POPULAR WIRELESS, February 11th, 1933. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

FOREIGN STATIONS IDENTIFIED AT LAST!

Popular Wireless

Every Wednesday PRICE 3d.

No. 558. Vol. XXII. February 11th, 1933.

FREE! FREE!

The Slider Log

INGENIOUS! INSTANTANEOUS!! INDISPENSABLE!!!

PRAISE FROM THE RADIO INDUSTRY
and more about the
"P.W." AIRSPRITE
1933's STAR SET employing
"A.T.B." CONTROL

THE NEW ACCUMULATOR

DOUBLE CAPACITY!

TAKES THE NUISANCE OUT OF RE-CHARGING

80 AMP. HRS. FOR 11/6

The new accumulator has no weak, unwieldy "plates." This, and its efficient cylindrical form, results in twice the ampere-hour capacity for its size! So your trips to the charging station are in any case halved! The revolution is due to Leonard Fuller, M.I.E.E.—grandson of the John C. Fuller who, as Faraday's collaborator, was a pioneer of Britain's battery industry. The new accumulator's length of life is extraordinary. The cell is practically unbreakable. Handsome, too, in its richly-coloured bakelite case. Get one now and be rid of the nuisance of the old-fashioned type of accumulator.

Specified for the wonderful POPULAR WIRELESS

"AIRSPRITE"

3 VALVER

Unique in Radio!

See page 1186

BLOCK

PLATE-LESS ACCUMULATORS

BLOCK BATTERIES LTD., ABBEY RD., BARKING. Tel.: GRA. 3346

THE FEBRUARY NUMBER OF

MODERN WIRELESS

IS NOW ON SALE

There is a

SPECIAL SECTION

entitled

THE WORLD'S PROGRAMMES

It includes

SITTING UP FOR AMERICA.
FRAMES FOR FOREIGNERS.
THE GERMAN POINT OF VIEW.
AN "ETHER COP" IN THE PRAIRIE.
Etc., Etc., and

ALL ABOUT THE FOREIGN STATIONS

Also many fine articles of general interest which every listener should make a point of reading, including:

NEW RADIO PLAY IDEAS ABROAD

THE MAN WHO HEARS IT ALL

RECENT RECORD RELEASES

MY BROADCASTING DIARY

SPOTLIGHTS ON THE PROGRAMMES

AUTHENTIC AND UP TO DATE

Among the practical and detailed features for the constructor are:

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Other Contributions Include

COMBINING CARRIERS By Sir Ambrose Fleming, F.R.S.
VOLUME WITHOUT WATTS
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CAN WIRELESS WAVES BE PHOTOGRAPHED? ETC., ETC.

AND

HOW TO OBTAIN

BETTER RADIO

A simple-to-understand section with universal appeal and intensely practical presentation.

THE BEST VALUE FOR

GET IT TO-DAY THE FEBRUARY NUMBER OF

MODERN WIRELESS

OBTAINABLE AT ALL BOOKSTALLS

1/-

PILOT AUTHOR KIT
Exact to specification

AIRSPRITE

SEND DIRECT to AVOID DELAY
CASH, C.O.D. or EASIWAY

DELIVERED Carriage Paid CASH or C.O.D.

KIT "A"

87/6

with FREE Full size Blueprint and Copy Popular Wireless

AIRSPRITE A.C. MODEL

KIT "A"

Cash or C.O.D. Carriage Paid.

£9:15:0

or 12 monthly payments of 18/-.

Author's Kit of Specified Parts including **FREE BLUE PRINT**, ready-drilled panel and terminal strips, but less valves and cabinet.

KIT "B." As Kit "A" but with valves less cabinet. Cash or C.O.D. £12:15:0 or 12 monthly payments of 23/4.

KIT "C." As Kit "A" but with valves and PETO-SCOTT A.C. Airsprite Cabinet Cash or C.O.D. £13:14:6 or 12 monthly payments of 25/3.

KIT-BITS

Selected C.O.D. Lines—You pay the postman, we pay post charges on orders value over 10/-.

	s.	d.
1 PETO-SCOTT "AIRSPRITE" CABINET A.C. Type	19	6
1 Pair TELSEN Coils, W.287, and Switch Coupling Link	17	6
2 UTILITY ·0005 Var. Condensers (Type 319) with S.-M. Dials	13	0
1 IGRANIC Output Choke, C.H.2	9	6
1 FERRANTI B.10 Choke	11	0
1 VARLEY D.P.35 Transformer	11	6
1 R.I. Mains Transformer, E.Y.30	£1 10	0
1 BULGIN Thermal Delay Switch S.100	7	6
4 Valves, as specified	£3 0	0

PILOT STRUCTAKIT AIRSPRITE (A.C. MODEL)

Comprises 1 Peto-Scott Red Triangle Ready Drilled Ebonite Panel, 2 Peto-Scott Baseboards, 2 Panel Brackets, 2 Peto-Scott Ready Drilled Terminal Strips, Connecting Wire, Screws, Flex, etc., as specified for A.C. Airsprite. IN SEALED CARTON, CASH OR C.O.D. CARRIAGE PAID. **13/6**

THESE ARE THE PARTS THE AUTHOR USED

BATTERY MODEL

	s.	d.
1 **PETO-SCOTT** Red Triangle black ebonite panel, **ready drilled**, 16 by 7 ins.	5	0
1 **PETO-SCOTT** baseboard, 16 by 10 ins.	1	3
1 Pair **TELSEN** Coils, type W.287, and switch coupling link, W.217	17	6
2 **POLAR** No. 2 S.M. ·0005-mfd. variable condensers	13	0
1 **ORMOND** S.M. type R 190 ·0003-·0005-mfd. differential condenser	3	0
1 **READY RADIO** special type 50,000-ohms potentiometer	3	9
1 **READY RADIO** 3-point on-off switch	1	6
1 **READY RADIO** ·0003-mfd. max. pre-set condenser	1	6
2 **LOTUS** valve holders, 4-pin type V.H.K.	1	0
1 **LISSEN** L.N. 739 S.G. valve holder	1	3
1 **LISSEN** type L.N.110 0·1-mfd. condenser	1	9
1 **R.I.** Quad Astatic H.F. choke	3	6
1 **LEWCOS** type M.C. reaction choke	2	6
1 **VARLEY** type D.P.35 L.F. transformer	11	6
1 **GRAHAM FARISH** ·01-mfd. condenser	1	6
1 **GRAHAM FARISH** Ohmite 1,000-ohm resistance and holder	2	0
1 **GRAHAM FARISH** Ohmite 100,000-ohm resistance	1	6
1 **T.C.C** Flat S. type ·0005-mfd. condenser	1	3
1 **IGRANIC** tag type ·0003-mfd. condenser		9
1 **BULGIN** type B fuse and F.5 holder	1	0
12 **BELLING LEE** type R indicating terminals	2	6
1 **DUBILIER** type 9,200 0·1-mfd. condenser	2	0
1 **FERRANTI** Synthetic 2-meg. grid leak and holder	1	6
8 **CLIX** battery plugs	1	0
2 **CLIX** spade terminals		4
1 **PETO-SCOTT** Red Triangle ready drilled terminal strip, 16 by 1½ ins.	1	6
1 **BELLING LEE** Anode connector		4
Insulated connecting wire, screws, flex, etc.	2	6

KIT "A." CASH OR C.O.D. **£4 7 6**

● **All panels and terminal strips accurately drilled to specification.**

KIT "A"

FIRST PAYMENT OF **8/0**

Author's Kit of specified parts, including FREE BLUEPRINT, ready drilled Panel, but less Valves and Cabinet.

Balance in 11 monthly payments of 8/-

KIT "B"

As Kit "A" but with valves less cabinet Cash or C.O.D.

£5:19:9

12 monthly payments of 11/-. *Carriage Paid.*

KIT "C"

As Kit "A" but with valves and Peto-Scott Airsprite cabinet Cash or C.O.D.

£6:14:9

12 monthly payments of 12/4. *Carriage Paid.*

3 valves £1:12:3. Peto-Scott Cabinet 15/-.

PILOT STRUCTAKIT AIRSPRITE (Battery Model)

Comprises Peto-Scott Red Triangle Ebonite Panel, 16" × 7", ready drilled, 1 Peto-Scott Baseboard, 16" × 10", 1 Peto-Scott Red Triangle ready drilled Terminal Strip, 16" × 1½", and connecting Wire, Screws, Flex, etc., for Panel and Baseboard assembly of Battery Model. In sealed carton. Cash or C.O.D. Carriage Paid. **10/6**

FIRST SPECIFIED By "POPULAR WIRELESS"

OAK TABLE CABINET

Specially designed at the request of "Popular Wireless" for the new 1933 STAR SET—AIRSPRITE. Soundly constructed of selected materials by expert craftsmen. Hand french-polished figured oak as illustrated.

CASH or C.O.D. Carriage Paid

15/-

Buy by Post—it's Quicker

● IMPORTANT

Parts, Kits, Miscellaneous Components, Finished Receivers or Accessories for Cash, C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid.

PETO-SCOTT CO. Ltd. 77, City Road, London, E.C.1.
Telephone: Clerkenwell 9406/7.
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Dear Sirs, Please send me CASH/C.O.D./H.P. .....

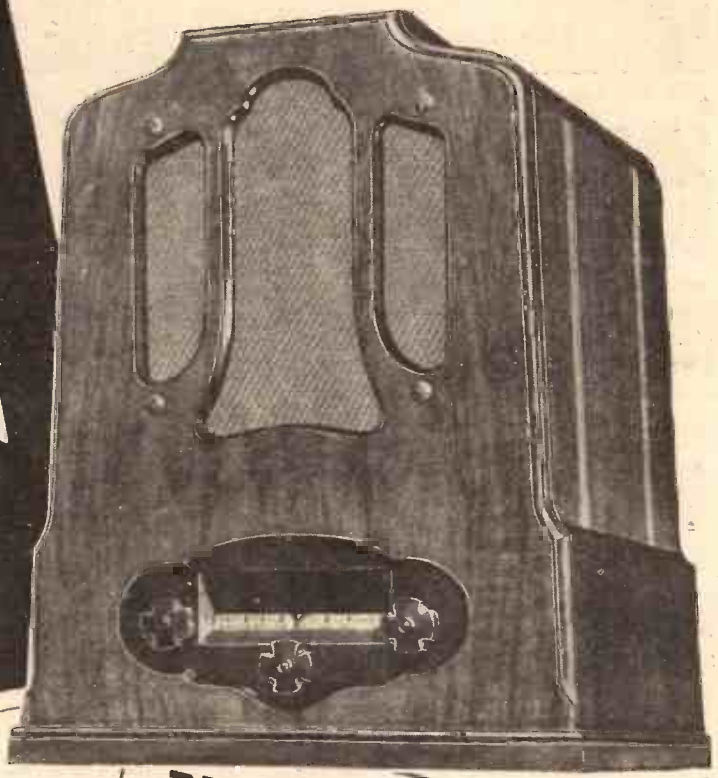
for which I enclose £ .....s. .....d. CASH/H.P. Deposit.

NAME .....

ADDRESS .....

..... P.W.11/2/33

What *you* want in MODERN RADIO



Home construction may not appeal to everyone. You may well prefer the finest Radio results ready for use without any trouble. In Columbia Radio you have perfection of melody, range, and absolute reliability.

Here, then, is a model many consider the ideal — the outstanding Columbia All-Electric Four. A luxury model in both performance and appearance, yet quite modest in price. An examination of the brief description given proves its power to meet the most exacting demands of the radio enthusiast. A demonstration—freely arranged—will convince you. It is a model well worth knowing better—fill in the coupon NOW.

THESE QUITE FREE

(Write in block capitals.)

★ Please arrange a demonstration of Model 355, free and without obligation, in my home.

★ Please send me a free Magazine Catalogue of the 15 Columbia Models (£4. 7. 6 to 90 Gns.)

★ Cross out if not required.

Name .....

Address .....

.....

Pop. W. 11/2/33.

Cut this out and post in an unsealed envelope bearing ½d. stamp to Columbia, 98/108, Clerkenwell Rd., E.C.1

MAGIC NOTES TRADE MARK

Model 355

Four valve. Band-pass tuning. Enormous but stable amplification. Reduction gear tuning. Same volume control for both radio and gramophone reproduction. Additional speaker terminals. Mains aerial device. Flood-lit scale calibrated in wave-lengths. Attractive cabinet. Marconi valves standard. Columbia Cradle Chassis.

33/- *deposit & 27/3 monthly or* **16 gns.** *cash.*

Columbia

ALL-ELECTRIC FOUR

POPULAR WIRELESS

THE FIRST AND FOREMOST RADIO WEEKLY

Scientific Adviser: SIR OLIVER LODGE, F.R.S. Chief Radio Consultant: Capt. P. P. ECKERSLEY, M.I.E.E.
Editor: N. F. EDWARDS.
Technical Editor: G. V. DOWDING, Associate I.E.E.
Assistant Technical Editors: P. R. BIRD and K. D. ROGERS.

The Paper that Made Wireless Popular

EXPORT TRADE
RADIO FOR CLIMBERS
DISSOLVING SILVER
THE LAWYERS DECIDE

RADIO NOTES & NEWS

WIRELESS IN FACTORIES
EARLY DAYS
THE EMPIRE SPEECH
BRIGHTER EDUCATION

Those Kentucky Minstrels.

THIS new venture of the B.B.C. had a satisfactory *debut*; so greatly did my household like it that they insisted upon hearing the repeat performance.

Such of us as remembered the good old nigger troupes were able to supply the black faces and whitened lips out of our imagination, but I submit that the "bones" were very conspicuous by their absence and that the producer would enhance his success by completing the illusion with those characteristic noise-makers.

Radio Trade Returns.

AN analysis of the British radio trade returns for 1931-32 produces some very interesting figures and facts. First of all, note that an adverse balance for 1931 of £1,120,178 was, in 1932, converted into a favourable balance of £225,000, a turnover of about 1½ million pounds.

This was due to a decrease of imports. Unfortunately our exports to British countries dropped during 1932 by about £20,000; a heavy decrease being recorded for S. Africa, and a decrease of some £16,000 in valves to Australia. Italy took £27,000 worth less in components.

Our "Slider-Log."

I SHALL be interested to hear what you think of our "Slider-Log." It seems to me to be the simplest and withal the brainiest device yet evolved for finding stations by science instead of dial-shoving, oscillating, etc.

I thought the idea of having that index of stations in *alphabetical* order, numbered and associated with a Log in *numerical* order, a positive stroke of genius.

This device ought to show you just what your set can do. One hundred and twelve stations! How many can you claim?

The Everest Expedition.

CERTAIN radio firms have done a fine bit of work towards the success of the British Everest Expedition. A receiver has been given to the Expedition by McMichaels; Ediswans and the G.E.C. have given valves; Siemens have presented batteries and Ferranti's have given meters.

The idea behind all this is to enable the climbers to receive weather reports at a height of 23,000 feet, from whence they will be signalled by Ever Ready lamps to the higher camps.

Keep an eye on the daily papers for the next few weeks for further news of the expedition.

UNEMPLOYED—BUT BUSY!

A radio class for the unemployed of Eastbourne. Their activities are of special interest in view of the B.B.C. series of "S O S" talks by Mr. S. P. B. Mais, broadcast on Friday evenings at 9.20.

Argument Against Prohibition.

THE idea of gravitation is said to have occurred to Newton when he saw or felt an apple fall from a tree.

Not so great an idea, but one which was probably more profitable, was that of using distorted photographs in the advertisements of a certain well-known make of radio set, and this idea came to the originators whilst they were listening to the orchestra in a New York "speak-easy."

Egypt to Have Radio Show.

ON February 10th there opened in Cairo a two weeks' "Radio Salon," under the auspices of the Royal Automobile Club of Egypt. It is held in the Exhibition Palaces of Guezireh. A broadcasting station for the use of exhibitors, with a power of ½ kw. has been erected and works on 250 metres.

Goods for this exhibition will be admitted into Egypt duty free, unless sold, and such goods will be carried on the Egyptian State Railways at half rates.

How to "Bang Saxpences."

A DAILY paper reveals that at the new Empire station the engineers invite the unwary visitor to place real "siller" on a certain ledge in the transmitting room. They then switch on some source of power and the boodle disappears, leaving nothing but smoke.

A layman in matters of law, I have the impression that to destroy a coin of the realm is an illegal act, and I would suggest that the D.-G. would consider the trick to be not only illegal but positively immoral!

Legal Problem; Legal Solution.

TO the consternation of the B.B.C. it was found that the deeds of the building which had been acquired for the new Leeds Broadcasting House contained a clause to the effect that the building must never be used as a place of entertainment.

The building was a converted Friends' Meeting House; hence the clause.

However, the lawyers have decided that so long as admission to the building is free the broadcasting will not constitute entertainment in the legal sense.

Shall "Wireless" Be Abolished?

A REPRESENTATIVE of a firm of manufacturers has suggested that radio trade journals should "drop" the word "wireless" and substitute "radio." He says, "'Wireless' is a misnomer, and the word 'wireless' as applied to radio is absurd."

There is no objection to any journal, other than "P.W." and its sister publications, relinquishing the word "wireless," but I join issue on the suggestion that it is absurd; moreover, we might at least do

(*Continued on next page.*)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

Marconi, Lodge and the other pioneers the honour of retaining their word for the art which they made possible.

That word distinguishes "radio" from the older forms of telegraphy and telephony which need wires between sender and receiver. Broadcasting is one-way wireless telephony.

Made-Man Static in France.

OUR logical Gallic neighbours! The Amiens Court of Appeal has ordered a doctor to pay about £40 damages to a radio dealer whose reception he interfered with by the use of certain apparatus; thus losing several sales to the dealer. Previously the doctor had been ordered to pay only £16, but he appealed and unfortunately for himself the Solicitor-General intervened and took the public's side, so that the Court of Appeal was antagonistic to the doctor. "Sorry I cannot treat you. I might prevent my neighbour from hearing some jazz music."

Another B.B.C. Resignation.

MISS DULCIMA GLASBY, who has been employed by the B.B.C. for seven and a half years, as a chooser and adapter of plays, has resigned in order to be free to write plays herself.

During her time with the B.B.C. she has adapted more than two hundred plays for broadcasting, a strenuous job which sometimes called for the cutting down of plays by famous authors and even for the writing of long passages herself.

A hint to would-be writers of radio plays: Miss Glasby has found that listeners demand a good human story.

The Psychological Effect of Music.

I REFER to no such idea as that enshrined in "The Kreutzer Sonata," but to the experiment which I hear is being conducted in a London factory which employs girl operatives. Radio music, marches and dance music preferably, is introduced for periods not exceeding three-quarters of an hour, and the effect upon the girls' movements is observed. The object of this experiment is to speed up the work. ("To such base uses," etc.)

Early Wireless.

SO much interest has been shown by our readers in the earlier methods of wireless that I think that I can best satisfy the curiosity of my friends, and keep the promise which I made to them some weeks ago, by writing an article on the subject. I will try to deal with some aspects of early professional and amateur wireless, but whether you ever read my words will depend upon H.M. Editor.

Useful Lecture Course.

A COURSE of six lectures on the Accumulator, by Mr. R. Wheatley Minter, A.I.E.E., begins at the Chelsea Polytechnic, Manresa Road, S.W.3, on Feb. 15th, at 7.30 p.m.

The lectures are intended to instruct makers, repairers, sellers and users of accumulators, both lead-acid and alkaline cells. The fee for the course is five shillings. Apply to the Principal of the Polytechnic.

An Old Comrades' Association.

FOURTEEN years after they had served together in the R.F.C., three ex-wireless operators met by chance in London in 1930 and decided to form an R.F.C. Wireless Operators' Old Comrades Association. There are now more than 350 members, who re-unite monthly in the West End.

SHORT WAVES

Mr. Justice Meredith having envisaged the day when roulette will be played by wireless, it is felt that it will not be long now before our heavyweight boxing champions will do their fighting through the post.—"Punch."

* * *

In America certain plays are sometimes first broadcast in the prisons.
The authorities seem determined to discourage crime at any price.

* * *

A professor predicts that in the future the weather will be controlled by radio.
Heaven help the sailors on a night like that!
—"Punch."

* * *

During a recent broadcast talk, the lecturer stated that a harpoonist has been known to earn as much as £200,000 in a season.
An old lady correspondent has written to the B.B.C. suggesting that some of these musicians are decidedly overpaid.

* * *

WOE ON THE WAVELENGTHS.

I felt a little bit depressed,
I thought perhaps I had the 'flu;
I settled by the fire to rest
And read the wireless programme through
To see if I could listen-in
To something which might make me grin.

The choice was not exactly vast:
There seemed to be a talk at eight
On "Chinese Tortures of the Past,"
And then a spirited debate
By Major Wince and Mr. B
On "Prisons—and the Third Degree."
—"Daily Mirror."

The Fourth Annual General Meeting is to be held on Feb. 14th. Applications for membership, which is open to all wartime ex-wireless operators of the R.F.C. and R.A.F., should be made to the Hon. Sec., Mr. R. McHugo, 16, Glennie Road, W. Norwood, London, S.E.27.

O.B.'s and Acoustics.

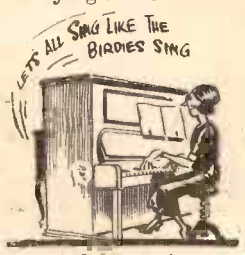
"AFTER more than ten years of broadcasting," says the B.B.C., "experts can only point to the lounge of a seaside hotel and to a disused wharf beside the River Thames as providing satisfactory conditions for musical broadcasts."

I hope that the B.B.C. considers its own studios to be fairly satisfactory—or was all that seaweed wall stuffing wasted?

The B.B.C. hopes that in future architects of public buildings will look upon the question of acoustics as a factor as important as the design of the building itself.

Why the Radio-Piano!

THERE have been demonstrations of a piano with a radio receiver situated behind its sounding board, and it is said that the idea underlying this combination is that the owner may accompany any song which may be broadcast. But anybody could accompany a song received on a separate radio set. And again, most songs broadcast are invariably accompanied by a piano or an orchestra. Therefore, I confess I see no *raison d'être* for the radio-piano.



In Memory of Wagner.

RICHARD WAGNER, the dramatist who wrote his own music in order to be sure that it suited his plays, thereby immortalising himself, died on Feb. 13th, 1883.

In his memory there is to be on Feb. 12th (Regional) a concert consisting of excerpts from "Die Meistersinger of Nuremberg," conducted by Adrian Boult. Soloists: Frank Titterton, Miriam Licette, Gladys Parr, Jan van der Gucht and Keith Falkner.

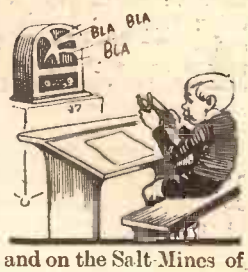
A "Record" Speech.

THOSE who heard, and still more those who did not hear, H.M. the King's speech to his Empire on Christmas Day, will be interested to know that he has given permission for it to be reproduced on a gramophone record, for sale in the interests of the "Wireless for the Blind" Fund, to which all the profits on it will be devoted.

The speech was recorded during its delivery, over a private wire. Ask for H.M.V. record R.B S. 4359.

Broadcasts to Schools.

DURING the Spring Term of School Broadcasts teachers will go out of action while unseen speakers expand on such subjects as World History, Life and Work in Europe, and Your Body Day by Day. For a lad who is not quite sure about decimals or how to spell "harassed," or what countries constitute the greater part of the Empire, talks on the Pripet Marshes and on the Salt-Mines of Wieliczka must be very helpful!



Secret History.

THOSE listeners who heard the play entitled "The Hatchet" early this month, may be interested to know that it was adapted from Rabelais by Edward Lewis. They will probably be still more interested in the fact that Edward Lewis is "Philemon" and that not only is he "Philemon" but he is the father of Cecil Lewis, one time B.B.C. Programme Chief—and "Uncle Caractacus"—and now an assiduous adapter of plays for the microphone.

ARIEL.

The "Airsprite"!

More about P.W.'s 1933 Star Set

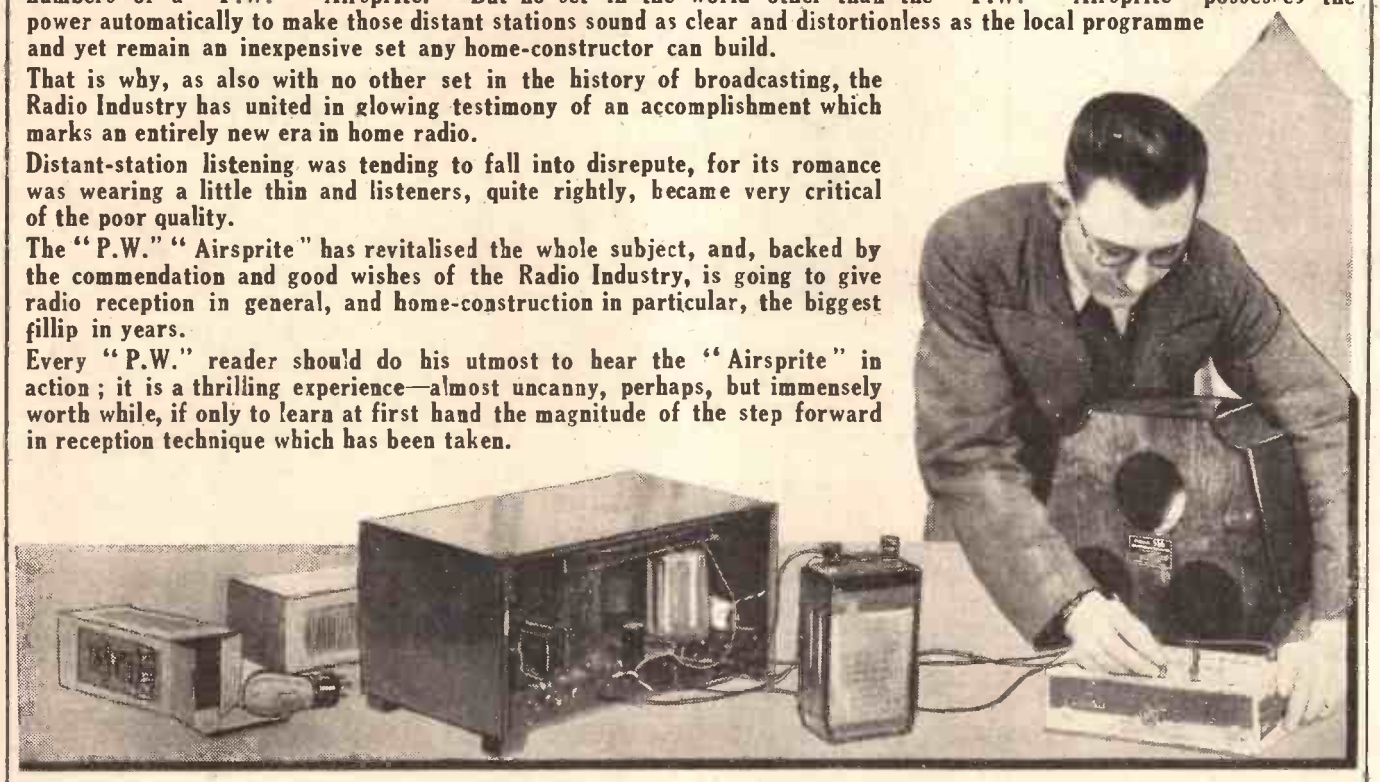
Other sets can tune in distant British and foreign programmes, though perhaps not always with the facility and numbers of a "P.W." "Airsprite." But no set in the world other than the "P.W." "Airsprite" possesses the power automatically to make those distant stations sound as clear and distortionless as the local programme and yet remain an inexpensive set any home-constructor can build.

That is why, as also with no other set in the history of broadcasting, the Radio Industry has united in glowing testimony of an accomplishment which marks an entirely new era in home radio.

Distant-station listening was tending to fall into disrepute, for its romance was wearing a little thin and listeners, quite rightly, became very critical of the poor quality.

The "P.W." "Airsprite" has revitalised the whole subject, and, backed by the commendation and good wishes of the Radio Industry, is going to give radio reception in general, and home-construction in particular, the biggest fillip in years.

Every "P.W." reader should do his utmost to hear the "Airsprite" in action; it is a thrilling experience—almost uncanny, perhaps, but immensely worth while, if only to learn at first hand the magnitude of the step forward in reception technique which has been taken.



COMPLETING THE CONSTRUCTION.

THE BATTERY VERSION

THE cabinet used for the original "Airsprite" has a fixed top instead of the rather more usual lid.

This enables the grid-bias battery to be fixed in the top of the set. Clips for retaining a battery in such a position are readily obtainable or can easily be made from sheet aluminium or tin.

Obviously, the lengths of the grid-bias leads depend upon the placing of the battery. Use a rubber-covered flexible wire for these G.B. leads.

The same material should also be employed for the short lead (No. 11) which connects to the top terminal of the S.G. valve.

Keep this particular lead as short as possible.

There is a point in regard to the coils which, perhaps, ought to have been mentioned before. The "coupling assembly" is

(*Continued on next page.*)

COMPLETING THE CONSTRUCTION.

THE MAINS VERSION

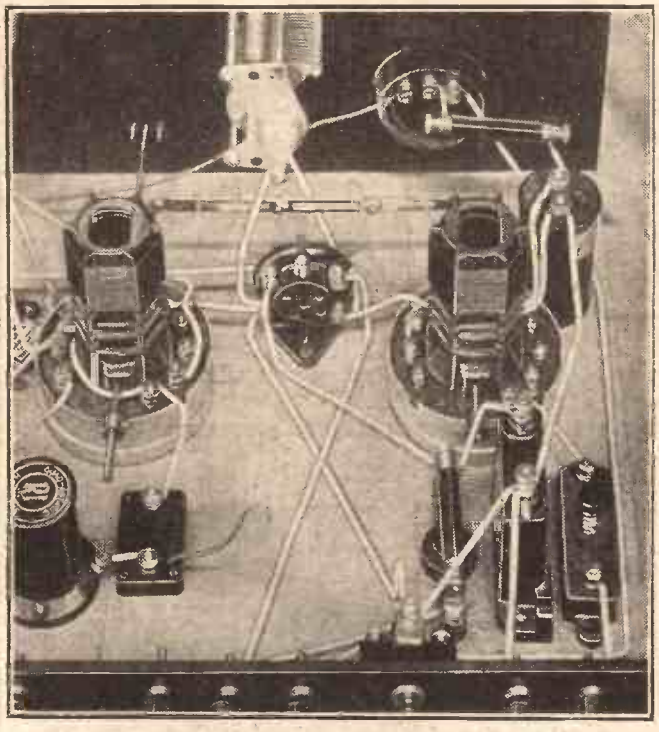
WE left the construction of the A.C. model of the "Airsprite" receiver at the point where we had just commenced the wiring of the main baseboard components, having finished the power pack.

This latter, as we saw, carried with it the on-off switch and the mains input plug, while at the back of the large baseboard are two terminal strips, one carrying the aerial and earth terminals and the local-distance switch, while the other carries the loudspeaker terminals, the pick-up terminals and the control for the radiogram switch.

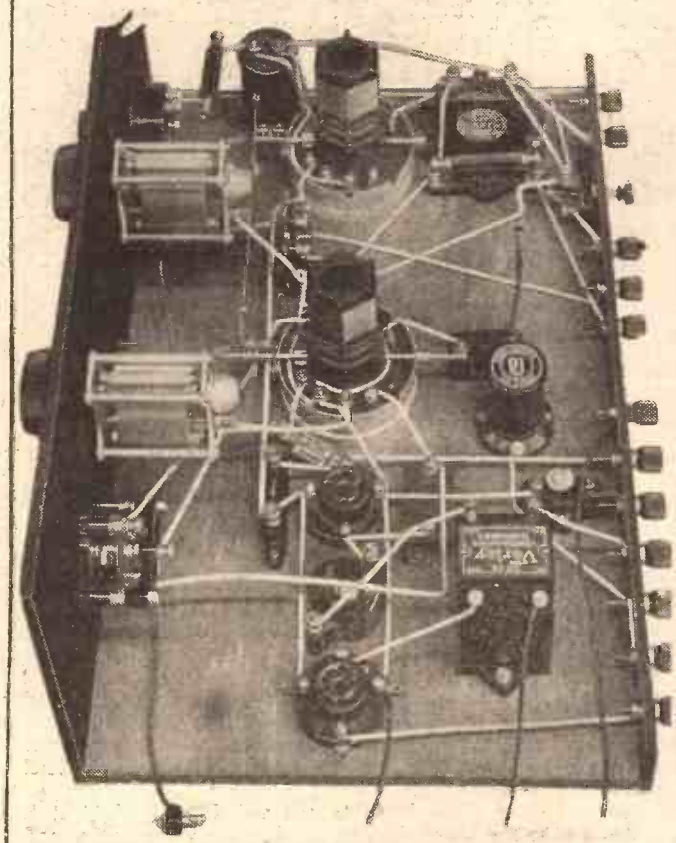
In order to make the leads to the switch itself short it is mounted on the baseboard close to the detector valve holder, and an extension rod connects it to the switch knob on the terminal strip.

