

CUTTING OUT YOUR LOCAL. By Capt. Fickersley

Popular Wireless

Every Thursday
PRICE
3d.

No. 397. Vol. XVI.

INCORPORATING "WIRELESS"

January 11th, 1930.

The "TWIN-WAVE" THREE



Extraordinarily Simple Wave-change Switching

OTHER SPECIAL ARTICLES THIS WEEK

THAT MILLIAMMETER

THE NEW "P.W." "SAFE-POWER" UNITS (II)

POINTS READERS RAISE. By "Pentode"

BROADCASTING FOLK-SONGS TO THE WORLD. By Ernest Butcher

(No. 7 of our popular "Life-Stories" Articles)

Tell Your Friends About Radio Week.

164 167

WISE WIRELESS USERS PREFER BATTERIES

BECAUSE -

pure H.T. current comes only from a dry battery, for it contains steady, direct current and does not depend upon humming generators for its source of supply.

Batteries are handy, portable and safe, too, and cheaper in the long run—no expensive valves or windings to burn out.

Buy a Battery and get the best in EVER READY, the battery that has stood the test for 25 years.



Use an EVER READY
refill battery for your
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Portable 1. 63 volts. 6" x 5" x 3"	8/6
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hears 'the impossible'!



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Marconiphone engineers make these speakers. All the skill of thirty years' leadership in wireless is in their construction. Ask any dealer for a demonstration. If there is no dealer near you, write to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

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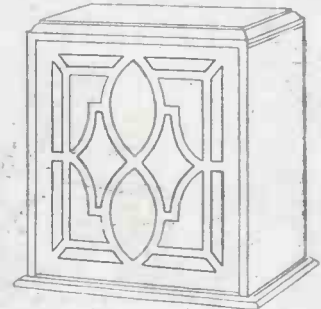


Listen with a

MARCONIPHONE LOUD SPEAKER

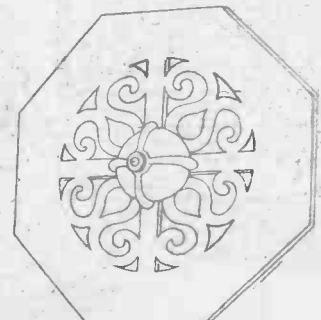
MODEL 60 CABINET CONE *(shown on left)*

Obtainable at the very moderate price of £3, the Model 60 is an extremely efficient "all-purpose" speaker. Embodying the Marconiphone reed system, it is outstandingly clear in tone.



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The highly accurate centring of the Moving Coil and the one-piece fibrous diaphragm ensure absolutely accurate reproduction. Units from £4.10.0. Cabinet models: for 6-volt accumulator, £7; for D.C. mains, £7.10.0; for A.C. mains, £12.12.0.



ONLY 30/-!

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

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ARE USED IN ALL THE MOST
SELECTIVE SETS

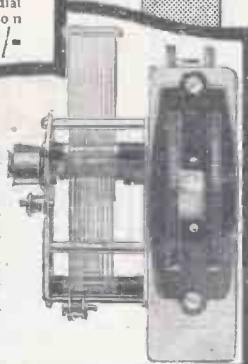


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With knob, dial and slow-motion device, '0003 or '0005 - **12/-**
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With Drum Control and slow-motion device, '0003 or '0005 - **15/6**
Triple K.C. each condenser, '0003 or '0005 - **38/6**
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A small variable condenser for panel mounting, '00005, '0001 or '0002. Complete with Knob **5/6**

Ask your
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"Go Home and Listen." Radio Week, Jan. 12-18.

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Invaluable to EVERY Amateur and Constructor.

The "POPULAR WIRELESS"

BLUE PRINTS of TESTED CIRCUITS

The following is a list of the "P.W." 6d. Blue Prints for Constructors in stock, showing the different circuits available:

"P.W." BLUE PRINT

- Number
1. DETECTOR VALVE WITH REACTION.
2. OUT OF PRINT.
3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
6. H.F. AND CRYSTAL (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. OUT OF PRINT.
11. OUT OF PRINT.
12. OUT OF PRINT.
13. 2-VALVE REFLEX (Employing Valve Detector).
14. OUT OF PRINT.
15. OUT OF PRINT.
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching).
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
19. OUT OF PRINT.
20. OUT OF PRINT.
21. THE 2-VALVE LODGE "N."
22. "THE GUARANTEED REFLEX."
23. THE 1-VALVE "CHITOS."
24. THE "SPANSACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-Radiating Reaction Control, and 1 L.F. Valve.
25. OUT OF PRINT.
26. A "STRAIGHT" 4-VALVER (H.F., Det. and 2 L.F. with Switching).
27. OUT OF PRINT.
28. A "MODERN WIRELESS" 5-VALVER (H.F., Det. and 3 L.F.).
29. AN H.T. UNIT FOR DIRECT CURRENT MAINS.
30. A REINARTZ ONE-VALVER.
31. OUT OF PRINT.
32. THE "CUBE SCREEN" THREE (H.F., Det. and L.F.).
33. A "KNIFE EDGE" CRYSTAL SET.
34. AN H.F. AND DETECTOR TWO-VALVER.
35. THE "UNIVERSAL THREE" (Det. and 2 L.F. stages resistance-coupled).
36. THE "SPANSACE FOUR" (H.F., Det. and 2 L.F.).
37. THE "LONG SHORT" CRYSTAL SET.
38. A TWO-VALVE L.F. AMPLIFIER.
39. THE "SYDNEY" TWO.
40. THE "SUPER SCREEN" THREE.
41. THIS YEAR'S "CHITOS" ONE-VALVER.
42. THE "Q AND A" THREE. A simple set (Det. and 2 L.F.).
43. THE "INEXPENSIVE FOUR."
44. THE "ECONOMY FIVE." For long-range loud-speaker work.
45. A SIMPLE A.C. H.T. UNIT.
46. THE "REGIONAL" THREE.
47. THE "WAVE-CHANGE" ONE.
48. THE "REGIONAL" CRYSTAL SET.
49. OUT OF PRINT.
50. OUT OF PRINT.
51. OUT OF PRINT.
52. OUT OF PRINT.

ALL "POPULAR WIRELESS" BLUE PRINTS———6d. EACH

All orders for these Blue Prints should be sent direct to the "Popular Wireless" Queries Department, Fleetway House, Farringdon Street, London, E.C.4. enclosing a stamped addressed envelope and a postal order for 6d. for each Blue Print ordered.

TUNE IN WITH THIS



THE Watmel Double Range Tuner, which does away once and for all with coil changing, is the ideal tuner for the modern Radio Set. Shunted with two .0005 variables (one for reaction) it controls accurately and smoothly all waves on the bands between 250 and 600

metres, and 1,000 and 2,000 metres. Change over is effected by a push-pull switch supplied with each tuner, and the price complete with switch and diagram of connection is

12/6

AND TUNE OUT WITH THIS



CONNECT this neat and attractive Watmel Wave Trap in series with your aerial lead, and you will be able to cut out those troublesome unwanted stations with ease and certainty.

There are six possible positions for the two plugs in the four sockets, so that you can suit your own aerial conditions precisely, and tune out stations simply by turning the small micro condenser knob.

A combination of the Watmel Tuner and the Watmel Wave Trap assures you of the finest, most selective tuning possible to the Modern Radio Receiver.

The Wave Trap costs only **8/6**

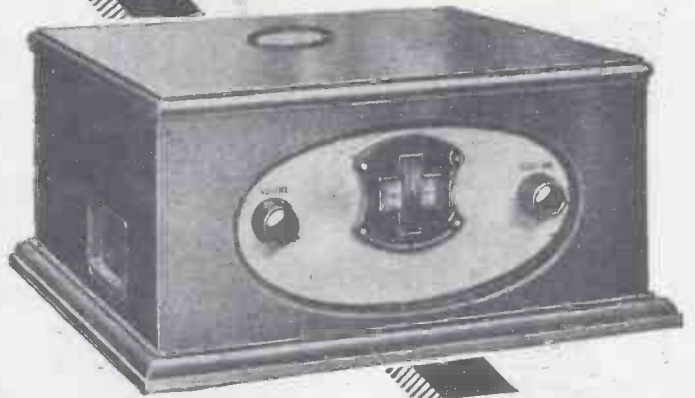
We shall be glad to send you on request our Folder No. 102, showing you how to make up a very fine Loud-speaker from a Kit of parts, also Folder and Blueprint for building up a modern 3-valve Set.

Watmel

Wireless Co., Ltd.,

Imperial Works, High St., Edgware, Middlesex.
Telephone: Edgware 0223. P. & T.

THE POPULAR LOTUS ALL ELECTRIC RECEIVER for £1-19-9 DOWN



Easily operated by connecting to any A.C. Mains light socket—no batteries needed—this Lotus All Electric 3 valve S.G.P. Set is highly selective and covers a good range of British and Continental stations. Cash Price £21 (with valves and Royalties paid).

The same circuit is used in the Lotus 3-valve S.G.P. Battery model—Cash Price £13 15s.

For home construction get the Lotus 3-valve S.G.P. Battery Model Kit at £7 12s. 6d. Cash. See and hear these Sets at any wireless dealer's, or write for the Lotus Sets Catalogue and Hire Purchase terms.

GO HOME AND LISTEN RADIO WEEK, JANUARY 12-18.

LOTUS

ALL ELECTRIC RECEIVER

GETS THE BEST RECEPTION.

Made by the makers of the famous Lotus components in one of the most modern radio factories in Great Britain.

