

Schemes of this kind are very useful in some radio-gram arrangements. But we are still controlling the volume after a place where distortion can occur and therefore let us see what we can do in the case of the screen grid valve.

This is where the "variable-mu" or variable-magnification screen-grid valve comes in. You have heard a lot about this valve lately but very few simple explanations have been given.

The variable-mu valve is really a specially-designed screen-grid valve wherein, varying the grid bias varies the magnification which the valve will give. The "characteristic curve" of this valve is rather peculiar, and if by some method you can steadily vary the grid bias on the grid from zero up to about nine volts in the case of a single screen-grid valve, or when two are used up to about fifteen volts, then the magnification given by the valve with a maximum grid bias is almost zero.

The great advantage of this scheme is that by simply turning a knob the valve can be adjusted so as not to overload and therefore distort and at the same time the volume can be adjusted so that the output from the screen-grid valve is just within the power handling capacity of the detector valve.

Stopping Over-load Distortion

If now we arrange our output valve to handle without distortion the maximum signals which the detector can pass on to it before it (the detector) reaches the overload point, we shall have a receiver free from valve-overload distortion at every point.

Furthermore, the variation of grid bias to give this particular form of volume control does not in any way affect tuning and it has the further advantage that when the volume is turned down on the local station an appreciable saving of the high-tension current in the screen-grid valve is effected.

I have not altered the construction of the set this week to include the transformer and detector forms of volume controls for in neither of these will permanency be required. If however, you wish to try (and I would recommend you to do so) the L.F. volume control idea, you can obtain a ¼-megohm potentiometer such as is sold for volume control purposes and connect the two outside terminals to the grid and grid bias terminals of your low frequency transformer.

Remove the wire which goes from the grid of the output valve to the grid terminal of the low-frequency transformer and connect it to the *centre* terminal on this potentiometer, leaving the grid bias connection as before. You will now find that you can control the volume accurately by turning the knob of the potentiometer one way or the other.

After you have tried this, restore the original connections and try the potentiometer in the detector circuit. To do this the two outside terminals of the potentiometer should be connected to the two grid leak terminals of the grid leak holder, the leak being temporarily removed. The lead which at present goes from the grid condenser to the grid should be removed and a new lead taken from the grid condenser to the centre terminal of the potentiometer. Volume will now be controlled again by varying the knob.

Extra Gadgets You Need

You can do these two experiments I have suggested if you care to buy a ¼-megohm volume control potentiometer, but as this particular component will not be necessary at the moment in this set you may care to dispense with it, taking my word for it that the effects I have just described actually do occur.

Next week, however, I suggest that you buy a 50,000-ohms potentiometer and a further 1-microfarad condenser, as a large number of readers who already possess a variable-mu valve are anxious to be told how to use it.

NEXT WEEK:—USING THE VARIABLE-MU VALVE

Simple Gadgets You Can Add To Your Set

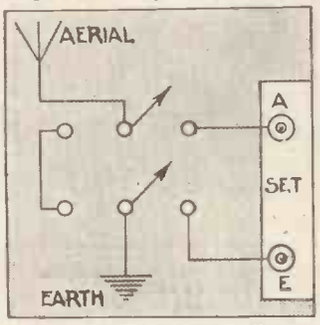
There are many simple gadgets the beginner can with advantage add to an existing set to improve its efficiency, as we explain in the article below. Even if your set works well you will learn a lot if you carry out some of the suggested experiments

THERE is no reason why the beginner, knowing little of the technical details of wireless, should not add various little gadgets and units to improve reception.

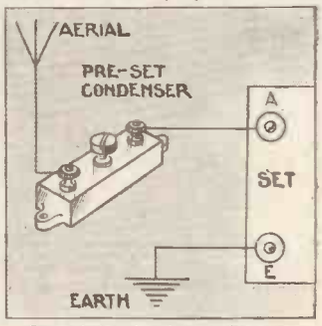
Indeed, the addition of one or more of the items we shall mention in this article may inspire the beginner to tackle more ambitious work in the future, such as the building of complete sets.