(*Continued on next page.*)

THE BATTERY VERSION—*continued.*



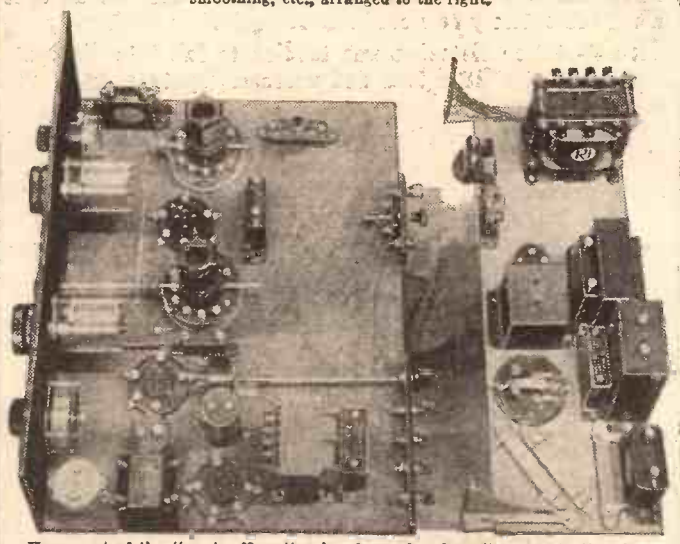
The 100,000-ohm resistance which is wired to the slider of the potentiometer on the panel is self-supported by its connections, one end going to the adjacent 1-mfd. fixed condenser, as shown.



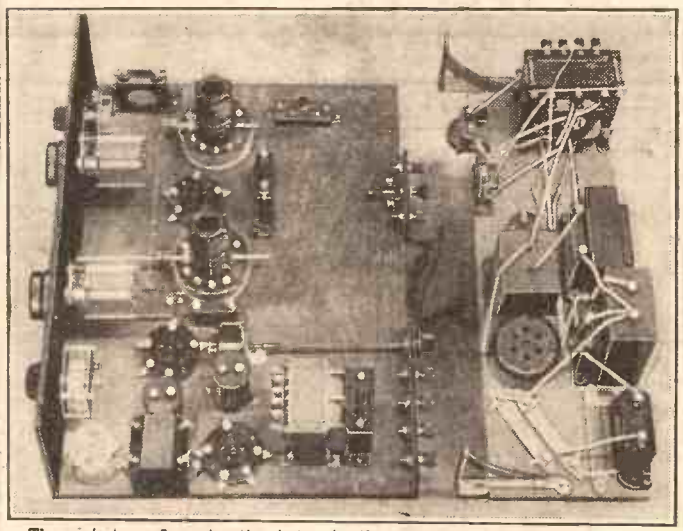
The "cans" have been removed from the coils to show the connections, but the set should not, of course, be worked without these "cans" in position. The complete absence of screen partitions, etc., and the consequent ease of wiring is largely due to the use of self-screened coil units.

THE MAINS VERSION—*continued.*

The grouped components above are for the A.C. version, with those for the smoothing, etc., arranged to the right.



Here most of the "mains" section has been placed on its separate "shelf," and the panel brackets which will fix it to the baseboard are screwed in position.



The next stage of construction is to wire the smoothing and other mains components as far as possible, as indicated in this view.

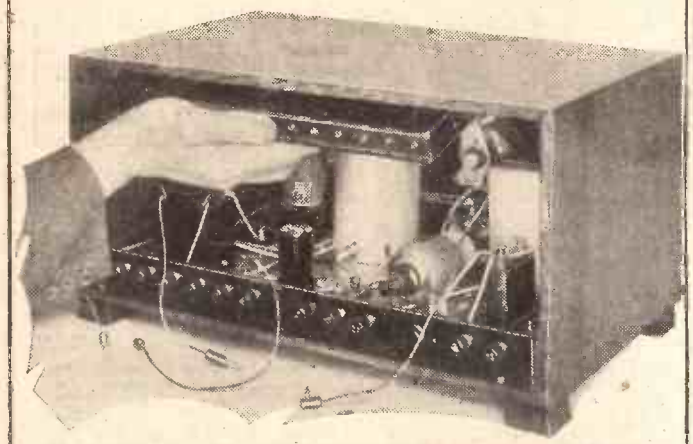
THE BATTERY VERSION—*continued.*

adaptable to any coil separation distance within fairly wide limits.

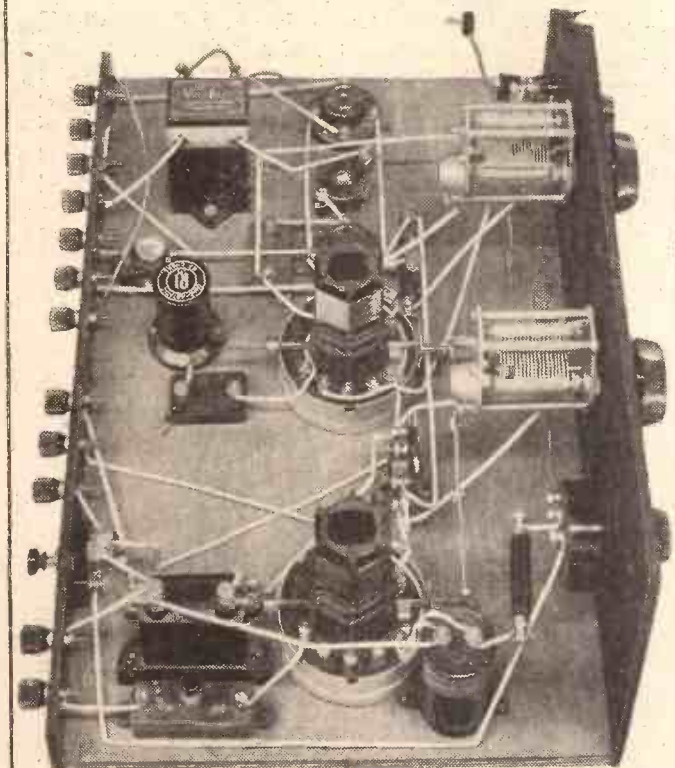
The switch bar is extended in the case of the "Airsprite," but this is a simple adjustment and is made merely by loosening the couple of nuts, stretching the bar to the required length, and retightening the nuts.

Well, we don't think there is anything more to be said about the assembly of the "P.W." "Airsprite," for it is a task devoid of intricacies.

As all the leads have been numbered it is a very easy job to check your work before proceeding to the next and most thrilling stage—the first test.



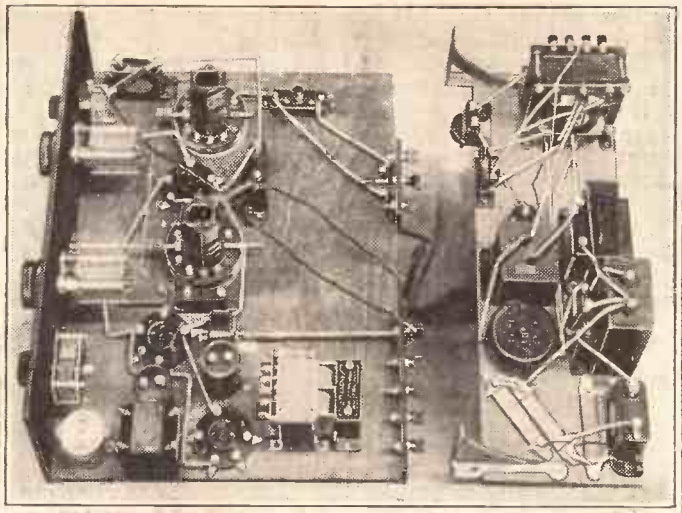
The most convenient place for the 16-volt grid-bias battery is under the top of the cabinet, as if fixed here the leads to it can be short and direct. If a suitable clip is not readily obtainable a short strap may be used for the purpose of support, or a piece of brass or similar material may be bent to U-shape, to form a clip, which can then be screwed to the cabinet top.



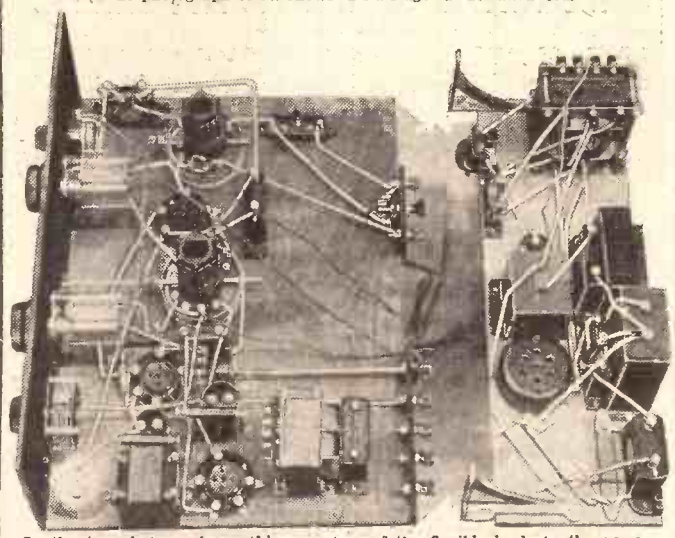
Be careful not to cut the insulation on wires which go to the coil units, at the point where the can fits on. There is ample room for the wires to pass through the slots, and there is no need to use force.

IMPORTANT.—Make sure that in wiring up the differential reaction condenser the lead from the ·01-mfd. fixed condenser is connected to F2 (the fixed vanes that short to the moving when the control is turned anti-clockwise).

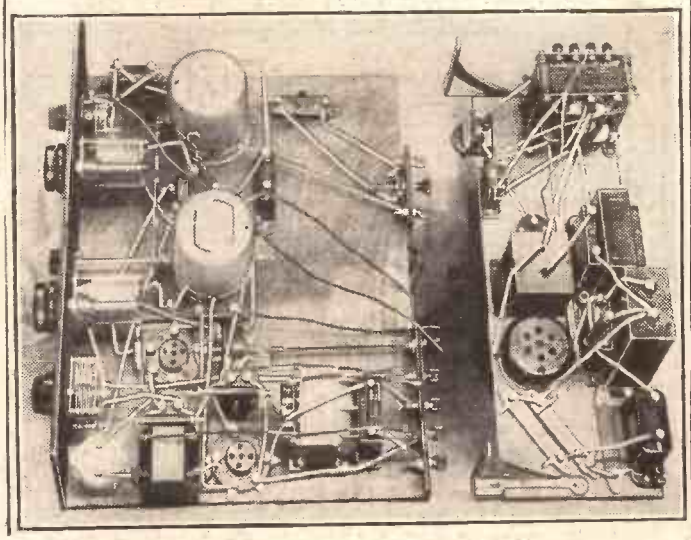
THE MAINS VERSION—*continued.*



Part of the wiring to the Distance Switch has been carried out above, while the photograph below shows this a stage further advanced.



In the top photograph on this page two of the flexible leads to the power pack can be seen, and in the centre picture a further flex wire is discernible, this being the one from No. 7 on the centre coil unit to the 1-mfd. condenser on the separate "mains shelf." The wiring to the output choke and condenser is shown in the picture below.



THE BATTERY VERSION—*continued.*

You can run through the lead numbers starting at "One," and, having checked each lead, you will be sure that you have neither omitted a wire nor made a wrong connection.

It will be advisable to examine all the terminal screws to see if these are tight. But don't use your pliers too vigorously or you may strip their threads. Remember that brass, for that is the metal of which the majority of terminals are composed, is much softer than steel.

But all the nuts should be more than "finger-tight." Screw them up as far as you can with your fingers and then give each one a half-turn with the pliers.

Be careful that the insulation of the leads is clear of the terminal screws and that only well-cleaned wire is gripped by them.

If you have cut the leads to the lengths given in "P.W." last week, there will be enough of them to enable loops to be made at their ends. And a nice loop snugly gripped by a screw terminal is better than a soldered joint.

Don't cut the grid-bias leads to length until you have fitted the grid-bias battery. These leads must be long enough to allow them easily to reach the required battery sockets but no longer.

THE "P.W." "AIRSPRITE" (BATTERY MODEL)

THE EASILY OBTAINABLE AND INEXPENSIVE COMPONENTS

1 PAIR OF MATCHED TWIN SCREENED COILS (Telsen W 287).
1 COIL SWITCH COUPLING ASSEMBLY (Telsen W 217).
2 ·0005-mfd. VARIABLE CONDENSERS (Polar No. 2 S.M., Ormond No. 6 Slow Motion, Utility W 319).
1 ·0003-mfd. to ·00035-mfd. DIFFERENTIAL REACTION CONDENSER (Ormond R/190 ·0003, Lotus D.C.3, J.B. No. 1080, Telsen W 185, Ready Radio). See text.
1 ·0003-mfd. max. PRE-SET CONDENSER (Ready Radio, Goltone, Formo, Sovereign, Ormond, Colvern, Telsen, Polar).
1 ·1-mfd. CONDENSER (Dubilier 9200, Telsen, T.C.C., Lissen).
1 ·1-mfd. CONDENSER (Lissen LN110, Dubilier, Telsen, T.C.C.).
1 ·01-mfd. CONDENSER (Graham Farish, T.C.C., Dubilier, Lissen, Telsen).
1 ·0005-mfd. CONDENSER (T.C.C. Flat S type, Dubilier, Goltone, Ferranti, Lissen, Telsen, Graham Farish, Sovereign).
1 ·0003-mfd. CONDENSER (Igranic tag type, T.C.C., Dubilier, Ormond, Goltone, Bulgin, Telsen).
1 50,000-ohm wire-wound POTENTIOMETER (Ready Radio, Bulgin, Wearite, Sovereign, Varley, Igranic, Watmel, Colvern, Lissen, Magnum, Tunewell, Telsen, Lewcos).
1 2-meg. GRID LEAK, with holder (Ferranti, Graham Farish "Ohmite," Ready Radio, Goltone, Telsen, Igranic, Watmel, Dubilier, Bulgin, Lissen, Tunewell).
1 1,000-ohm RESISTANCE and holder (Graham Farish "Ohmite," Watmel, Lissen, Sovereign, Bulgin, Ferranti, Wearite, Colvern Strip, Telsen).
1 100,000-ohm RESISTANCE with terminals or tags (Graham Farish "Ohmite," Dubilier 1-watt, Lissen).
2 4-pin VALVE HOLDERS (Lotus, Telsen, Igranic, W.B., Lissen, Tunewell, Clix, Bulgin, Benjamin, Wearite, Ready Radio, Peto-Scott, Goltone).
1 HORIZONTAL VALVE HOLDER (Lissen LN 739, Telsen, W.B., Bulgin, Wearite).
1 S.G. H.F. CHOKE (R.I. Quad-Astatic, Graham Farish L.M.S., Slektun, Wearite, Lewcos, Keystone, Telsen, Dubilier, Ready Radio, Lotus, Lissen, Varley, Sovereign, Tunewell, Watmel, Bulgin, British General, Goltone).
1 H.F. CHOKE (Lewcos type M.C., or as above).
1 COMPENSATING L.F. TRANSFORMER (Varley D.P. 35, Telsen Audioformer, R.I. Varitone).
1 THREE-POINT ON-OFF SWITCH (Ready Radio push-pull, Lissen, Bulgin, Tunewell, Telsen, Sovereign, Wearite, Goltone).
1 EBONITE PANEL, 16 in. × 7 in. (Peto-Scott, Permcol, Goltone, Lissen, Wearite, Becol, Direct Radio).
1 BASEBOARD, 16 in. × 10 in. (Peto-Scott).
1 CABINET, to fit, 16 in. × 7 in. panel and 16 in. × 10 in. baseboard (Peto-Scott, "Airsprite," Camco, Morco, Pickett, Direct Radio, Gilbert, Osborn, Lock).
1 EBONITE TERMINAL STRIP, 16 in. × 1½ in.
12 INDICATING TERMINALS (Belling & Lee type "R," Walnut, Clix, Bulgin, Igranic, Goltone).
1 ANODE CONNECTOR (Belling & Lee).
1 FUSEHOLDER (Bulgin type F 5, Telsen, Goltone, Belling & Lee).
1 FUSE (Bulgin, Type B, Belling & Lee, 100 m/a Scrufuse, Goltone, Telsen).
8 BATTERY PLUGS (Clix, Belling & Lee, Bulgin, Igranic, Goltone).
2 SPADE TERMINALS (Clix, Belling & Lee, Goltone).
4 YARDS INSULATED SLEEVING and 6 yards 18-gauge tinned copper wire (Goltone, Wearite).
FLEX, SCREWS, etc.

Grid-bias plus will never want to reach any other socket than the plus one in the battery. Grid-bias Number One will permanently connect to the maximum negative socket—the one farthest removed from the plus socket.

Grid-bias Three will always be somewhere near this maximum negative socket. But Grid-bias Two, on the other hand, will remain at 1½- or 3-volts negative.

If you remember these points you will be able to cut the G.B. leads to very convenient lengths—neither too long nor too short.

We would advise constructors not to attempt to work without proper wander plugs for G.B. and H.T.

THE MAINS VERSION—*continued.*

There is one point that should be specially mentioned. It concerns the variable-mu valve potentiometer control. As shown in the blue print and photographs the set is wired for the Mullard M.M.4V. valve, but it may be desired to use alternative valves which will give excellent results, such as the Osram V.M.S.4, Marconi V.M.S.4, Cossor 41V.M.S.G., and so on.

In this event slight alteration of the potentiometer connections is required, for the system of control advised for the M.M.4V. is not advised for the other valves.

Accordingly, in order to make the necessary circuit changes the following alterations to the connections in the blue print should be carried out.

The unused terminal on the 10,000-ohms potentiometer is to have connected to it the flex lead shown on the right-hand terminal. This terminal is to have connected to it those wires now on the slider terminal, and this latter terminal is to take the lead from the Ohmite resistance which in the blue print goes (with the flex lead above mentioned) to the right-hand terminal. It is very simple but very necessary.

COMPONENTS FOR THE "P.W." "AIRSPRITE" (A.C.)

1 SET TWIN MATCHED SCREENED COILS (Telsen W 287).
1 COIL SWITCH COUPLING ASSEMBLY (Telsen W 217).
2 ·0005-mfd. VARIABLE CONDENSERS (Utility W 319, Polar No. 2 S.M., Ormond No. 6 Slow Motion).
1 ·0003 to ·00035-mfd. DIFFERENTIAL REACTION CONDENSER (J.B., Ormond Slow Motion, Lotus, Telsen).
1 ·0003-mfd. max. PRE-SET CONDENSER (Ready Radio, Telsen, Goltone, Sovereign, Ormond, Polar, Colvern, Formo).
1 4-mfd. FIXED CONDENSER (Dubilier B.S., T.C.C., Igranic, Formo, Ferranti).
1 4-mfd. FIXED CONDENSER (T.C.C. 87, Dubilier L.E.C.).
1 2-mfd. FIXED CONDENSER (Telsen W 226, Dubilier, T.C.C., Igranic, Lissen, Ferranti, Formo).
2 2-mfd. FIXED CONDENSERS (Dubilier 9200, or as above).
1 2-mfd. FIXED CONDENSER (Lissen L.N. 134, or as above).
2 1-mfd. FIXED CONDENSERS (Lissen L.N. 133, or as above).
1 1-mfd. FIXED CONDENSER (Telsen W 227, or as above).
1 ·01-mfd. FIXED CONDENSER (T.C.C. Type No. 34, Graham Farish, Lissen, Dubilier).
1 ·0001-mfd. FIXED CONDENSER (Graham Farish, T.C.C., Dubilier, Goltone, Ferranti, Sovereign, Lissen, Telsen).
1 10,000-ohm WIRE-WOUND POTENTIOMETER (Lewcos Standard, Bulgin, Wearite, Sovereign, Watmel, Igranic, Colvern, Varley, Magnum).
1 50,000-ohm FIXED RESISTANCE WITH TERMINALS OR WIRE ENDS (Colvern strip, Graham Farish "Ohmite," Dubilier, Wearite).
1 25,000-ohm FIXED RESISTANCE WITH TERMINALS OR WIRE ENDS (Colvern strip, or as above).
1 20,000-ohm FIXED RESISTANCE WITH TERMINALS (Colvern strip, Graham Farish "Ohmite," Wearite).
1 10,000-ohm FIXED RESISTANCE WITH TERMINALS OR WIRE ENDS (Graham Farish "Ohmite," Wearite, Dubilier).
1 1,000-ohm FIXED RESISTANCE WITH TERMINALS OR WIRE ENDS (Graham Farish "Ohmite," Dubilier, Wearite).
1 350-ohm FIXED RESISTANCE WITH TERMINALS OR WIRE ENDS (Graham Farish "Ohmite," Wearite, Dubilier).
1 200-ohm FIXED RESISTANCE WITH TERMINALS OR WIRE ENDS (Graham Farish "Ohmite, Dubilier, Wearite).
1 1-meg. GRID LEAK WITH WIRE ENDS OR TERMINALS (Goltone, Lissen, Igranic, Ready Radio, Dubilier, Graham Farish "Ohmite").
1 POWER TRANSFORMER (R.I. EY 30, Wearite Standard T.21.A.).
1 SMOOTHING CHOKE (Ferranti B 10).
1 OUTPUT CHOKE (Igranic CH 2, Bulgin, Varley, R.I., Lotus, Lissen, Ferranti, Wearite, Heayberd).
1 COMPENSATING L.F. TRANSFORMER (Varley D P 35, Telsen Audioformer, R.I. Varitone).
1 H.F. CHOKE (Bulgin H.F. 9, Lewcos, Telsen, R.I., Ready Radio, Slektun, Lissen, Lotus, Wearite, Graham Farish, Tunewell, Goltone, Igranic, British General, Keystone, Dubilier, Sovereign).
3 5-pin VALVE HOLDERS (Benjamin, W.B., Telsen, Ready Radio, Bulgin, Clix, Wearite, Lotus, Goltone, Tunewell, Lissen).
1 HORIZONTAL MOUNTING VALVE HOLDER (W.B., Lissen, Wearite, Telsen, Bulgin, Goltone).
1 ROTARY RADIO-GRAM SWITCH (Ready Radio, Tunewell, Bulgin).
1 PUSH-PULL ON-OFF SWITCH (Lissen L.N. 5070, Ready Radio, Goltone, Wearite, Lotus, Benjamin, Bulgin, Keystone, W.B., Ormond, Igranic).
1 ROTARY MAINS TYPE ON-OFF SWITCH (Bulgin S 85, Ready Radio, Wearite G.22).
1 EBONITE PANEL, 16 in. × 7 in. (Peto-Scott, Goltone, Permcol, Lissen, Becol, Direct Radio, Wearite).
1 BASEBOARD 16 in. × 12 in. (Peto-Scott).
1 BASEBOARD 16 in. × 5½ in. (Peto-Scott).
1 TERMINAL STRIP, 5½ in. × 1½ in. (Peto-Scott, etc.).
1 TERMINAL STRIP, 3 in. × 1½ in. (Peto-Scott, etc.).
1 COMBINED MAINS FUSE AND PLUG (Bulgin F.15).
1 COMBINED PLUG ADAPTER (Goltone R.80/90).
1 THERMAL DELAY SWITCH (Bulgin S.100, Varley).
6 INDICATING TERMINALS (Belling & Lee Type "R" Walnut, Clix, Igranic, Goltone, Bulgin).
2 PANEL BRACKETS, 4 in. × 4 in., or 4 in. × 3 in. (Magnum, Bulgin).
1 ANODE CONNECTER (Belling & Lee).
1 SWITCH BRACKET, 2 in. × ¾ in. (Wearite).
1 COUPLING LINK, 1 in. × ⅛ in. (Wearite).
1 SPINDLE, 5½ in. × ⅛ in. (Wearite).
1 BUSH FOR SPINDLE (Wearite).
6 YARDS INSULATED SLEEVING and 10 yards 18-gauge tinned copper wire (Goltone, Wearite).
FLEX, SCREWS, etc.

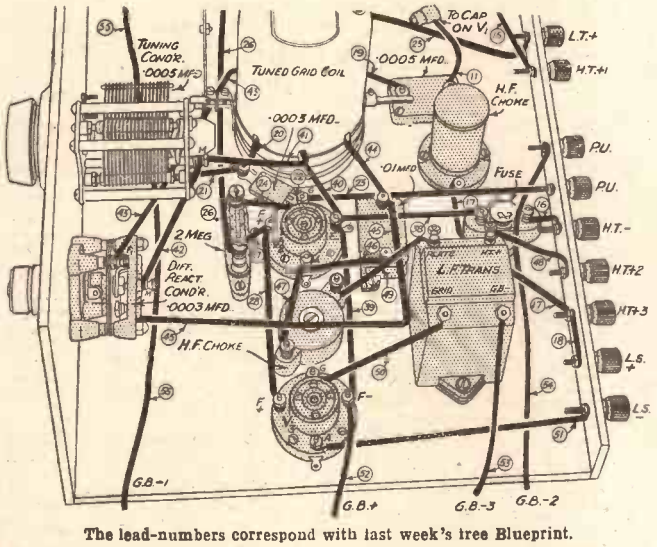
ACCESSORIES FOR THE "P.W." "AIRSPRITE"

THE BATTERY VERSION

THE accessories largely share in contributing to the exceptional results given by the "P.W." "Airsprite." Particularly does this apply to the valves.

The characteristics of these were very carefully chosen, for they play an important part in developing the alternative responses of the A.T.B. system.

There is nothing exceptionally critical about this; indeed, it can be safely said that the reverse is the case. Nevertheless, if 100 per cent A.T.B. effects are desired, then no other valves than those specified ought to be used.



The lead-numbers correspond with last week's free Blueprint.

Although A.T.B. might seem to be associated only with the detector circuit, the characteristics of both the H.F. and the L.F. stage react upon it in a definite manner.

Next in importance is undoubtedly the loudspeaker. If you haven't got a good modern loudspeaker, we would earnestly advise you to invest in one.

Actually, much the same ratio of benefit will accrue with a poor loudspeaker as with a good one. Indeed, A.T.B. may show up in its effects to an even greater proportion.

Nevertheless, you won't be enjoying to the maximum the

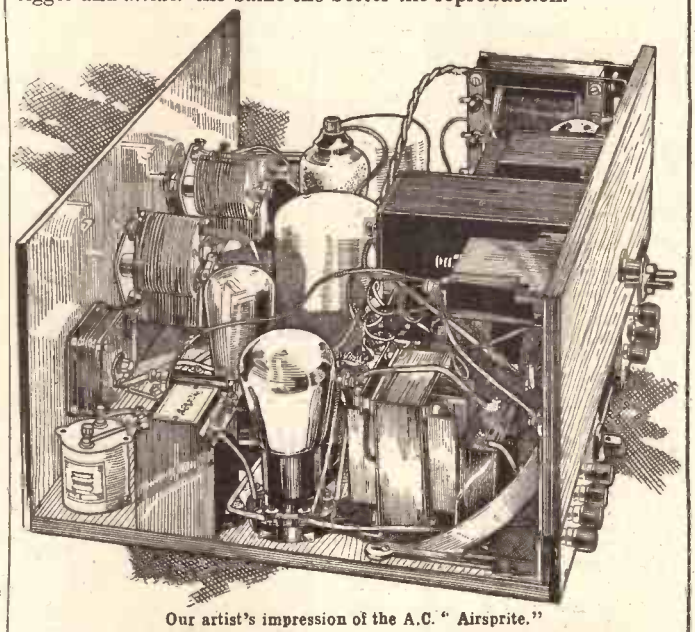
THE VALVES FOR THE BATTERY VERSION

Name	H.F. Stage	Detector	Output	Output Mains Unit
Cossor	220VSG	210HL	220PA	230XP
Mullard	PM12V	PM1HL	PM2A	PM202
Marconi	VS2	HL2	LP2	P2
Mazda	S215VM	HL2	P220	P220A
Osram	VS2	HL2	LP2	LP2
Lissen	SG2V	HL2	P220	PX240
Tungsram	—	H210	P220	SP230
Eta	—	BY1814	BW604	BW602
Six-Sixty	SS215VSG	210HL	220PA	220SP
Micromesh	—	HLB1	PB1	—
Clarion	—	H2	P2	—

THE MAINS VERSION

THE most important "external" parts or accessories for the A.C. mains model of the "Airsprite" are undoubtedly the valves and the loudspeaker. Both these sections need careful choosing if the best is to be obtained from the set.

In the case of the loudspeaker, naturally the depth of the pocket of the individual constructor will be largely the deciding factor; but we should like to stress the importance of getting the best you can afford. The better the speaker the better the results, and if it is of the moving-coil type, as we hope, please do not forget that the bigger and *thicker* the baffle the better the reproduction.



Our artist's impression of the A.C. "Airsprite."

Too many listeners forget that thin baffles are practically useless; they should be as thick as you can get them, up to about 1 in.

The list of speakers gives some well tried representative makes from which you will be able to pick a model to suit your requirements, and the list of valves goes one further by definitely specifying the makes and the types you should use.

Valve picking is more critical than speaker selection, and we

MAINS VALVES AND THEIR APPROXIMATE RESISTANCES

Make	Variable Mu	Detector	BiasRes. (ohm)	Output	Bias Res.	Rectifier
Mullard	MM.4V	354V.	1,000	—	—	D.W.?
Cossor	MV.SG	41M.H.L.	750	41M.P.	350 ohm	506B.U.
Mazda	—	A.C./H.L.	1,000	—	—	U.U.2
Marconi	VM.S4	M.H.4	600	—	—	U.10
Osram	VM.S4	M.H.4	600	—	—	U.10
Six-Sixty	SS4MMAC	S.S.4G.P.A.C.	1,000	—	—	S.S.W.482
Tungsram	AS4105	A.R.4101	600	—	—	P.V.495
Lissen	VSGA1	A.C./H.L.	700	—	—	U.U.41
Micromesh	AC/SGV	H.L.A.1	300	P.A.1	225 ohm	R.1

THE BATTERY VERSION—*Continued.*

advanced 1933 radio which the "Airsprite" can give, unless all the links in your reception chain are of good standard.

We are recommending a minimum of 120-volts H.T. The "Airsprite" will work, and work well, on less than that. But the variable-mu valve does not get a chance to show what it can do unless it is provided with adequate H.T.

Naturally, the grid bias will depend upon the particular valves employed. The output valve is really the determining factor here,

FOR THE BATTERY "AIRSPRITE"

LOUDSPEAKERS.— Marconiphone, Celestion, B.T.-H., Blue Spot, G.E.C., R & A Epoch, Clarke's Atlas, Igranic, Baker's Selhurst, Ferranti, Lanchester, Ormond, H.M.V., W.B.

H.T. BATTERY.—120 v. Super capacity Ediswan, Ever Ready, Siemens, "Silver Knight," Pertrix, Marconiphone, Drydex, Lissen, Magnet, Oldham.

G.B. BATTERY.—16 volt Ever Ready or see above.

L.T. BATTERY.—Exide, Ediswan, G.E.C., Oldham, Pertrix, 'Block,' Lissen.

AERIAL AND EARTH EQUIPMENT.—Electron "Superial," Goltone "Akrite," Graham Farish "Filt" earthing device.

MAINS UNIT.—This should have three positive tappings with outputs to suit valves chosen (Clarke's Atlas, Ferranti, Ekco, Regentone, R.I., Heayberd, Tunewell, Formo).

although the variable-mu must not be stinted of G.B. if you want it to give you a wide and effective power control.

We shall discuss actual values and voltages next week, when we come to the operating details.

In the meantime, there is no reason at all why constructors should not "get on the air" with their "Airsprites." The "P.W." "Airsprite" is a perfectly straightforward instrument in action even if its results are so outstanding.

However, we can easily point the way for all to get the last ounce out of the set by supplying a few easy-to-understand instructions, and that is what we shall be doing in our next issue.