GARNETT WHITELEY & CO., LTD., Dept. P.W.5,
Lotus Works, Mill Lane, Liverpool.

REAL SETS NOT SET-BACKS.

All receiver designs described in

MODERN WIRELESS

ARE GUARANTEED.

Success is assured to all who build

THE "KENDALL" REJECTOR

AND

THE "B.P." THREE

NO INTERFERENCE.

PERFECT QUALITY.

HEAR WHAT YOU WANT WHEN YOU WANT IT!

For full constructional details see the

JANUARY

MODERN WIRELESS

Build Britain's Best Broadcast

Receivers.

Jan. Modern Wireless

Price 1/-

Jan. Modern Wireless



SCIENTIFIC RESEARCH USURPS THE THRONE OF

MAGIC

Dead and gone are the days of Magic.

The inventor works no longer with the old-time elements considered necessary in the art of creation—those unknown qualities which were assumed to be the stock-in-trade of magicians.

In these days the basis of invention is scientific research—definite knowledge of every small detail, every element which ultimately constitutes the finished article.

It is on this basis of scientific research that the work of the Lewcos Laboratories is carried on—hence this firm's world-wide reputation for "perfection in every detail."

The Lewcos Dual Range Binocular Coil, illustrated above, is designed to meet the demand for high efficiency astatic or field-less coils, having wave-length ranges of 235/550 metres and 1000/2000 metres, the wave-length range being selected by a simple push-pull switch which protrudes through the receiver panel. Three types are manufactured, as follows:

Aerial Coil without reaction (Reference D.B.A.).

H.F. Transformer for neutralised 3-electrode valve with Reinartz reaction (Reference D.B.P.).

H.F. Transformer for screened grid valve with magnetic reaction (Reference D.B.G.). Price 17/6 each.

A special switching mechanism can be supplied so that one or more coils can be mounted on the baseboard of the receiver with switching mechanism parallel with the panel. Price 3/-. (Reference S.M.5.)

A specially written leaflet on this marvellously efficient Coil will be sent on request. Please quote Reference No. R.55.



LEWCOS DUAL RANGE BINOCULAR COILS (References D.B.A. and D.B.G.) ARE SPECIFIED FOR THE "TWIN WAVE" THREE, DESCRIBED IN THIS ISSUE.

Trade Counter:
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Golden Lane, E.C.1

LEWCOS

(Regd.)

COILS FOR SUPERIORITY

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

Church Road, Leyton,
London, E.10.

LOCKED for SAFETY!

LOCKED for RIGIDITY!

LOCKED for LONG LIFE!



THE *NEW* Cossor Screened Grid Valve is shock-proof, noise-proof and break-proof. Its Interlocked Construction makes it the strongest and most robust Screened Grid Valve ever produced. Its elements are immovably locked in position—vibration is impossible—all risk of microphonic noise is eliminated. And because of the girder-like rigidity of its elements the *NEW* Cossor has exceptional strength, even the hardest blow cannot mar its remarkable performance. Use the *NEW* Cossor Screened Grid in your Receiver—no other make has Interlocked Construction.

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

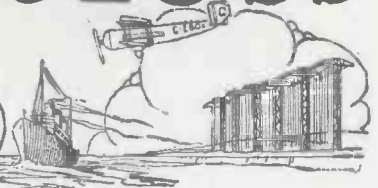
Cossor 4- and 6-volt
Screened Grid Valves are
also obtainable from all
Wireless Dealers.

The **NEW**
COSSOR
Screened Grid
Valve

Popular Wireless



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SHORT ANSWERS.
 WHO INVENTED IT?
 RADIO RUM RAID.
 HOPE FOR HUBBY.

A PRETTY STORY.
 CRASH-PROOF VALVES.
 X-RAYS NUISANCE.
 ONE FOR THE A.A.

RADIO NOTES & NEWS

Short Answers.

CHEERIO, and thanks to N. L. T. (Clapham), T. G. (Nairn), M. F. R. (Bexley) and our old friend, A. W. M. (Middlesbro'), whose kind greetings are reciprocated. All inquire anxiously about the gramophone, the advent of which appears to have tickled some of the hardboiled radio "fans." A. W. M. tells me that 2 M E advertises the telegraph services of Amalgamated Wireless, Ltd., on its confirmation cards. A cheering sign that one bit of the Empire is awake.

Mrs. S. G. Brown

THE close of the old year was clouded for a great many radio people by the news of the sudden and serious illness of Mrs. S. G. Brown, of the famous Acton firm. She was stricken with double pneumonia, but I am glad to say that as we go to press the news of her progress is very hopeful and satisfactory.

I am sure that all "P.W." readers will join with me in wishing Mrs. Brown a very speedy recovery to complete health.

Wireless Invented by American?

WE all thought so, of course, but now we know!

According to Mr. C. F. Jenkins, the television expert, the first message by radio was sent by an American dentist, Dr. M. Loomis, as early as 1865. This pioneer built an oscillating circuit, sent up an aerial by means of a kite and by interrupting a "buzzer-spark circuit" sent dot and dash messages to a station fifteen miles away, where reception is said to have been done with a galvanometer. The "Loomis Aerial Telegraph Company" was incorporated in 1869, but nobody would buy the stock. It would be useful if some of the circuits used could be dug out and described.

When to Re-Charge.

I HOPED to begin the year without quarrelling with an expert, but just before sitting down to write my bad angel focussed my eyes upon half a column in a provincial "Gazette" all about accumulators—a subject which invariably tempts me into a scrimmage. "Gazette" says that

NEXT WEEK
 IS
 RADIO WEEK
 SO
 LET YOUR FRIENDS LISTEN!

it is wrong to wait until signals drop to a murmur before recharging the L.T. battery, and verily he speaketh sooth. But I greatly doubt whether the average listener would be so long suffering as to do so.

CLEARING THE ETHER!



Dr. James Robinson, the British inventor, with his new "wonder-box." This contains the "Stenode Radiostat," a device with which he hopes to enable five thousand stations to be heard between 300 and 500 metres, without interference.

Counting the Hours.

IF you are using an H.T. battery the falling off of the signals may be its fault and not that of the L.T. battery, anyway. "Gazette" desires us to guard against over-discharging by the use of a hydrometer; here he is excessively practical. If we won't do that, then he wants us to work out how many hours the battery ought to give the full current required by the valves and to recharge several hours before that period expires; here he is excessively

theoretical, for I think listening-in would be a nuisance to most of us if it involved arithmetic and the keeping of a diary. If signals begin to weaken and you find that they become stronger when you work the rheostat (or filament current control), recharge the battery.

That Radio Rum Raid.

THE recent capture of 32 rumrunners and oceans of "rum" on the New Jersey coast was "all along o' thet dingbusted raddio," for if the illicit station had not been so prominent in the ether it might have remained undetected. As it was, however, an ex-Signal Corps man paid its signals a lot of attention, and the result was a "clean up." As a side issue, the operator who was actually working the set at the time of the raid is in a sticky situation, because the penalty for his offence is, at its maximum, a fine of £1,000 and five years in prison!

Hope for Hubbies.

THE introduction of radio into the New York State Reformatory for Women has led to a discovery which I hope may cause a mild boom in the sale of receivers here, and bring peace to certain households. The great discovery is that "the artistic emotional stimulation" produced by radio programmes "has a definite tendency to reduce to a minimum temperamental outbursts of an individual nature." Need I explain further?

A Pretty Story.

A WRITER in the "Derby Daily Express" tells a story which contains the elements of "the true romance" of which Kipling sang. A friend

of his, looking for a case for his radio set, knocked out the side of an old chest which had lain in his attic for years, and found that concealed in a false bottom were some letters written in French on tattered paper. Investigation by experts showed that the letters had been written by certain French soldiers imprisoned during the Napoleonic wars in the Medway hulks. Somehow the plan to deliver the letters miscarried, the chest found its way to

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

India, came back, and over a century later the letters saw daylight again:

The Decay of Melody.

THE receipt of a letter from an Eye-talian gentleman, addressed from a Yorkshire workhouse, complaining bitterly that broadcasting has thrown the organ-grinding profession on to its beam-ends, reminds one that barrel-organs have almost vanished from the streets, another curious example of the unlooked-for results of wireless telephony. Unfortunately, this very amusing letter is a "fake." Signor "Giovanni Marita" forgot to disguise his excellent English handwriting.

Grease the Grooves.

A SCHOOLBOY sympathiser with me in my trouble with the gramophone which "struck" and stuck, tells of his own apparently similar experience. His remedy was to anoint the record with bicycle oil; he thinks that the grooves on that particular record were too "wiggly" for the needle to negotiate. Sounds rather a

SHORT WAVES.

TELEVISIONAL ROMANCE.

Jim: "I saw a ripping girl last night."
John: "Did you? What was her name?"
Jim: "I don't know. But do you think, if I ring up the tailor again to-night, the exchange would give me the same wrong number as last night?"

"To test a choke," runs a headline in a wireless magazine.
Take a few small fish bones, swallow them hurriedly, and we think the result will be quite satisfactory.

LOOKED LIKE 'PHONES.

It was so cold that day that the traffic cop stationed at the school corner had to wear muffs over his ears. But he was slightly surprised when one little lad stopped to look at him carefully, and then came up close and inquired confidentially:
"Say, mister, what station are you getting now?"—"Radio News."

WIRELESS TERMS EXPLAINED.