If you look at any wireless set you will find that there are three main points where gadgets can, if desired, be added.

Firstly, there is the aerial and earth end of the set—the input end. Then there is the loud-speaker or output end. Thirdly, we must not overlook the battery connections at the back.



The connections for an efficient aerial-earthing switch are shown above. Fit the switch up outside the house, near the lead-in wire if possible



One of the simplest gadgets you can fit to your set is a pre-set type of condenser, as shown in the above diagram. Make sure that the set does not already contain such a device

Gadgets for Aerial Circuits

Dealing with these three points in turn, we find that there are several worth-while gadgets that can and often are added to the aerial-input end of the set. The first gadget that occurs to us is an aerial and earth switch.

This is a safety device that ought to be installed with all sets, though often the wrong kind of switch is fitted and the efficiency of the aerial and earth system is thereby impaired.

We suggest that one of the best though not necessarily the only satisfactory method of earthing the aerial is to use a two-pole change-over switch.

The aerial and earth leads are taken to the centre poles of the switch and two of the outers are connected together, so that when the switch handle is moved over to them, the aerial is automatically switched to earth.

The remaining two "outers" are taken by the usual aerial and earth leads to the aerial and earth terminals of the set, so that when the switch handle is moved to them the leads are automatically taken to the set.

Even to-day there are many sets that have no means of varying the selectivity of the aerial tuning. This is a valuable facility, because in varying aerial selectivity you also to some extent vary the volume.

The easiest way of varying the aerial signal input is to connect a pre-set type of condenser between the aerial lead and the aerial terminal of the set. Make sure, though, that such a condenser is not already incorporated in the set.

If there is a fixed condenser already in the set you will have to use a fairly high maximum capacity condenser, otherwise the signal strength will be too greatly reduced even at the maximum setting of the pre-set.

For most requirements a .0003-microfarad pre-set condenser will do quite well. This assumes the normal length of aerial, but if a very long aerial is in use a smaller capacity condenser —.0001-microfarad— will be needed to get really effective results.

Adding a Wave-trap

One of the most interesting gadgets you can add to the aerial input side of the set is a wave-trap. This simple device will give you greatly increased selectivity so far as the separation of a strong local from a weaker foreigner is concerned.

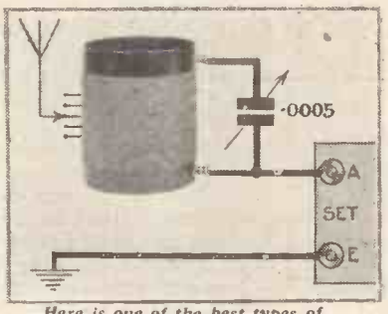
Do not make the mistake of thinking that a wave-trap will improve the *general* selectivity of a set. All even the best of traps can hope to do is to lessen the swamping effect of a powerful local. As a rule it is not possible to make a trap so selective that it will cut out one station and enable the station on the next wavelength to be received at good strength.

In trapping the local station the wave-trap usually traps two or three stations on either side of the point of tune of the local. This effect can be reduced to the minimum by using the tapped coil type of trap, as shown by the diagram.

The procedure is simple: You connect the aerial lead to the tap on the trap coil, which can consist of a 60-turn coil tuned by a .0005-microfarad condenser, and then connect the end of the coil nearer to the tap to the aerial terminal of the set.

You then tune in the local station and very carefully turn the knob of the trap condenser until at one particular spot the local will disappear or at any rate will be greatly reduced in volume.

If this idea does not appeal to you, and you really want to make the overall selectivity of the set better, there is nothing to beat a band-pass system.



Here is one of the best types of wave-trap, consisting of a tapped coil tuned by a .0005-microfarad variable condenser. Vary the tap and you vary the trapping effect

You can easily devise this by adding on to the front of your set a simple tuned circuit coupled to the existing tuning circuit by means of a very small capacity, such as a neutralising condenser.