THE MAINS VERSION—*Continued.*

believe we have exhausted in the list all the types and makes that are really suitable for use with the "Airsprite."

Don't forget that in the case of the variable-mu valve the wiring of the potentiometer in the blue print is shown as arranged for the Mullard M.M.4V. (listed above.)

If you decide to use an Osram, Marconi, Mazda or other variable-mu valve (see the list), the connections to the potentiometer should be altered in accordance with the instructions given in the article describing the construction of the set.

You may wonder why certain blanks appear in the list of valves. This is not necessarily because the firms opposite the blanks do not make any valves that *could* be used in the set in the particular

A.C. "AIRSPRITE" ACCESSORIES

LOUDSPEAKERS. — Blue Spot, B.T.-H., Clarke's Atlas, Celestion, Ferranti, H.M.V., R & A Marconiphone, Lanchester, Ormond, W.B., Igranic, Baker's Selhurst G.E.C., Epoch.

AERIAL AND EARTH EQUIPMENT.—Electron "Superial," Goltone "Akrite," Graham Farish "Filt" Earthing Device.

position in which the blank occurs, but because we feel that the valves of those makes available would not be quite so suited as those we have listed.

A good case in point is the output valve, which we have chosen because of its particularly high mutual conductance—7·5. There are two makes of indirectly heated cathode valves giving that figure (or thereabouts), and they are the Cossor and Micromesh (Standard).

Therefore, you find Cossor 41M.P. and Micromesh P.A.1 specified and *no others*. Mullard, Marconi and the rest make excellent output valves, such as the 104V., M.L.4, and so on; but while they *could* be used in the set, with the proper change of bias resistance, they would not give such loud results as the first two mentioned, owing to their lower mutual conductance.

We stress this point because we do not want any reader to slip up here. Please use the valve specified and no others.

The A.T.B. CONTROL

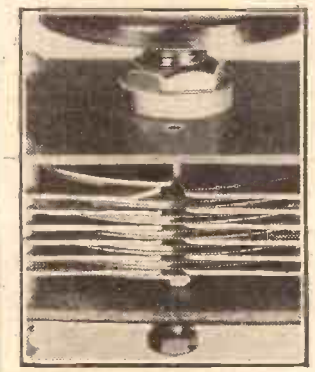
HOW TO MODIFY YOUR REACTION CONDENSER.

THERE are many differential reaction condensers which are extremely easy to modify for A.T.B. use. But before we discuss actual cases it may be as well if we remind constructors exactly what is wanted.

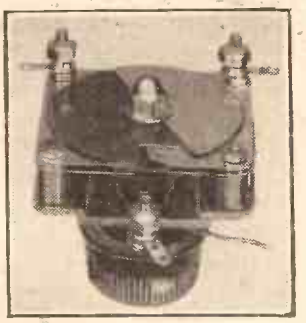
It is simply that when the condenser is turned to "minimum," hard over in an anti-clockwise direction, the moving vanes (or one of them) shall make contact with the F.2 fixed vanes.

The easiest type of all to modify is the air dielectric type, for all that has to be done is to bend up the corner of one of the F.2 vanes so that the moving vanes strike or scrape it.

The Ormond slow motion lends itself readily to the



A J.B. modified for A.T.B. working.



This Lotus is particularly easy to adapt, as you can see.

modification. A portion of the insulating leaf nearer the terminals is cut away with scissors (it cuts very readily) and the corner of F.2 vane bent up. This can be done with the fingers.

Much the same procedure is adopted with that type of Lotus differential which is illustrated on this page. The other Lotus differentials are, however, not so easily altered.

There are several ways in which the Telsen differential can be modified although the one illustrated will probably appeal most to constructors.

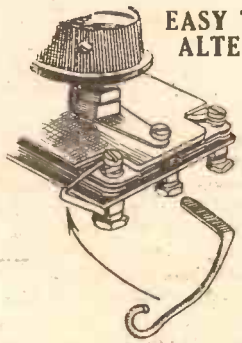
A piece of ordinary 18-gauge connecting wire is cut and bent to the shape detailed and the one end is flattened somewhat by beating it with a hammer.

The loop is then secured under the F.2 terminal and the flat end of the wire forced down between the edges of the vanes and the insulating sleeve.

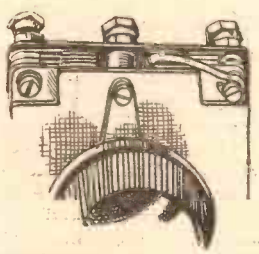
The switching now occurs through the moving vanes striking the flattened end of the wire.

The Ormond slow motion after modification. (See also the photo published last week.)

EASY TO ALTER



This simple method of modifying the Telsen differential involves no structural alterations to the component whatever.



The piece of wire pressed into position in the Telsen differential.

The P.W. "AIRSPRITE"

MORE PRAISE FROM THE RADIO INDUSTRY

From CELESTION LIMITED.

Dear Sir,—I must thank you for allowing me to hear your new three-valve set in operation. **Apart from its neat and clean design, I was particularly impressed by the clarity of reproduction obtained on distant stations demanding the utmost use of reaction.**

Too often, under such conditions, distant stations are heard, but not enjoyed. The ingenious and simple tonal device which is included in the set, however, certainly clears up the position, and makes for intelligibility of even the most distant broadcasts.

Any arrangement which assists in improving quality of reproduction is particularly interesting, and, I am certain, **will compel the admiration of all your readers.**

May I congratulate you on overcoming what is almost accepted as "a necessary evil" in such a clever and simple manner.

Yours faithfully,
E. J. MARRIOTT,
CELESTION LIMITED.

From BELLING & LEE LTD.

Dear Sir,—**I was greatly impressed by the demonstration of your new receiver,** and in particular I must congratulate you on your unique and ingenious device for automatic compensation of tone when using reaction. **When listening to a distant station on the edge of reaction, your tone compensation made all the difference between enjoyable music and the usual deep, muffled noise, and, more important still, in my opinion, is the fact that it made it possible with a very weak, distant station to hear the announcer's voice clearly and understand what he was saying.** We all know that intelligible speech depends almost entirely on the high notes, and if we want to make our voices carry over a distance or to be heard above another noise, we always pitch our voices upward to make more use of the high notes which are the most audible and intelligible. Thus the use of reaction in cutting out the high notes has always made it very difficult to understand speech, and **I am sure your readers will join with me in thanking your staff** for having evolved this means of putting back the high notes.

Mr. F. M. Lee, B.Sc.

Yours faithfully,
F. M. LEE, B.Sc., Director.

From A. F. BULGIN & CO. LTD.

Dear Sir,—We thank you for your courtesy in permitting our technical representative to view and hear, under the guidance of Mr. Rogers, your new three-valve battery-driven "Airsprite" three-valve set.

This set has normally an L.F. characteristic rising steadily from just above middle C to 6,000 cycles, but it is arranged to minimise this rise when the receiver is used for local stations by loading the primary of the L.F. intervalve transformer with a condenser, this latter being brought into circuit by a simple contact operated by the reaction condenser at its minimum position. When it is desired to receive distant stations, reaction is naturally used, and the loading capacity is thus removed from circuit. The rising characteristic then obtained in the amplifier compensates to a great extent for the loss of treble (cut sidebands), due to the lowering of the resistance of the tuned circuit concerned by the application of reaction. **The demonstration showed our representative that your claims in this direction were well borne out in practice, both aural and measured tests being made.** Such an arrangement undoubtedly gives considerably more even amplification whenever sidebands have to be cut in a receiver of this type. We believe that many constructors will be interested in this arrangement which, as applied to receivers for the home-constructor, is, as far as we know, quite novel.

Mr. A. F. Bulgin.

Yours faithfully,
A. F. BULGIN,
For A. F. BULGIN & CO., LTD.

From DIRECT RADIO LTD.

Dear Sir,—Your Research Dept. were good enough to give me a **very practical and thorough demonstration** of your new "Airsprite" receiver, and I hasten to convey to you my sincere congratulations on the remarkable method of automatic reaction tone compensation developed by your Technical people and now incorporated in the "Airsprite" Circuit. **In my opinion, this discovery is as important as that of the reacting detector valve itself,** and will no doubt have as far-reaching effects on future radio development The problem of overcoming high-note losses when reaction is increased has for too long remained unsolved, and **I know you will all be very proud to feel that once again it has been left to "Popular Wireless" to provide the solution.** I am sure your readers will not be slow to take advantage of this great improvement in radio technique.

Mr. Donald P. Marcus.

Yours very truly,
DONALD P. MARCUS.

From THE MARCONIPHONE COMPANY LIMITED.

Dear Sir,—Many thanks for the opportunity of examining the new receiver incorporating the distant-station tone-corrector device.

Its use **should do much to simplify the good reception of distant stations and to enable their programmes to be received at good quality** We would emphasise, however, the necessity for the use of high-class components in such a receiver, for it would be a pity if the results obtained in your design were to be lost through the use of unsuitable valves, condensers, etc.

Wishing the design every success,

We are,
Yours sincerely,
A. S. RADFORD, Valve Department,
THE MARCONIPHONE COMPANY LIMITED.

★ ★ ★

Mr. G. Taylor.

Here is a photograph of Mr. G. Taylor, of Whiteley Electrical Radio Ltd., whose "Airsprite" report was published last week, together with those from Telsen Electric Co., Ltd. The Mullard Wireless Service Co. Ltd., Peto-Scott Ltd. Varley (Oliver Pell Control) Ltd., Ready Radio Ltd., The Genera Electric Co. Ltd., Wingrove & Rogers Ltd., Cossor Ltd., and Ferranti Ltd.

★ ★ ★

A further selection will appear in next week's "Popular Wireless."

All the interesting news and views of current short-wave practice.

MY few remarks a week or so back about the extraordinary exaggerations with which one meets when comparing notes with other short-wave fans have caused not a few letters to be directed to me. Some agree; others differ in no uncertain tones; while yet a third class express surprise that there should be any need for prevarication, so startling are the results that can be *genuinely* obtained without adding "frills."

J. M. (Bath) confirms that W 1 X A L works on 49·67 metres and relays W E E I, Boston, Mass. Reports will be gratefully received and acknowledged, and the full address is "Station W 1 X A L, 70, Brookline Avenue, Boston, Mass." J. M. mentions that he has heard this fellow as early as 7 p.m., in spite of his fairly high wavelength. He also comments on the excellent strength of our old friend W 2 X A D from time to time, usually at 7.30 p.m. or thereabouts.

Preference for Small Sets.

R. C. W. (Liverpool) writes to tell me that he is quite unable to get a set to oscillate when the grid leak is put in parallel with the grid condenser—between grid and the top of the grid coil. Presumably (although he does not say so) everything is all right when the leak is taken down to filament. I haven't the faintest idea what the trouble is here, as things generally happen the other way round.

I don't know what circuit you are using, R. C. W., and I presume that you have tried another leak. I suspect that there is something important that you have omitted to tell me.

A. E. B. wants me to inform readers that the London Chapter of International Short-Wave Club is holding meetings at the R.A.S.C. Hall, Wandsworth Road, S.W., on February 10th, March 3rd and 24th, and April 7th and 28th.

R. S. B. (Durban) either has a strong sense of humour or a super-enthusiast's preference for small sets. He says, in the course of an interesting letter, "We have a 4-valve A.C. set for short waves, which works, although it is a poor substitute for my W. L. S. one-valver." No comments necessary!

"Don't Do It."

He was just on the point of getting an announcement from Buenos Aires when abrupt "family interference" closed down his activities for that night! He also asks some questions about the safety of using a mains unit and high H.T. voltages when wearing headphones.

My advice, R. S. B., is "Don't do it." Unless, of course, you have choke filter or transformer coupling to the 'phones. You might, otherwise, receive what is usually termed a "nasty packet."

H. E. H., another South African reader, is charmed with the Empire station, in spite of a long period of severe atmospherics. He uses the old "S.G." Four, which seems to be the type of set they need out there for good reception on the loud-speaker of the Europeans.

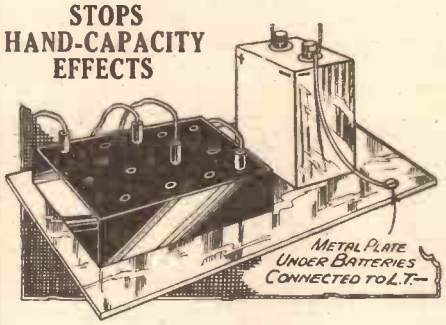
Battery Shielding.

If hand-capacity troubles persist on a short-wave set, with or without the earth connection, a "capacity" earth may nearly always be arranged to cure them. An old aluminium panel stood under the H.T. and L.T. batteries, connected to L.T. —, is sometimes sufficient.

In bad cases a larger metal plate extending underneath the operator's feet is needed. In this event a sheet of tinfoil between two similar-sized pieces of paper or cardboard is more convenient than a large sheet of metal.

Another possibility is the use of an "indoor aerial" run round the skirting of the room, low down, and connected to the earth terminal of the set.

STOPS HAND-CAPACITY EFFECTS



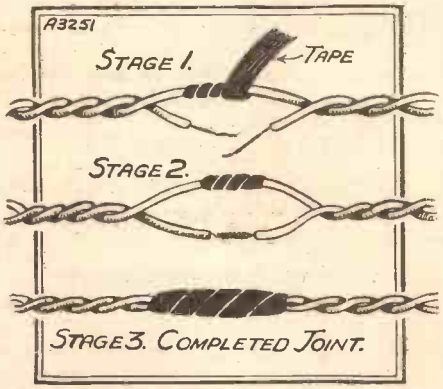
JOINING TWIN FLEX

The simplest, and at the same time neatest way of doing the job.

AFTER making a joint in twin flex, it is often a fact that the constructor will juggle with the roll of tape, pushing it in and out between the two wires. This is quite unnecessary.

The procedure to adopt is to join two of the wires together first. Then tape them.

ONE WIRE AT A TIME



There is no need to cut the roll of tape until the job is completed. This leads to economy and convenience.

The other two wires are now twisted together and then they are taped.

But instead of doing this separately the tape is bound round *both* wires, thus making one neat join of the whole thing.

Weekly jottings of interest to buyers.

PERIODICALLY our national newspapers strike a note of cheery optimism by heralding (usually prematurely, alas!) some gigantic trade revival or other. Personally, when such headings adorn the top of my morning newspaper these days, I am apt to turn immediately to the back pages, wherein I can read the facts about the Arsenal or Walsall, or perhaps about England's doubtful "try" in the recent international.

The truth of the matter is that although I am far from being a pessimist, I *do* like facts, and when such statements are backed up by facts, then I am one of the first silently to applaud.

"Airsprite" Enthusiasm

Last week, for instance, the story of my many trade activities is one of unbounded enthusiasm for the "Airsprite." Everywhere I went I was greeted with the same sort of remarks. "Business is great; 'P.W.' has brought off the hat-trick again"—"'Airsprite' kits are being ordered by the thousand"—"Interest is phenomenal," and so forth.

Incidentally my journeys round the radio trade took me to the vast Ekco Factory near Southend, and there I found the test department busily engaged in trying out various Ekco mains units with a view to finding which was the most suitable for use with the "Airsprite."

Ekco are most enthusiastic about this set, and they have taken very great pains in finding out which of their huge range of units is best suited to it. The verdict is that for the D.C. user the D.C.15/25 is most suited, while for use with A.C. mains the A.C. 25 or the K 25 should be used, the latter having the additional advantage of a trickle-charger.

The Keynote of Success.

One of my many calls last week took me to the factory of what I believe I am correct in saying is one of the oldest radio firms in existence. I refer to Messrs. Wright & Weaire, Ltd., who were making components long before broadcasting commenced in this country.

In company with Mr. Wright and Mr. Weaire, I was privileged to make a tour of inspection of the works, and I enjoyed every minute of it. Thoroughness both in regard to manufacture and ultimate testing seems to be the keynote of the success that is enjoyed by Wearite products.

Everything is checked and double checked, and even the transformer case that was stamped out under the gentle guidance of my own hand was subjected to an impressive if unorthodox test before being passed out as O.K.

I came away feeling that the survival of "my" transformer case under the "test"

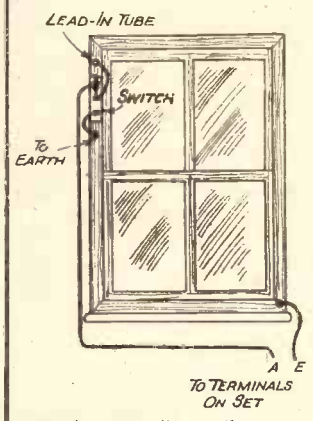
(*Continued on page* 1228.)

RECOMMENDED WRINKLES

A SHORT CUT TO EARTH.

EVEN when an earth lead is apparently at its shortest, there are generally at least a few inches more to be saved by taking the wire from the receiver at once to earth, *regardless of the switch.*

In some cases, where the receiver is at the opposite side of the window (as in the sketch), it saves a foot or two.



Showing how the earth can be taken by the shortest ronte.

Often, indeed, circumstances arise in which the aerial comes in best at another window altogether; and the set then can be earthed via its own nearest window or door.

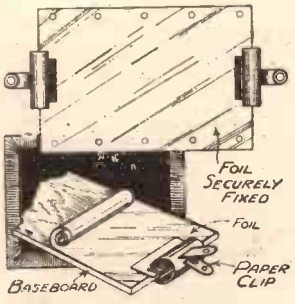
Simply put the earth plate where it most efficiently serves the receiver, and put the lead-in tube where that most efficiently serves the aerial. The switch is then fixed next to the lead-in tube, having its own wire (preferably passing immediately to the outside of the window) to the earth plate.

The lead from terminal E of the set may, of course, while taking the shortest route to earth, join at some point the earth wire from the switch.

FIXING FOIL.

THE following notion is very useful to the short-wave experimenter.

Fixing copper foil to baseboards is a very tedious job, but it can be accomplished very easily, in this way. First cut the foil to the correct size, then secure on two sides of baseboard with two stout paper clips (spring type), taking care to keep the foil as flat and free from kinks as possible.



Paper clips hold the foil while the fastenings are being made.

The foil is then held firmly by inserting a few drawing pins through the foil into the board, after which the paper clips are removed.

AUTOMATIC LIGHTING.

HERE is an idea for a light which comes into action when the lid of the receiver is lifted.

Most receiver cabinet lids have a brass hinge, which supports the lid when opened.

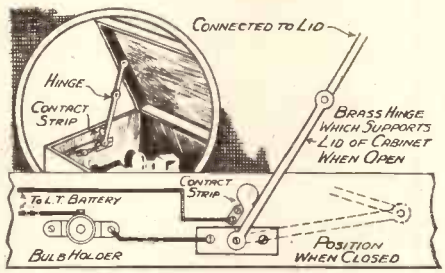
A small piece of thin brass or copper is bent into the shape shown in sketch and screwed to the wood of the cabinet.

This should be attached only when the lid is open; otherwise, of course, it will not function.

A pocket lamp holder is now screwed on to cabinet, and connected up, as per sketch.

When a lamp is inserted in the holder it will be found to light up when the lid is lifted up and go out when it is lowered.

A small adjustment may be necessary to the copper strip when all is completed.



The action of closing the lid switches the lamp.

TURN YOUR IDEAS INTO MONEY!

Readers are invited to send in a short description, with sketch, of any original and practical radio ideas of their own.

Each week £1 1s. will be paid for the best "Wrinkle" from a reader, and others published will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Send your idea to-day, marking the envelope "Recommended Wrinkles," to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4.

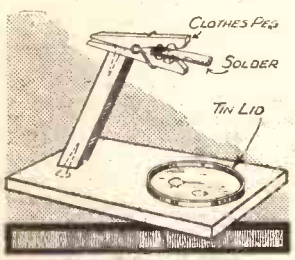
The name of this week's guinea winner will be published on this page next week.

Owing to the tremendous number of hints received from readers there have inevitably been duplicated suggestions, of which only the first can be accepted. "Wrinkles" not accepted for publication can be returned if a stamped and addressed envelope is enclosed.

I may state, the above idea has been in operation on my own receiver for some time, giving every satisfaction.

EXTRA "HAND" FOR SOLDERING.

IT happens when soldering that you could do with an extra hand, especially if you are holding a wire in a certain position and want a blob of solder on the iron.



With this "gadget" you can use two hands for the job.

This gadget answers the purpose, and also saves dropping solder.

The tin will hold flux, and a dip at intervals keeps the iron well tinned.

CURING A MICROPHONIC VALVE.

MICROPHONY is one of the worst bugbears to pleasant reception, but usually the most obstinate cases disappear with the following treatment.

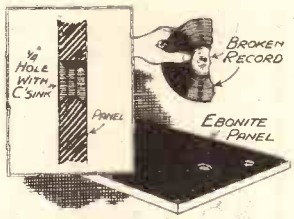
Take a reel of half-inch sticking plaster and cover the bulb of the offending valve completely.

This damps the glass in exactly the same way as we apply damping to the piano string by the soft pedal.

It is, of course, only applicable to valves which get just warm under operating conditions, since with a bright emitting valve the winding is reduced to a sticky mess.

FILLING THE CAVITY.

FILLING up a hole in an ebonite panel to some constructors is no new idea, but to some it will be of no small interest.



An old gramophone record has many uses—here is one.

Take, for example, a ¼-in. diameter hole. Countersink both sides of the hole. Then take a broken piece of gramophone record, and with a red-hot bolt gradually work into the hole a piece of the record. The record will become soft when held against the hot bolt (it will not actually melt to a liquid).

After you have filled the hole from the one side turn to the other side and fill up from here, since the record will have become hard before it has filled into the countersink.

To finish off the whole job, file or scrape the extra gramophone record flush with the surface of the ebonite. With a little practice one can fill up to a ¼-in. diameter hole so that it cannot be noticed even with the most careful inspection.

THE IDEAL EARTH.

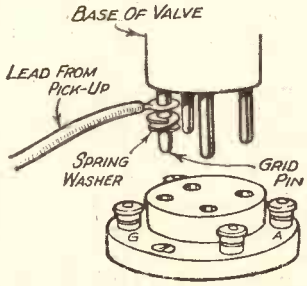
BURY a piece of aerial wire under and along the length of outdoor aerial.

The idea is that if the ground is dry a "capacity" earth is formed, and a perfect connection to earth is made when the ground is damp.

QUICK PICK-UP CONNECTIONS.

HERE is an idea that will appeal to readers interested in radiogram working. It enables any wireless set to be converted into a radiogram in a few moments.

The construction of the connection is as follows: A circular terminal is attached by solder or other means to the end of the pick-up lead.



Just slip the tag over the valve-pin and the connection is made.

The terminal tag can now be slipped on to the grid leg of the detector valve and after the addition of a small spring washer to keep the connection tight the valve may be replaced in the valve holder.

A similar connection may be made for the wander plug on the grid-bias battery.

SCISSOR-MADE HOLES.

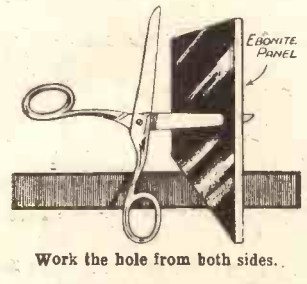
IT is very often the case that a constructor finds that he has not the correct size of drill required in his tool-box to drill his panel.

Since constructors are usually very impatient people, tempers are tried to the utmost until the frail constructor has bought or acquired the necessary drill.

When the size of the hole required is a little larger than the size of the drill you have in hand, a pair of scissors usually does the trick.

By working with one arm of the scissors and from both sides of the ebonite, one can acquire the correct size of hole with very little trouble.

If no drill is available at all, the point of the scissors, if pressed and



Work the hole from both sides.

twisted hard enough against the ebonite, will soon make a hole as good as any drill can do it.

(Continued on next page.)

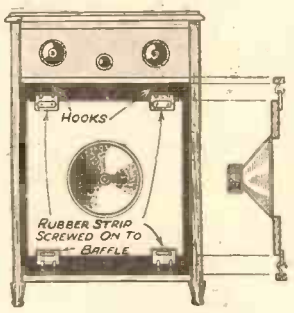
RECOMMENDED WRINKLES

(*Continued from previous page.*)

FLOATING BAFFLES.

HERE'S an idea for housing a loud-speaker in a wireless cabinet and make a floating affair of it.

Four strips of rubber cut from an old motor-tyre tube are screwed to the baffle board. The rubber wants to be about 1½ in. wide and 3 in. long. Four pairs of brass hooks are screwed into the cabinet. Two top and two bottom.



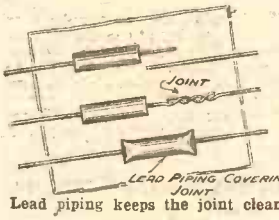
The speaker baffle here is hanging on rubber supports.

Two holes are punched in each rubber strip and then put on the hooks.

The job should be stretched on to the hooks and kept tight. The whole thing is then suspended on the rubbers.

JOINING THE AERIAL.

HERE is a tip for aerials and earths. If by some chance when erecting an aerial or earth the wire has to be cut, or is not long enough, and a joint has to be made, before the joint is made slip about two inches of lead gas



Lead piping keeps the joint clean.

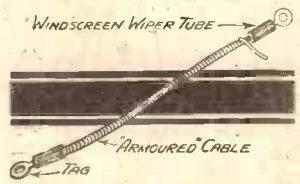
piping over the wire, then make the joint. Slip the length of tube over the joint and close the ends tightly with pliers.

This will keep the joint clean and perhaps save a lot of trouble in the future.

ANODE LEADS.

A USEFUL screened anode lead can be made from a short length of single armoured cable (as used for wiring on motor-cars).

About 6 in. is used, and the ends of the aluminium are unwound. The end is bared and a small piece of windscreen wiper tube is pushed over each end.



Windscreen wiper tube is slipped over each end of the cable.

A small tag is fixed at each end and the tubing is pushed up so as to just cover the tag.

One end of the unwound aluminium is cut off the other is used for earthing at a suitable point.

H.T. FROM FLASH-LAMP BATTERIES.

MANY people still use the common flash-lamp battery for building up H.T. batteries of various voltages, and if for no other reason than that a defective cell can be replaced at small cost and little trouble, there is justification for their use.

But they have a further advantage in that a super-capacity battery can be built up at very small cost. This is done by coupling the flash-lamp cells in pairs in parallel, which, of course, results in a double capacity and a considerably longer life if used with a small wireless set.

Two positives are coupled together and two negatives, then the joined positives are coupled to another pair of joined negatives, and so on. It is very essential that the clips used for coupling up such a battery should make a really good contact, or the losses will be considerable, in fact, by far the best method is to solder the connections together.

Moreover, it pays to see that the individual batteries are well insulated from each other and their containing box.

CIRCUIT TESTING PRONGS.

WHEN testing a circuit for a breakdown, I have found that the tags on 'phones or voltmeter are not long enough to handle properly.

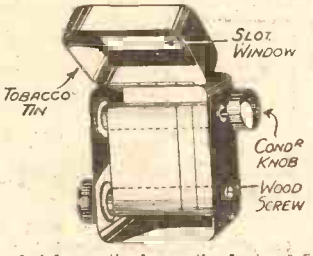
I have therefore made up a useful gadget by removing the lead from two pencils and inserting in its place an ordinary cycle spoke, first cutting off the head of the spoke, but leaving the threaded end intact.

Use a large pencil!

I used one red and one black coloured pencil.

A STATION INDICATOR.

THIS indicator was designed with the idea of making a list for reference of all the medium- and long-wave stations, on a long continuous strip of paper with sufficient space in



A tobacco tin forms the basis of this constant station reference.

between the entries so that any changes or variations could be easily recorded.

It consists of the roller film spools of the popular size of 3¼ x 2¼ inches. They are mounted in a tin box—many of the quarter-pound tobacco tins are suitable for the purpose—or a sweet box may be found of the correct size.

Holes will need to be punched in the sides of the tin and the burr on the inside must be removed with a file, or it will impede the free winding of the rollers.

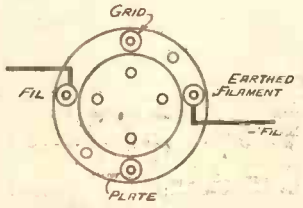
The pivots consist of wood screws, which are slack and fit in these holes. For easy operation one end of each roller is fitted with an old condenser knob.

With a pair of tin snips a slot for observation purposes is cut in the lid of the box from side to side.

On the paper slip are entered the name of the stations and their wavelengths and, if thought desirable, columns can be ruled for condenser readings.

FOR EFFECTIVE SCREENING.

A POINT which may easily be overlooked by those who like sometimes to make up their own design, is that concerning the filament pin to which the metal coating of metallised



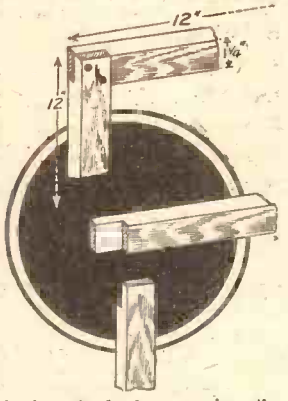
Remember that the earthing pin of metallised valves is standardised.

valves is joined. The connection is standardised, of course, and should be remembered since it may be found that after a neat layout has been made, the filament leads, if they are to be joined to right terminals, are much longer than would be the case if the holder were in a more suitable position.

MOUNTING CONES AND CHASSIS.

WHEN mounting loudspeaker cones and chassis, I have found the following to give good, solid reproduction.

Construct (for a 10-in. cone) a jointed framework of 1½ in. batten wood. The edge should be of a 12-in. square and jointed with a single lap joint and



A framework for carrying the chassis.

secured with two screws at each corner.

To this, the chassis can be firmly attached.

On the 12-in. square baffle board stretch and pin (with drawing pins) the gauze; then securely screw the newly-mounted chassis and frame to the baffle.

Such an arrangement has been found to give excellent results with such a sensitive unit and giving the power of a Senior Ormond unit.

BACK-COUPLING AND OSCILLATION.

A DIFFICULTY sometimes experienced with screened-grid receivers is oscillation on the long-wave band. Both tuned-anode and tuned-grid connections may be tried on occasion without effecting any improvement.

This trouble will be found invariably to be due to one or more of the following causes:

1. Defective screening of coils.
2. Unsuitable H.F. choke.
3. Excessive screen voltage or too small by-pass condenser.
4. Back-coupling through H.T. source.

If touching the screen anode stops oscillation, the most probable causes will be Nos. 2 or 4.

The remedy for Nos. 1 and 3 is self-evident.

Regarding No. 2, a choke of high inductance is required for coupling purposes.

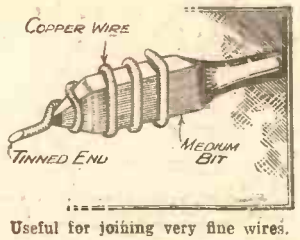
Back-coupling (No. 4) can be cured by inserting a resistance of about 1,000 ohms between H.T. + and the H.F. choke, in the case of choke coupling, and connecting a 1-mfd. condenser from this point to earth.

SOLDERING SMALL JOINTS.

THE soldering enthusiast who finds himself in need of a very small bit to facilitate joining very fine wires, such as those used for winding tuning coils, may easily improvise one by winding the bit of a medium-sized iron with a length of heavy gauge copper wire.

If the end of this is left projecting as shown, cut askew, and tinned, it will prove ideal for use on small joints, since it will neither cool rapidly nor prove too cumbersome.

The iron should be heated in a clear flame, that of a gas ring or spirit lamp,



Useful for joining very fine wires.

to avoid fouling the small tinned surface.

AN EFFICIENT EARTH CONNECTION.

IT is always difficult for those who do not wish to solder, to achieve a good weather-resisting earth connection; as if insulating tape is used to bind round the connection to the earth plate or tube wet will creep through sooner or later. A simple screw connection is not satisfactory, as the exposed metal soon becomes corroded.

The way I overcome the difficulty is by making as good a mechanical joint as possible by tightly screwing the wire to the tube, and then coating the joint with a liberal application of rubber tyre-repair solution, which covers the joint with an efficient and permanent insulation against corrosion.

The aerial lead-in can be treated in the same way.

Many readers will already have a tube of solution at hand, but in any case, the good connection obtained is well worth the slight expenditure entailed.

CLIPPING A PICK-UP.

HERE is an easy way of adding a pick-up, either as a makeshift or if one doesn't wish to fix a proper switch.

It works quite satisfactorily with sets of the straight three type.