Feed Back.—What you expect to get when, after inviting guests to your house to dinner, you are asked to return the visit.
Gang Control.—Popular game in America, played with tear bombs and .45's.
Hard Valve.—One that does not break when hit with a hammer.
Key.—A handy little gadget used to open doors and to put down the backs of necks to stop nose bleeding.—"British Radio."

A HAPPY THOUGHT.

Householder (suddenly awakened by noise in night, from head of stairs): Who's there? (Clicks gun.)
Resourceful Burglar (hoarsely): This is station 10 U, Washington, signing off. Good-night, ladies and gentlemen.—"Radio News."

heroic remedy, and I would prefer to confine myself to dry records. However, my trouble affected all records, and was due to a faulty governor. I am now in the throes of a hunt for the perfect non-steel needle.

The Crash-Proof Valves.

CONTINUING my series of anecdotes illustrating the invulnerability of modern valves, I beg to report that in September a Gipsy Moth aeroplane, fitted with a wireless receiver embodying Mullard

P.M. valves, was fetched into a crash and completely wrecked; but not so the wireless gadgets. The set, with quite undamaged valves, was put into service again and is still O.K. (Next week: Carnera stunned by a — Valve).

Why Not Do It Here?

HERE is a tip for the B.B.C. or P.O. Why not issue a voting slip with every licence or renewal, for listeners to register their views and preferences, as is done in Denmark. Most people would use the opportunity, and the analysed results would be vastly interesting and useful. The "Daily Herald" states that in Denmark two-thirds of the listeners asked for less opera and more drama, and that there was an eight-to-one majority in favour of an increase of older types of dance music in preference to jazz.

A Bob a Branch.

CERTAIN householders in the vicinity of Enfield Town Park have taken advantage of their natural resources and hitched their aerials to trees standing within the demesne of the Town Council. By this stratagem they avoid the expense of poles and the possibility of offending the eyes of the Councillors with a regiment of poles of different heights and angles. But they cause grievous wear and tear of the trees, which, of course, are grown at the great expense and personal effort of the Councillors, and so the Council charges them—the real owners of the trees—a shilling per annum as "rent"!

The X-Rays Nuisance.

THE use of anything between 7 p.m. and midnight which may interfere with broadcasting, (including X-Rays and the unholy contraptions of modern massage methods), has recently been prohibited by the police of Klagenfurth, Carinthia. Even doctors using X-Ray apparatus must prove to the authorities that the case is urgent. Let us hope that no patient expires while the doctor is trying to convince a policeman how ill he is.

Radio-Telephony Afloat.

ISN'T it rather wonderful to be able to sit at home by the fire and talk by telephone to a ship battling with the rollers in mid-Atlantic? Yet it seems that this experience will within a few years be a commonplace thing. Already the "Leviathan" has been equipped for such service and placed in the world's telephone system, and it is said that the "Berengaria" and "Majestic" will be equipped also. Less than twenty years ago we marvelled at the idea of a ship telegraphing over distances of a few hundred miles by means of electric sparks.

The Van Errant.

HAVE you seen or heard the wonder van, that travelling demonstration room of Philips? It has a staff of four and is divided into driver's cabin, engine room, sound-proof studio and control room, making altogether a complete broadcasting station, including an "uncle," from which can be sent out either relays from B.B.C. or foreign stations, or the car's own programmes. I may add that there are also windows in which are displayed samples of the firm's products.

Wireless on Wheels.

ALL the power required is provided by an alternator driven by a petrol engine. The amplifier is extraordinary. It is rated at 600 watts and the rectifier carries a potential of 8,000 volts. The transmitting valve has a filament as thick as a lead pencil; 4,000 volts is applied to its anode. Communication with the announcer is done entirely by means of a highly-ingenuous indicator board operated electrically. Quite the best bit of radio advertising I have seen so far.

DON'T FORGET NEXT WEEK

is to be filled with special programmes in celebration of

RADIO WEEK!

Why not let your friends hear what your set can do—so that they

DON'T FORGET NEXT WEEK!

One for the A.A.

N. R. S. (Forfar) is good enough to tell me that he made up our "Antipodes Adaptor" as a self-contained short-wave receiver and has with it heard programmes from U.S.A., Canada, Australia, and Africa, besides 40 British amateurs and several Continental amateurs. He states that hand-capacity is extremely slight and that it is fairly easy to tune in Australian stations with this circuit. We have examined his diagram and find that it is exactly as we published it, plus the pair of telephones.

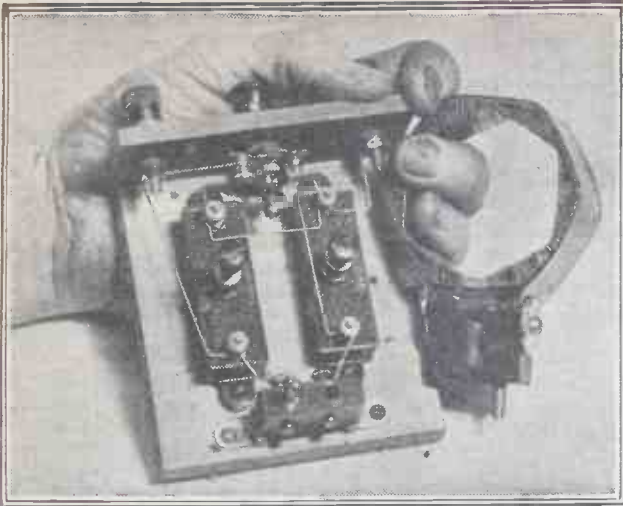
Radio Rounds the Corners.

I WAS dispirited to observe in the Press recently that there still exist people who profess to believe that the earth is flat. A world with eight corners, six sides and twelve edges is a dangerous object to be floating about in the universe. But when one tries to imagine what the Planarians' theory of radio must be like the mind becomes numbed. The thought of a wave putting on the brake or banking in order to negotiate a corner is a noble thing, and I present it to Mr. H. G. Wells to play with.

The "Magic" Two.

NOTWITHSTANDING the fact that short-wave conditions have been somewhat "off colour" recently—so I am informed—our "Magic" Two has agreeably surprised even some of the "old-timers," and my own particular post-bag has been filled with screeds from delighted constructors, who will kindly accept this note as an acknowledgment, with thanks. In general the letters show that for the long-distances and large number of stations it can tackle the manipulation is easy. Beginners in short-wavery had better look into the "Magic" series.

ARIEL.



Capt: ECKERSLEY M.I.E.E., ON CUTTING OUT YOUR "LOCAL"



The problems arising from the commencement of the dual programme broadcasts from Brookmans Park are many and difficult, but these solutions suggested by our Chief Radio Consultant will be found to be extremely effective.

MR. KENDALL of POPULAR WIRELESS has designed a rejector about which you, as readers, have heard a lot. As one is anxious, apart from other reasons, for the success of the Regional Scheme, I am particularly glad to recommend to your notice what appears to me to be a most efficient form of rejector circuit.

The main function of a rejector is, as its name implies, to reject an unwanted transmission. One of the problems incident to the policy of fewer stations and higher power is that inevitably the "local" scheme makes it more difficult for the listener to reach out for foreign programmes, even though these programmes are that much easier to receive owing to the higher power policy.

"DX" Listening.

I am a confessed sceptic in the matter of "reaching out" and believe it has little to do with broadcasting; what I know is that it provides many people with a fascinating hobby, and I can understand those who say that it gives them sometimes needed relief when they find little that pleases them locally.

I say I can understand, but I do not necessarily sympathise, believing that wireless exists, much as do cinemas and theatres, for giving occasional but not everlasting entertainment. Nevertheless, let us be broadminded and realise that many do sincerely desire not only to cut out the local programme (which can always be done by putting the switch in the "off" position) but desire simultaneously to listen to a programme coming from far away.

There are two or three ways in which this can be done, and each gives certain advantages and disadvantages. As I have continually preached, it's all a matter of the shape and amplitude of the resonance curve.

Improving Selectivity.

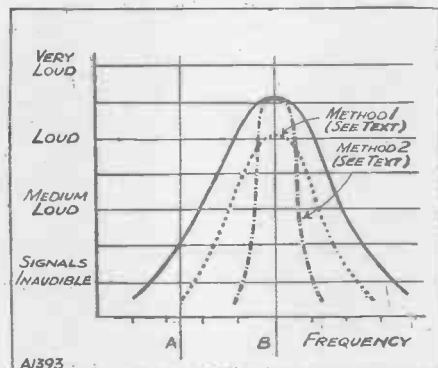
The resonance curve is a curve showing the amplitude of the response of a receiver against the frequency to which it is tuned. If the amplitude is less than a certain amount, the incoming signal, for a variety of reasons, is inaudible. If it is greater than a certain amount it is audible, and its "loudness" increases as the received amplitude is greater.

Consider Fig. 1, which shows a resonance curve. Along the bottom we have a scale

say A as well as B, and if both are of equal intensity (conditions of the Regional Scheme) A will be faintly audible when the receiver is tuned to B. This is just what we don't want.

There are three possible courses open to us to effect a curve as follows:

- (1) Reduce the maximum amplitude of the signal so that the skirts of the curve come (at A) below the audibility line,
- (2) sharpen up the resonance curve as shown, and so achieve the desired result again, or
- (3) connect a rejector in series with the aerial which makes A quite inaudible because the rejector circuit offers a very high resistance to frequencies of value equal to and around A.



The black curve is that of the response of an insufficiently selective receiver which will not reject transmissions of frequencies round A when the set is tuned to B. We can reduce the sensitivity as shown in method 1, when the apparent selectivity increases, or we can sharpen up the resonance curve (Method 2). A rejector having a high impedance at frequency (A) has the same effect qualitatively as methods (1) and (2).