As most modern sets have dual-range coils it is as well to arrange that the coil of the external tuning circuit is of the dual-range type, with a simple two-way switch to give you medium or long waves at will.

Often it will be desirable to erect a small capacity screen between the add-on tuning unit and the set, so as to prevent inter-action between the tuning circuits. This can easily consist of a short vertical aluminium plate mounted at one end of the baseboard on which you have fitted the dual-range coil and condensers.

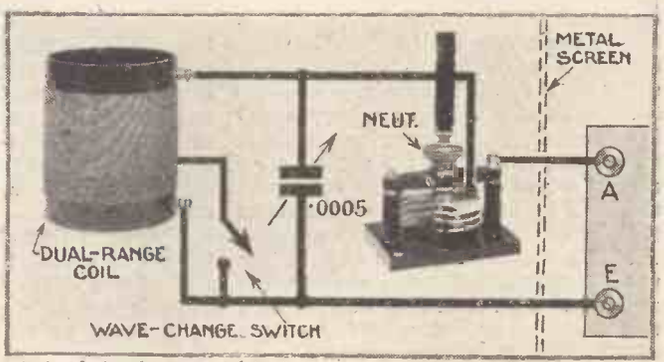
Operating a Band-pass

The procedure in operating a set with a band-pass arrangement such as we have described is, of course, a little more complicated than without the gadget. But although it is necessary to tune both external and internal tuning circuits for every station received, the value of the increased selectivity will soon be appreciated.

As a matter of fact the aerial tuning on the external circuit is not usually very critical, and you can always disconnect the external unit if you require the utmost simplicity of operation, as, for example, when you are leaving the set for the family!

On the output side of the set the first gadget of importance that can easily be added by the beginner is the choke-capacity filter. This simple gadget will enable the direct current of the high-tension battery to be diverted from the loud-speaker winding.

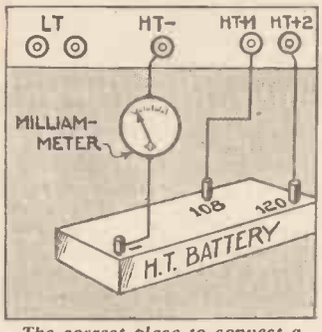
The advantage of this is that



A simple band-pass aerial tuning arrangement can be fitted up with a dual-range coil, a tuning condenser, and a small coupling condenser, as shown by the above pictorial diagram

A Practical Article for Beginners

extension leads between the set and the loud-speaker will then carry only the low-frequency



The correct place to connect a milliammeter when you want to find the total anode-current consumption is in the high-tension negative lead. To find what each valve is taking insert the meter in the individual positive leads

current, and not the battery or mains-unit current.

Furthermore, the elimination of the high-tension current from the loud-speaker will improve the working of the speaker.

Once again it is necessary to point out that a filter such as this does not enable a valve to be matched to a speaker. The impedance of the choke is common to both valve and speaker, which for good results must therefore be approximately matched without the choke.

Choke-capacity Connections

In modern sets the method of using a choke-capacity filter is to connect the choke in the anode circuit, that is, between the anode of the power valve and the high-tension supply, and to connect the loud-speaker winding in series with the fixed condenser between the anode and earth.

If you look at the diagram you will see that this method, which is to be adopted wherever possible, involves the use of five terminals on the choke-capacity unit, if this is used as an externally-connected gadget.

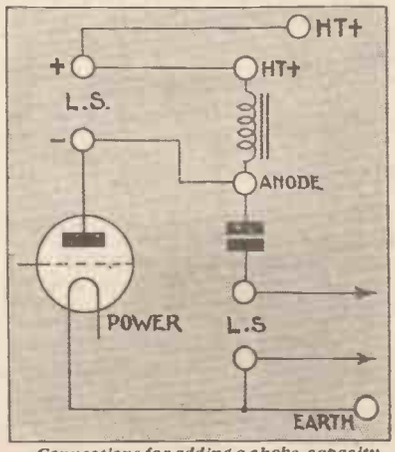
Two terminals are needed for the loud-speaker, one for the anode and another for the high-tension, and the fifth for the earth.