All one has to do is to fix a crocodile clip to each pick-up lead, these being clipped on to each side of the grid-leak holder.

This makeshift idea is quite satisfactory with a straight three set.

For a two-valver you fix a clip to one lead and a wander plug to the other which goes to 1½ grid bias.

NOW — a component which solves the problem of TONE COMPENSATION without necessitating an extra L.F. stage!

TELSEN AUDIOFORMER

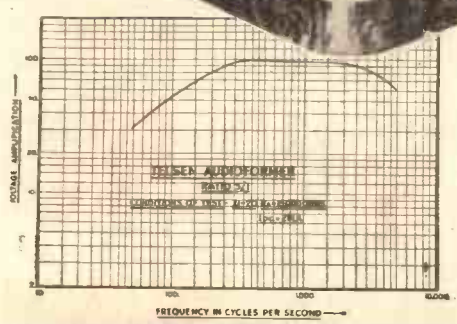
—the essential component for all selective circuits

SPECIFIED FOR THE 'P.W. AIRSPRITE 3'

THE Telsen Audioformer solves the problem of tone compensation which has been created by to-day's demand for super selectivity. Its fixed compensation restores all the high notes which have been lost by the cutting of the sidebands, yet it does so without any loss of amplification or reduction in bass response, and without necessitating either an extra L.F. stage or any additional components. Absolutely self-contained, this single brilliant component is all you need to achieve that perfect reproduction which your critical ear demands, but your set is at present unable to provide. You will be amazed at the improvement it effects. Obtainable everywhere now.

Ratio 5 to 1.

PRICE **11/6**



The excellent treble response secured can be seen at a glance in this graph showing the Telsen Audioformer curve.

TELSEN
RADIO COMPONENTS
FOR LASTING EFFICIENCY

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

Capt. ECKERSLEY'S QUERY CORNER

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers. Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

THOSE GRAMOPHONE BROADCASTS.

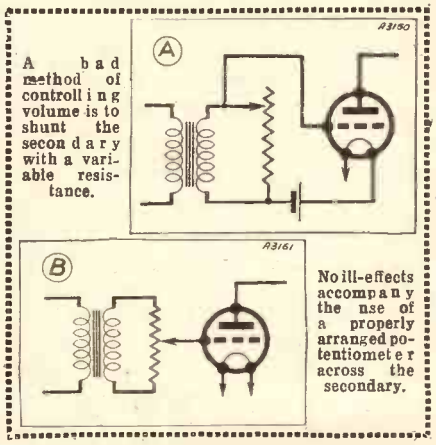
H. D. (Rochester).—"I have always appreciated that a mechanical gramophone reproduces music which usually sounds quite different from the same music heard on a good wireless receiver.

"I assumed that this was due to the mechanical gramophone introducing more distortion. However, having been a constant broadcast listener during the past year or two, I find that the same difference is noticeable between a gramophone record broadcast and a broadcast of the same music played by an orchestra in the studio.

"It seems to me that the musical time of the record is different from that of the actual performance, and I should be pleased if you could suggest any reason why this should be, as I have never noticed any comments on this subject."

B.B.C., please note!

A mechanical gramophone produces "resonances" in certain parts of the musical scale, and makes a peculiar distortion of the resulting sound.



An electrical reproducer on a gramophone has fewer pronounced resonances and distortions, and can give a very good result indeed. Some say a result better than average wireless to-day.

When the B.B.C. broadcast a record the input of their system is the same electrically as the input to an electrical gramophone's loudspeaker.

Their system does not produce noticeable distortions, or should not if they are taking care.

But the listener's wireless set may produce a distortion which, added on to the inevitable gramophone distortions, shows that a gramophone record and not "first hand" music is being broadcast.

But there cannot be any distortion anywhere in the system of actual musical time.

I understand that the announcers "put on" gramophone records. They may not be so skilled as ordinary people, and so send out the gramophone record with the turntable turning at the wrong speed—this will produce quite a noticeable effect—a distortion not only of musical time, but of pitch as well.

I assume the poor wireless set may introduce distortions not in the gramophone records and B.B.C. pick-up, and the good wireless set hears the gramophone as it is played by the B.B.C., and the musical time and pitch may be distorted if the turntable turns too fast or too slowly.

CONTROLLING VOLUME.

L. O. P. (Hornsey).—"In my receiver the volume control consists of a variable resistance connected across the L.F. transformer secondary terminals.

"Does this resistance have any effect on the amplification of the different frequencies, and will adjusting the resistance to different values have any marked effect?"

You can vary volume either as shown at A or B. But if you use method A you take more and more current out of the transformer as the voltage fed to the valve is made less. In the limit you short the transformer.

This is very bad and cuts down the high frequencies and introduces distortion due to altering the anode current—anode volts load line characteristic.

DON'T DO IT!

But method B is better, provided the potential divider has a good high resistance. In method A you may in the limit short-circuit the transformer—in method B the load on the transformer is constant, and if the resistance is of the order 200,000 ohms quite small.

Remember, the whole essence of distortionless amplification is that a satisfactory relationship between valve impedance and anode load must *always* be maintained.

As you approach the ultimate short-circuit position of method A you make the anode load more and more unsuited to the valve's impedance. And so you get distortion when reducing volume.

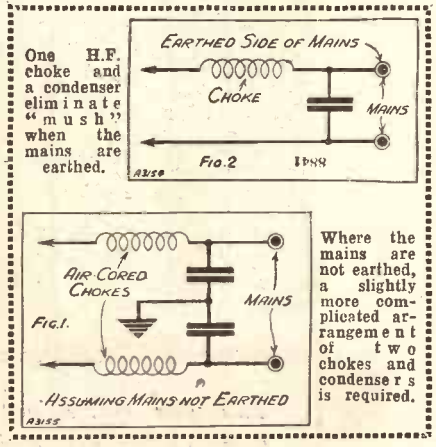
ELIMINATING MUSH.

H. C. T. (Nottingham).—"I recently read an article on mains supply for radio, and it stated that the mains could pick up high-frequency currents and transfer them to the radio receiving circuits. Apparently these currents, when amplified up, were audible as mush and other unwanted noises.

"What kind of high-frequency currents would these be? Presumably they would have no connection with broadcasting, otherwise the interference would be heard in the form of music or speech."

No; they're probably not much to do with broadcasting. Some of them may be created in the electric generators.

Their mains may run along near to tramways mains where the sparking in the trolley wire creates high-frequency disturbances.



Neon signs, small motors and refrigerators may all set up high-frequency disturbances, and these are picked up by the mains and pushed along them.

The best way to eliminate the disturbances is to get air-cored chokes and connect them as in Fig. 1, and across them put small ·001 condensers to shunt away the high-frequency which pushes through the chokes. If one side of the mains is earthed, you can do as in Fig. 2.

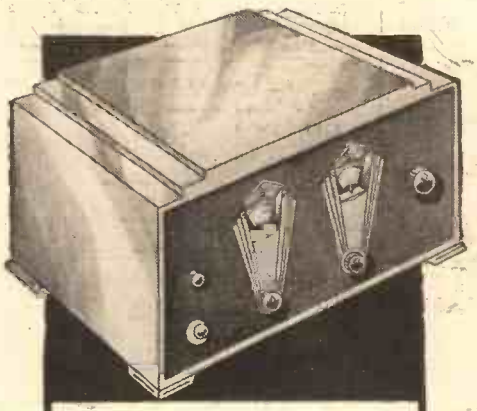
When the mains are D.C. it is as well to see that the air-cored chokes do not have unduly high resistance, otherwise you will lose anode volts. Special chokes for the purpose may be purchased.

For the finest results at the lowest

construct your exclusively of

TELSEN

Matched Components



This view of the front panel of the completed ALL-TELSEN 'P.W. Airsprite 3' shows the handsome commercial "finish" given by the silver oxidised escutcheons of the Telsen Disc Drives.

BE *sure* that the 'P.W. Airsprite 3' which you build will give you lasting efficiency at the lowest cost consistent with quality. *Make it an ALL-TELSEN receiver*—with the Telsen Matched Components shewn in the list on the next page. Specially prepared for you by Telsen technicians, every component in this list has been individually tested for immaculate performance, the complete ALL-TELSEN 'P.W. Airsprite 3' being itself subjected to prolonged testing to ensure its lasting efficiency. Take this list to your dealer's—now.

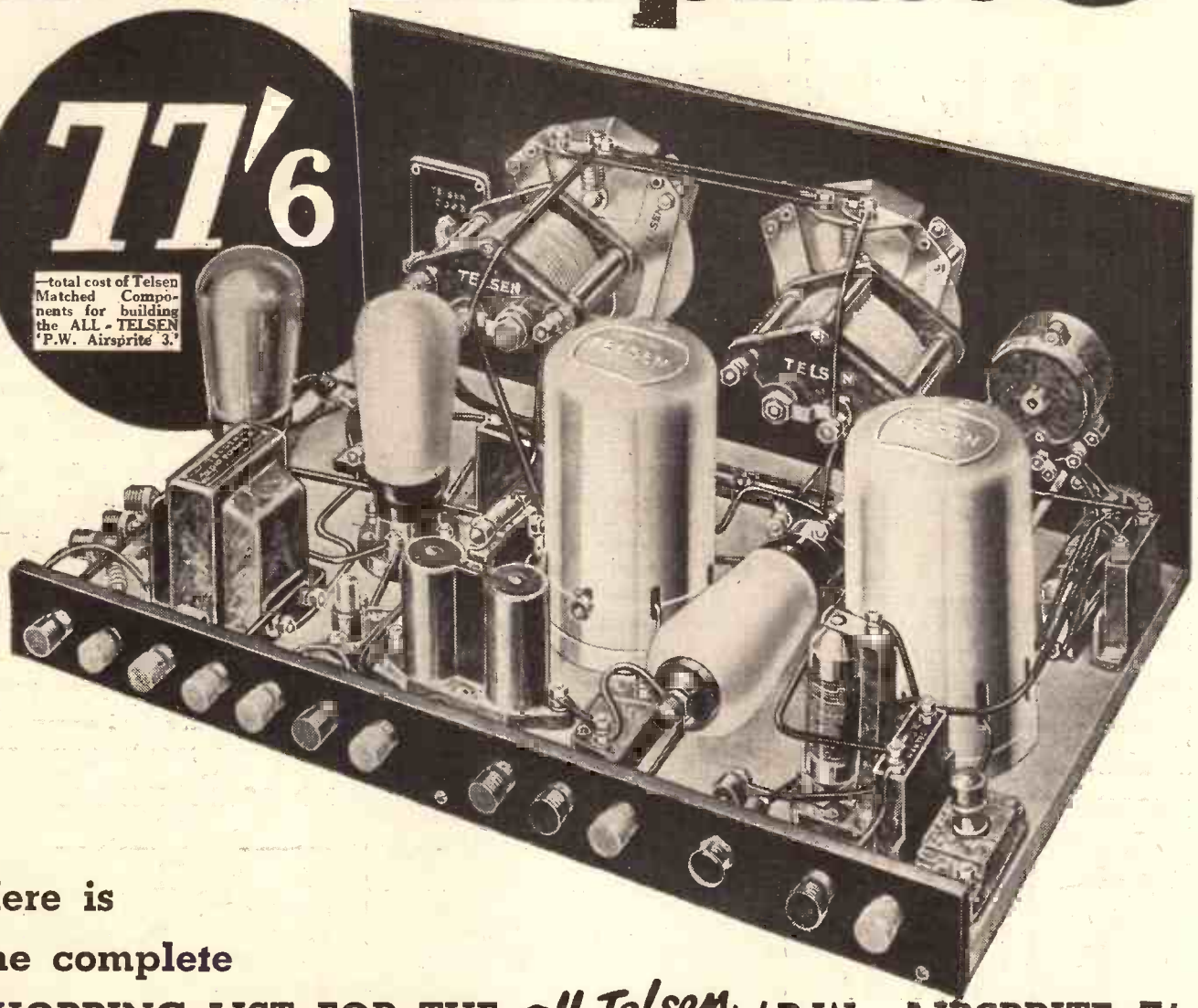
TELSEN
RADIO COMPONENTS

cost consistent with quality . . . .

'P.W. Airsprite 3'

77/6

—total cost of Telsen Matched Components for building the ALL-TELSEN 'P.W. Airsprite 3.'



Here is the complete SHOPPING LIST FOR THE *all Telsen* 'P.W. AIRSPRITE 3'

Quantity.	*Description.*	*Cat. No.*	*Price.*
2	Twin-Matched Screened Coils	W.287	17 0
1	Coil Switch Coupling Assembly	W.217	0 6
1	Log. Variable Condenser, L.H. .0005 mfd.	W.256	4 6
1	Log. Variable Condenser, R.H. .0905 mfd.	W.132	4 6
2	Illuminated Disc Drives	W.184	7 0
1	Standard H.F. Choke	W. 75	2 0
1	Binocular H.F. Choke	W. 74	5 0
2	.1 mfd. Mansbridge Condensers	W.231	3 6
1	.01 mfd. Mansbridge Condenser	W.232	1 6
1	.0905 mfd. Mica Condenser	W.244	1 0
1	.0903 mfd. Mica Condenser	W.242	1 0
1	.0003 mfd. Pre-set Condenser	W.151	1 6
1	.0003 mfd. Bakelite Differential Reaction Condenser	W.185	2 6
1	1,000 ohm. Cartridge Resistance	W.268	1 9
1	100,000 ohm. Cartridge Resistance	W.282	1 9
2	Cartridge Resistance Holders	W.286	1 6
1	2 meg. Grid Leak	W.251	1 0
1	Fuse Holder	W.146	0 6
1	Fuse Bulb	W.318	0 6
1	Universal Valve Holder	W.198	1 0
2	4-pin Solid type Valve Holders	W.224	1 6
1	Telsen Audioformer	W.327	11 6
1	Three point Switch	W.108	1 3
1	50,000 ohm. Volume Control	W.295	3 9

Obtainable from radio dealers everywhere

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

THE MIRROR OF THE B.B.C.

THE TELEVISION SITUATION

Nonsense About Women—Dr. Boult's Difficulty—The Danger of Broadcasting House—An Announcer Promoted, etc., etc.

THE Marconi Company, the E.M.I. and the Baird Company all profess to have television. From my own knowledge, the Baird Company has television capable of reception on certain sets, but I would like to know whether all these television concerns are taking the advice of the B.B.C. in getting together in order to enable the general public to purchase a receiver capable of dealing with all the various idiosyncracies of transmission which are inherent in the problem.

Nonsense About Women.

There is great excitement at Broadcasting House about the employment of women, and I think it is entirely justified.

This looks to me very much like a subject that Colonel Moore Brabazon will keep in mind. Incidentally there are altogether too many women employed in the B.B.C. Why does not its notepaper bear the badge of the National Scheme for Disabled Men?

Dr. Boult's Difficulty.

I hear that Dr. Boult is having one of his periodical difficulties with the "Junta" at Broadcasting House. Every now and then circumstances combine to discourage Dr. Boult in one way and another. Fortunately, however, he seems to defy discouragement.

Of course, it is an advantage to be independent financially, but this is surely not a reason which the B.B.C. would approve. For the moment the struggle is to maintain Dr. Boult's authority and dignity. And this, I suggest, is a concern of the listening public.

The Danger of Broadcasting House.

I think I have already mentioned the danger of the elegance about Broadcasting House. I wish now to emphasise it almost to the extent of suggesting that from the point of view of broadcasting it is a pity that the B.B.C. Headquarters is not still at Savoy Hill.

No doubt it is happier for purposes of direct presentation; that, of course, is another matter. What I am concerned about at the moment is that people of middle status are looking inward to such a degree that they encourage in themselves and in their subordinates a curious arrogance. This is a warning. I shall refer to it again, if necessary.

An Announcer Promoted.

For once in a way, an announcer has been promoted, this case being John Snagge, the son of the eminent judge.

Mr. Snagge has been appointed to the Outside Broadcast Department as one of the principal assistants of Mr. Gerald Cock, the Director of "O.B.s." I hope the procedure continues; it is overdue in its inception. Incidentally, it is amusing to recall that Mr. Snagge holds the world's record as "announcer probationer."

Dr. Adrian Boult for Vienna.

Dr. Adrian Boult, the Director of Music to the B.B.C., has been invited to conduct

(*Continued on page* 1228.)

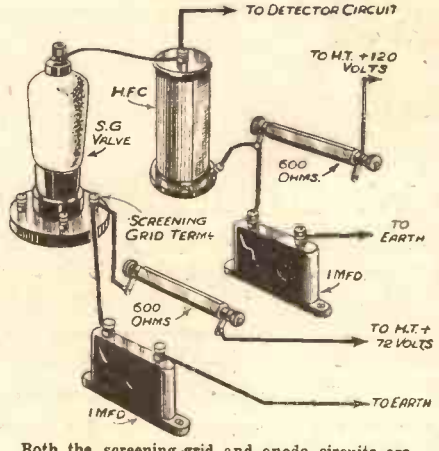
IMPROVES STABILITY.

THE importance of confining H.F. currents to their own particular portions of a circuit is not always fully appreciated.

For example, one quite often meets a fellow constructor whose cry is: "I have just put an S.G. stage on to my set, and although every precaution has been taken to screen the aerial from the detector circuits, the S.G. valve tends to oscillate as soon as the receiver is tuned to a station."

In many cases the trouble can be traced to lack of decoupling in the screening-grid and anode circuits of the S.G. valve.

DECOUPLING CONNECTIONS



Both the screening-grid and anode circuits are here provided with resistances and by-pass condensers.

Decoupling the screening grid should be tried first of all, and if this fails to remedy the fault, the same procedure may be adopted for the anode circuit.

The scheme is perfectly straightforward and well worth while if the amplifying stage is one of those which just can't be "held down."

ISOLATING H.F.

A tip to ensure stability and other handy schemes for the set owner and constructor.

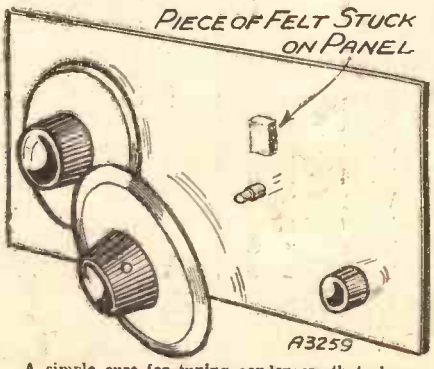
STEADYING DIALS.

OCCASIONALLY, a variable condenser with a plain dial, becomes loose in operation, and will not stay just where set. It tends to turn due to the weight of the moving vanes.

This can be overcome by applying damping to the dial. And the ideal form for this damping is a piece of felt stuck to the panel behind the dial so that it presses on the latter and so stiffens up the movement and holds the dial where set.

LABELLING LEADS.

THOSE little celluloid tags which you buy for slipping on to battery and other leads are very useful and look most professional—*but* they have an annoying habit of getting lost when you are building a new receiver.



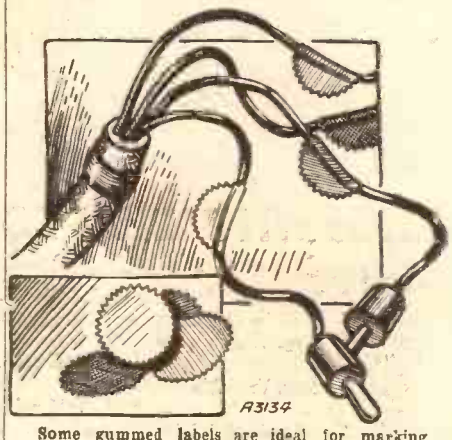
A simple cure for tuning condensers that show a desire to swing immediately the dials are released.

It is a most unwise proceeding to try to connect up a set without being sure of the correct leads at a glance and tying a varying number of knots in the battery cords—one for H.T.+, two for G.B. —, three for L.T. —, etc.—is not a satisfactory idea, despite its popularity!

The simplest method is to beg, borrow or steal from the family mending basket a number of pieces of coloured wool which can be tied round the leads and make identification a matter of seconds.

Another method which I use myself is to buy a dozen or so of those little circular

NO CONFUSION POSSIBLE



Some gummed labels are ideal for marking battery leads, and will avoid their being misconnected.

labels which are supplied in all colours by stationers for sticking at the bottom of important business correspondence. (They denote enclosures or something of the sort, I believe!)

When stuck round the leads, these tags make most handsome identification discs, and the appropriate lettering can be written on in ink.

COMPLETE

TO THE LAST SCREW

Purchasers should be on their guard against so-called complete Kits which are neither complete nor to specification.

Insist on a Ready Radio "Airsprite" Kit and you will be sure of getting *everything* necessary with panel ready cut and drilled, baseboard and Jiffilinx for wiring. *With full instructions and full-size double blue print free.*

£4·9·6 Or 12 monthly payments of **9/-**

Fully approved by "Popular Wireless"

"With regard to the Ready Radio 'P.W.' 'Airsprite' Kit which you are offering to the public, I am pleased to inform you that it meets with the requirements of my Technical Staff and I therefore have pleasure in giving the Kit the official approval of this journal."

(Signed)
NORMAN EDWARDS.
Editor.

The Ready Radio 'AIRSPRITE' is the GUARANTEED AND APPROVED KIT

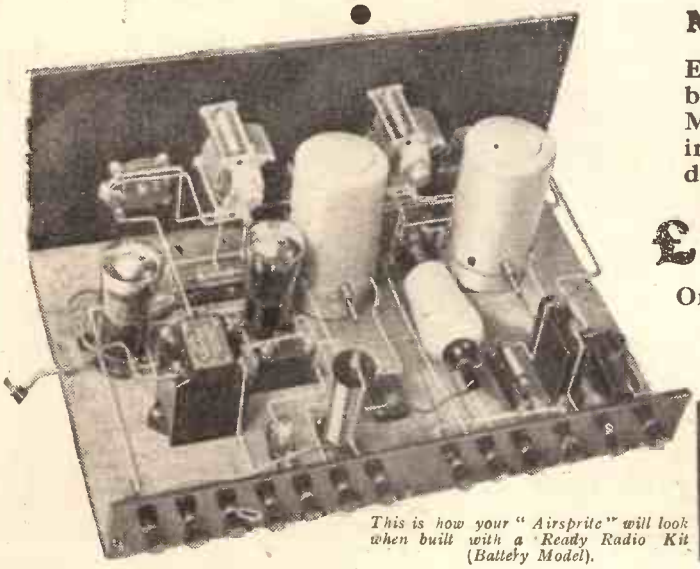
Every Ready Radio Kit is tested, passed and packed under the personal supervision of Mr. G. P. Kendall, B.Sc., and is contained in a special display carton so that every component is in perfect condition and the Kit is absolutely complete. Mr. G. P. Kendall has included Colvern Coils and the Varley Transformer in the Ready Radio Kit in order that you may obtain the highest possible efficiency and efficient tone correction.

"AIRSPRITE" MAINS MODEL

Everything necessary to build the "Airsprite" Mains Model, with full instructions and full-size double blue print.

£10 · 17 · 6

Or **12** monthly payments of **21/-**



This is how your "Airsprite" will look when built with a Ready Radio Kit (Battery Model).

Ready Radio "Airsprite" Kits are obtainable from all leading radio shops; in case of difficulty order direct from Ready Radio Ltd., Eastnor House, Blackheath, S.E.3.

READY RADIO

TELSEN SELF-SEALING CONDENSERS

MICA CONDENSERS AND GRID LEAKS

TELSEN MICA CONDENSERS

Adaptable to flat and vertical mounting. H.F. losses, even in the larger sizes, have been virtually eliminated. Grid leak clips supplied free with the smaller capacities.

In capacities of from ·0001 to ·002 mfd. - **1/-**

Also ·006 mfd. - - - - - - - - 1/3

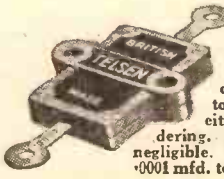
TELSEN PRE-SET CONDENSERS

Give widest variation between maximum and minimum capacities, and exceptional range of selectivity adjustment when used in the aerial circuit. High insulation with low loss. In mfd. capacities of from ·002 (max) and ·00025 (min.) to ·0001 (max.) and ·000005 (min.) - **1/6**

TELSEN GRID LEAKS

Absolutely silent and practically unbreakable, the resistance being unaffected by the application of different voltages. Guaranteed completely non-inductive. Produce no capacity effects. In capacities of from 5 to ½ megs. - - **1/-**

TELSEN TAG CONDENSERS



Of compact and sturdy construction. May be mounted on either insulated or metal panels. Tags enable the condensers to be connected to any other components, either directly or by soldering. H.F. losses are negligible. In capacities of ·0001 mfd. to ·002 mfd. - **6D**

TELSEN

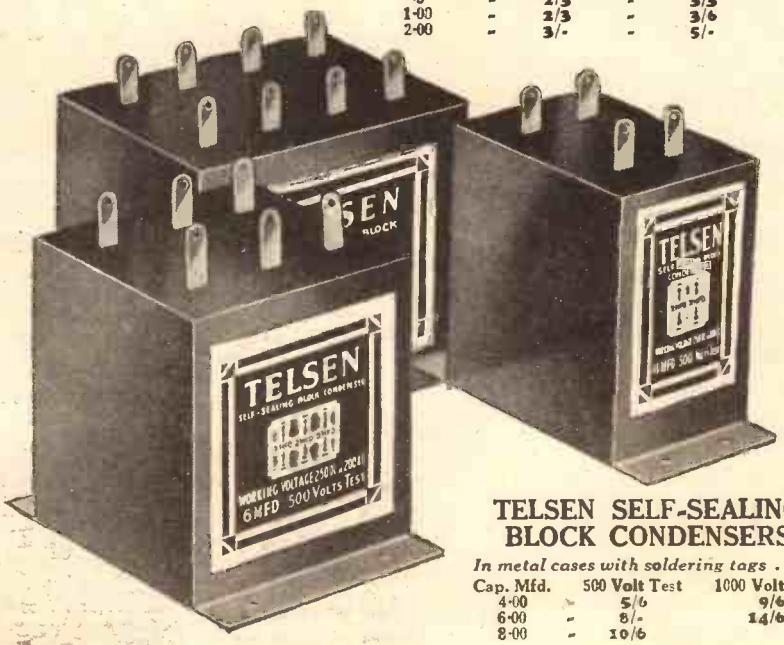
TELSEN SELF-SEALING CONDENSERS

represent a very definite advance on current condenser practice. Only the highest quality foil paper and the finest linen tissue are employed, each individual plate being self-sealing and the case itself finally triple-sealed with a newly-discovered bitumastic compound, for permanent efficiency. Every condenser is subjected to rigorous tests up to Post Office and Admiralty standards, the exclusive method of construction making them genuinely non-inductive. They give the highest insulation with complete freedom from breakdown — built for lasting efficiency under all conditions.

TELSEN SELF-SEALING BAKELITE CONDENSERS

Specially designed for 2-way fixing.

Cap. Mfd.	500 Volt Test	1000 Volt Test
·01	1/6	2/6
·04	1/9	2/9
·1	1/9	2/9
·25	2/-	3/-
·5	2/3	3/3
1·00	2/3	3/6
2·00	3/-	5/-



TELSEN SELF-SEALING BLOCK CONDENSERS

In metal cases with soldering tags . . .

Cap. Mfd.	500 Volt Test	1000 Volt Test
4·00	5/6	9/6
6·00	8/-	14/6
8·00	10/6	

RADIO COMPONENTS FOR LASTING EFFICIENCY

ANNOUNCEMENT OF THE TELSEN ELECTRIC COMPANY, LIMITED, ASTON, BIRMINGHAM.

RADIO SIMPLIFIED

A PRACTICAL OUTLINE FOR BEGINNERS

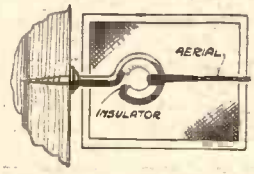
INDOOR AERIALS

CITY dwellers, especially those who live in flats, are often unable to use any form of outdoor aerial. What is the next best thing in such circumstances?

To answer that question we must bear in mind that the electro-magnetic waves from a broadcasting station will readily penetrate through open spaces and through non-conductive materials, but when they reach a conductor, such as a wire or larger metal surface, they will set up high-frequency currents in it.

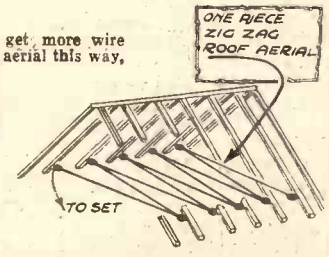
If the wire is an outdoor aerial, such currents will appear in it, even though it is well covered with a good insulator, like a coating of rubber or enamel. But if the aerial is partly surrounded by metal (or other conductor) the currents will partly appear in that metal and not so much in the aerial, which is then said to be "screened." **Thus, the fundamental difference between an indoor aerial and an outdoor aerial is that the former is necessarily screened, to some extent, by the surrounding conductive walls, etc.**

INSULATED HOOK



Let us take the case of an attic aerial. The best shape for it depends upon its situation. Under a long lofty roof a single wire, exactly like an outdoor aerial, is suitable. But owing to the restricted space usually available it is generally better either to use several wires, or to zig-zag the wire from side to side of the roof-space.

The snag here is that if several wires are used, as shown in our central sketch, they should be soldered to the centre wire. (This, like the outdoor aerial, is best left unbroken from farthest insulator to aerial terminal on the set). So, as soldering is usually a nuisance, and twisted joints between the outer and central wires are sure to develop poor contact in time, the "zig-zag" aerial is usually preferred.



You will get more wire into your aerial this way, but will also have more insulators to fix up.

In this the wire is all in one piece.

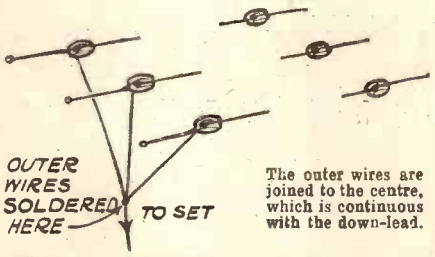
Usually it should not zig-zag more than three or four times across the roof-space, but different arrangements are easily tried to find which is best for any given house.

The sketch above shows the general shape of a zig-zag aerial, but in practice it would not be supported on adjoining roof-beams unless the roof-space was very restricted.

Sometimes a clear space across from side to side is not available, and then a "long-run" aerial is best. The final sketch shows the general idea of this type. It may, of course, be modified by the shape of the roof-space, so that it then resembles also the zig-zag aerial.

All indoor aerials should be properly insulated. But being protected from the weather it is generally quite sufficient to use porcelain lined hook-insulators instead of "shell" or "reel" types.

HOW TO JOIN THEM UP

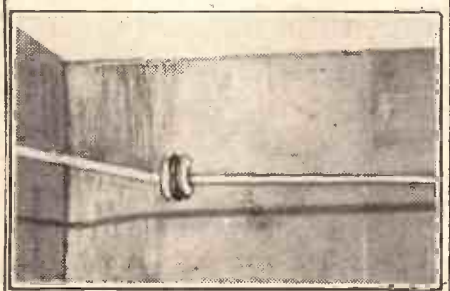


The outer wires are joined to the centre, which is continuous with the down-lead.

An important point, usually overlooked, is to keep the aerial wire well away from conductive surfaces, such as metal pipes, tanks, and wet slates or tiles.

For this reason "stand-off" or "rod" insulators are often necessary, and if not stocked by the local dealer they can readily be made by fitting the end of a wooden rod of the required length with a hook-insulator.

Remember that the lead-in to the set is a vital part of the aerial system, so its insulation and spacing should be considered rather carefully if long-distance reception is hoped for. Keep the lead to the set as short as possible, and away from the walls except where necessary to pass straight through one.

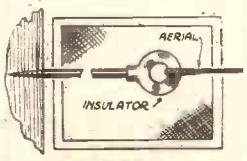


An aerial in a room should be kept as clear of the walls as possible.

As regards wire, you can use the kinds specially made for aerials, or bell-wire, or flex, or a reel of the ordinary cotton-covered or silk-covered wire—a quarter of a pound reel of, say, No. 18 or 22 D.S.C. or D.C.C. is quite inexpensive, and contains enough to allow for trying out different shapes and sizes of aerials.

So far we have discussed the roof or attic type of indoor aerial, but often a large room, or long passage, has to be utilised instead of roof space. Here, however, exactly the same conditions apply—good contact through-out from farthest end to set, good insulation, ample spacing from walls, and especially from metal girders and the like.