The best method of achieving (1) is to shorten the aerial physically or electrically, the conditions of (2) can be obtained by using a coupled circuit, cascade tuning, lower resistance coils, etc., etc. (3) can be best implemented by using a rejector circuit in series with the aerial and aerial terminal, or an acceptor circuit ("bypassing" the unwanted frequency to earth) in parallel with the aerial terminal of the set and earth.

The advantage of (1) is that it is an extremely simple method applicable in its essentials to any set whatsoever. Its disadvantage is that once done it reduces the overall sensitivity of the set.

of frequency to which the device is tuned, upwards we have the amplitude of response. In the case given, if a signal comes in at

If the aerial has been reduced physically (e.g., with a pair of pliers!) it's not easy to put it back if distant station listening is required (say on Sunday when, as it is a day of rest, the B.B.C. denies us continuity of programme). That's why I like a small variable aerial series condenser which with a twist of the hand can throw the set into a condition for local or distant listening.

The "Brookmans" Rejector.

As to (2) (sharpening up the resonance curve), this has the advantage of always having a definite performance, and when the sharpness can be varied at will is supremely advantageous. It is however complicated, costly, and not easy to adjust if ultra selectivity is required.

As to (3) its supreme advantage is that it does act to give a practically distant listening set at small cost. It partially achieves the conditions of (2) and enables the listener to tune close to the local station and all at small expense, and only by adding something to the set rather than re-building it.

Mr. Kendall's rejector strikes me as being the best I have ever used, and I strongly recommend it to those who want to retain their distant listening qualities in spite of the strong local station. One point must be remembered, however. Brookmans Park transmits on two frequencies, each powerful, and the rejector can only reject one. (Two rejectors may inter-act in curious ways and give one trouble in adjustment).

In the particular case of London one will be able to reject the upper wave-length, say, and be sure of lots of medium-wave stations above it in wave-lengths; below the 360 metre point, however, the second Brookmans Park transmission will surely come in and wipe out the shorter medium-wave stations.

Three Methods to Choose From.

In conclusion then we have three possible ways of conserving distant listening even though Brookmans Park has invaded our ether. (1) by means of connecting a small variable condenser in series with the aerial, (2) by means of re-building our set with several H.F. stages, etc.; (3) by a rejector for one of the two unwanted stations.

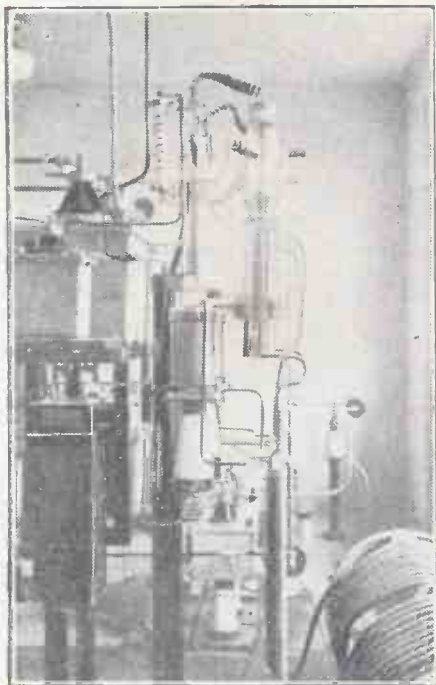
(1) reduces sensitivity and reduces the possibility of getting many foreign stations, but when the local station shuts up we can by a flick of the fingers restore all our stations (we can, of course, with a reasonable connection get 7 or 8 even when the local station is transmitting), (2) is theoretically perfect, BUT (3) is an excellent compromise but fails to reject two unwanted transmissions.

THE KING TO BROADCAST TO AUSTRALIA?

New Year Broadcasts—Extra Test Transmission—Lectures on Religion.
By THE EDITOR.

IT has been suggested in one of the leading Australian newspapers—the "Melbourne Herald"—that the Federal Government of Australia should try to arrange for the King to broadcast an address to Australia by radio. As a wireless telephone service between London and Aus-

ON 352 METRES.



The water-cooled transmitting valves of the Graz (Austria) relay station.

tralia will shortly be opened, it will be seen that the suggestion is at least technically feasible.

A Fine Idea.

The Federal Prime Minister, Mr. Scullin, has given the suggestion a warm welcome, and there is no doubt that Australia would be delighted if the King consented and the broadcast were arranged. No finer send-off for the new London-Australia radiophone service could be imagined; and thousands of loyal Australians who, in the ordinary course of events, will never hear the King's voice, would thus have an unique opportunity of listening to His Majesty.

Imagine the thrill—listening, perhaps, in the heart of some Australian bush camp, to the voice of the King speaking, let us say, from Buckingham Palace!

We hope this fine idea will be put into practice.

The B.B.C. informs us that the programme of broadcasts to schools for the spring term (January 20th to April 4th) shows that on Mondays the broadcasts to schools will

consist of readings and dialogues in foreign languages for secondary schools, history, and stories for younger pupils; on Tuesdays of music, elementary and advanced, French, and special talks for secondary schools; on Wednesdays, of nature study and English literature; on Thursdays, of speech and language; and on Fridays, of rural survey and farming, geography, miscellaneous courses, concerts, and plays.

Two new important series of broadcasts will start in January—"Modern Poetry," by Miss V. Sackville West, herself a modern poet; and "Newspapers and the World," by Mr. Wilson Harris, a journalist of wide experience and authority.

Foreign Language Courses.

The foreign language courses will be undertaken by Mademoiselle Camille Vière and Monsieur E. M. Stéphan, who, in addition to their respective courses, will, on alternate Mondays, broadcast together amusing dialogues of everyday French life. Dr. Herbert Schroeder will give German readings, and Dr. A. R. Pastor readings in Spanish. Miss Rhoda Power will continue her history broadcasts, and will also be responsible for the narratives from the mythology and folk-lore of the world. Sir Walford Davies will be in charge of the music broadcasts, and the speech and language course will be in the care of Mr. A. Lloyd James. Nature-study talks are again to be given by Miss Clotilde von Wyss, and rural survey talks by Miss Charlotte Simpson, B.Sc. The latter series is complementary to the farming talks of Dr. B. A. Keen, D.Sc.

Professor H. J. Fleure, D.Sc., has planned the series on "Peoples of the World, and Their Homes," and the talks will be broadcast by various travellers of repute, including Sir Herbert Samuel, Captain G. I. Finch, and Mr. L. S. S. O'Malley.

The B.B.C. announces that on every Sunday until further notice an alternative programme test transmission will take place from 2 to 3 p.m. from the two transmitters at Brookmans Park and from Daventry 5 X X. This test is being added to the existing series in order to assist those who cannot take advantage either of the morning or evening tests on weekdays.

One transmitter at Brookmans Park will radiate on the Regional programme wavelength of 356 metres, while the other will

radiate on the national programme wavelength of 261 metres. Daventry 5 X X will radiate the same programme as the 261-metre Brookmans Park transmitter. It is not intended to publish details of the programmes, since the transmissions are for test purposes only; but, states the B.B.C., they will be sufficiently contrasted to prevent all possibility of confusion.

A New Psychology Series.

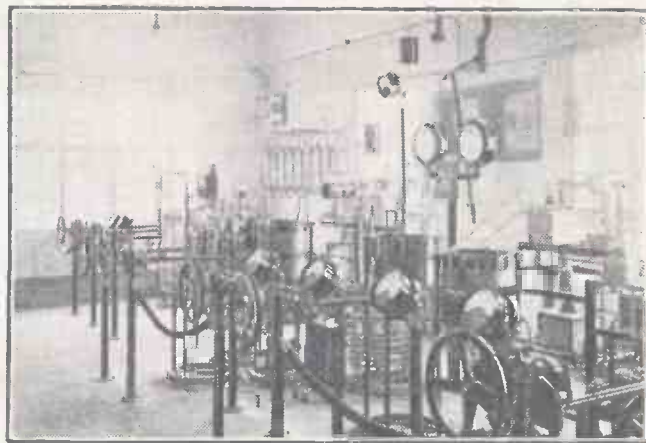
The first Sunday in the New Year (January 5th) saw the beginning of an interesting new departure in broadcasting; for Dr. E. S. Waterhouse, lecturer in Psychology and the Philosophy of Religion at the Wesleyan College, Richmond, and a member of the Senate of the University of London, started a course of twelve lectures on religion in the light of psychology. The following is an outline of the course:—

1. Where from and where to? The Beginnings and Ends of Religion.
2. "As a Little Child": how children see it.
3. The Self we do not Know: Unconscious Experience—its Meaning.
4. Sense and Symbols: The Value of Imagination.
5. Belief, Over-Belief, Unbelief: Suggestion as a Factor in Belief.
6. Reasoning. Feeling and Acting: Intellect and Heart in Religion.
7. "Like Lost Sheep": The Soul Astray.
8. Turning Again: Conversion and its Value.
9. The Heart of the Matter: Prayer.
10. The Crowd and the Group: Fellowship in Religion.
11. Health and Healing: The Religion of Body and Soul.
12. The Mystic Way: Things that pass Understanding.

This course has been arranged to meet the needs of thoughtful students of religion in general. The series is to be broadcast every Sunday from 5.45 to 6.15 p.m. from Daventry 5 G B and subsequently from Brookmans Park No. 2 transmitter when that becomes available.