The earth is simple enough, a lead being taken from the unit earth terminal to either the earth terminal or low-tension negative of the set.

The anode and high-tension terminals must be rightly connected. They will go to the loud-speaker terminals of the set, which internally you will find connected to the anode of the valve and high-tension positive. Take care to connect the anode terminal of the unit to the loud-speaker connection of the set that actually goes to anode of the power valve.

Cutting Down the High Notes

If your set uses a pentode output valve and the quality is on the harsh side you can add a simple gadget that will cut down the high-note response, and that will, in fact, act as a very satisfactory control of the tone.



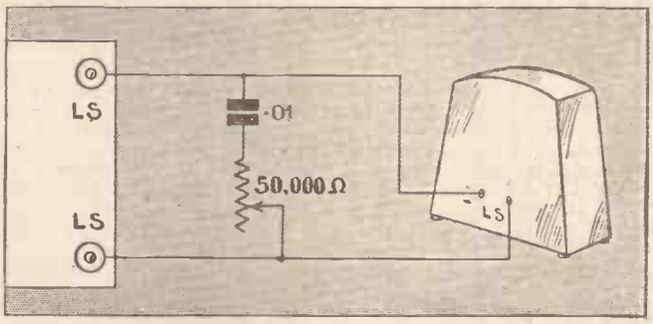
Connections for adding a choke-capacity filter to your set, to isolate the loud-speaker from the direct current of the high-tension battery

All you need is a fixed condenser and a variable resistance in series with one another across the loud-speaker terminals, as shown by the diagram. For ordinary loud-speakers a .01-microfarad condenser and a 50,000-ohm variable resistance should prove suitable, but you may have to use a larger condenser, say, up to .1 microfarad.

Coming now to the connection of gadgets to the back of the set, around the terminal connections to the batteries, one of the most useful of all gadgets is the trickle charger.

This gadget enables you to maintain the accumulator in a fully-charged condition. Every other night you leave the charger on all night and the accumulator is charged at the slow rate of .5 ampere.

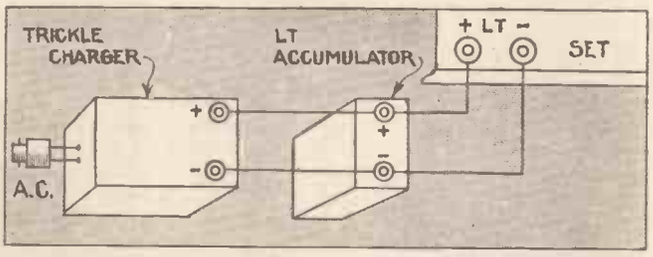
Few listeners realise how simple are the connections for a trickle charger. As the diagram shows, the charger is permanently connected to the



A simple loud-speaker tone control can be made up with a .01-microfarad fixed condenser and a 50,000 ohms variable condenser, connected in series across the speaker terminals

accumulator. No damage will be done to the set if the charger is accidentally switched on while the set is in action, but the mains hum will prevent any reception being carried on during the charging process

All you do is to switch off the set by pushing in the filament on-off switch and then



A trickle charger can be permanently connected up to the filament accumulator, but it is essential to switch off the A.C.-mains supply when using the set, otherwise there will be an unbearable background noise due to mains hum

plug into the main on the charger side. The accumulator will then start to charge up and so replenish what has been taken out of it by the filaments of the valves of the set.

Remember that this applies only to A.C.-mains operation. The mains voltage is stepped down by a transformer inside the set, so that the charging voltage is not more than about 9 to 12 volts at the most. These trickle chargers employ metal rectifiers that are practically everlasting.

Another very useful gadget for the batteries is a milliammeter, preferably one with two or three ranges. One range should read from 0 to 50 milliamperes, to take the total anode current of the set, and ranges from 0 to 5 and from 0 to 10 milliamperes are very useful for taking the current of individual valves.