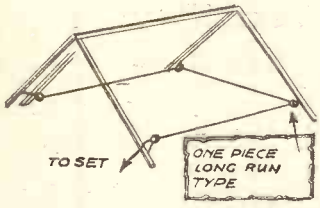
STAND-OFF INSULATOR



Another good reason for avoiding walls is that they may contain bell or light wiring, which will cause noises in the set.

It is surprising how many possessors of indoor aerials put up with interference due to causes of this kind without realising that the cure may lie in their own hands all the time. The mere changing of the aerial wire from one side of the room to the other will often result in an almost complete removal of what is deemed to be the incurable nuisance of buzzing and humming noises caused by electrical machinery.

Another point that is often overlooked is that the direction in which the indoor aerial runs is often of much more importance than the directional effect obtained with an outdoor aerial.



A simple roof aerial with one straight run round the loft.

Thus, a north-to-south arrangement may pick up quite a lot of interference along with the programmes, and yet a similar length of aerial, in the same room but running east to west instead, would be comparatively free from the interference without any reduction in the programme strength. So it is always advisable to try different arrangements of an indoor aerial—and fortunately that is generally quite an easy matter.

The possibilities of "accidental" aerials are also worth exploring, especially in large buildings. For instance, metal window-frames will sometimes be found to make better aerials than anything that can be installed inside the house.

"Frame" or "loop" aerials are not truly classed as indoor aerials, and will be dealt with separately.

Special Beginners' Supplement, Page 2.

THE importance of good insulation cannot be overestimated, and laxity in this direction is often the cause, not only of poor reception, but of damaged batteries, valves, and other components.

The object of insulation is to confine the currents in the circuit to their proper paths, and the various conductors along which the currents pass are therefore separated from each other or from earth by some material through which these currents will not flow.

Air is a good insulator, but for obvious reasons is impracticable, except in a few cases which we shall mention later.

The chief insulating materials used in connection with radio reception are porcelain, ebonite, bakelite, waxed paper, mica, rubber, and silk.

Glazed stoneware or porcelain is impervious to weather conditions and its mechanical strength makes it particularly suitable for supporting aerials; or, in fact, for any work in which strength as well as good insulation is an essential feature.

Turning now to the set itself we find insulating materials wherever we look. For instance, the leads joining the batteries or mains unit to the receiver are rubber covered, the valve holders consist of a moulding, usually of bakelite, in which the valve sockets are embedded, and the tuning coils are wound with silk-covered or enamelled wire supported upon moulded formers.

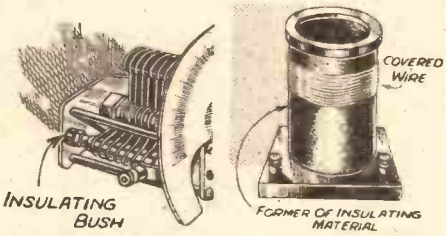
The question of insulation losses enters very largely into the choice of the material employed for the different components. This is specially true in so far as the high-frequency side of the set is concerned.

Some insulating materials, although quite suitable for use with direct or low-frequency currents, cause serious losses if called upon to separate conductors carrying high-frequency currents.

Since the currents picked up by the aerial are extremely minute, perhaps a few millionths of an ampere, it is evident that the possibility of wastage is a matter that cannot be treated lightly.

Thus the best insulation material to employ on the high-frequency side is obviously the one that produces the smallest amount of absorption or loss.

Air is foremost among these materials and is used wherever possible. For instance, in variable condensers the moving and fixed vanes are frequently air-spaced. But air, unfortunately, has definite limitations because it has no mechanical strength whatever, and therefore other low-loss materials having the desired strength and rigidity are employed for such components as coil formers, valve holders, valve bases, etc.



Insulating material crops up in many places—on variable condensers, in coil formers and surrounding wire.

MOULDING SURROUNDING SOCKETS STOPS LEAKAGE

Good insulating material must be used.

Ebonite and bakelite are two insulating materials possessing properties which render them suitable for high-frequency work, but unnamed components of doubtful origin should be eschewed by the constructor who wishes to get the best out of his set.

The mouldings in components of this type are often composed of poor quality materials which may introduce marked losses. This applies in particular to short-wave receivers in which all solid insulating materials, even the better qualities, should be cut down to a minimum.

Rubber, enamel and silk coverings are employed on wires because flexibility is essential.

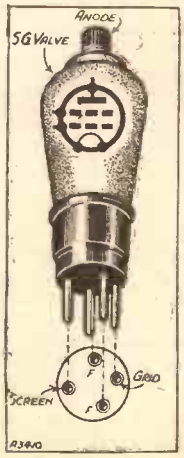
VALVE TYPES

ALTHOUGH the various valves listed by the valve manufacturers differ in certain details, there are virtually only three main types which we need consider under this heading.

Battery and mains valves are fundamentally the same, differing only in the means employed to produce the necessary electron emission.

This is achieved in the battery valve simply by coating the filament with thorium which becomes active and emits electrons upon the passage of a low-tension current through the filament. Thus the filament is also the cathode.

In the mains valve the filament and cathode are separate, the name **heater** being given to the former because its work is merely to heat up the cathode (which is a coated tube surrounding the heater) to the temperature at which it gives off electrons.



The S.G. valve.

The constructional variations are solely to meet the different conditions under which the valves are operated, and have no bearing upon their ability to amplify or detect.

These two classes of valves can therefore be grouped together for all practical purposes, but it must be remembered that the mains class are more efficient than their battery equivalents, and in consequence are not interchangeable stage for stage in a receiver designed primarily for battery operation.

Dealing with the three types of valves in common use we have:

(1) The screened-grid or four-electrode valve.

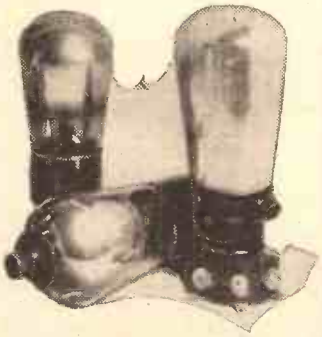
(2) The three-electrode valve, and

(3) The Pentode, which has five electrodes.

The screened-grid (S.G.) valve is used principally as a high-frequency amplifier and occasionally as a detector.

Prior to the advent of the S.G. valve high-frequency amplification had to be carried out with the aid of the three electrode valve, which was generally neutralised to prevent self-oscillation.

THREE MAIN TYPES



Triode, screened grid (lying down), and pentode (on the right).

The S.G. valve has four electrodes, the extra one being the screening grid, and when this is joined to the appropriate tapping of the H.T. supply perfectly stable amplification can readily be achieved.

The variable-mu valve is a particular form of S.G. which permits the magnification given by the valve to be varied at will without introducing distortion.

Turning now to the three-electrode valve, among its many uses are those of detection and low-frequency amplification. The "H" and "HL" types make very good detectors, while the "L" type performs excellently as first stage low-frequency amplifiers.

For the output stage there are the power and super-power types. The last-named is capable of handling more power than the former, but does not magnify weak transmissions to quite the same extent.

There is no advantage in using a super-power valve unless the sensitivity of the receiver is such that it overloads a valve of the ordinary power type.

The pentode is a power valve with five electrodes, its primary advantage being the ability to give a relatively large power output for a small input.

In other words, the pentode magnifies a weak transmission to a greater degree than a three-electrode power valve, and for this reason is a good valve to use in cases where it is desired to get the utmost from a set. But this high magnification is often a limitation, because it is easy to overload a pentode.

The Pentode.

Special Beginners' Supplement, Page 3.

YOUR H.T. VOLTAGE

ONE of the secrets of success in receiving the broadcast programmes loudly and clearly is to apply the correct high-tension voltages to the valves.

The anode of the valve is always joined to H.T. positive (+) although not necessarily directly. Usually the current from the high-tension supply has first to flow through a choke or transformer winding, or a resistance, but it must eventually reach the anode otherwise the valve will not work.

The actual high-tension voltage that it is necessary to apply depends upon the type of valve and its position in the circuit.

In some valves two of the electrodes have to be joined to the H.T. supply. For example in the S.G. valve the anode and screening grid are both connected to H.T.+ tappings on the H.T. battery or mains unit.

Owing to the S.G. valve having four electrodes, the anode is joined to a terminal on the top of the valve bulb, the screening grid being connected to the valve pin which is normally the anode pin in a three-electrode valve.

The anode requires a higher positive voltage than the screening grid and the usual values for a battery S.G. valve are 120 volts on the anode and about 72 volts on the screening grid.

These valves will also continue to work equally well with anode voltages up to a maximum of 150, at which figure the optimum screen voltage is usually approximately 80.

The H.T. required by the detector varies between 60 and 80 volts, the most suitable value being the one that gives the smoothest reaction on both medium and long wave-bands.

The best method of determining the correct voltage is to try different values by varying the position of the wander plug in the H.T. battery or by altering the voltage adjustment on the mains unit, assuming such a procedure to be possible.

In some circuits the detector H.T. voltage may be as high as 120, as for instance, when the detector valve has a resistance of 100,000 ohms or more connected to its anode circuit.

On the low-frequency side of the set there is never any question as to what voltage should be applied, because it is invariably the maximum available.

Battery "L" type, and power or super-power valves (not mains valves) are designed to operate on voltages up to 150.

To apply more than 150 volts is to overrun the valve and so shorten its life, but it is essential from the reproduction standpoint to use as much H.T. as possible within the makers' specified limit.

Therefore apply at least 120 volts, and if you can use a higher voltage, so much the better. But remember that the grid-bias voltage must always be adjusted accordingly.

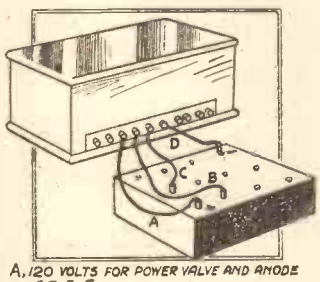
An increase of H.T. on the anode of the valve automatically entails an increase in the grid-bias value.

Pentodes require a similar treatment, but like the S.G. valve, there is an additional point to which a positive voltage has to be applied. This is the screen or priming grid.

In a five-pin pentode the screen is connected to the centre socket and "C" terminal of a five-pin valve holder.

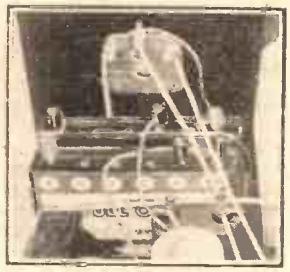
As a general rule the screen of a pentode should be connected either to the same H.T. positive voltage as the anode or to a slightly lower voltage.

USUAL TAPPINGS



A. 120 VOLTS FOR POWER VALVE AND ANODE OF S.G.
B. 60 - 80 VOLTS FOR DETECTOR
C. 72 VOLTS FOR SCREENING GRID
D. — —

Showing how varying voltages are obtained.



If you alter the power valves H.T., remember to alter its G.B. as well.

VALVE TIPS

ALTHOUGH the modern valve does not require any attention once it has been properly installed in the set, there are nevertheless, certain points that need watching if the best results are to be achieved.

The first of these concerns the metallised valve, a type in which the glass bulb is sprayed with a conductive coating to serve as a screen. These valves are commonly used in S.G. and detector stages, and are easily recognisable by their grey, metallic surface.

This is a point to which attention should be given if you hear crackles or get poor results.

DIRTY VALVE PINS AND BAD CONNECTION WITH VALVE HOLDER CAUSE POOR RECEPTION

This coating is always joined to one of the filament pins, and the disposition of this pin in relation to the grid and anode pins at the base of the valve has now been standardised.

When connecting up a valve holder in which one of these valves is to be inserted, the negative filament terminal should be joined to the terminal which goes to the pin in question.

This is because the metal coating of the valve should be joined to the earthed side of the circuit in just the same way as all other screening in a radio set, and therefore must go to L.T. negative which is the "earth line" of the receiver.

Suppose we take an instance where this procedure has not been carried out, the coating having been connected to the positive filament terminal in error.

In some cases no unfortunate results will occur, but the consequences will be serious if the coating should accidentally be brought into contact with any of the earthed screening.

A fairly common example of how this might take place is when a metallised S.G. valve is mounted horizontally, so that it passes through a hole in a vertical metal screen.

Some clearance may exist between the valve and the screen, but there is also the possibility that the metal coating may touch the screen, in which case positive and negative of the L.T. supply would be joined together, to the detriment of the L.T. accumulator.

In a mains valve the metallised coating is connected to the cathode pin.

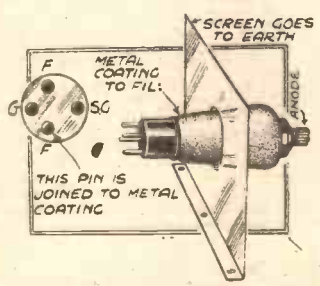
Never overrun a valve. A 2-volt battery valve is designed to work from exactly 2 volts, and the application of a higher voltage to the filament will considerably shorten its life.

Of equal importance is the grid-bias voltage applied to the grid of a power or pentode valve. No valve should be under biased. To apply too little bias is greatly to increase the anode current passing through the valve.

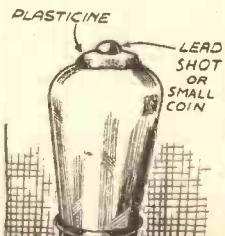
This, in turn, decreases the useful life of the valve and increases the drain on the H.T. supply. It is, moreover, a frequent cause of distortion on loud transmissions.

The most serious consequences may occur when the grid bias negative plug is removed from the battery in order to make an adjustment, or perhaps the plug may get knocked out accidentally. In such a case the valve is left without any grid bias at all, and the anode current rises to a very high figure.

THE RIGHT WAY



See that the pin which goes to the metal coating of the valve is the negative one.



Valves which ring due to sound waves from the speaker can often be cured in this manner.

A rule which should be observed when altering the grid-bias voltage is to switch off either the H.T. or the valve filament.

High amplification detector valves are sometimes microphonic—a trouble which manifests itself as a howl that gradually builds up after the reception has been switched on for a time, and which may commence by the set receiving a slight jar.

One method worth trying is the one shown in the sketch above. Another scheme is to wrap cotton wool round the valve and to support the cabinet on Sorbo rubber "cushions."

CONCERNING CONSTRUCTION

JUST a pair of pliers and a screwdriver—they are the essential and simple tools required to build the modern wireless set. But once the pleasures of making one's receiver have been experienced there is a great fascination about the handiwork side of the hobby, and generally a few more simple tools are acquired.

A hand-drill, capable of making holes in wood, ebonite, metal, etc., is one of the likeliest things that the would-be home-constructor will covet, and fortunately they are very cheap nowadays. But often their work can be done by the carpenter's brace, already in the household tool-box.

For the larger holes in panels the brace and bit are invaluable. And a set of small drills of the various sizes needed for wireless can usually be adapted for use in a brace by the simple expedient shown.

Normally adapted to take a rather large drill, the "jaws" of the brace will usually be found too large to "bite" on the shank of a small wireless drill. But bind a length of wire round this latter, in the form of a spiral, as shown, and its shank is effectively thickened.

If the spiral is wound neatly around it, it will be found that the drill will now be held quite firmly enough in the jaws of the brace.

When drilling a panel, remember that although scratches can easily be hidden to some extent, a little care in construction will enable them to be avoided altogether. **If you lay a sheet or two of newspaper on the table or workbench, and work with the panel face downwards, you will never need to fear an unsightly scar on it.**

Another useful and cost-free accessory is a false table top in the form of a large stout board, into which a couple of nails can be driven to hold the panel or other piece of work firmly in place.

This will not be harmed by the drill penetrating it when a hole is being made through the panel, and an additional advantage is that its detachability enables one to keep the table underneath it almost perfectly clean, the board being taken outside and knocked clean at intervals, if necessary.

Before drilling, mark the exact spot where the hole is to be made with a punch. Otherwise the drill may wander a little off the mark.

There is no need to buy a punch—a sharp nail and a tap with a hammer will do the job perfectly.

Incidentally, when a really large hole has to be made, it is often an advantage to extend the same principle, and drill through first with a small drill, which will then be a guide to the larger one.

The hacksaw is another inexpensive tool that the home-constructor soon finds invaluable. Its appearance, detachable blade and ability to cut through metal as well as almost any other workshop substance are well known. But it has features which are not always appreciated by a novice at radio construction.

For instance, there are two ways of putting on the detachable blade, and the direction of its teeth will determine whether the cut is on the "forward" or "backward stroke." Don't forget this fact when cutting is awkward.

The blade-holder and handle can be taken out of the frame and turned at right angles to their usual position, if necessary, so that the blade faces across the frame, instead of in line with it. This also in a very useful property enabling the blade to reach and cut in positions which at first might appear to be inaccessible.

Another very low-cost tool of great utility is the table-top vice. Easily fixed by a thumb-screw, it enables panels or pieces of metal to be held firmly while being worked on and even the smallest table-vice, costing only a few pence, seems to have a hundred uses in the workshop.

Don't however, let its teeth mark panels or spoil the thread on any screws that may be held in it, but fit it with small jaws of wood, as shown in the sketch. **These will completely protect a smooth or easily-marked surface, and they cost nothing to make.**

The file is another household tool that has many uses in set-building, especially if its handle is loose enough (as so often it is!) to be removed, and enable the "tang" of the file to be employed as a reamer for enlarging holes in ebonite, etc.

A little point that sometimes puzzles the novice in set-construction is that small components sometimes appear to be unnecessarily well provided with screw holes for fixing. Four screw holes for an upright condenser may seem to be excessive.

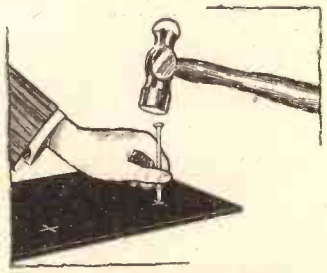
They are. The idea is that if plenty of holes are provided a couple of opposite ones will be likely to be conveniently reached, whereas if only two were provided one might prove to be inaccessible owing to neighbouring wiring.

Similarly the constructor's needs are often catered for by the provision of detachable feet on L.F. transformers, small condensers, etc., to enable them to be mounted upright or sideways.

One tip which may prove useful to the inexperienced constructor concerns the problem of the un-get-at-able screw. It so often happens that a screw has to be driven into the baseboard, but surrounding wiring or components prevent it being held.

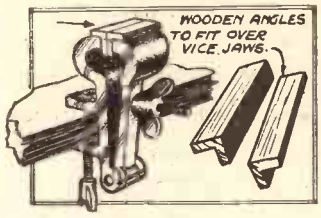
The "old hand" at set-building never wastes time and temper fiddling about with a screw which will not stand upright. He simply reaches for a piece of stiff paper or cardboard, folds it into a thin strip several inches long, pushes the "awkward" screw through one end of it, and then holds the end of the strip instead!

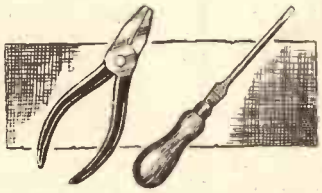
BEFORE YOU DRILL

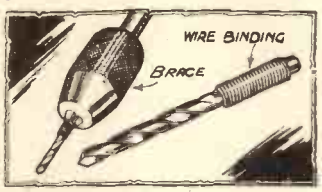


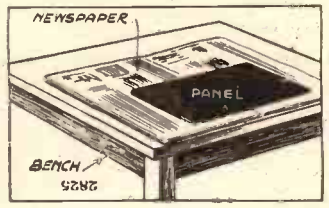
A nail makes a good centre-punch to keep the drill from wandering.

TOOLS AND TIPS FOR EASY BUILDING OF RADIO RECEIVERS AT HOME

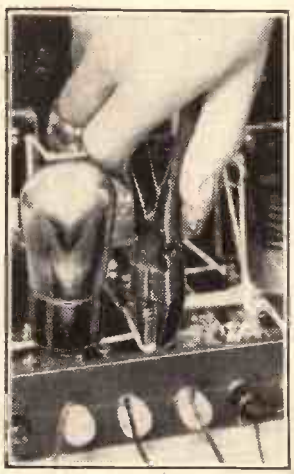








The first illustration shows how to fit protective wooden jaws to a table vice, which is a useful though not essential tool. Pliers and a screwdriver are the only two you simply must have. The third sketch shows how a carpenter's brace can be used for twist drills, while, lastly, is shown how to protect the panel's surface during drilling operations.



Don't depend on finger-tight wiring, but always use pliers. Also remember insulated wire is much better than bare.

NEXT WEEK: **The Special Beginners' Supplement will deal with H.F. Amplification, L.F. Amplification, What is a Circuit? and Wires and Wiring.**

Insist on the SPECIFIED PARTS

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The components illustrated have been specially chosen and specified for the "Airsprite" and are essential if you want results equal to those obtained with the original model. They possess special features not obtainable in other makes and assure you maximum efficiency and satisfaction. Do not accept substitutes—insist on Ready Radio.

Ready Radio are the largest distributors and manufacturers of Kits in the World and are recognised as official distributors for all "Popular Wireless" and other press sets. For details of Ready Radio "Airsprite" Kits, see page 1197.

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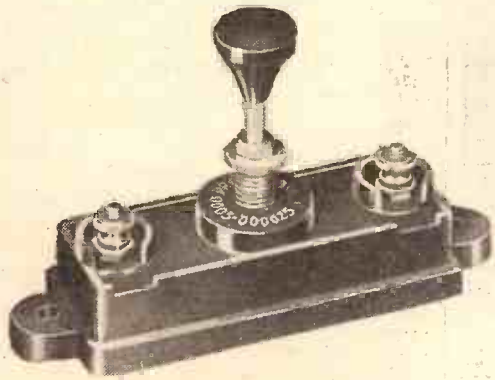

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OUR SPECIAL BROADCASTING COMMISSIONER, whose well-informed survey of **B.B.C.** activities and policies is creating great interest in broadcasting circles, deals this week with

MUSIC

OBVIOUSLY the first problem of the B.B.C. in music during the next ten years is to establish and consolidate the world supremacy of its main orchestra.

Fortunately, Dr. Adrian Boult has laid an excellent foundation through diligence and ability. Fortunately, also, Dr. Boult is likely to remain in command of the orchestra for several years. I was going to say for the whole period under review, but I have misgivings as to whether the B.B.C. will have the wisdom to retain him after 1936 against the encroachment of the wealthy organisations in the United States.

Anyway, here is a tip to those who will be administering the B.B.C. then: do keep him, because he will want to stay!

Model for the World.

In the next ten years the issue will be decided as to whether the B.B.C. is the patron or enemy of original music; in other words, whether the B.B.C., in the words of Lady Snowden, will rise to its destiny in becoming a "Ministry of the Arts." There is, of course a tenable alternative which is merely to be efficient at broadcasting. This, however, should be ruled out in any long view, and I believe it will be.

If the B.B.C. carries on with a modicum of statesmanship, it will recognise its responsibilities to original music, and will not accept the dictum proffered in the United States that broadcasting will become merely an instrument of distribution.

The issue, however, will not be easy of solution. There will be councillors pro and con, those con being reinforced by financial arguments. On the whole, however, I anticipate that the B.B.C. will rise to the occasion, and that ten years hence it will be the model for the world as a Ministry of the Arts.

Future Constructive Policy.

I have mentioned a postulate of an eminent American about the function of broadcasting. This leads me to considering what I can only call the menace of mechanisation. In other words, there will be a constant tendency to introduce gramophone records, Blattnerphone and other devices to develop and replace normal broadcasting.

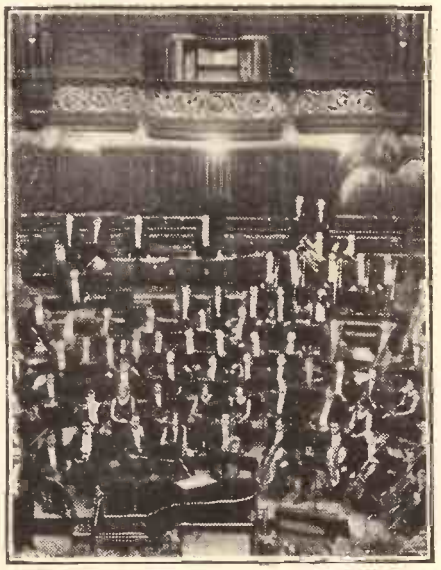
The only counter-irritant I can suggest to this process can be described as the result of the form of statesmanship to which I have already alluded.

And now for the constructive policy of the next ten years. First of all, it must be recognised that the B.B.C. is not the enemy but the patron of all legitimate and qualified musical endeavour.

The first application is for the B.B.C. to reconsider its policy towards its own Regional orchestras, which were demobilised during the financial panic of 1931. These should be properly reconstituted, giving full-time employment to a considerable number of deserving artistes.

Secondly, there should be devised a broad scheme of constructive co-operation with civic authorities maintaining local orchestras. For instance, the Hallé Society should receive an established and permanent subsidy from the B.B.C. over and above what is paid for the actual relays that are taken for broadcasting.

FROM THE QUEEN'S HALL



Situated only a few yards from Broadcasting House, the Queen's Hall provides some of the most successful broadcasts. This picture was taken during a B.B.C. Orchestra rehearsal.

It is understandable that, in the past, the B.B.C. has been reluctant to do more than pay for what it believed it was securing for listeners; but the attitude of statesmanship which should prevail in the next ten years must bring in new considerations, and it must be admitted that competent orchestras will be supported over and above their direct contribution to the microphone.

Moreover, the numerous societies engaged in developing local talent for music in villages up and down the country must not be neglected. Fortunately, Dr. Adrian Boult has always kept these in mind, and therefore there is not likely to be any opposition to this aspect of policy, at least as long as Dr. Boult is at the B.B.C.

The national organisations of musical festivals and similar organisations are being received at Broadcasting House, Midsummer, 1933, where they are sure of an excellent welcome. Let this be an established precedent for the future attitude of the B.B.C. towards executant music.

And now as to Chamber Music, I think the B.B.C. will be more cautious in the next ten years than in the last. Again it is a question of benefiting from experience and of allowing the lesser quantity to appear on the lesser channel.

Ten Minute Limit!

Perhaps the B.B.C. did right in challenging public opinion by imposing an undue proportion of Chamber Music in the last few years. It did at least create controversy at a time when that might have been useful. But it would have been absurd, and will be absurd, to continue in the more professional period to impose a form of music which at best has a very small following.

I am accustomed to the arguments of people like Mr. Edward Clarke, who complains that famous German composers were, in their day, as unpopular as the composers he now sponsors. My answer to him is that the microphone is in no sense the right medium for trial in this respect; certainly so far as whole concerts are concerned.

I think that short excerpts of modern music, not exceeding ten minutes of duration, or "endurance," is all that should be done on the microphone, and is all that will be done when the broadcasting of music really settles down.

Alliance With Musical Institutions?

The encouragement of new talent, both for musicians and artistes, is a problem which will bulk large in the next ten years. Obviously, the opportunities for adequate auditions at Broadcasting House are bound to be limited. Therefore, there should be a continuous alliance with institutions like the Royal College of Music, which would mean the more active participation of people like Sir Landon Ronald in the selection of broadcasting artistes.

True, both Dr. Maclaren and Sir Landon Ronald are members of the Central Advisory Committee on Music, but my impression is that this Committee does not influence policy or practice to any considerable extent. Therefore, it would be better to create a joint board of audition for all candidates for B.B.C. musical work.

If B.B.C. policy moves in this direction, it will find many of its political problems automatically solved.

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1	Fuse Bulb	W.318	6d.
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2	.0003 mfd. Fixed Mica Condensers	W.242	2/-
1	2 meg. Grid Leak	W.251	1/-
1	Slow Motion Disc Drive	W.313	4/6
1	"Astrala 3" Constructors' Outfit	W.326	3/6

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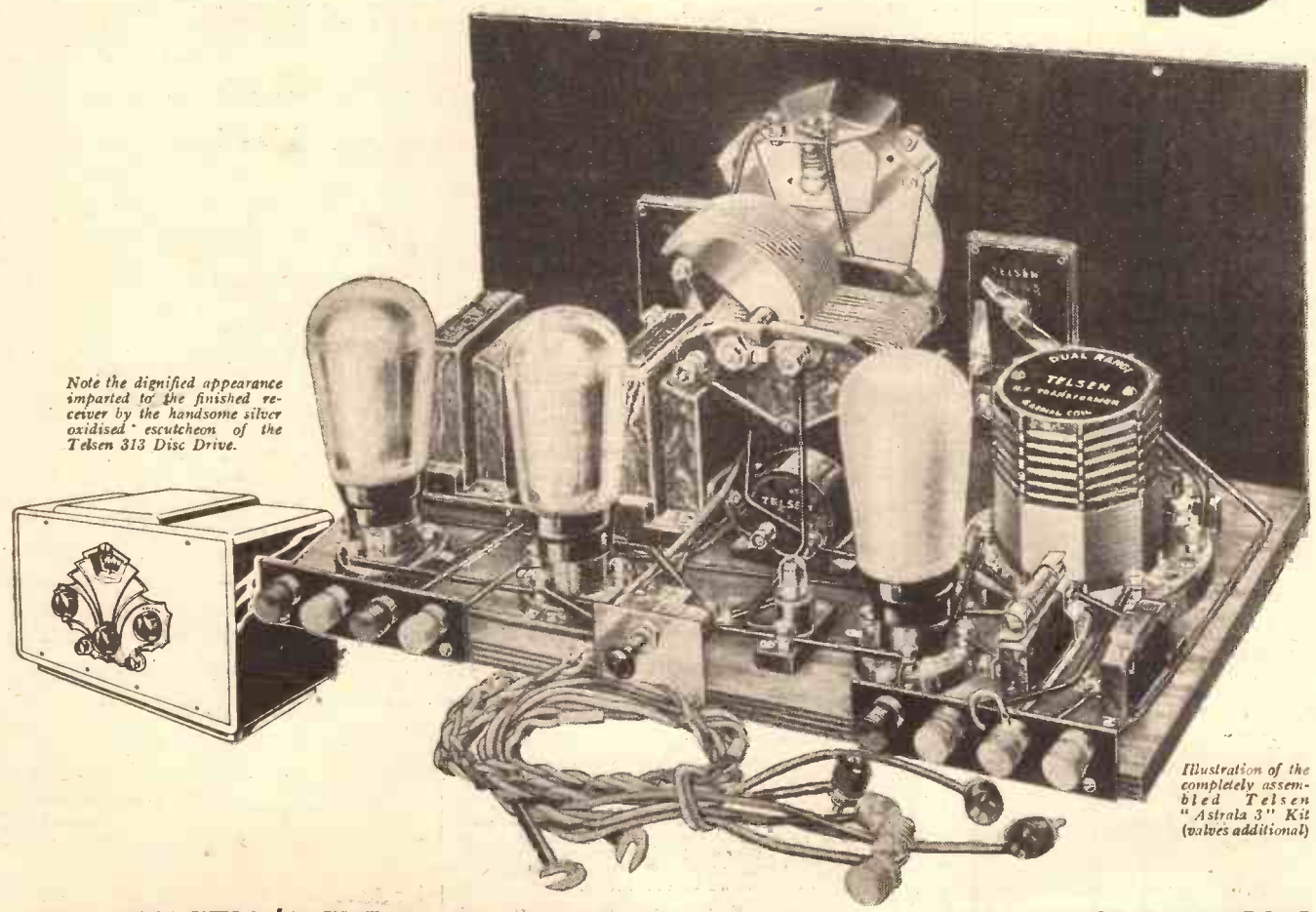

Note the dignified appearance imparted to the finished receiver by the handsome silver oxidised escutcheon of the Telsen 313 Disc Drive.

Illustration of the completely assembled Telsen "Astrala 3" Kit (valves additional)

The TELSEN 'ASTRALA 3' embodies every ultra-modern refinement including slow-motion disc drive control, air-spaced logarithmic condensers, decoupling in circuit, separator control and handsome silver oxidised escutcheon plate.

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The arrangement for dial illumination is typical of the forethought with which the "ASTRALA 3" has been designed. A special dial lamp switch is provided at the back of the set, which enables the lamp to be switched off when the required station has been tuned in, thus economising in battery current consumption.