It is hoped that in many places listening groups may be formed for the discussion of these lectures, which are bound to provoke and stimulate thought and discussion.

HIER RADIO WIEN!



The H.F. oscillator and tuning section of the Vienna transmitter.

Dr. Waterhouse has already given a course on Comparative Religion, which attracted more than the average amount of interest and appreciation.

Next Week is Radio Week.

LIFE STORIES OF FAMOUS BROADCAST STARS N^o7

BROADCASTING FOLK-SONGS to the WORLD

BY ERNEST BUTCHER



Muriel George and Ernest Butcher are among the most popular radio artistes. Here Mr. Butcher tells the interesting story of the couple's introduction to broadcasting, and some of their microphone adventures.

HOW the tables have turned! How oddly the pendulum of Fate has swung! Here am I asked by the Editor of POPULAR WIRELESS to tell the story of Mrs. Butcher and myself—for Muriel is really my wife—yet less than four years ago we were opponents of the B.B.C.!

It was our contention then that they did not pay enough for valuable and exclusive material, and for many months we would have nothing to do with broadcasting. And now? Well, we've both changed our view-point. You should see our morning mail!

Enemies of Radio!

In any case, opponents or not, our first broadcast could not have been made under more auspicious circumstances. It was part of an outside broadcast from the Albert Hall! We had agreed to assist in a charity concert there, and found at the very last moment that the proceedings were to be heard by listeners.

Enemies of the radio as we were, we attempted to draw back, but when we heard that all the other artistes had consented, we could not very well continue in our opposition, and finally agreed. That was the end of our disapproval of the B.B.C. The next day brought such a delightful pile of correspondence entreating us to appear again before the microphone that we did so, and gave a performance from Savoy Hill.

It was one of the most frightful events of our stage career—from our point of view—for we felt quite lost in the unfamiliar surroundings of the studio, even though we had previously made gramophone records. Now, however, you might say that we are hardened broadcasters. At least, we do think that we understand the microphone, and we are not quite so afraid of it.

The First "Engagement."

As with our wireless activities, so with our stage careers. In each case, we were both given the most auspicious start. Muriel's musical gifts are inherited from her father, who was a professor of singing at the Royal Academy of Music, London, and she practically started her stage career when little more than a child, in the never-to-be-forgotten "Follies," founded by Harry Pelissier, where she was the original singer of "Moon! Moon!" a tune that has almost become a folk-tune itself. But I'm afraid that here I must skip a little. I could fill

pages with "Follies" memories, for my wife can talk for hours about those early days.

Meantime, I had myself studied at the R.A.M., and had joined a concert party, and it was shortly after this that we met. Of course, it was something like love at first sight. I said "Can I escort you home?" and she said "Yes"—but, anyhow, this has nothing to do with wireless.

From that time we linked up, and began to sing the Folk-Songs I had always loved, at first at concerts and then on the halls, where no one had ever thought of doing them. Work was interrupted by the war, but from 1919 onwards we made headway, and so come to the present day.



With television the lot of the broadcast "turn" would be far easier. Here is a cathode ray tube which forms the receiver of a new American television system.

Nowadays, we both enjoy studio work. For one thing, when you get accustomed to it, the silence and the privacy are very delightful conditions under which to work.

I shall never forget when we were appearing at a certain music hall where a performing donkey was quartered right under the stage. He was so enchanted apparently by our song about the Nightingale and the Moon that he attempted to join in, and his loud "Hee-Haw!" made the audience scream with mirth. You get nothing like this in the wireless studio!

Nor do you get performing sea-lions. We were once appearing at a small theatre

where a pack of these creatures were housed just behind the stage, and they made such a noise barking, and splashing about in their tanks that our songs were almost drowned in the din!

Every night we sat by them and gave them biscuits just prior to our appearance on the stage, but would they be silent? They would not. Directly the curtain rose on us, the sea-lions' chorus commenced.

An Announcer's Dilemma.

No, you get none of that in the studio. It is absolutely silent, if anything too silent. The quiet is apt sometimes to be oppressive, and I am sure that the audience we occasionally have in the studio feel it as much as we do. Quite a number of them are so unnerved by it that they quite forget to laugh or clap and are relieved when the programme is finished. As my wife would say: "Poor darlings!"

Still, the studio is not always like a padded box. Strange things sometimes occur of which the public know nothing, and I must violate secrets if I am to mention them.

One of the announcers, for instance, was a great humorist. One night, when we were waiting in the studio for the red light to flicker, and our programme to begin, he was busy in a corner eating sandwiches and drinking tea—apparently having a makeshift dinner. And the poor fellow must have been hungry, for when the microphone was switched on by the Control Room, his mouth was so full that he could not speak and could only gasp, gobble, gulp and choke, whilst we silently shook with laughter.

While Listeners Waited!

The next night we were again due to broadcast and when we entered the studio he signified his delight by doing a fairy dance round the room in true Maud Allan style I joined him, and round and round we went, leaping about with arms wide and generally behaving as though the padding of the studio were fully justified.

Imagine the scene! My wife shaking with laughter in a corner, and the announcer and I leaping around the studio—with the red light flickering impatiently and unnoticed. It was five minutes before we realised that we were keeping listeners waiting, and then we were so breathless that the announcer could hardly speak, and my opening song might just as well have been "Now pants the hart!"

SHORT-WAVE NOTES.

Some details of particular interest to those who listen on the really short waves.

By W. L. S.

I HAVE a large number of interesting letters to acknowledge from readers who have been kind enough to answer my appeal for information regarding new stations, etc., and will deal with those of general interest this week.

H. S. H., of Coventry, reports hearing two aeroplanes over the Cardington airship hangar working on telephony, on a wave-length that I should imagine, from his description, to be in the neighbourhood of 60 metres.

They were using the "call-signs" of Buttercup and Buffalo Red. Has anyone else heard them? I often used to receive, on a higher wave-length still, two mysterious stations called Daisy and Stark, who used to converse about everything in general, but were obviously not amateurs or pirates.

The "Leviathan" Service.

2 A O P, of Glasgow, reports a transatlantic telephony service operating on 72 metres between Deal, New Jersey, and W S B N, which appears to be the "Leviathan."

He says that the W S B N operator is very bothered over harmonics of the ship's other transmitters, which form an annoying accompaniment to American millionaires' small-talk!

He makes another remark, with which I agree entirely, regarding the excellent properties of this wave-length (round about 70 metres), for work of every kind. Skip distances work out conveniently, and it is a thoroughly useful all-round wave-length.

And British amateurs have lost the 75-85-metre band from their licences, because they didn't use it when they had got it, because of the tremendous 40-metre craze.

A reader from Jubbulpore, India, sends a very interesting account of receiving conditions in that part. Regarding 5 S W, he finds that the midday programme received out there at 6 p.m. is usually excellent, whereas the programme from 7 p.m. onwards is not worth anything. Also, since 2 L O has shifted to Brookmans Park the strength of 5 S W appears to have gone up!

"Brooklyn's Own Station."

We talk here about unaccountable noises, but one of the Jubbulpore variety eclipses all that I can boast experience of myself. A tremendous roaring noise in the speaker for the whole of one evening was traced at daybreak to a large "flying fox" that had flown into the overhead power lines and electrocuted itself!

Two or three enthusiasts have been querying about a station up in the region of 60 metres, which announces itself as "Brooklyn's own station," and occasionally gives a call-sign, which is believed to be W 2 X B H.

Can anyone enlighten me or give definite particulars? I, personally, must plead guilty to keeping well below 60 metres nowadays, and have not heard it myself!

A Manchester reader suggests that a short-wave set with the following refinements incorporated would be very popular: (1) H.F. with switching or extra aerial terminal for going on to detector. (2) Provision for elimination of hand-capacity effects and H.F. current in the 'phone leads. (3) A vernier adjustment for the reaction

A RUMANIAN STUDIO.



A view of the studio of the Bucharest broadcasting station which clearly shows how it is draped to avoid echo.

coil as a cure for flat spots in the tuning. (4) The name of a reliable slow-motion dial that is noiseless (he has bought four and isn't satisfied yet). (5) A totally enclosed S.G. H.F. stage. (6) The names of proved chokes. (7) A good aluminium panel.

Certainly there are some good points in this list. Regarding chokes and slow-motion dials, though, I am afraid he has been unlucky. I have used at least six makes of dials over protracted periods without any grumbles whatever. As for chokes, my present short-wave receiver doesn't possess one.

The "Elettra" Again.

I should be glad to have other readers' remarks on the above list, and would probably be able to describe a receiver incorporating most of the "refinements" mentioned without unduly departing from the circuit arrangement of my present one.

E. J. W., of Ware, thinks he can enlighten the Oxford reader who was asking for particulars of a mysterious transmission he heard on 25 metres or thereabouts.

E. J. W. has heard, on this wave-length, the Dorchester beam station calling the yacht "Elettra," and giving gramophone records. Apparently he transmits every half-hour or so from 11 a.m. till 7.30 p.m. Many thanks, E. J. W. I hope this has solved the other reader's problem.

A "Humless" Mains Unit.

S. S., of Oldham, is very anxious to know the make of the eliminator I mentioned recently as being in use on my short-waver, and as giving no hum whatever. Wild horses would not drag it from me in print, S. S., but it is *not* the make you mention!

In any case, I should imagine that every commercial eliminator worthy of the name would give equally good results, particularly if one were to connect a few more microfarads across the detector H.T. tap.