To take the total anode current you must connect the meter in the high-tension negative lead, but if you want to find what each valve is taking you connect the meter in the appropriate high-tension positive lead, assuming each valve has its separate high-tension feed.

If the valves are all fed from a common high-tension positive terminal, as they are on some sets, and you still want to find what each valve is taking, you can do so by the aid of a simple little gadget.

A Useful Adaptor

This is the Bulgin split-pin adaptor, which is like a valve holder with two terminals on the side for the connection of the meter terminals.

The anode lead is "split" inside the valve holder, so that when you connect up the meter to the two side terminals you connect it in series with the anode of the valve and the high-tension supply.

Meters are among the most useful of all the gadgets you can add to your set. If you want to make a permanent job there is no reason why you should not fit a milliammeter on the panel, and then you can always tell at a glance what is the anode-current consumption.

ARTICLES YOU MUST NOT MISS NEXT WEEK

THE A.B.C. OF SWITCHING

WHAT HAPPENS WHEN YOU ALTER THE VOLUME?

IT'S EASY TO BUILD A WIRELESS SET!

OHM'S LAW WITHOUT TEARS

Everyone interested in wireless must know something of Ohm's Law, which is quite simple to understand, and use in practice, as you will appreciate from this article

ONE of the most used formulae in electrical work, and in wireless too, is Ohm's Law. Before we show how to use this very important law, let us look at the three constituents of an electric circuit, for it is about them that the law tells us so much.

In any simple electric circuit there are three things to worry about. The resistance, the current and the voltage.

Ohm's Law states: The current is directly proportional to the E.M.F. and inversely proportional to the resistance.

What the Law Means

Looked at in the simplest possible way, this means that *the current flowing in a circuit will increase if the voltage is increased or decrease if the voltage is decreased.*

Also that the current will increase if we decrease the resistance and decrease if we increase the resistance.

Before we go any further into the meaning of Ohm's Law, it will be as well to clear up our ideas on the meaning of current, E.M.F., and resistance.

Current in electricity is analagous to the *rate of flow* of water in hydraulics. In fact, current is a measure of the rate of flow of electrons, those tiny particles of negative electricity the movement of which constitutes an electric current.

Let us see the connection between current and electrons in terms of quantity. The unit of quantity in electricity is the coulomb. It takes 10^{19} electrons to make a coulomb. The unit of current is the ampere, and we say that an ampere is the rate of flow of one coulomb of electricity in a second of time.

As a rule we are not concerned with the amount of the electricity in the circuit, but we *are* vitally interested in the rate at which it flows through the circuit.

The Ampere Defined

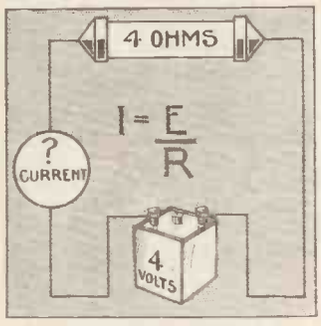
You may, therefore, forget about the coulomb and remember that the rate of flow of electricity corresponding to *one ampere is the current flowing when there is a pressure of one volt and a total resistance of one ohm.*

Pressure, electro-motive force (E.M.F. for short) potential difference and voltage are all used to denote the same thing, though the most common word is voltage. Just as the ampere indicates the rate of flow, *the volt indicates the pressure causing that flow.*

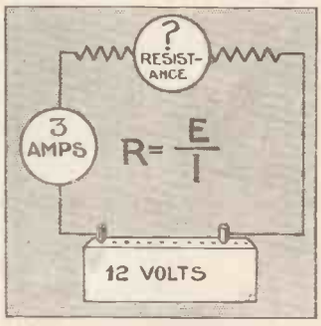
You might compare the foot pounds per square inch of water pressure with the voltage pressure in an electrical circuit.

Resistance is not difficult to visualise because it is obviously analagous to *friction* in mechanics. The greater the resistance in a circuit, the greater the opposition to the flow of current, caused by whatever pressure is available.