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO. LTD., ASTON, BIRMINGHAM

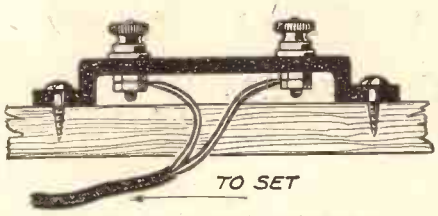
EMPLOYING LOUDSPEAKER EXTENSION LEADS

Some information of interest to all those who work loudspeakers in rooms remote from their radio receivers.

LOUDSPEAKER EXTENSION POINTS.

OLD fixed condensers can be used for a variety of purposes when their useful life has ended.

Many constructors who wish to run several loudspeaker leads will find that an old condenser with the mica, etc., removed



A use for old fixed condensers.

and the wax scraped away, will make an ideal extension point. It should be wired up as shown in the sketch.

KEEPING OUT THE H.T.

WHEN a loudspeaker is connected directly into the anode circuit of the output valve of a receiver, the loudspeaker leads are carrying high-tension current. The same is the case when an output transformer is incorporated in the loudspeaker.

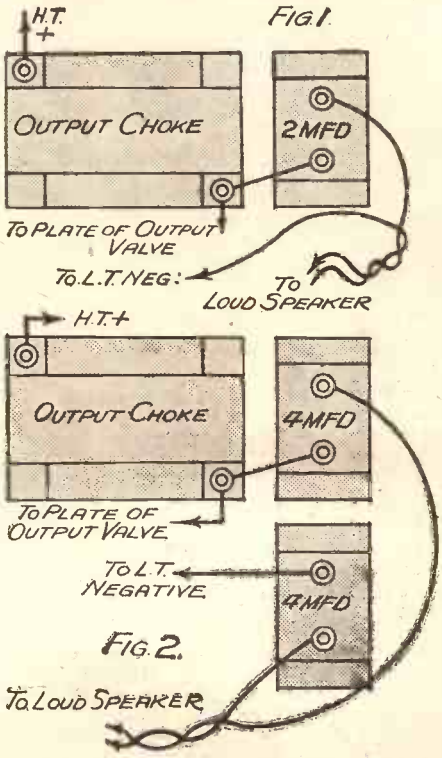
When extension leads are used to various parts of the house, there is a danger that they may short to earth, which would cause the high-tension supply to be short-circuited. In the case of receivers obtaining their current from the mains, it is positively dangerous to run such leads, as a shock may be given to anybody touching the bare ends, by the comparatively high voltages used in this type of receiver.

Output Filter.

All possibility of such things happening is prevented by incorporating a choke-capacity output arrangement in the receiver itself, when no anode current flows through the loudspeaker leads.

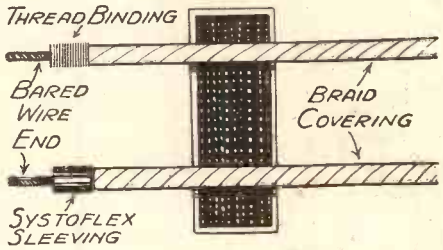
The arrangement in Fig. 1 is suitable for battery and A.C. supply, whilst that in Fig. 2 should be used when the supply is D.C.

ALTERNATIVE CONNECTIONS



Two fixed condensers are desirable when working on a D.C. mains receiver.

MAKES THE LEADS TIDY

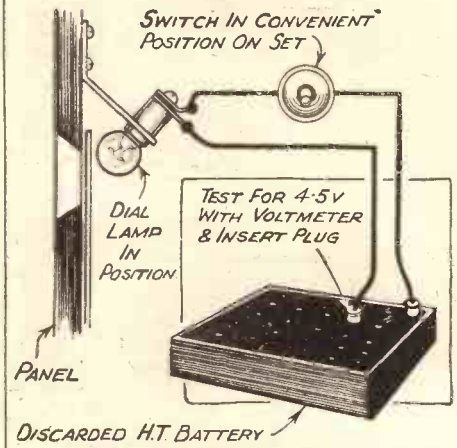


STRAY THREADS.

UNLESS some precaution is taken the ends of flexible battery leads soon become very frayed and untidy. This can be prevented by carefully binding the end of the braided covering with thread.

A very neat finish can also be made by cutting away the rubber insulation and then carefully forcing a short piece of systoflex sleeving over the end of the covering. The systoflex should be of a size which just fits over the wire.

SAVES LIGHTING-UP



A scheme which will enable you to see what you are doing when you go to change to another station.

CHEAPER DIAL LAMPS.

ONE of the chief objections to the use of a dial lamp on a receiver is the amount of current taken from the accumulator.

Here is a method which will save this current drain and at the same time find a use for those old H.T. batteries which you now throw in the dustbin.

Take an old battery and test with a voltmeter for 4·5 volts. Wire the lamp up, as shown, with a switch in the circuit. If the cells in the battery run right down when in use this way, change over to another part of the battery until the whole thing is used up.

THE LISTENER'S NOTEBOOK

A rapid review of some recent radio programmes from home stations.

A REMARK over the ether a week or so ago still lingers in my mind. It was this: "I don't suppose there's *one* listener who pays an infinitesimal fraction of his 10s. to hear opinions; He wants facts."

I wonder how far this is true. Whether I hear facts or not, I for one can never disabuse myself of the notion that I may be hearing opinions. In other words, I've always a small supply of salt accessible, to be taken in grains if I think it necessary.

In point of fact, I think we should be prepared to hear opinions. We don't all see alike; we don't all think alike.

The facts of a case aren't always apparent to everyone to the same degree, if apparent at all. And there are, of course, such things as real facts, which are of necessity a different article from the alleged ones. Else why the existence of "real" facts?

A Definite Opinion.

Take this as a case in point. Our theatre critic couldn't speak badly enough of a certain American play now running in London. At the same time, he says, all London is flocking to see it.

Can it be as bad as one theatre critic said it was? I should hardly think so. Nor do I think it would be just to see the two bright spots in the show which did manage to please the critic.

No! I think it is a case of our critic expressing a very definite opinion and one that isn't shared by London generally. For I can't believe that theatre-goers would go to see a bad play, at any rate in their thousands.

Personally, I like to hear opinions, and nowhere better than via the loudspeaker. They make for intelligent and healthy conversation.

I read, for instance, of the particularly appreciative reception given to the "Country of the Blind." Evidently many people saw great virtue in this play. I saw very little, and I can visualise a very interesting evening whenever I chance to run into anyone of the other camp.

I don't know what are the facts of Mr. Wells' play. Nor do I care much. All I know is that it didn't appeal to me, though I recognise that it did to many others.

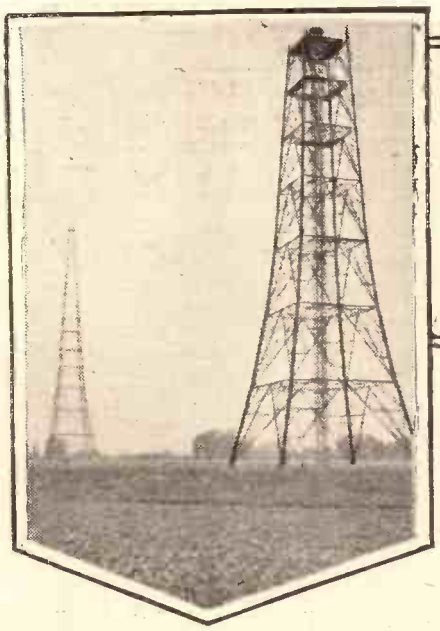
Varying Merit.

The same thing applies to all radio fare, not excepting radio drama. I am very fond of radio drama on the whole, though I don't think it is all of equal merit. I am enthusiasm itself when I think of the "School for Scandal." It was a good play, beautifully done.

By the way, I stress the point that it is a good play, because I think all the controversy raging over radio drama—and particularly the stage-play versus radio-play controversy—boils down to the question whether the play is a good or bad one.

There are bad stage-plays as well as bad radio-plays. At least, that is my opinion, and the chances are that a bad stage-play will never make a good radio-play, no matter who adapts it.

(*Continued on page* 1223.)



LEIPZIG'S LATEST

Have you heard him, on 389·6 metres, between the Midland Regional and Toulouse? Rated at 120 kilowatts Leipzig is the latest high-power medium-wave station in Europe. This account of it was specially written for "P.W." By Dr. ALFRED GRADENWITZ.

THE new Middle German transmitter, the most powerful of the country, has been installed at Wiederau near Leipzig, in a location found to be particularly suitable by actual tests.

This transmitter, which has been built by the C. Lorenz Company, is capable of a non-modulated output of 120 kw., which in the case of a 70 per cent modulation, will increase to about 150 kw.

Because of the narrow wavebands separating the various broadcast transmitters it is of the utmost importance that the official wavelength should be accurately maintained. In fact, any fluctuation in the transmitter wave is bound to result in interference with neighbouring stations, thus making clear reception impossible.

Controlling the transmitter by a quartz crystal is a particularly handy means of securing great constancy of wavelength, the crystal being fitted into a copper thermostat. The constancy of temperature thus obtained is 1/1,000 degree Centigrade, and the constancy of frequency is about 1/1,000,000.

Seven Stages of Amplification.

The high-frequency energy of Leipzig, up to about 120 kw. radiated from the aerial, is generated in 7 stages, which are subdivided into two groups.

The first group comprises stages 1 to 4, which are pure high-frequency amplifier stages, serving to raise the low initial output of the quartz stage from a few watts to about 300 watts.

Stages 1 and 2 are working on the double wavelength, thus avoiding any reaction of the final output upon the first stages. In fact, the radiated wavelength of 390 metres is not found before stage 3.

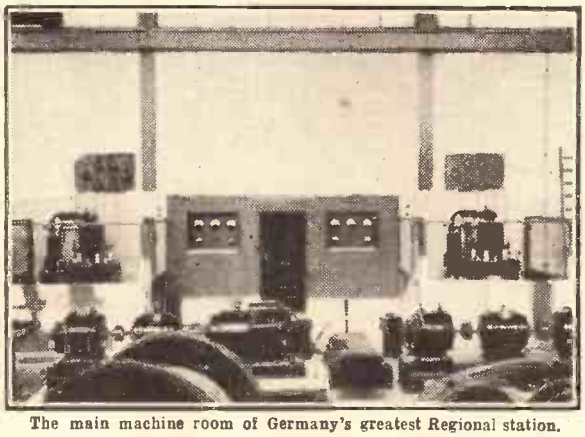
The second group comprises stages 5 to 7, viz. those of low frequency, where speech or music is added by modulation. After stage 7 there is available an output of 120 kw., which, before being radiated from the aerial must be submitted to some "cleansing" process.

Eliminating Overtones.

The whole output is passed through a filter circuit, eliminating all overtones, after which the energy is supplied through an overhead line to the aerial cabin. The aerial cabin, in addition to tuning devices, comprises two important apparatus, viz. an instrument connected with another instrument on the main switchboard in the transmitter room and indicating the current intensity in the aerial, and a switch enabling the aerial to be either earthed from the switchboard or connected up to the overhead line.

The former is used in ascertaining (and remedying) any trouble and the latter in earthing the aerial in the event of a thunderstorm, etc.

There has been a great change in the current supply of modern broadcast transmitters. Whereas both the heating of transmitter valves and the grid bias used to be derived from batteries, only anode tensions being supplied from machines, the heating of valves is now done by means of machines.



The main machine room of Germany's greatest Regional station.

The Leipzig transmitter would in fact, require a heating current of upwards of 2,000 amperes, entailing very expensive batteries and heavy operating expenses. The grid bias and anode tension (2,000 volts), serving to operate the first four stages, are likewise derived from machines.

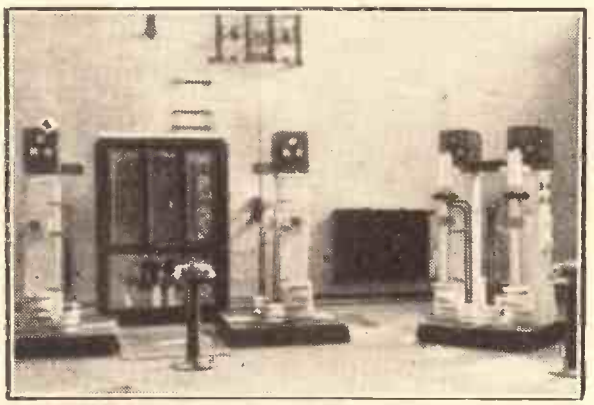
These D.C. tensions must, of course, be cleansed carefully from any upper harmonics, which is readily done by means of condensers and chokes.

(*Continued on page* 1212.)

THE MAIN CONTROLS

These are the principal switchboards for control work, their neat exteriors hiding a complicated mass of connections.

WATER COOLING FOR THE VALVES



The Germans favour isolation of the separate valve stages to a greater extent than we do, and to the right two of the huge valves, each with its pedestal and water-cooling equipment, are shown in position.

DIRECT RADIO AIRSPRITE DELUXE

DIRECT RADIO AIRSPRITE KITS ARE OFFICIALLY APPROVED BY MR. NORMAN EDWARDS Read what he says:

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Yours faithfully, NORMAN EDWARDS, Managing Editor."
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Atlas A.C. 244 H.T. Mains Unit	2 19 6
Atlas A.K. 260 H.T. Mains Unit with L.T. Trickle Charger (or 12 monthly payments of 8/6)	4 10 0
Atlas D.C./15/25 H.T. Mains Unit for D.C. Mains	1 19 6
Celestion Soundex Permanent Magnet Moving Coil Speaker with Input Transformer	1 7 6
WB. PM.4 Speaker	2 2 0
Bowyer-Lowe AED Pick-up	1 10 0
Collaro Double Spring Gramo. Motor with Automatic Stop	1 13 0
Cop. Aerial Lead-in & Lightning Arrestor	0 2 6
Selectanet Indoor Aerial	0 2 6
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T.C.C. A.C. POWER UNIT KITS

Exact to T.C.C. Booklet specification, with all necessary components, screws, wire, baseboard, terminals, mains plug, etc.

Power Unit No. 1 £3.7.6 (or 10 monthly payments of 7/6).

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Full constructional details of these units are contained in a book entitled, "The Design and Construction of Radio Power Units," obtainable, price 6d., from The Telegraph Condenser Co., Wales Farm Road, North Acton, W.3. A detailed specification less Valves and Cabinet.

The AIRSPRITE A.C. Mains Version

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1 Set Twin Matched Screened Coils. Telsen W.287	0 17 0
1 Coil Switch Coupling Assembly. Telsen W.217	0 0 6
2 Polar type S.M.2 ·0005-mfd. Variable condensers	0 13 0
1 Polar ·0003-mfd. Slow motion Differential Reaction condenser	0 6 6
1 Sovereign ·0003-mfd. Pre-set condenser	0 1 3
1 Dubilier type B.S. 4-mfd. Fixed condenser	0 5 0
1 T.C.C. type 80 4-mfd. Fixed condenser	0 8 6
2 T.C.C. type 50 2-mfd. Fixed condenser	0 7 8
2 Dubilier type 9200 2-mfd. Fixed condensers	0 7 6
3 T.C.C. type 50 1-mfd. Fixed condensers	0 8 6
1 T.C.C. type 34 ·01-mfd. Fixed condenser	0 3 0
1 T.C.C. type "S" ·0001-mfd. Fixed condenser	0 1 3
1 Lewcos 10,000-ohm wire-wound Potentiometer	0 3 0
1 Colvern 50,000-ohm Stripresistor	0 2 3
1 Colvern 25,000-ohm Stripresistor	0 1 9
1 Colvern 20,000-ohm Stripresistor	0 1 9
1 Erie 10,000-ohm wireendresistance	0 1 0
1 Erie 1,000-ohm wireendresistance	0 1 0
1 Erie 350-ohm wireendresistance	0 1 0
1 Erie 200-ohm wireendresistance	0 1 0
1 Erie 1-meg. wire end Grid Leak	0 1 0
1 R.I. E.Y.30 Mains transformer	1 10 0
1 Smoothing Choke R.I. 28/14 henry	1 1 0
1 Igranic Output Choke	0 9 6
1 Varley Tone Compensating Transformer D.P.35	0 11 6
1 Ready Radio S.G. H.F. Choke	0 5 6
3 5-pin valve holders	0 2 0
1 S.G. valve holder 5-pin	0 1 0
1 Ready Radio Radiogram Switch	0 2 9
1 Ready Radio Push-Pull Switch	0 0 10
1 Bulgin Mains Switch S.85	0 1 6
1 Permcol Panel 16" x 7" drilled to specification	0 4 6
2 Baseboards 16" x 12" and 16" x 5¼"	0 2 0
2 Terminal Strips 5¾" x 1½" and 3" x 1½"	1 0
1 Bulgin F.15 Mains fuse and plug	0 3 6
1 Goltone combined plug adaptor, flex, mains lead and plugs	0 3 0
1 Bulgin Thermal delay switch S100	0 7 6
6 Belling Lee type "R" Indicating terminals	0 1 3
2 Panel Brackets	0 0 6
1 Belling Lee Anode Connector No. 1030	0 0 4
1 Set switch Bracket coupling link and spindle and brush	0 1 6
6 Yards Systoflex, connecting wire, flex, screws, etc.	0 1 5
4 Valves, Mullard MM4V, 354V, DW2, Cossor 41 MP	3 0 0
1 Cabinet "159" type in walnut	1 5 0
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The AIRSPRITE Battery Model

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1 Pair Telsen matched twin screened coil type W. 287.	0 17 0
1 Telsen coil switch assembly type W.217	0 0 6
2 Polar ·0005-mfd. Variable condensers No 2 Slow motion	0 13 0
1 Ormond R.196 ·0003 mfd. Differential Condenser Slow Motion	0 3 0
1 Ready Radio 50,000-ohm Potentiometer	0 3 9
1 Ready Radio 3-pt. on-off switch	0 1 6
1 Sovereign ·0003-mfd. max. preset condenser	0 1 3
2 4-pin Valve holders	0 1 0
1 S.G. Valve holder	0 1 0
1 T.C.C. ·1-mfd. condenser	0 1 10
1 Ready Radio S.G. H.F. Choke	0 5 6
1 Ready Radio Reaction choke	0 1 6
1 Varley Rectatone L.F. Transformer type D.P. 35	11 6
1 T.C.C. ·01-mfd. Condenser	0 2 6
1 Graham Farish 1,000-ohm resistance and holder	0 2 0
1 Dubilier 100,000-ohm resistance with wire ends	0 1 0
1 T.C.C. ·0005-mfd. condenser	0 1 3
1 T.C.C. ·0003-mfd. condenser type M	0 1 0
1 Fuse and holder	0 1 0
12 Belling Lee indicating terminals	0 2 6
1 Panel 16" x 7" drilled to specification	0 4 6
1 Baseboard 16"x10"	0 1 6
1 Dubilier ·1-mfd. condenser type 9200	0 2 0
1 Ready Radio 2-meg. grid leak and holder	0 1 4
8 Belling Lee battery plugs	0 1 4
2 Spade terminals	0 0 4
1 Terminal strip 16" x 1½" drilled to specification	0 1 6
1 Belling Lee Anode Connector	0 0 4
Flex, screws, etc.	0 1 10
3 Mullard Valves: PM.12 V., PM1HL, PM2A	1 12 3
1 Cabinet "159" type in walnut	1 1 0
	£7 1 6

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KIT No. 3
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CASH, C.O.D., AND EASY PAYMENT ORDER FORM
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WISE SPENDING—DISCRIMINATING SET BUILDERS INSIST ON DIRECT RADIO SPECIFICATION

FOR THE CONSTRUCTOR

Position of the Aerial — Emergency Connections—Battery Plugs —Metal Screens — Frayed Ends.

MAINS AND YOUR AERIAL.

MANY people are obliged to use indoor aerials, and, whilst these are often fairly satisfactory as collectors of high-frequency currents, they are also extremely efficient in picking up hum from the mains—that is, assuming there are mains in the house.

If you are being troubled by this and are unable to erect an outside aerial, try the effect of altering the position of your aerial, so that it does not run near the lighting wires.

EMERGENCY CONNECTIONS.

IF it becomes necessary to lift one component out of a set and try others in its place experimentally, the question of holding the temporarily-joined leads safely in place often arises.

As the twisted leads will be needed only for a few moments whilst the test is made, there is a temptation to use existing leads instead of fitting new ones of correct length and good insulation for each change-over of apparatus.

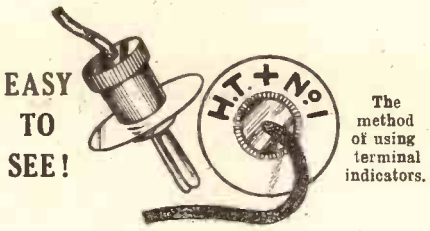
The danger of such bared wires accidentally causing a short may be overcome by an empty match-box. Push one of the wires through the outer case, twist the wires, and then shut the "empty" box on the joint, and your bared metal surfaces are completely protected from other wiring or components.

The bared ends are protected from other wiring.

MARKING BATTERY PLUGS.

THE usual method of marking wander plugs for H.T. or grid-bias batteries at the side, makes them very difficult to recognise at once. If the marking is at the top it is usually so small as to be of little use.

It has been found that a very good method of overcoming this snag is to take a number of terminal indicator discs with the appropriate lettering and drill them out to take the screwed part of the plug. The discs should then be clamped between the milled brass nut and the coloured milled top.



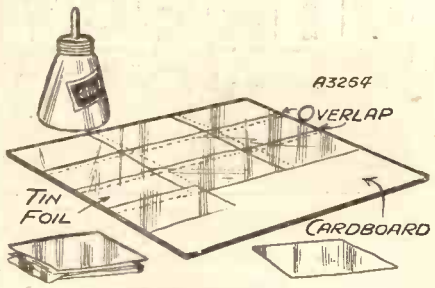
The method of using terminal indicators.

IMPROVISING A METAL SCREEN.

THE importance of metal screening in a receiver employing one or more H.F. stages cannot be too greatly emphasised, and where open or unscreened coils are used such a screen is an essential feature in preventing H.F. instability due to coupling between the coils and various grid leads.

In the majority of instances aluminium is chosen as a suitable metal, although when this is not immediately available a very efficient method of screening may be employed by utilising tin foil, similar to that found in cigarette packets.

FROM CIGARETTE PACKETS



How the foil is fixed.

The sheets should be carefully smoothed out and attached to a piece of cardboard of the required size. Paste is quite a good adhesive for fixing the foil.

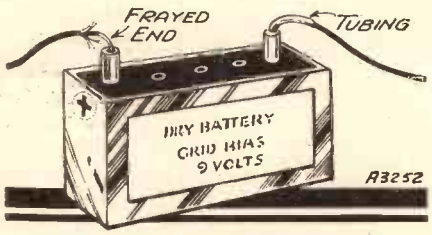
THOSE FRAYED ENDS.

UNTIDY frayed ends on cotton or silk-covered flex leads to batteries, etc., are an ever-present problem. Binding with coloured thread or silk looks neat, but takes time and nimble fingers.

A less troublesome solution to the problem is to employ thin rubber tubing such as is sold in any sixpenny store for cycle valves.

An inch and a half length slipped on the end of a lead will deal successfully with the most recalcitrant fraying.

Some shops sell coloured tubing, which may be employed to distinguish one lead from another.



The tubing as sold for cycle valves is slipped on the flex, as shown to the right.

The anode tension for the 5th, 6th and 7th stages, viz. 10,000 volts, is derived from a mercury vapour rectifier, which means a great simplification of the whole service. In the case of the Heilsberg high-power transmitter, a 10,000-volt anode machine was provided as stand-by for a mercury vapour rectifier, but this type of apparatus has in the meantime done such good work that another mercury vapour rectifier is, in the Leipzig transmitting station, installed as spare unit.

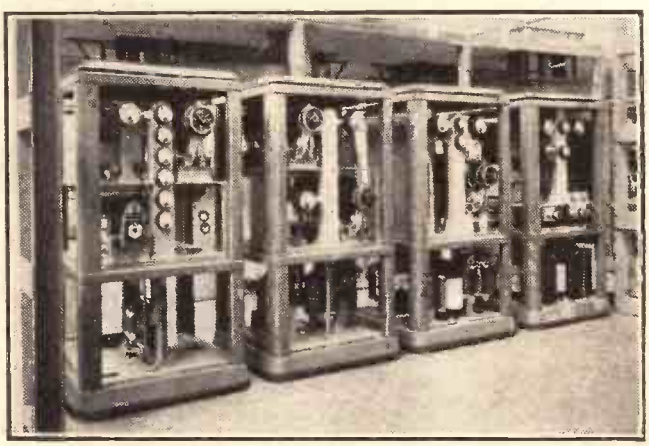
The very expensive 150-kw. valves had to be protected against injury by comprehensive measures of precaution. Relays were, for instance, inserted into the heating circuit, which are operated as soon as a maximum or minimum tension accurately adjusted for is reached.

Whenever the grid tension or water cooling should fail to operate the transmitter would be switched off at a moment's notice. All these protective relays are provided with signal lamps, enabling any defect to be ascertained immediately.

LEIPZIG'S LATEST

(*Continued from page* 1210.)

There are in all 20 lamps on the switchboard, each of which corresponds to one of the relays, so that any damage can be located immediately. Again, some relays will actuate a horn, calling the operator to the rescue. Moreover, all vital parts of the transmitter have been provided in duplicate so as to reduce the frequency and duration of disturbances to a minimum.



The first stages of Leipzig's giant transmitter.

Replacing Faulty Valves.

Spare valves are provided both in the 6th and 7th stages, and a central switch made up of a number of individual switches is actuated from the transmitter room by means of a hand-wheel, performing the following switching operations: (1) switching the water off the injured valve stage and supplying it to the reserve stage, (2) switching off and on the grid bias, the heating tension, the grid A.C. tension, the 10,000-volt high tension and the anode A.C. tension, as well as (3) earthing the damaged stage. It will be readily understood that the whole switch system should take up an area of about 1 by 1·50 metres, and be about three-quarter metre deep.

SPECIFIED by Popular Wireless *for the* AIRSPRITE

R.I. have contributed to the success of practically every famous circuit with components that are admitted most efficient and trustworthy. As foremost radio engineers with over 28 years experience, R.I. design and build their components regardful only of efficiency, and not merely low price, yet their prices are no more than those of ordinary radio products. Remember, insistence on R.I. components is the surest way to get the best results that any circuit can possibly give.

Specially Designed & Specified for the P.W. "Airsprite"

VARITONE COMPENSATING L.F. TRANSFORMER

The Essential Transformer for the Job

"Varitone" is without doubt the latest and best transformer of the automatic tone compensating type. It preserves the higher audio frequencies together with a perfect balance of selectivity with reaction set almost to a point of oscillation.

List No. D.Y.36. "Varitone" Transformer with the Nikalloy metal core as used in our latest "Quiescent" Transformer. Primary D.C. Resistance 700 ohms. Secondary D.C. Resistance 6500 ohms. Primary Inductance 30 henrys.

11/6

Ask your dealer or write direct to R.I. for a copy of the "Varitone" Technical Leaflet.

THE QUAD ASTATIC H.F. CHOKE

Selected for the "Airsprite" to give *absolute freedom from resonant losses and blind spots and to ensure highest stability* in conjunction with the very critical reaction employed. The method of astatic winding of the "Quad Astatic" Choke prevents possible H.F. interference with adjacent components.

List No. F.Y.2. Resistance D.C. 700 ohms. Inductance 150,000 microhenrys. Size: base 1⅞ in. diameter, height 2¼ in.

3/6

VALVE RECTIFIER Transformer E.Y.30

Selected specially for the important mains section of the "Airsprite" to give *ample output and maximum freedom from hum* and other mains noises.

List No. E.Y.30. Output 250-0-250 volts 60 milliamps; 4 volt centre tapped, 1 amp.; 4 volt centre tapped, 5 amp.

30/-

RI LTD.

STEERED BY RADIO

How members of a model yacht club employ radio as an adjunct to their navigational activities.

From A CORRESPONDENT.

BY means of a small short-wave radio transmitter and a receiver (which is installed on the yacht) embodying a ratchet relay switch capable of moving the rudder bar, a group of boys at Pomona, California, spend their spare time guiding a 7-ft. sailing vessel around a nearby lake.

The receiving set is of the type universally used by "hams" throughout the country for short-wave reception, with a very carefully balanced relay across the output terminals in place of the more usual ear-phones. A power valve is used in the transmitter, and an ordinary H.T. battery giving about 135 volts supplies the necessary plate current. The set operates on 85 metres, with a variation of not more than 5 kilocycles in either direction. The range is about one quarter of a mile. A telegraph key is used to break the circuit.

Relay Impulses.

For messages, the transmitter will carry about 25 miles, although sufficient power for operating the boat can be transmitted only about one-hundredth of that distance. The receiver is left switched on, and the ratchet relay switch moves the rudder bar from neutral to right or left or from either of those two extremes to neutral according to the signal received. Dashes are used entirely, with one impulse for every move.

Thus, one dash moves the rudder bar from left to neutral, but to change the rudder bar from neutral to left three dashes would be required, sending it (theoretically) right, neutral, and then left. The relays work so rapidly from the impulses that the rudder bar does not actually move from neutral to right before swinging left.

The receiver results from considerable experimentation on the part of the members of the radio division of the Pomona Model Yacht Club. It does, however, follow largely the "junk box" type, and employs three valves.

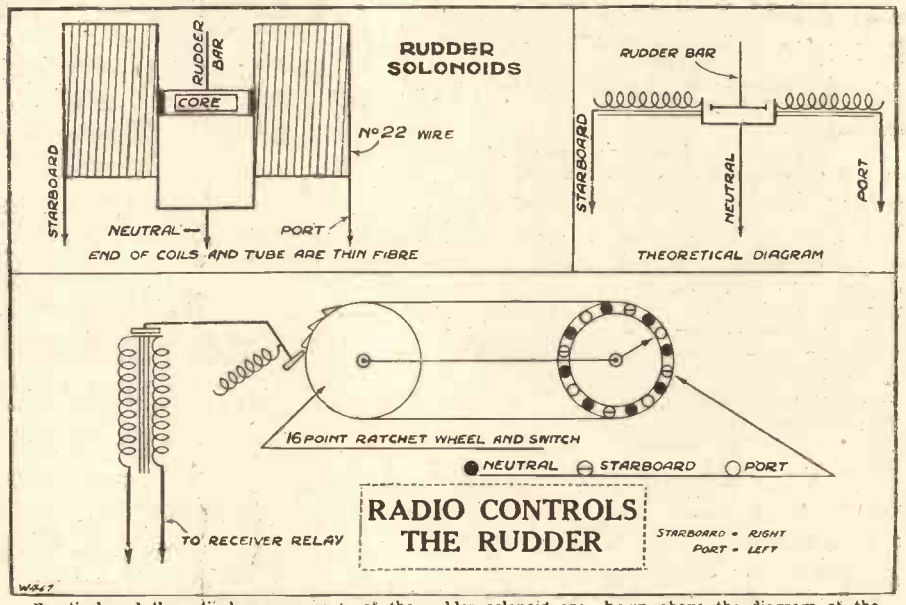
Earthed to Keel.

Approximately 18 ft. of wire are used in the aerial, and it may be found best to use a small condenser in this circuit. The total weight is about 40 lb., with batteries and equipment, all of which are set down within the hull of the yacht. An earth is made by connecting to the keel of the boat.

Much care should be taken in the balance of the relay on the output side of the set. One having a resistance of about 1,000 ohms is used. A magnetically operated rotary switch, automatic in action and wired so that the contacts are separated by a neutral point, is used. This is connected direct to the solenoids of the rudder.

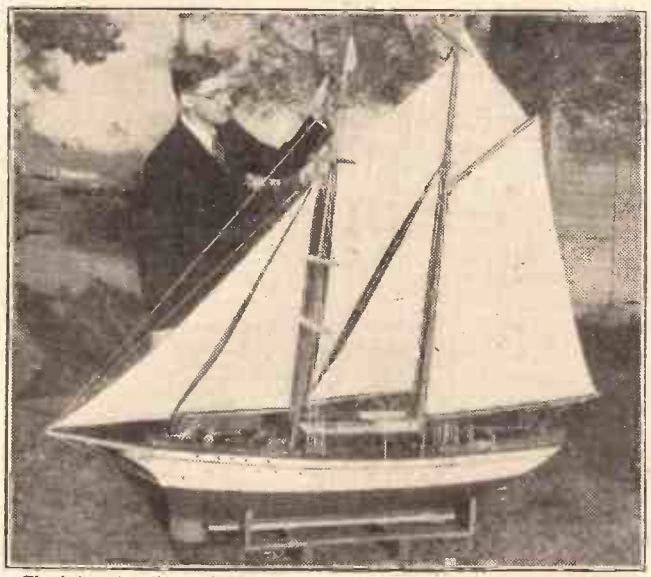
Both transmitter and receiver were built without cost to the boys from parts of discarded sets donated to the club by one of the more senior members. The boat itself is brigantine-rigged, 7½ ft. over all, of 14-in. beam, and 14-in. draft. All cabins and deck fittings are made of solid mahogany and the vessel is electrically lighted.