I have made at least four eliminators for myself, and the standard by which they were passed as "fit" was that they should supply the H.T. to a short-waver set down to 12 metres without hum. I had no trouble in any case.

De-coupling Devices.

"Hum" due to a bad eliminator, and "motor-boating," due probably to feedback and coupling effects in the set, should not be confused. In any case, a short-waver ought to be provided with de-coupling resistances, even if it is to be worked off

batteries, or all sorts of horrible symptoms are likely to be present.

I have standardised a 20,000- or 30,000-ohm resistance, bypassed to earth by at least 2 mfd. (preferably 4), and a choke output circuit on all my future short-wavers, and, in addition to these precautions, I often find it beneficial to connect a further 2 or 4 mfd. right across the H.T. and L.T.

Naturally, a poor earth is a great drawback to the use of a short-waver operating from the mains. Also the presence of mains leads behind the wall or under the floor near where the set is operating, causes nasty troubles that are rather difficult to obviate.

**Next Week is Radio Week
Let Your Friends Listen.**

THAT MILLIAMMETER

MANY are the uses of a milliammeter to the experimenter who tackles his work in a truly scientific manner, and if this were an article on "Trouble Hunting," they could probably be enumerated; but in this article we are really concerned with the instrument itself, and with the simple means of increasing its sphere of usefulness.

Arranging the Range.

You may have an instrument, for instance, reading from 0 to, say, 10 milliamps, but to deal with the larger output you are now using, you wish the instrument could measure 20 to 30 milliamps. Your wish can easily be fulfilled without

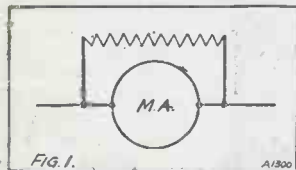


Fig. 1. Showing how the milliammeter can be shunted for the measurement of large currents.

another instrument. In fact, the meter could well have been of only 2 milliamp range, yet easily adapted to handle

even filament current without the least deleterious effect. Fig. 1 shows the principle. A resistance, R, is shunted across the instrument, of such a value as to divert all the current in excess of that necessary to actuate the pointer.

Thus, with a 0-10 milliamp range, the current required to move the pointer over the measuring scale is obviously 10 milliamps, and the same instrument will serve to measure 20, 30, or a 100 milliamps if matters are so arranged that only 10 milliamps always traverse the instrument for a full-scale reading. In other words, the meter and shunt together form a "divided circuit," and it is only a question of arranging the shunt resistance relative to the instrument resistance.

The Multiplying Factor.

But it is at once clear that the meter now reads only a fraction of the current to be measured, and to obtain the latter, the readings must be multiplied by the reciprocal of this fraction. This "multiplying factor" is the first point to decide; it is simply the new, divided by the old range, e.g., if the present full-scale reading is 15 milliamps, and the range is to be raised to 60 milliamps, the multiplying factor is $60 \div 15 = 4$, and so on.

We have next to find what resistance shunt is required to give the multiplication decided upon. In order to calculate this, the resistance of the instrument itself must

A milliammeter is a most valuable instrument and can be made to fulfil a number of purposes, as shown in this practical article.

By H. REES.

be known. If this is not given on the instrument, it should be obtained from the makers.

Knowing this, and the multiplying factor, subtract 1 from the latter, and divide the resistance of the meter by the remainder; the result is the resistance of the shunt in ohms. Or, expressing it mathematically: if n = the multiplying factor, r = resistance of instrument, then R, resistance of shunt,

$$R = \frac{r}{n - 1} \text{ ohms.}$$

As an example suppose a milliammeter of range 0-5 milliamps is to be multiplied to measure up to 30 milliamps. Let its resistance be 30 ohms. The multiplying factor will be $30 \div 5 = 6$. Subtracting 1 from this, and dividing the remainder 5 into 30 ohms, gives a value of 6 ohms for the shunt resistance. Or, using the formula

$$R = \frac{30}{6 - 1} = 6, \text{ as before.}$$

Only Ohm!

A shunt of this value could be obtained at a fairly low price from a firm of instrument makers. It would be corrected within very small limits (0.1 per cent, 0.2 per cent, etc.), the price, of course, varying with the accuracy desired. For ordinary measurements on a receiver, however, very great precision is not essential, and an error of 2 or 3 per cent would be of little consequence. The shunt can, therefore, be easily made by winding the proper length of resistance wire on a small former fitted with terminals (Fig. 2).

A voltmeter is really nothing but a high-resistance milliammeter with its scale calibrated in volts. The milliammeter can, therefore, be used to measure voltage if a high resistance is put in circuit to limit the current to the working value.

Actually, a very high resistance will be required when the voltage is high, as a milliammeter is a low resistance instrument, and so the method is apt to prove costly if corrected instrument resistances are to be bought.

Again, however, closely corrected multipliers are not really essential, and for low-range instruments (not exceeding, say, 10 to 15 milliamps), ordinary wire-wound anode resistances can be used without introducing serious errors,

Consider a milliammeter reading from 0-10 milliamps. Neglecting the comparatively low resistance of the meter itself, it is clear from Ohm's Law, that if a resistance of 1,000 ohms is connected in series, the instrument current will be about 1 milliamp with an applied voltage of 1.

That is, the meter will register 1 milliamp, which also now stands for 1 volt. If the applied voltage is 2, the reading will be 2 milliamps again, also representing 2 volts, and so on. With a multiplier of 1,000 ohms, therefore, the milliammeter will be a direct reading voltmeter up to 10 volts.

With a multiplier of 2,000 ohms, the same instrument will serve to measure up to 20 volts, but the readings will now obviously have to be multiplied by 2. Similarly, 0-100 volts can be measured with a resistance of 10,000 ohms and multiplying factor of 10.

Cutting Down the Current.

Now, it is apparent that, in the last example, a total resistance of 10,000 ohms for a range of 100 volts, is equivalent to a resistance of 100 ohms per volt. This is rather on the low side for the measurement of the voltage of small H.T. batteries, etc., for good instruments for such purposes have resistances of 500 to 2,000 ohms per volt.

Another way of putting it is to say that the maximum current of 10 milliamps required for a full-scale reading is altogether too high a drain on a small type H.T. battery; so that means must be found of reducing the current to, say, a half.

This can easily be accomplished by "over-multiplying" the range. That is, by increasing the resistance to 20,000 ohms and using half the working scale only. The

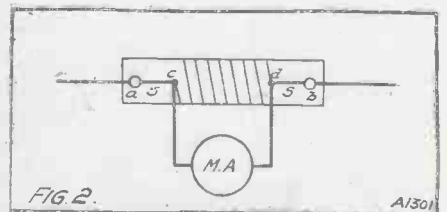


Fig. 2. The shunt is easily made by winding a length of resistance wire on a piece of fibre or ebonite.

multiplying factor will, of course, now be 20, and the full-scale reading 200 volts, but the current for 100 volts will be reduced to 5 milliamps.

It is thus evident that the milliammeter is a very flexible instrument, for by making a set of shunts and multipliers, the amateur can possess practically a universal testing set, which although not the last word in precision, yet is sufficiently accurate to meet all his requirements.

LATEST BROADCASTING NEWS.

"JOE" LEWIS FULL-OUT AT BIRMINGHAM.

LONDON DRAWS ON SCOTLAND—MANCHESTER'S LUCKY DIPS—SIR WALFORD'S SUCCESSOR—SPORT ON THE AIR—ARSENAL v. CHELSEA—NEXT NATIONAL LECTURE.

THE Birmingham Station (or, as it is known officially, the Midland Regional Station) enjoys a greater reputation than any other for the popular type of its programmes, possibly because its functions do not include the arranging and broadcasting of any studio talks to 5 G B listeners.

Mr. Joseph Lewis, the Musical Director there, is "great" on community singing and other jolly, rollicking stuff, which appeals to a large section of listeners not yet so musically educated as to dote on the ultra-modern items which the programme builders elsewhere think so essential.

After all, it must be confessed that real enjoyment can be derived from an hour of listening to songs which soldiers sing as they march or sit round the camp-fire, and the spirited shanties as warbled by sailors.

That is the type of programme arranged for Thursday evening, January 16th, when songs sung in the days of Waterloo, in the distant campaign of the Crimea, in the South-African War, and by the Tommies in France and Flanders during the Great War will be broadcast from the Birmingham Studio.

The artistes are Edgar Lane, Vincent Curran, Donald Davies, William Hughes, John Rorke and Harry Saxton, who will have the assistance of the Birmingham Studio Chorus and Orchestra. It will be little short of a tragedy if the B.B.C. carries out its intentions of axing the Birmingham musical organisation. Anyway, nothing untoward can happen until next autumn, and much may come to pass in the interval.

London Draws on Scotland.

Two important items originating in Scotland are included in forthcoming programmes for London and other stations. The first is a Burns Night concert arranged by the Glasgow Station for Saturday, January 25th, further details of which we hope to give in due course.

The other is a broadcast adaptation of "Huntingtower," the well-known novel by John Buchan, in the film version of which Sir Harry Lauder took the leading part. The radio version of this story has already been broadcast to Scottish listeners under the title of "The Holiday Adventures of Mr. Dickson McCunn."

Manchester's Lucky Dips.

The Regional Scheme resulted, as everyone knows, in the closing down of the majority of the old relay stations, with the exception of retaining their transmitters until the high-power stations are working, but the old studios still remain.

Northern Region listeners will hear another "Round the Region" programme on Tuesday, January 14th, when items by the Orpheus Male Voice Quartet will be taken from Sheffield, after which a switch-

over to Bradford will be made for excerpts from a concert to be given by the local branch of the Music Society. Finally, pianoforte items by Sidney Graham will be heard from Liverpool.