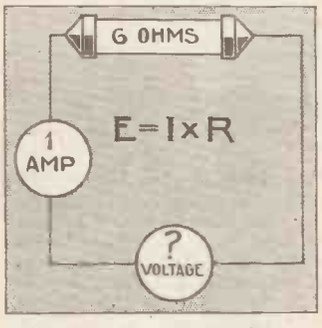
Resistance in a circuit is the property of matter of opposing the flow of the electrons, which flow is brought about by the potential difference or electric pressure—the voltage.



When the voltage and the resistance are both known, you can find the current by the aid of Ohm's Law



If you know the voltage and the current flowing through the circuit, you can find the resistance by Ohm's Law



Knowing the current flowing through the circuit and the resistance of the circuit, you can readily find the voltage producing that current. Just another application of Ohm's Law

Ohm's Law links up the three constituents of an electric circuit. The practical interpretation of this Law is that I equals E divided by R, when I is the current in amperes, E is the voltage in volts and R is the resistance in ohms.

We can express this Law in three different ways, and can find out the value of the current, the voltage or the resistance when the other two are known.

(1) Current equals voltage divided by resistance.

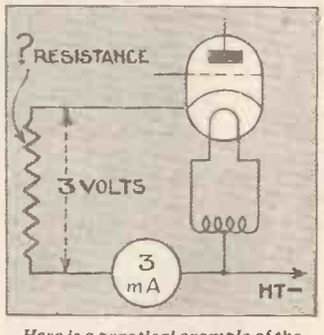
(2) Resistance equals voltage divided by current.

(3) Voltage difference equals current multiplied by resistance.

We can apply these three simple equations to the solution of three typical problems.

Let us deal first with a circuit in which the resistance and voltage are known and in which we desire to find the current flowing. Of course, we could easily do that by inserting a meter in the circuit, but we can just as easily work it out from Ohm's Law.

We know that current equals voltage divided by resistance,



Here is a practical example of the working of Ohm's Law. You want to know the value of resistance for grid bias in a mains valve circuit. It can be found quite easily as you know the voltage required (the grid bias) and the anode current flowing

and we know from the circuit that the voltage is four volts and the resistance is four ohms.

Then by applying our equation we know that the current flowing under these conditions of voltage and resistance must be four volts divided by four ohms, which is one ampere. The current is, therefore, one ampere, as a meter would show if inserted in the circuit at any point.

Now another problem. We might have a circuit in which it was known that the voltage was twelve volts and the current flowing through the circuit was three amperes. What would be the resistance?

From our second equation we know that resistance equals voltage divided by current, so here we know the resistance is twelve volts divided by three amperes, which is four ohms.

Just as it is easy to find the resistance and current of a circuit by using Ohm's Law, so it is just as easy to determine the voltage when we know the resistance and current.

We might have a circuit in which the resistance was known to be six ohms and the current flowing through the circuit was one ampere. What would be the voltage?

From our third equation we know that voltage equals current multiplied by resistance. So in this circuit the voltage would be one ampere multiplied by six ohms, which is six volts.

Using Ohm's Law

In actual practice we make a great deal of use of Ohm's Law. For example, when we want to apply grid bias to a mains valve by inserting a resistance in the cathode circuit we make use of the second equation or variation of Ohm's Law, which is that the resistance is equal to the voltage divided by the current.

We should know the voltage, because that would be the grid bias required. And we should know the current, because that would be the anode current of the valve in question. From these two knowns we could find the unknown, namely the value of resistance needed to give us the required bias voltage.

Amperes And Milliamps.

In practice the current would not be three amperes but probably it would be three milliamperes, that is three-thousandths of an ampere. The required voltage or grid bias might be three volts.

Then from the equation we should know that the resistance in ohms needed to give this result would be found by dividing three volts by three milliamperes, which would be 1,000 ohms.

$R = \frac{E}{I}$ Then $R = 3$ divided by $\frac{3}{1{,}000}$ or $\frac{3}{3} \times 1{,}000$ which is 1,000 ohms.