Elegibility for membership in this novel club is based on enthusiasm for a hobby of some kind.



Practical and theoretical arrangements of the rudder solenoid are shown above the diagram of the ratchet wheel and switch.

"ALL SHIPSHAPE AND BRISTOL FASHION"

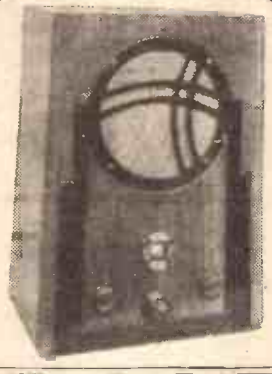


The brigantine "Alita" "on the stocks" having her aerials overhauled by a member of the club.

THE HELMSMAN'S ABOARD!

The receiving unit, which controls the rudder on receipt of "orders from the owners" ashore, being placed in the hold.

RECEIVERS of RENOWN



THE CLARKE'S ATLAS "LAMBDA" RECEIVER

A SELF-CONTAINED THREE-VALVER FOR BATTERY OPERATION

THE question of upkeep cost is perhaps *the* main consideration with every would-be purchaser of a commercially-built battery-operated receiver.

Naturally enough, such questions as performance, initial cost, and general suitability have all, in turn, to be considered, but in these not-too-easy times the frequency with which the hand has to be dipped into the pocket for the replenishment of batteries is a consideration which few can afford to overlook.

It is for that reason that we venture to approach this present review from what is perhaps the unconventional angle of economy of operation.

Without fear or favour, we feel that the manufacturers of the set in question will forgive us for being frank by an admission that the high standard of performance of the instrument left us with considerable doubts as to the accuracy of their claim that it consumed a maximum of only 8 milliamps.

Really Low Consumption.

Actually, in our preliminary measurement tests, the total H.T. consumption *was* in excess of this figure, but reference to valve characteristics brought to light the information that the correct bias for the particular output valve used is 4½ volts, and not 3 as given in the instructions, and with the higher bias, the total consumption was well within the figure claimed.

For the benefit of those who may not be familiar with these technicalities and before we proceed with the more orthodox considerations, a translation of the consumption figure into terms of how it affects the pocket will not, we feel, be amiss.

We have no hesitation in saying that to produce a more efficient instrument than this Atlas "Lambda" receiver with a total H.T. consumption lower than—or even as low as—the particular model under review would be well-nigh impossible.

Economy of Operation.

Eight milliamps is an extremely economical figure for a three-valver of its type, or for that matter for a three-valver of any type, and it is a figure at which most of the standard types of H.T. batteries will give very good service. So that in your considerations of the Atlas "Lambda" Receiver what is normally a paramount point—that of economy of operation—can in this case be completely ignored.

You can judge the set solely on its merits as a radio receiver unconcerned with its ultimate maintenance, and in this connection our tests have revealed it as a most praiseworthy achievement.

With the exception of the usual aerial and earth arrangements, the Atlas "Lambda" Receiver is entirely self-contained. Complete with its permanent-magnet moving-coil loudspeaker, it is built into a well-finished cabinet that is pleasingly futuristic in appearance.

The circuit sequence, although fundamentally S.G., det. and L.F., is not altogether devoid of originality. The provision of a variable-mu S.G. H.F. stage naturally leads one to look for the usual bias control, and its absence from this particular design might lead one to wonder why the variable-mu type of valve had been used.

High Degree of Selectivity.

But a more detailed consideration of "variable-mu" technique provides a likely answer, for applied in the way that Messrs. Clarke have applied it, a valve of this type no doubt gives a higher degree of selectivity commensurate with the use of only one H.F. stage. This certainly seems to be borne out in practice, and it is commendable originality.

Provision is made at the back for the connection of a gramophone pick-up and, where desired, for an external speaker.

Our aerial tests leave no room for doubt concerning the efficiency of this latest "Atlas" production. Inevitably, there is a limit to the degree of amplification that can be obtained from three valves, and this set seems to be about as near to that limit as any we have tested.

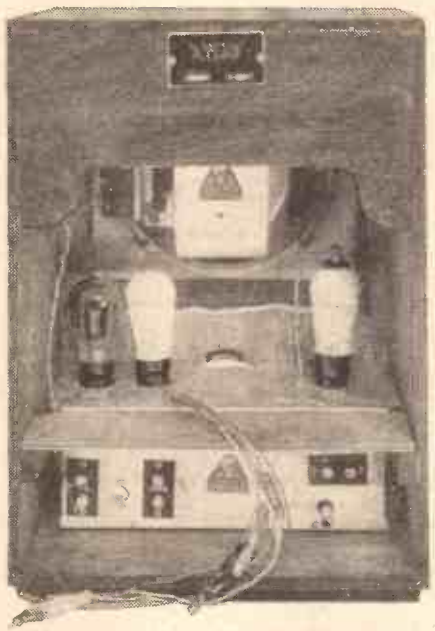
It brings in the locals and dozens of the Continentals with a degree of fidelity and "nearness" that makes listening to them a real joy, and such results can only be obtained these days with instruments in which selectivity is of a high order.

On The Long Waves.

On the long waves, the same high standard of performance was fully maintained. We detected just the slightest trace of "break-through" right at the bottom of the long-wave range, but it wasn't sufficient to interfere with any of the more important long-wave broadcasters, and we are therefore content to ignore it.

Taking into consideration the string of good features which characterise this latest "Atlas" production, it becomes immediately obvious that we can have nothing but praise for it. We are confident that the high reputation which Messrs. Clarke have established for themselves will be even further enhanced by the advent of this new design, and we congratulate them.

A GOOD LAYOUT



There is plenty of room for the batteries inside, and the internal arrangement is such that moving-coil loudspeaker, valves, etc., are easily accessible.

TECHNICAL DATA

GENERAL DESCRIPTION : Self-contained battery-operated receiver requiring only the provision of external aerial and earth arrangement.
NUMBER OF VALVES : Three, in the circuit sequence of variable-mu S.G., Det. and Output.
CONTROL ARRANGEMENTS : One for tuning (central), with concentrically-mounted trimmer device; one for wavechanging (left), one for reaction-volume control (right). Selectivity adjustment is provided at back.
SPECIAL FEATURES : (1) Extremely low total H.T. consumption of 8 milliamps. (2) Simplicity of operation. (3) Dial calibration in actual wavelengths. (4) Provision for connection of pick-up and external loudspeaker. (5) Permanent magnet moving-coil speaker.
PRICE : £9 15s. complete with valves and batteries and royalty paid.
MAKERS : H. Clarke & Co. (Manchester) Ltd., George Street, Patricroft, Manchester.

A SMALL CHOKE

DIMENSIONS must constitute one of the most puzzling things in radio to many constructors. What is a man, whose knowledge of the subject is slight, to think when he is faced by two H.F. chokes, one as big as a half-pint tumbler and the other small enough to go bodily into an egg-cup ?

I can visualise his puzzlement. I can almost hear him asking himself, " Is this small one too small to be good ? " " Is that big one unnecessarily bulky ? " In fact, is bulk an expression of clumsiness in design, or is compactness a virtue obtained at the expense of efficiency ?

Actually, such questions cannot be answered categorically. But this I would say, never pay too much attention to the physical dimensions and forms of radio components.

Compactness is often a desirable quality in building a set, but it can easily become a rather dangerous fetish. On the other hand, it is foolish not to take advantage of any reasonable compactness that is possible without loss.

The British General " Apex " H.F. Choke.

Which remarks are occasioned by the British General "Apex"H.F. Choke, a particularly small component. It is indeed the smallest H.F. choke that I remember having ever seen, with perhaps one exception.

But for the tasks for which it is specified it is particularly satisfactory. Additionally, it is a well-made component, and is built into a finely moulded case.

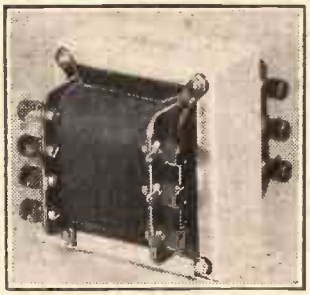
AN EFFICIENT MAINS TRANSFORMER

With mains components, other considerations than purely technical characteristics have to be taken into account, or, at least, ought to be.

A connection to the power mains brings you into contact with almost limitless power. Fire and shock are factors to be guarded against.

Obviously, then, mains components need to be soundly designed. But there are definite rules and regulations to guide designers, and if these are carefully borne in mind safety can be assured.

Messrs. Wright and Weaire are producing mains apparatus which fulfils these essential requirements, and is technically sound in other directions as well.



Messrs. Wright and Weaire's T21B Mains Transformer.

I have been testing their Type T21B mains transformer, which has a 350-volt 120-m/a H.T. output, and 2–0–2 volt 2·5 amp., and 2–0–2 volt 3·4 amp. L.T. outputs. The inputs are 200, 220 and 240 volts, 40 to 100 cycles.

It is a stoutly constructed transformer, and it carries a full load without appreciable temperature rise.

In regard to voltage regulation, I find that it is definitely first-class, the differences on both H.T. and L.T. windings between " load " and " no load " conditions are, from a practical point of view, quite negligible.

I can certainly recommend this Wearite component as a safe and reliable production from all points of view.

A NOVEL COUPLING UNIT

The Dubilier Combined Resistance Capacity Coupling Unit and valve holder is practically a complete amplifying unit. There is a coupling resistance and a coupling condenser and grid condenser and leak all built into a single compact unit, in the centre of which is the valve holder.

The grid leak and resistance are carried in accessible clips so that, if desired, they could be changed for others of different value, though it is unlikely that there would be any desire to do this as their values are, of course, carefully chosen.

The Dubilier combined R.C.C. unit and valve holder.

The retail price of this unit is 8s. 6d. When the cost of individual parts is reckoned up it will be found that it is an economical procedure to purchase a device of this nature.

It has the additional advantages, too, that space is saved and a number of connections are eliminated.

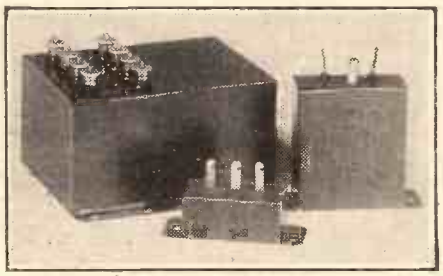
Constructors contemplating the introduction or addition of a stage of resistance-capacity L.F. amplification would be well advised to bear this Dubilier unit in mind.

We have used several samples in different amplifiers and sets with great success. Needless to say, the device is well made and cleanly finished,

ECONOMICAL CONDENSERS

The manufacture of commercial sets and mains units is greatly facilitated and much expense saved by the use of what are known as " condenser blocks." These comprise groups of fixed condensers built into single blocks or units.

Hitherto, however, these devices have been available to constructors only in a rather limited way. It is therefore very good news indeed that the Telegraph Condenser Co. has introduced a quite comprehensive range for retail marketing.



T.C.C. sub-divided condensers.

Of particular interest is a " sub-divided " T.C.C. Type R.M.12, in which there are two 4-mfd. and two 2-mfd. condensers, each tested at 500-volts D.C. and designed for a working maximum of 250-volts D.C.

It is not difficult to visualise the space-saving and facilitating of assembly which follow the use of such a useful article.

Another attractive model is the " block " embodying two ·01-mfd. capacities tested at 1,000-volts D.C., which is especially applicable to certain hum-reduction circuits.

There is also a special 0·1 plus 0·1-mfd. type capable of withstanding a working voltage of 500-volts raw A.C.

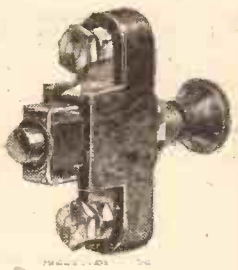
Those constructors who have mains should make a point of acquiring all the available literature concerning these most attractive T.C.C. components.

COMING SHORTLY

Among the interesting new apparatus shortly to be reviewed on this page are R & A loudspeakers, four new Bulgin L.F. Chokes, a Heayberd L.T. transformer, Cifel Paper Condensers, Ward and Goldstone screened lead-in, Celestion "Rectone" loudspeaker, Watmel Potentiometers, and the Cleary " Basso " loudspeaker.

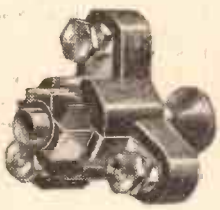
TELSEN DUAL-RANGE COILS
PUSH-PULL SWITCHES AND VALVE HOLDERS

TELSEN TWO-POINT SWITCH



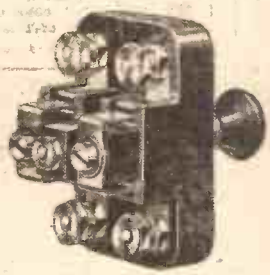
Particularly suitable for use as wave-change switch with the dual-range S.W. coil unit. Employs electrical 'knife' type self-cleaning contact with wedge shaped plunger, and a positive snap action, a series gap reducing self-capacity to a minimum - - **1/-**

TELSEN THREE-POINT SWITCH



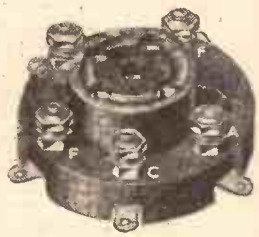
Soundly constructed on engineering principles, this is the perfect wave-change switch for use with a dual-range aerial coil or for breaking L.T. and H.T. currents simultaneously. Minimum self-capacity - **1/3**

TELSEN FOUR-POINT SWITCH



Highly suitable for use in wave-changing on two coils or an H.F. Transformer, or for switching pick-up leads or an additional speaker. No possibility of crackling. Minimum self-capacity - - **1/6**

TELSEN VALVE HOLDERS



An improved range of valve holders in both rigid and anti-microphonic types. Employ special contact sockets of one-piece design with neat soldering tag ends and terminals. Extremely low self capacity

Rigid type 4 pin . . **9d.**
Rigid type 5 pin . . **1/-**
Anti-Microphonic 4 pin **1/-**
Anti-Microphonic 5 pin **1/3**

TELSEN SCREENED COILS

WITH separate coupling coils for medium and long waves. Highly suitable for use as aerial coils or as anode coils following a screened-grid valve, giving selectivity equal to that of a well-designed band-pass filter. Fitted with cam-operated rotary switches with definite contacts and click mechanism, and supplied complete with aluminium screening cans, bakelite knob, "Wave Change" escut cheon plate finished in oxidised silver, and full instructions for mounting **8/6**

Twin Matched **17/-**

Triple Matched **25/6**

TELSEN DUAL-RANGE AERIAL COIL

incorporates a variable selectivity device, making the coil suitable for widely varying reception conditions. This adjustment also acts as an excellent volume control, and is equally effective on long and short waves. The wave-band change is effected by means of a three-point switch and a reaction winding is included - - **7/6**

TELSEN H.F. COIL

may be used for H.F. amplification with Screened-Grid Valve, either as an H.F. Transformer, or, alternatively, as a tuned grid or tuned anode coil. It also makes a highly efficient Aerial Coil where the adjustable selectivity feature is not required. **5/6**

TELSEN

RADIO COMPONENTS FOR LASTING EFFICIENCY

ANNOUNCEMENT OF THE TELSEN ELECTRIC COMPANY, LIMITED, ASTON, BIRMINGHAM

RADIOTORIAL

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

Technical Queries Editor: A. JOHNSON-RANDALL

QUESTIONS AND ANSWERS

SWITCHING ON AN A.C. MAINS UNIT.

C. W. R. (Bournemouth).—"My A.C. mains unit employs a metal rectifier, and in the wiring, between this and the mains transformer, there is a fuse bulb which is visible through one of the holes in the cover.

"Quite by chance I happened to switch on recently in the dusk, with my eye opposite the hole in question, and I was surprised to see that the fuse lit up. Fearing something might be wrong I switched off immediately and made inquiries, but found nothing had been touched in any way. So I switched on again, and once more there was a distinct glow in the bulb.

"It was only to be seen for a moment, and the unit worked perfectly, but as I never noticed it before I got anxious in case it was something out of order. However, reception remains perfect in every way, so I suppose it is O.K. But while writing I thought I had better mention that I still get a glow when switching on. Is there anything wrong?"

No, it is quite common for a unit's fuse to glow momentarily when switching on, as a greater current flows then than when the steady working conditions obtain. But remember that before the A.C. rectifier is called upon to supply current to the set the filaments of the latter should be glowing, so switch the set on *before* you switch the A.C. mains unit.

When switching off, the mains unit switch should be turned off before the filament switch. In other words, for an A.C. mains unit it is best to always provide a load in the form of a set with filaments alight, so the set's switch should go "on" before the unit's. It should not go "off" while the unit remains on, so always operate the set's switch first, when switching on.

LOW-FREQUENCY INSTABILITY.

W. G. (York).—"In answer to an inquiry I made at the 'P.W.' Stand at the last Wireless Exhibition you were kind enough to let me have a summary of the causes and cures of low-frequency instability. I found this very useful, and in a weak moment lent it to an acquaintance who has never returned it. Could you favour me with the details again, or publish them for the benefit of other readers as well?"

The following summary covers most of the common troubles in radio receivers caused by instability of the L.F. side.

The chief symptoms which indicate L.F. troubles are:

1. A continuous howl, the howl taking the form of a musical note, which does not vary with the tuning adjustment.
2. Very bad distortion, frequently accompanied by a rushing or noisy background, which in many cases indicates that the L.F. stages are oscillating at a frequency above audibility.
3. "Motor Boating," which takes the form of a noise not unlike that of a single-cylinder petrol engine, that is, a steady pop, pop, pop.

In the majority of cases, L.F. oscillation is due to a coupling effect in the H.T. supply circuit. It is, therefore, necessary first of all to make sure that the source of H.T. is "clean."

If dry cell H.T. batteries are employed, the voltage should be taken with the aid of a high resistance voltmeter, after the set has been working for some time. The fact that the battery is a new one does not prove that it is in perfect condition, since dry cells deteriorate if they are kept in stock, even though they are not in use. (In addition, a single defective cell can, in itself, produce L.F. troubles.)

(*Continued on page* 1220.)

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them, they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) Does an empty hall require more or less power to fill with music from an amplifier than a similar hall with a large audience?

(2) What is the formula for calculating the capacity of three condensers (C_1, C_2 and C_3) in series?

(3) What would be the resultant capacity if C_1 = 2 mfd., C_2 = 4 mfd. and C_3 = 5 mfd. were connected in series? (Use the above formula.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1218.)

Even H.T. accumulators can cause trouble if they are in a partly run down condition, or if any of the cells are sulphated, or there are poor connections between the cells. All contacts on top of the batteries must be kept perfectly clean.

In the case of H.T. "battery eliminators," it is essential to see that the output is adequate. If the set is a large one, and has a super-power valve in the last stage it may take 20/30 milliamperes.

It is, therefore, quite useless to expect a small mains unit, with an output of 15/20 milliamperes, to supply the necessary smoothed current. In any case, such over-loaded units cannot give their rated voltages.

Sets with three, four or five valves should have separate H.T. "feeds" to each valve or group of valves when used with a mains unit. For instances, one H.T. tapping should be taken to the H.F. side, another to the detector, and another to the L.F. stages, and so on.

Suggested Remedies.

If the H.T. is found to be up to the standard, the following schemes should be tried:

1. Reverse the leads to the secondary terminals of one of the L.F. transformers.
2. Earth the cores of both transformers.
3. Connect a ·25-meg. resistance across one of the secondary windings.
4. In the case of R.C. coupling, try reducing the size of the coupling condenser or reducing the value of the grid resistance.
5. Insert a ·25-megohm resistance in series with the lead to the grid terminal of each L.F. valve-holder.

It should be pointed out that an output filter unit with one side of the loudspeaker taken to L.T.— is a very useful method of improving the stability of the L.F. stages.

Fitting a Decoupling Device.

Perhaps one of the best schemes is to insert an "anti-motor-boating" or decoupling device in series in the H.T. lead of the detector valve. The procedure is as follows:

The lead, which goes from the detector valve H.T.+ terminal on the set to the primary of the L.F. transformer, should be broken.

A resistance of 20,000 to 40,000 ohms is now inserted between this H.T.+ terminal and the L.F. transformer primary terminal.

A lead is taken from the side of the resistance which is joined to the primary terminal to a 2 or 4 mfd. condenser. The other side of the condenser is connected to H.T.—.

This scheme can be employed externally to the set by those who do not wish to interfere with the wiring of the receiver.

In this case, the resistance would be inserted between the H.T.+ lead from the H.T. supply and the H.T.+ terminal on the baseboard terminal strip. The condenser would then be connected to the H.T.+ terminal on the strip and the H.T.—.

In the case of receivers incorporating two L.F. stages, the inclusion of another resistance and condenser connected in the H.T. feed to the first L.F. valve in the same manner as described for the detector is often beneficial. In this case, the resistance should be 10,000 to 20,000 ohms, and the condenser 2 mfd.

Microphonic Valve Howl.

In some cases a howl gradually builds up to such a strength that finally it becomes necessary to switch off the set. When the set is again switched on, it will quite probably work satisfactorily for a

(*Continued on page* 1222.)

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scales of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS, PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

"P.W." PANELS. No. 110.—GOTEBORG.

The Goteborg transmissions are made on a wavelength of 322 metres, the programme often being a relay of Stockholm.

* * *

Goteborg is 641 miles from London, and is well heard considering that the power is only 10 kilowatts. The name sounds like "Zhorteborg." Closes down with the Swedish Good-night—"God-natt."

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 1218 ARE GIVEN BELOW.

(1) The presence of a large audience makes a great difference, and generally two or three times the power is required when the hall is full of people.

(2) The capacity C of the condensers in series is given by the formula

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}}$$

(3) Resultant capacity $C = \frac{1}{\frac{1}{·5} + \frac{1}{·25} + \frac{1}{·2}} = \frac{1}{·95} = 1·05$ **mfd. (approx.).**

DID YOU KNOW THEM ALL?

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1220.)

short time, and then the howl will again start, gradually increasing in volume until it becomes unbearable. This is caused by a microphonic valve, usually the detector.

The fault can be produced artificially by tapping the detector valve with the finger. The remedy is to shield or insulate the troublesome valve from all external vibration.

A sprung valve holder is essential, and it is necessary to keep the loudspeaker well away from the set itself, since the sound waves produce the howl by impinging on the valve.

It is a good scheme to change the vibration period of the valve by placing a piece of plasticine on the bulb, and embedding in the plasticine a small piece of lead or a coin. Padding the valve with a layer of cotton-wool is another remedy.

The R.C. type of valve is a very frequent offender, and it sometimes pays to make a complete change to one of a less sensitive nature, such as an "H.F." or general-purpose valve.

A MAINS SET "FADE-OUT."

"BRUNSWICK" (London, W.C.1).—"Mine is a mains-driven four-valver (from D.C.), and the other evening it got very weak for a moment or two, and then 'burst' into full life again.

"No one was near it, but after that it went perfectly until yesterday, when it became very weak again until the wave-change switch was clicked over hard. This cured it every time.

"Looking over it I found one of the coil units inside a screened compartment was wobbly, and slight movements of this coil would cause the programme to fade out or in, according to pressure of the finger.

"So I packed the coil up against the screen in the 'good' position with a cardboard packing, and it has gone perfectly ever since. What would have been the matter to cause the fade-out, and do you think it will go on satisfactorily now, or should it be mended in any way?"

The cause of the trouble is bad contact. It might be a partially-touching "soldered" contact, or a wire loose under a terminal, or a switch contact. (Very likely the latter, as you found the switch-clicks an effective cure.)

There are other less likely possibilities, too, for almost any imperfect circuit due to a bad contact might cause symptoms such as you describe.

Whether the "packing" is going to remain satisfactory it is impossible to say, but we should doubt it. Almost any vibration may cause the trouble to recur, so we should get the set overhauled and put right, otherwise it is pretty sure to "go back on you" just when you want it most! And the next time you may not find the switch-clicks or packing will restore it again so easily.

MEASURING THE H.T. CURRENT.

"MILLI" (Pershore).—"Where should a milliammeter be connected to show the total drain on H.T. battery?"

In the negative H.T. lead—negative of battery to negative terminal of milliammeter, and the latter's positive terminal to set's H.T.– terminal.

MILLIAMMETER NEEDLE FLICKS BUT NO DISTORTION.

C. W. (Watford).—"I am greatly interested in this new method of "push-push" or "quiescent" amplification, and was recently able to attend a demonstration, where I naturally used eyes and ears.

"As for ears—they had a treat, quality sounding very fine indeed. But I noticed that the milliammeter which was, apparently, connected in the H.T.+ lead to the output stage, had got the needle jumping all over the place. In fact, on first reflections I did not think it is possible that it could have been connected as it appeared to be, because quality was really excellent.

"It has since occurred to me that perhaps with this new system the test of the steady needle of the milliammeter does not apply. Or do you think I was wrong about the instrument being used to show the anode current in the output stage?"

We don't think you were wrong about the milliammeter connections. It would almost certainly be used there to demonstrate how low the anode current falls when no programme is in progress.

With the "quiescent" system the anode current *increases* during reception, which is quite unlike the usual arrangement.

A milliammeter joined in a "quiescent output stage does not usually remain steady, and by very slight "flicks" indicates when distortion occurs; it varies the whole time, as the programme varies.

THE REASON FOR BETTER QUALITY.

A. V. N. (Hinckley).—"I have been rebuilding the low-frequency end of my set into a separate unit detachable from H.F. and detector, the idea being to try out different selectivity and tuning, etc., without having to alter the whole set every time.

"It is now going first class, and I am particularly satisfied with quality, which is really noticeably better than anything I got before, although the only difference is that I can now use 150-volts high tension where before I got only about 100.

"All the components are the same, and I notice the improvement irrespective of what kind of H.F. and detector circuit I put on. What do you think would be the cause of the improved quality, bearing in mind that all the components are the original ones? Why did the same circuit when wired permanently give inferior reproduction?"

The fact that you have re-wired and separated the low-frequency amplifying section from the H.F. does not appear to us to be so significant as the increased high-tension voltage that you are now employing.

It is quite *possible*, of course, that in changing over you have effected some improvement in the wiring, or in the alignment and spacing of components, and this is helping towards better reproduction.

But it is *probable* that your noticeably better quality is due to the higher H.T. voltage now obtainable. Increased H.T., when accompanied by correct readjustment of grid bias, always tends to improve quality on account of the longer valve slope available for distortionless operation.

The risk of overloading is thus greatly lessened. As this is a risk which is constantly taken in the natural tendency to run the set "all out," we think that it is probably the better valve working conditions which are causing the improvement.

With 150 volts available you are probably getting a full 120 on the plate of the output valve, which is vastly better for reproduction than some figure necessarily (and possibly considerably) below 100, which was all you had before.

THE LINK BETWEEN

(*Continued from page* 1188.)

to which it was subjected (Mr. Wright actually stood on it!) was a striking tribute to the method of manufacture rather than to my workmanship!

Incidentally, it is opportune to mention that Messrs. Wright & Weaire have just produced an excellent leaflet in which is described their comprehensive range of H.F. Chokes. The amount of technical information contained in it renders it a publication of interest to every home constructor, and for that reason I regard it as eminently suitable for inclusion in my postcard literature scheme. **No. 19**

* * *

Radio Paris continues to provide a source of real "variety" on Sunday afternoons and evenings, and the competitive spirit which prevails ensures some most enjoyable programmes.

When last I listened, I was particularly interested in a programme sponsored by Messrs. Graham Farish, and I sat and listened right through it. For the benefit of those "R.P." fans among my readers, I hasten to pass on the good news that the Graham Farish programme commences at 6.30 p.m., and I understand that the series of broadcasts is to continue for some weeks.

I also have it on the best authority that a brand new 1933 car is offered as a prize in a simple competition which is being run in conjunction with these broadcast programmes. What about it, "P.W." readers?

Incidentally, Messrs. Graham Farish would particularly welcome criticisms of their programmes from "P.W." readers. Letters shoud be addressed to Messrs. Graham Farish, Ltd., Masons Hill, Bromley, Kent.

* * *

G.E.C. Conversion Equipment.

The conversion of the country's electricity supplies to A.C. under the "grid" system is proceeding apace, and almost every week new areas are affected. In this connection, it may be of interest to readers

(*Continued on next page.*)

THOSE SHORT-WAVE STATIONS

Have you ever been disappointed by not receiving an acknowledgment from a short-wave station after reporting your reception to that station? These tips may help you in the future.

By ALF. W. MANN.

A COMMON complaint voiced by new enthusiasts who have entered the field of short-wave reception is that, whilst fellow enthusiasts receive a reply to every report sent out, they find that for some unexplainable reason their reports apparently never reach their intended destination, or are, it seems, completely ignored by the station officials to whom they are addressed.

Conversation and correspondence with several of the unfortunate ones brings me to the conclusion that the reason for the existing state of affairs is invariably due to the fact that the wrong method is followed when making out reports. Too much space is devoted to programme matter, and far too little to technical observations.

No doubt the station staff who are responsible for the transmission of programmes via short waves appreciate letters from listeners who have been successful in receiving same, but to write stating simply the bare fact that the transmission was received conveys nothing of a helpful nature to them.

It is desirable, of course, to give details of at least three items heard, also the exact times of reception in G.M.T., and the standard of time in operation in the country where the transmitter is located.

The Exact Position.

Never take for granted that the station authorities are familiar with your district, country, or the particular part of the world in which your receiver is located. In many cases they are not, and are not prepared to waste time trying to locate obscure places, even if same are to be found on their maps.

The best plan is to state in latitude and longitude the exact position in which your receiving station is located. This should be followed by your full name and address, together with a few words expressing the pleasure experienced by you due to reception of the particular transmission, followed by a few details of the programme and a request for verification. Technical data should follow the above.

Commercial broadcast stations receive many thousands of letters per year, and in order to make certain that a reply to your letter, together with verification, will be forwarded on to you, it is advisable to enclose an International Coupon to cover return postal charges.

When sending reports to Amateur stations the same procedure should be followed, with the exception of those addressed to stations within your own country. In this case it is only necessary to enclose stamps of the correct value to cover postage of Q S L card.

The preparation of useful and accurate reports is a problem which the beginner has to face and solve. This, however, is not difficult, and briefly the solution is: keep a log book.

For this purpose a stiff-backed exercise book is ideal. I will take my own log book as an example.

The front page is left blank: pages two and three are ruled off into four and five columns respectively. These are headed: Date, Remarks, Country, Coil, Wavelength, Time, Call, Strength, Fading, in the order given. Here is an entry taken at random.

August 18th, 1932. Modulation 100%, followed by a few programme details and weather conditions (these being entered under "Remarks"). Coil S.W.3. Wavelength 19·57 m. Time, 11.58 p.m. Call W 2 X A D. Strength, Q S A 5 on loudspeaker. Fading moderate at minute intervals.

When writing out your station reception report these technical details should be given, together with details of local weather conditions, temperature, type of receiver, valves, tuner, also aerial and earth in use during the reception period.

THE LINK BETWEEN

(Continued from previous page.)

to know that the G.E.C. has developed two conversion units which overcome the radio-set difficulties associated with a change-over from D.C. to A.C.

With one of these conversion units connected between the mains and the set, the necessity for modification to the receiver is completely obviated.

"P.W.'s" postcard literature scheme saves you time and money! Week by week in these columns reviews are given of all the latest catalogues and leaflets appertaining to every aspect of radio, and if you want any or all of the literature to which reference is made you need only send a postcard giving the numbers of those in which you are interested, and the required literature will be sent off to you free of charge except where otherwise stated. The reference numbers in each case are given at the end of the appropriate paragraph, and applications need not be limited to any one particular issue of "P.W." Postcards, on which your name and address should be printed in block capitals, should be sent to G. T. Kelsey, at Tallis House, Tallis Street, London, E.C.4.

The units are available in two types—one for sets in which an H.T. eliminator is used, and the other for "all-mains" types of receivers.