Sir Walford's Successor.

The first talk in the new series on "Music and the Ordinary Listener," by Dr. G. Dyson, who succeeds Sir Walford Davies in what has become one of the most important features of the broadcast programmes, will be given on Tuesday, January 21st, under the title of "Progress in Music."

Sir Walford Davies has received hundreds of letters expressing regret at the circumstances which have compelled him to cease his famous evening talks, and although many people find consolation in the fact that his talks to schools will continue to bring him regularly before the microphone, the general body of his enthusiastic listeners do not at all relish his complete absence from the evening programmes of 1930.

The B.B.C. and Sir Walford Davies are probably well advised to arrange to give him a rest from microphone work, but, unfortunately, Savoy Hill is strangely evasive when asked when Sir Walford is to return. There

is apparently a powerful movement bent on permanent exclusion. This must be watched and defeated.

Sport on the Air.

Provided weather conditions are not too inclement fully 65,000 people are expected to be present at Cardiff Arms Park on Saturday, January 18th, when the great Rugby International match will be played between teams representing Wales and England.

This number, however, is only a small proportion of those who will be interested in the match, and arrangements have been made to broadcast a running commentary on the play from London and other stations.

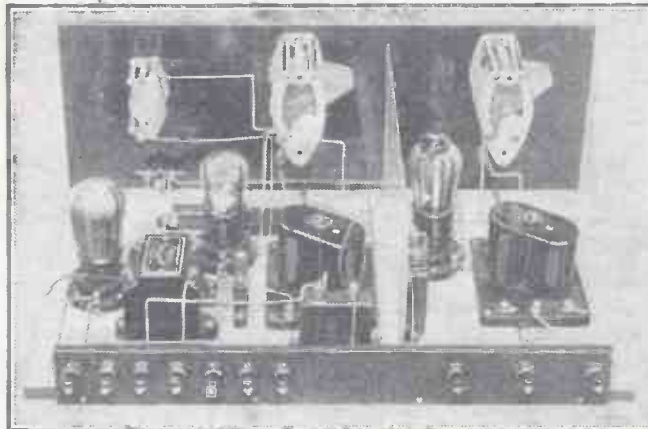
The commentary will be given by Captain H. B. T. Wakelam, whose ability to give accurate descriptions of what he sees has made him famous in many branches of outdoor sport.

Arsenal v. Chelsea.

A running commentary on the second half of the F.A. Cup match between Arsenal and Chelsea, which is to take place at Highbury on Saturday, January 11th, will also provide another sporting "O.B." to which many listeners will look forward. The commentators will be Mr. George F. Allison and Mr. Derek McCulloch.

The Next National Lecture.

Sir J. J. Thomson is to give the next of the series of great national lectures which is to be broadcast from all stations on January 27th. This lecture will be the fourth in the series, others having been given by the Poet Laureate (Dr. Bridges), Professor Eddington, and Professor Trevelyan.

THE "TWIN-WAVE" THREE.

Here is a back-of-panel view of the fine three-valve described elsewhere in this week's "P.W."

FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events.

By CECIL LEWIS.

(Formerly Director of Programmes of the B.B.C., and well known to radio enthusiasts as "Uncle Caractacus.")

NEW YEAR resolutions! We make 'em, and, alas! we break 'em! But it is well to make a good start. Here are one or two "for the ordinary listener"! That's you!

* * *

"I will be thankful for mercies!" Never since "Adam delved and Eve span" has entertainment of such wide range and high standard been brought right down to your fireside; and at a price which, when you come to think of it, is almost ridiculous!

You can hear the best music, tap the best brains, dance to the best bands, and be turned either to laughter or tears, for the cost of a set and ten shillings a year—for "a couple o' ducks," as a jolly song had

it the other night. You're lucky! Remember that you can hear Wagnerian Opera or Mabel Constanduros in your slippers by the fire, and no need for a long ride home on the top of a bus on a wet night when the show is over! You're very lucky!

Remember that if it hadn't have been for wireless you might never have known Sir Oliver Lodge, Sir Walford Davies, Mr. A. J. Alan, or even me! You're very, very lucky! Be thankful.

* * *

"I will give Savoy Hill a fair chance!" Broadcasting is a new art. Every man engaged in it is still learning his job. They are experimenting, exploring all the time.

(Continued on page 979.)



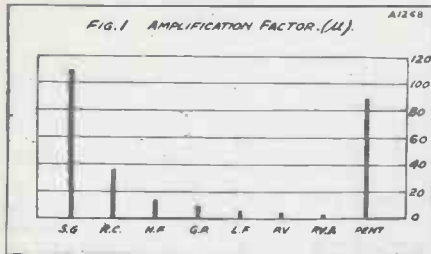
VALVE COMPARISONS

At one time or another you have probably spent half an hour or so looking through valve-makers' catalogues, or studying a valve guide in a wireless periodical. This may have been for the purpose of learning something about valves in

Here is a chat about valves which will do more to give the amateur a thorough grasp of the application of the various types than could a whole book of orthodox theory.

By C. E. FIELD, B.Sc.

The heights of the black lines represent the amplification factors of the valves drawn to scale. You will gain an idea from the diagram of the enormous strides that have been made, for instance, in the manufacture of H.F. valves, when you remember



general, or of choosing a particular valve for your own use.

In any case, you have almost certainly found it a confusing business, and found it very difficult to obtain a mental picture of the points of difference between the valves.

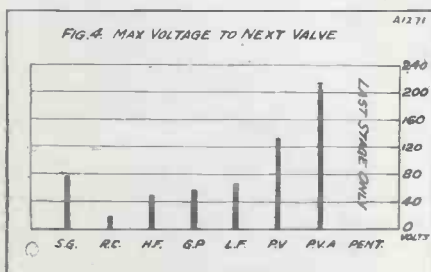
By means of simple diagrams, however, we can see at a glance how any one property differs in various types of valve, and so we will review the types which are now manufactured by nearly all makers, and have become practically standardised.

Seven Types of Valves.

First, there is the type usually recommended for high-frequency amplification, and sometimes for use in low-frequency resistance-coupled circuits. This we will call the H.F. type.

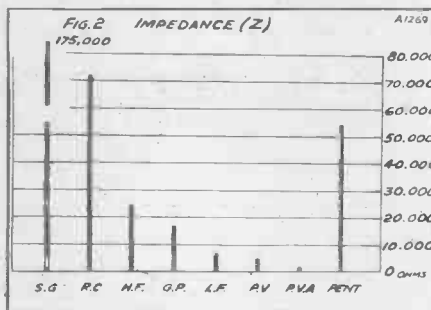
Secondly, there is the type specially made for use in resistance-coupled circuits, referred to as the R.C. type.

Thirdly, we have the general-purpose or G.P. valve, which may be used either as high-frequency or first stage low-frequency amplifier or detector.



Fourthly, there is the low-frequency amplifier, or L.F. valve, often recommended for use directly after a detector, before an intervalve transformer.

Then come the power valves, and here classification is rather difficult. We might, however, recognise two types, which we will call the power valve (P.V.), and the super-power valve (P.V.A.).

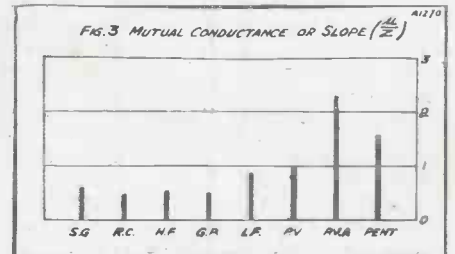


Finally, there are the two new types—the screened-grid (S.G.) valve, used for high-frequency amplification, and the pentode, which is a power valve with a very high amplification factor.

Amplification Factor.

The feature of a valve which, at first sight, is of the greatest importance, is the amplification factor. This is practically a measure of the number of times by which the valve magnifies signals, no account being taken of the inter-valve coupling.

Thus, in the case of a valve with an amplification factor of 10, voltage variations—and, therefore, the signal strength—in the output circle of the valve are ten times as great as those in its input circuit. In Fig. 1 are shown diagrammatically the relative amplification factors of the types of valve enumerated above, all the figures being taken from the catalogues of leading valve manufacturers.



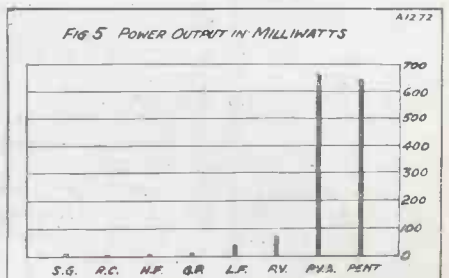
that in the early days of broadcasting the only valves available for high-frequency amplification were general-purpose valves with an amplification factor similar to, or less than, that of the low-frequency amplifying valve shown in the diagram.

Impedance and "Slope."

In Fig. 2 are shown the relative impedances of the valves under discussion. It will be seen that the valves with the highest amplification factor also possess the highest impedance, which, unfortunately, is not a desirable characteristic. A very low impedance is necessary for a power valve, because this means a large possible power output for operating a loud speaker, and a capability of handling a large voltage input (i.e. strong signals) from the preceding valve.

In the case of H.F. and R.C. valves, a high impedance means that a relatively small percentage of the available output from the valve is expended upon the coupling resistance or tuned circuit, and handed on for further amplification.

(Continued on next page.)