Any readers who are affected by the change-over would be well advised to consult the G.E.C. leaflets describing these conversion units before modifying existing designs, and I shall be happy to arrange for copies to be sent upon receipt of the usual postcard. **No. 20**

FOR TECHNICAL TRAINING

A view of the famous Bennett College at Sheffield, which specialises in correspondence courses.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Anode Current.

I HAVE been asked what is the best way to measure the total anode current passing through the receiver, whether it is better to measure the total current flowing through the H.T. negative which, of course, is common to all the valves, or whether it is better to measure the H.T. current of each valve separately.

I should say first of all that in any such measurements the milliammeter used should be of as low resistance as possible, because obviously if its resistance is comparable with the resistance of the circuit in which it is introduced, the current indicated by the milliammeter will not be the same as the current which would flow in the same circuit if the milliammeter were removed and the circuit completed—in other words, the resistance of the milliammeter will make (in such a case) an appreciable difference to the total resistance of the circuit.

A Question of Relative Resistance.

At first sight it would seem simplest to include the milliammeter in the H.T. negative lead because, although the various anodes are connected to different tappings on the H.T. source, the different anode currents all go back via the common path of H.T. negative.

But the objection just mentioned applies particularly in this case, since if you introduce the meter in the H.T. negative lead you introduce it into a relatively low resistance circuit, this circuit comprising the anode circuits of the different valves in parallel. Whatever the resistance of the milliammeter may be, therefore, it is more likely to upset the resistance of this circuit than the resistance of the individual anode circuits.

Individual Circuits.

It is, therefore, preferable to measure the anode current of each valve separately and add together the several results.

If the meter which you use has a very low resistance, quite small compared to the resistance of any of the circuits in which it is placed, you will find that the current measured in the negative H.T. lead will be pretty accurately equal to the individual currents measured for the separate valves. It all turns on the question of whether the resistance of the meter used is appreciable in comparison to the resistance of the circuits concerned.

Additional Speakers.

A frequent question concerns the addition of a loudspeaker to an existing one. Sometimes the two loudspeakers can be put in parallel, whilst sometimes it is better to put them in series.

On the other hand, there are cases where neither of these methods is suitable, and it is preferable to put in a capacity in series with the extra loud-speaker, more particularly when this is of the ordinary high-resistance type.

Alternatively, where there is an inductance in the anode circuit, such as the primary of a step-down transformer used with a moving-coil speaker, the extra loud-speaker can be connected in series with this inductance. The condenser by this way, should have a capacity of at least one microfarad, preferably more.

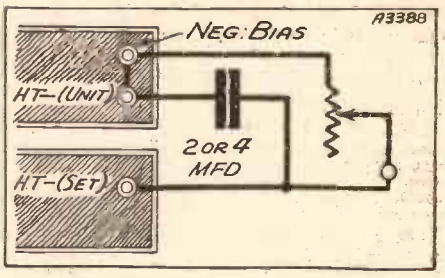
Grid Bias from Unit.

You can get negative grid bias from an H.T. unit, if grid bias is not already provided on the unit, by connecting as shown in the figure.

The condenser should be at least two microfarads preferably 4 or more) and the value of the grid bias can be adjusted by adjusting the external resistance.

You will notice, however, that the value which is obtained for grid bias has got to be subtracted from the maximum voltage value given by the unit, that is to say, the maximum voltage is reduced to that extent. It very often happens, however,

BIAS FROM A MAINS UNIT



The connections for the scheme referred to by Dr. Roberts on this page.

that a few volts can be spared from the maximum H.T. positive value, so that in such a case you get your negative bias without any material sacrifice.

The actual value of resistance in both these cases depends, of course, very much on what voltages and loads you intend to use, and the maximum value of the resistance may go up to as much as 5,000 ohms. You can very easily work this out for yourself by Ohm's Law.

Induction Motors.

The induction gramophone motor as put on the market to-day by the high-class makers, is really a beautiful job. It is extremely silent, and as the rotor is usually connected direct to the turntable spindle (that is, without any intermediate gearing) it runs at the slow turntable speed, with consequent freedom from mechanical vibration. I have used quite a number of different types of induction motor, and I must say have found them perfectly satisfactory in every way. In fact, I have been responsible for the design of two well-known types.

Self-Starting.

The induction motor is self-starting and the speed can be mechanically regulated

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

by means of an ordinary regulator on the governor in the usual way. This is a point where some difference of opinion exists.

Some people consider that the user of the gramophone ought to be able to vary the speed at which he plays his records, whilst other people maintain that, inasmuch as there is a more or less generally accepted speed for the recording and reproduction of records—usually stated to be 78 r.p.m.—there is no necessity for the user to vary the speed at all, and if he has the means of varying the speed he is more than likely to play his records at the wrong speed. This is where one of the main advantages of the synchronous motor comes in, for the synchronous motor turns at a precise speed, one speed and one only.

Record Speed.

It is usually designed to run at a turnable speed of 78 r.p.m. in accordance with the frequency of the A.C. supply. The motor must run in step and at this speed, or else it will not run at all. There is, therefore, no speed regulator with it but, on the other hand, the speed must be always correct.

I think this synchronous gramophone motor a good idea as I know from my own observation that the majority of people have very little idea when their records are playing at the right speed. There is a great tendency for people to play records too fast

PHOTOGRAPHS FROM READERS

The Editor is always glad to receive from readers topical photographs with a radio interest, suitable for publication in "P.W."

10s. 6d. will be paid for each photograph accepted for publication.

—probably because this seems to liven them up and also because it tends to increase the apparent loudness. (When I have more space I will tell you why it is that playing the record fast makes it louder; there is a definite scientific reason for it.)

Synchronous A.C. Motors.

The principal *dis*advantage of the synchronous motor, however, is that it is not self-starting, and consequently the turntable must be given a flick round with the hand, up to or beyond the normal running speed, so that it can fall into step.

With some types of synchronous motor this starting up can be done while the current is on, which is not so bad, but with other types the starting must be done when the current is off, and then the current must be switched on immediately, which some people regard as rather a troublesome operation. However, you very quickly get used to it, and once you have been accustomed to use a motor of this kind you do the starting and switching on almost without noticing it.

Synchronous gramophone motors are usually very simple in construction, and there is little or nothing to go wrong with them. I think we shall see a great extension in the popularity of this type of motor for turning gramophone records, and if you are thinking of buying a motor of this kind,

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

provided you buy a good make, you need have no doubts as to its efficiency.

Pick-up Characteristics.

The characteristics of a pick-up must be considered in relation to the amplifier, loudspeaker, and any other factors which will influence the sound before its final reproduction. Some people think that the perfect pick-up will have an absolutely straight characteristic parallel to the frequency axis, that is to say, the R.M.S. volts output will be constant and independent of frequency.

It would not, of course, be at all easy to make a pick-up which would have such a characteristic, but even if it were possible, such a pick-up would not meet the case. And this is why. When the output from the pick-up is fed into the amplifier it there has impressed upon it all the various characteristics of the amplifier and comes out pretty well weather-beaten only to go through the same process all over again when it gets to the loudspeaker.

Now if it is going to have certain lumps taken off it and other lumps added to it as it goes through these various stages, the cunning thing to do is to add to the lumps in the places where they are going to be knocked off, and to take away at parts where something is going to be added.

You might call this making the characteristic of the pick-up *complementary* to that of the amplifier and the rest of the circuit. It is somewhat like the customer's 2½ per cent discount which the tradesman adds on to the bill before he starts, so everybody is satisfied.

Rising and Falling Curves.

The result of all this is that the perfect pick-up, assuming such to exist, will be found to have the characteristic curve very far indeed from a simple straight-line parallel to the frequency axis. Generally, it is necessary to have a rising characteristic in the lower frequencies, up to about 200, a fairly uniform run then from 200 up to about 2,000, with a rising characteristic again between 2,000 and 4,000, and then a fairly sharp cut-off about 5,000. The rising characteristic in the early stages helps to make up for the absence of bass in the average amplifier at frequencies up to about 200 or 300, whilst the rising characteristic between 2,000 and 4,000 brings up the higher notes which often is neglected by certain types of loudspeaker—some moving coils, for instance. As for the cut-off after about 5,000 or 6,000 cycles per second, this is generally found to be helpful in minimising the needle scratch, because a large part of the "surface noise" appears to lie in the fairly high audio-frequency region.

As a matter of fact, surface noise is probably due in the main to minute gritty irregularities passing under the needle, and you will see that, if there is an abundance of these gritty particles, and their dimensions are small compared with the regular waves of the sound track, the noise produced by them will have an effective frequency high compared to the average frequency of the regular sound.

It is sometimes stated that after playing a record for a minute or so the needle

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

becomes too blunt to reproduce anything over about 4,000 cycles per second, but how this is reconciled with the fact that the surface noise is supposed to be in the region of 6,000 and more, and is, nevertheless, still reproduced by the blunt needle, I do not quite know.

Reaction and Detection.

When you are using reaction with a detector valve you will often find yourself being led more or less unconsciously into a compromise between the efficiency of the detector and the smooth and convenient operation of the reactio... The fact is that frequently we sacrifice quite a good deal of the efficiency of the detector for the sake of the reaction.

Now this is not really necessary, and can often be avoided by giving attention, first and foremost, to the detector, quite regardless of the reaction. Make sure that the detector valve has the proper anode voltage—the maximum that can be properly employed—and also that the best values of grid leak and condenser are used.

Having got this all working properly and, as I say, without any regard, in the first instance, to the operation of reaction, you can then turn your attention to the reaction circuit and make the necessary adjustment in that. It may be necessary, for instance, to try different values of reaction condenser and reaction coil, whilst the relative positions of the reaction coil and the tuning coil can very easily be varied.

Systematic Adjustments.

Having done all this, if you still have not got smooth and easy reaction control, you may then perhaps sacrifice a little on plate voltage of the detector or make other slight adjustments of the detector conditions.

As a rule, however, you will find that by adjusting the two circuits quite independently in this way the amount of sacrifice which you have to make in the operating conditions of the detector is very much less than before, if, indeed, you have to make any sacrifice at all.

This is just one of those cases where a step-by-step methodical handling of the problem will work much.

Equalising the Load.

I have often been told by readers from time to time that they have found that the lower tappings on their high-tension battery get "worn out" first; for instance, the voltage from, say, 0 to 30 or 0 to 45 will drop much more quickly than the voltage between, say, 60 nominal and 90 nominal.

If you think about it for a moment this is only to be expected because the cells in the "lower" part of the battery are carrying the whole of the high-tension current, whereas the cells in the vicinity of tapping, say, 90 may be carrying only the current which goes to the last valve.

You can think of it as like a group of acrobats standing up on one another's shoulders: the poor old chap at the bottom has to carry the weight of *all* those above him, whilst the second man carries the weight of one less, the third man the weight of two less and so on until the top fellow carries no weight at all except his own.

With two series connected H.T. batteries changing them round occasionally distributes the load more equally.

MIRROR OF THE B.B.C.

(*Continued from page 1196.*)

the Vienna Philharmonic Orchestra in one of its big winter series of concerts on Thursday, March 2nd. Dr. Boult has accepted this tribute to himself and to British broadcasting, and listeners are to hear the concert which will be relayed from Vienna and broadcast on the London Regional wavelength.

The programme will consist of works by Mozart and Brahms, and also some of the compositions of Elgar and Holst.

Dance Band Features.

Jack Payne and his Band have a date at Broadcasting House on Monday, February 13th, while Jack Hylton and his "boys" are due to appear before the microphone a fortnight later.

Meanwhile, Debroy Somers and his Band will be heard in several Saturday afternoon relays from the Plaza Theatre, London, their programmes being followed, on February 25th, by a running commentary on the Ireland v. Scotland Rugby International Match at Belfast, and on March 4th, a description of the Navy v. Army Rugby Match, at Twickenham.

Our "A. J."

Even at the risk of overdoing it a bit (which most people will say is a remote possibility), I think that more frequent appearances before the microphone of that

NEXT WEEK

There will be an article on

THE "P.W." "AIRSPRITE" IN ACTION

also another

BEGINNERS' SUPPLEMENT

Out On Wednesday. Price Threepence.

Prince of Story-tellers, A. J. Alan, especially during the winter, would be tremendously appreciated. I know that "A. J. A." is a busy man, and that broadcasting is not his sole concern, and further that he will not even consider to tell one of his delightful yarns until he has rehearsed it to the perfection of his inimitable style.

It may well be, therefore, that Broadcasting House would also like to welcome him more often than it gets the opportunity. His name in the programmes is always enough to keep me at home on the nights of his broadcasts, and I shall certainly be listening on either Thursday or Friday March 2nd and 3rd, respectively, when he is to tell the world what happened during "A Joy Ride."

By the way, I think I shall make it March 2nd, so that I can also hear the recital by Peter Dawson (baritone) and Tapia Caballero (pianoforte), which comes just before the story.

THE LISTENER'S NOTEBOOK

(*Continued from page 1208.*)

If the play is a good one, I don't think it matters much what the medium employed is in producing it. The "School for Scandal" is a good play and that's why it made such a successful radio play.

Cyril Maude, and Miriam Adams as Lady Teazle, were brilliant. So were the rest of the cast, for that matter. It was evident that Cyril Maude was troubled with a cough, but he worked it so cleverly that he made it appear a feature of his part.

Another thing that struck me about this particular production—and a feature I had never noticed so markedly in a radio play before—was its strong modern comedy flavour. As a stage play, the "School for Scandal" is essentially a costume play very much dated by its costumes.

But as a radio play to be heard and not seen, it might have been a modern play just produced for the first time in London. It was only the often repeated Egad! that reminded one that it was not of this age.

Needs No Props.

I've come to the conclusion that a good play doesn't need effects. If the dialogue is good, it is self-supporting and needs no such props. Furthermore, with the distraction caused by effects removed, listeners can concentrate better on the dialogue.

This is perhaps a controversial point. Obviously, B.B.C. producers think more highly of the value of effects than I do. Vaudeville and music-hall promoters are particularly fond of them, judging by that extraordinary grating circular movement that was made the background of a recent variety hour.

What *was* the point of that? It just reminded me of that very unpleasant sounding contrivance used by road builders for mixing road materials. I don't question its use as such, but why introduce it into a variety programme?

Like good drama, good variety shouldn't need any props. One can draw one's own conclusions from the fact that it does.

The B.B.C. seem very proud (and rightly, too) of its variety artistes, whose names have now become household words. I doubt somehow whether some of them enjoy the good reputations the B.B.C. would have us believe they do. I refer to those who have appeared before the public only as radio artistes.

I can't help wondering, however, whether a variety bill containing the names of a dozen of its best artistes would need the help of the road-menders' mixer. Of course they wouldn't! So I say, give us good variety, and leave the mixer to the road-man.

Best-Seller.

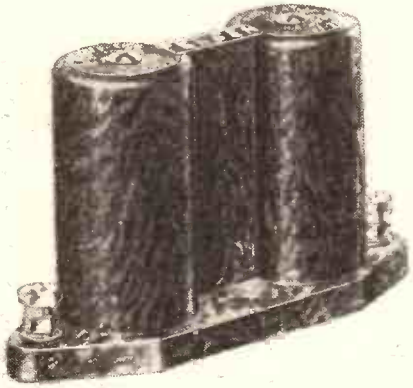
I am not surprised to read that "Auf Wiedersehen" proved the best-seller among songs for 1932. Well, it came over the air a few times, and I got a bit of a fright when I heard it dished up again by Petulengro's Ladies' Hussar Band. Surely it hasn't pretentions for 1933 as well?

This would be sheer madness, considering the number of very good tunes that are to be heard just now. I hardly remember a time more fruitful than the present. The year is young yet, however, but it promises to be a bumper one for song music.

TELSEN H.F. CHOKES and DIFFERENTIAL, REACTION and TUNING CONDENSERS

TELSEN STANDARD H.F. CHOKE

Covers the entire broadcast band, yet occupies only the minimum of baseboard space. With an inductance of 150,000 microhenrys, a resistance of 400 ohms, and an extremely low self-capacity, it is highly suitable for use in reaction circuits, and is constantly being specified in this respect by the leading set designers - - **2/-**



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Where the highest efficiency is the primary requisite, the Telsen Binocular H.F. Choke is the inevitable choice. It has a high inductance of 250,000 microhenrys, with a very low self-capacity and a practically negligible external field (due to its binocular formation). It is definitely the essential choke where high class circuits are concerned - - - - **5/-**

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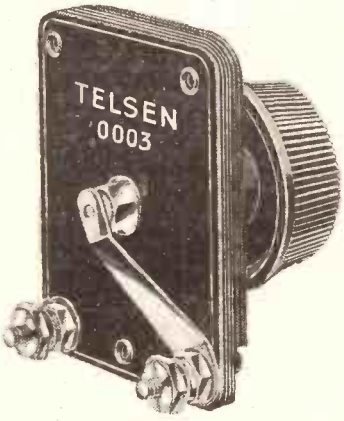
TELSEN DIFFERENTIAL CONDENSERS

Improved type of exceptionally rigid construction. The rotor vanes are keyed to the spindle and fitted with definite stops. A strong nickel silver contact makes connection to the rotor, a positive connection being made to the stator vanes. Supplied complete with knob.

In capacities .0003 .00015 and .0001 - - - - **2/6**



TELSEN REACTION CONDENSERS

Embodying every improvement and refinement indicated by the latest research. The vanes are interleaved with the finest solid dielectric, the construction throughout being of great rigidity and exceptional precision. Supplied complete with knob.

In capacities .0003 .00015 and .0001 **2/-**

In capacities .00075 and .0005 - **2/6**

TELSEN AERIAL SERIES CONDENSER

The ideal volume and selectivity control, solidly constructed, with very low minimum capacity. The externally keyed switch-arm when rotated to a maximum position, connects with a contact on the fixed vanes, thus short-circuiting the condenser for maximum volume. Supplied complete with knob.

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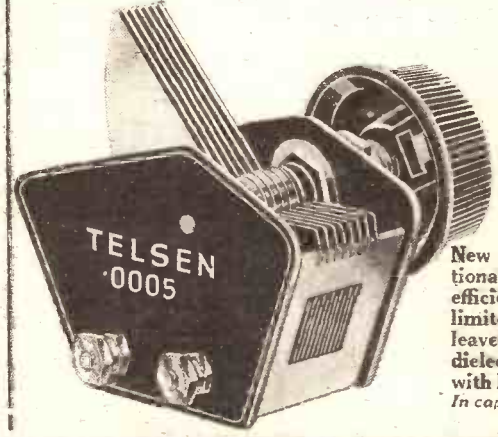

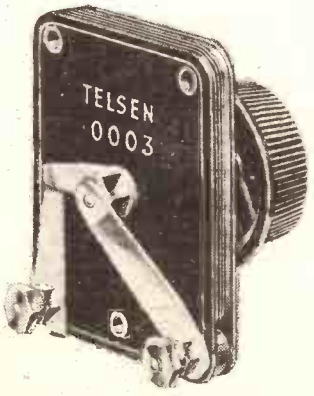

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New design of great rigidity and exceptional compactness, ensuring the utmost efficiency in use even where space is very limited. The well-braced vanes are interleaved with a minimum of the finest solid dielectric. Supplied complete with knob.

In capacities .0005 and .0003 - **2/6**

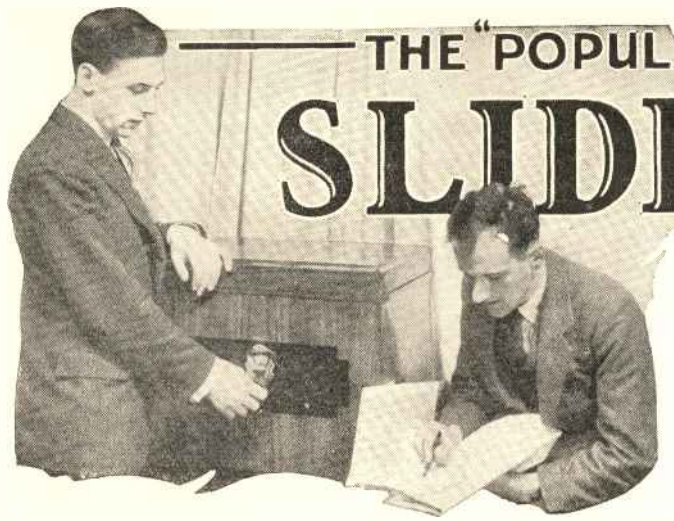
RADIO COMPONENTS FOR LASTING EFFICIENCY

ANNOUNCEMENT OF THE TELSEN ELECTRIC COMPANY, LIMITED, ASTON, BIRMINGHAM

INDEX TO STATIONS

(IN ALPHABETICAL ORDER)

Aalesund (Norway)	95	Liege "Radio Liege" (Belgium)	39
Aberdeen	2	Liege Experimental (Belgium)	21
Algiers (North Africa)	71	Lisbon (Portugal)	41
Archangel (Russia)	81	London National	32
Barcelona Radio (Spain)	65	London Regional	68
Barcelona Association National (Spain)	27	Lodz (Poland)	14
Basle (Switzerland)	22	Lwow (Poland)	79
Belfast (North Ireland)	20	Lyons (La Doua) (France)	99
Belgrade (Yugoslavia)	91	Lyons Radio (France)	44
Bergen (Norway)	72	Madrid (Spain)	90
Berlin Relay (Germany)	42	Malmö (Sweden)	12
Berlin (Witzleben) (Germany)	89	Marseilles (France)	55
Berne (Switzerland)	23	Midland Regional	84
Beromunster (Switzerland)	98	Milan (Italy)	60
Beziers Radio (France)	18	Montpellier (France)	43
Bodö (Norway)	97	Moravska-Ostrava (Czechoslavia)	33
Bordeaux-Lafayette (France)	51	Moscow (Russia)	78 and 105
Bordeaux-sud-Ouest (France)	16	Munich (Germany)	110
Bournemouth	45	Naples (Italy)	56
Bratislava (Czechoslavia)	38	Newcastle	1
Bremen (Germany)	34	North National	50
Breslau (Germany)	58	North Regional	102
Brno (Czechoslavia)	63	Nürnberg (Germany)	17
Brussels No. 1 (Belgium)	107	Odessa (Russia)	96
Brussels No. 2 (Belgium)	62	Palermo (Italy)	111
Bucharest (Romania)	83	Parede (Portugal)	92
Budapest (Hungary)	112	Paris Ecole Superieure (Same as Aalesund)	95
Cadiz (Spain)	61	Paris Poste Parisien (France)	59
Cardiff	53	Paris Radio L.L. (France)	75
Christiansand (Norway)	15	Pori (Finland)	6
Copenhagen (Denmark)	40	Prague (Czechoslavia)	103
Cork (Irish Free State)	8	Rabat (Morocco)	88
Dublin (Irish Free State)	87	Rennes (France)	35
Falun (Sweden)	52	Riga (Latvia)	109
Fecamp (France)	7	Rome (Italy)	94
Flensburg (Germany)	10	Salzburg (Austria)	5
Florence (Italy)	106	Scottish National (Same Wave as Bournemouth)	45
Frankfurt-am-Main (Germany)	31	Scottish Regional	77
Fredriksstad (Norway)	73	Seville (Spain)	74
Genoa (Italy)	54	Sebastopol (Russia)	101
Gleiwitz (Germany)	28	Stavanger (Norway)	19
Goteborg (Sweden)	57	Stockholm (Sweden)	93
Graz (Austria)	67	Strasbourg (France)	64
Halmstad (Sweden)	3	Stuttgart (Muhlacker) (Germany)	70
Hamburg (Germany)	76	Sottens (Switzerland)	85
Heilsberg (Germany)	37	Swansea (Same as Berne)	23
Hilversum (Holland)	48	Tallinn (Estonia)	49
Hörby (Sweden)	30	Tiraspol (Russia)	69
Hüdiksval (Sweden)	9	Toulouse P.T.T. (France)	29
Juan-les-Pins (France)	25	Toulouse Radio (France)	80
Katowice (Poland)	86	Trieste (Italy)	24
Kiel (Germany)	13	Trondheim (Norway)	104
Konigsberg (Germany)	4	Turin (Italy)	36
Kosice (Czechoslavia)	47	Uddevalla (Sweden)	11
Langenberg (Germany)	100	Varberg (Sweden)	26
Leipzig (Germany)	82	Vienna (Austria)	108
Leningrad (Russia)	66	Viipuri (Finland)	46



THE "POPULAR WIRELESS" — 6d

SLIDER-LOG

AN EASY-TO-USE STATION-FINDER FOR ANY RADIO SET.

THERE ARE NO GRAPHS TO DRAW OR CURVES TO PREPARE.

HOW TO USE IT

This device is automatic in its action, and there is no writing or curve-drawing to be done. All that is necessary is to note the dial readings of two stations.

The farther these two stations are separated in wavelength the better.

The North Regional and the London National are a good example.

We will suppose that these come in at exactly 80 and 20 degrees on a tuning dial, and that the tuning condenser has a 0—100 marking and conforms with the Log-Mid-Line method of design.

The dial-reading scale should be carefully cut out and trimmed around its edges. The Slider-Log is then opened and laid on a flat surface.

Place the scale with its Log-Mid-Line readings on the top surface and its 0—100 markings uppermost.

Keep the scale absolutely horizontal (this is facilitated by the horizontal lines which are provided) and move it upwards or downwards and to either side until the vertical line from London National coincides with 20 on the scale, and the vertical line from the North Regional with 80.

The dial-reading scale can now be gummed or pasted in position.

This being done, it is possible to obtain the readings of any of the other stations merely by following their vertical lines down and noting where these strike the scale.

Also, unknown stations can be identified by following the vertical lines radiating upwards from the dial readings at which they are tuned-in on the set.

STATION SETTINGS AT A GLANCE

To facilitate the finding of desired stations an index is provided. It appears on the back of the Slider-Log and all the stations are given numbers.

These numbers also appear against the names of the stations printed on the Slider-Log, only in this case they run in numerical sequence.

Therefore, it is but a matter of moments to find a station in the index (for this is alphabetically arranged), turn to the Slider-Log and ascertain its position, first in the actual station list and then, by running down its vertical line, the dial reading.

Naturally, only the medium-wave stations are included.

If two tuning condensers are used by the set it is necessary to have two Slider-Logs or of course, the dial reading scale can be shifted to one or other of two pre-arranged positions instead of being gummed or pasted down.

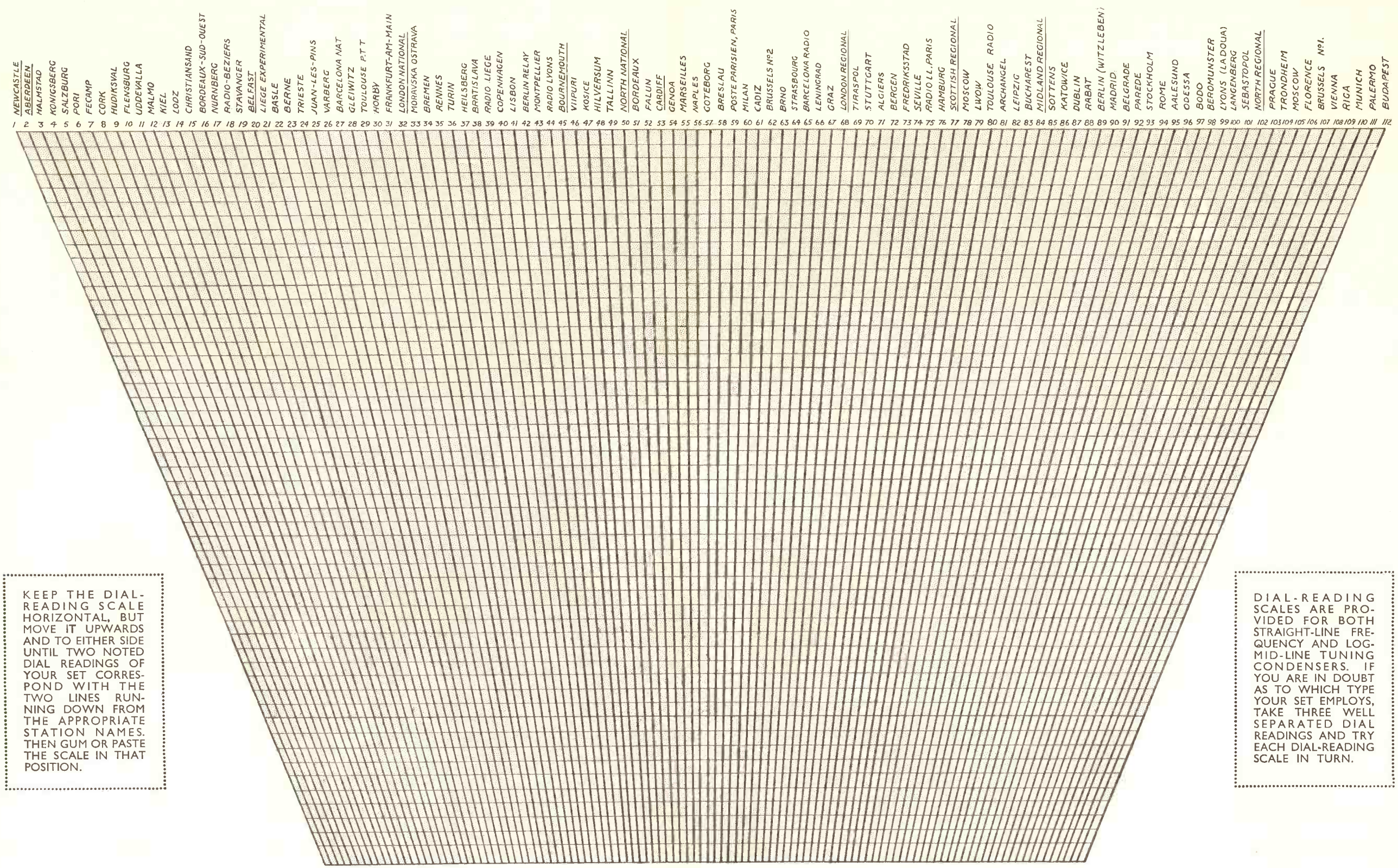
Should the type of condenser not be known, it is an easy matter to discover which of the two scales applies by taking the readings of three widely separated stations instead of two. By trying both scales it will only take a few moments to find the one on which the readings line up with the three verticals representing the stations.

There may in cases be trifling errors, due to the peculiarities of individual receivers, but even so, the general disposition of the stations on the dial will closely conform with the Slider-Log settings.

The type of dial does not affect the Slider-Log. Direct-Drive, Slow-Motion, Drum and Disc can all be dealt with and equally accurate results obtained.

SCALES ARE PROVIDED FOR 0—100 AND 0—180 DIALS OF BOTH S.L.F. AND LOG-MID-LINE TUNING CONDENSERS.

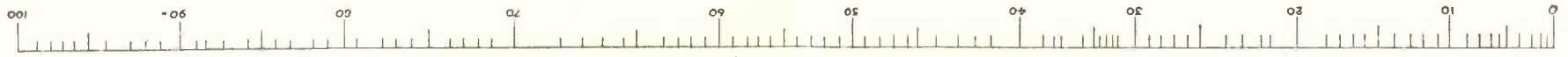
THIS DIAL-READING SCALE SHOULD BE CUT OUT AND CAREFULLY TRIMMED ROUND SO THAT THE MARKINGS TERMINATE AT STRAIGHT EDGES OF THE PAPER.



KEEP THE DIAL-READING SCALE HORIZONTAL, BUT MOVE IT UPWARDS AND TO EITHER SIDE UNTIL TWO NOTED DIAL READINGS OF YOUR SET CORRESPOND WITH THE TWO LINES RUNNING DOWN FROM THE APPROPRIATE STATION NAMES. THEN GUM OR PASTE THE SCALE IN THAT POSITION.

DIAL-READING SCALES ARE PROVIDED FOR BOTH STRAIGHT-LINE FREQUENCY AND LOG-MID-LINE TUNING CONDENSERS. IF YOU ARE IN DOUBT AS TO WHICH TYPE YOUR SET EMPLOYS, TAKE THREE WELL SEPARATED DIAL READINGS AND TRY EACH DIAL-READING SCALE IN TURN.

DIAL READINGS FOR STRAIGHT-LINE FREQUENCY TUNING CONDENSERS



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3.	S.G Four with Pentode; or S-Power Output; Super-Hets; 5-Valve Sets	100/-	A.C. 25 25 m/a Output	77/6 or by Easy Payments	2/-
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* Based on 3 hours' daily use.

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