VALVE COMPARISONS.

(Continued from previous page.)

Since valves are required to have as high an amplification factor as possible, consistent with the lowest possible impedance, the ratio of these two figures, i.e. the amplification factor divided by the impedance, is a very useful criterion of a valve's performance, especially as a low-frequency amplifier.

This figure is given by the steepness of the slope of the ordinary plate current-grid voltage characteristic curve of the valve, and so is often simply referred to as the slope, but more technically as the *mutual conductance*. The relative slopes of the types of valve under consideration are shown in Fig. 3, but it must be remembered that, while the slope is a feature which largely determines the relative merits of two valves of the same type, it cannot fairly be used for comparing, for example, a power valve with a high-frequency amplifier.

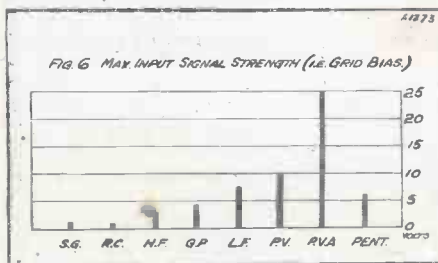
Output Qualities.

In Fig. 4 are shown the relative voltages available from the different types of valve at the following valve grid, the type of inter-valve coupling being assumed which will give the greatest signal strength combined with good quality of reproduction. Thus, the small power valve is assumed to be followed by a 5 to 1 ratio transformer, the L.F. valve by a 3 to 1 transformer, the R.C. valve by a half-megohm resistance and four-megohm grid leak, and the H.F. and S.G. valves by H.F. tuned transformers.

It is noticeable from this illustration that, in spite of its very high amplification factor, the R.C. valve will hand on considerably less voltage to the following stage than will the L.F. amplifier or power valve followed by a suitable transformer.

The signal strength obtainable from a loud speaker depends almost entirely upon the power output from the last valve of the receiving set. This, in turn, depends upon the amplification factor, impedance, and possible grid swing of the valve, and is a figure which is seldom given by valve manufacturers.

In Fig. 5 the relative power outputs possible from the valves under consideration



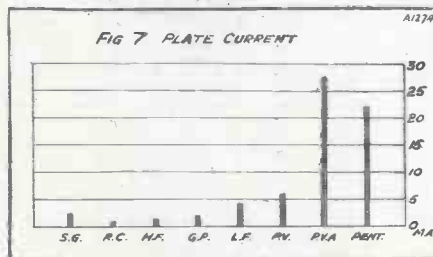
are shown. From this diagram it is evident what an enormous increase in available power results from the use of a really large power valve.

Fig. 6 shows the values of grid bias required by these valves, and is thus an indication of the relative strengths of input signals that can be handled by the different types. The remarkable properties of the pentode will be clear from Figs. 5 and 6 considered together, for you will see

that the outputs of the pentode and the super-power valve are practically equal, whereas the signal strength necessary to produce these results in the case of the pentode is only about a quarter of that required by the three-electrode valve.

Now, what about the cost of upkeep of these valves? In Fig. 7 are shown the relative plate currents taken under proper working conditions. This diagram will serve to emphasise the need for large high-tension batteries, when good loud-speaker results, involving the use of a large power valve, are required, for it is evident that the drain put upon the battery by a super-power valve may be several times as great as that produced by all the other valves in the set put together.

It will be realised, of course, that the constants (amplification factor, impedance, and so forth) of any one type of valve vary considerably according to the make of valve. These diagrams should, nevertheless, enable the essential differences between the types to be seen at a glance, and should serve to emphasise the importance of using the right valve in the right place.



RADIO REMINDERS.

Among the easily tried cures for electrical interference are the better spacing of leads, the avoidance of hidden mains wiring in the walls, the provision of screening, and the placing of large condensers across sparking contacts.

In home-made H.T. units the rated working voltage of the fixed condensers connected across the mains should be greatly above the normal voltage which the finished unit will take, so that for 200-volt mains a condenser tested for 500 volts is advisable.

The frayed edges of flexible wires may be tidied either by a little blob of sealing-wax, binding with cotton, or by pushing on a length of bicycle valve tubing.

If your output filter is to incorporate only one large fixed condenser instead of two, be sure that its insulation is above suspicion as it will have to bear the full voltage of the H.T. supply across it.

The damping effect of a close-coupled aerial circuit is very much greater in a short-wave set than in the case of a set working on ordinary wave-lengths.

Instead of loose inductance coupling between the aerial and grid circuit it is often an advantage in short-wave work to use capacitive coupling, obtainable by means of a neutralising condenser.

Before trying to find a fault in a receiver, always disconnect the batteries.

AMERICAN RADIO PRACTICE.

(FROM A CORRESPONDENT.)

IT is interesting to make comparisons between our popular radio ideas and those of America. The Americans have developed the A.C. receivers to a high state of perfection, and battery-operated receivers are in the minority. This state of affairs has been brought about by the fact that in that country nearly all mains voltages are identical and all A.C.

Of course, there are exceptions, and in those places the battery receiver still reigns supreme. Of course, all the new receivers are screen-grid models. Here it might be mentioned that the average commercial American receiver employs four screen-grid valves.

The American prefers to use a large number of valves and to work them all at a low state of sensitivity, whereas the practice in this country is to use as few a number of valves as we possibly can and work each valve at its highest point of efficiency.

Four S.G. Stages.

The American receiver is now practically a standard article. Practically all manufacturers build their sets on the following plan: They use four screen-grid valves, a detector valve and two stages of L.F., the last stage being a push-pull combination. The receiver is, as before mentioned, A.C. operated, and so four hundred volts or so can be applied to the output valves.

A moving-coil loud speaker is invariably employed. Only three controls are used, one to switch on with, another to tune in with, and another for volume control. The better-class receiver is invariably placed in a "tall-boy" cabinet, the receiver in the upper half and the loud speaker in the lower half. The set is invariably built on a metal chassis, and looks very neat and sturdy. Ganged condensers are always used to provide one-dial control.

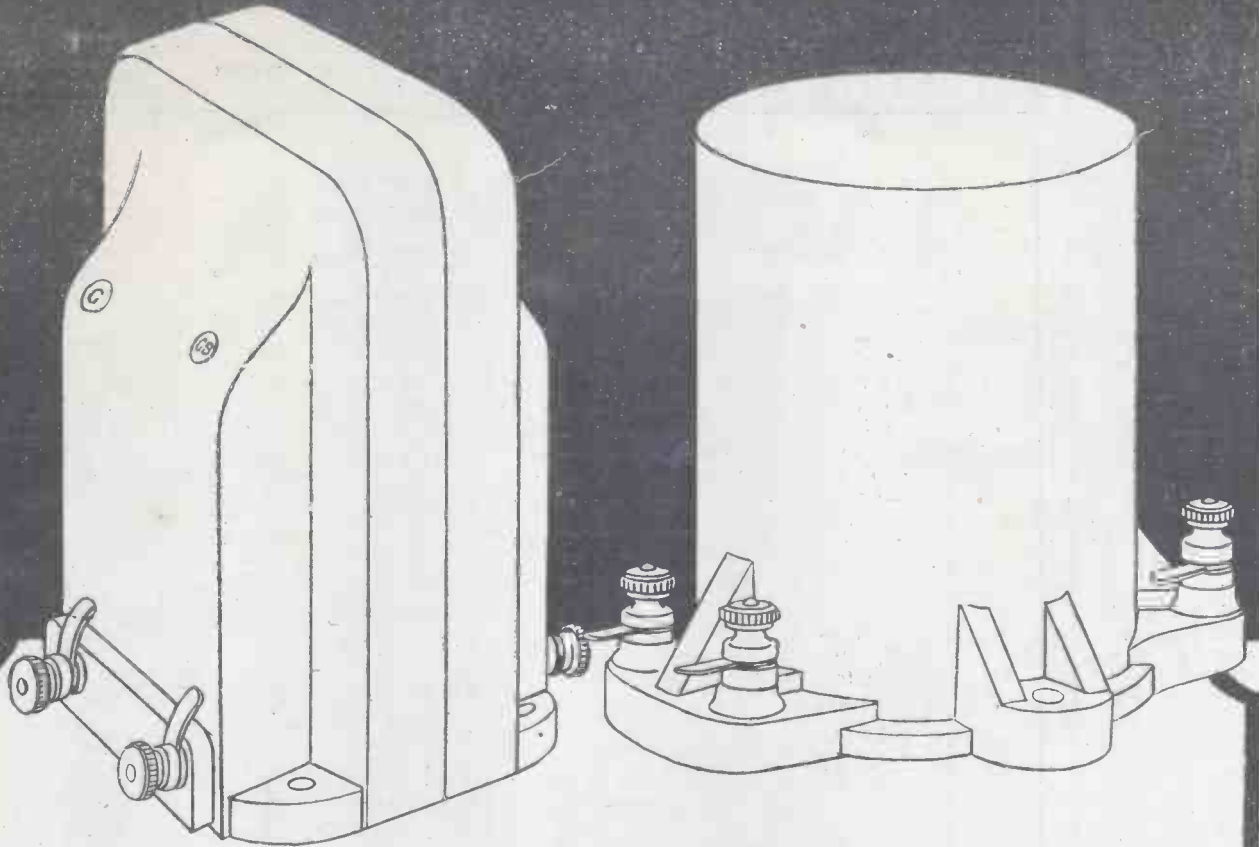
The one-dial control set has been greatly developed in America, but, of course, has been hampered over here by the fact that we have two wave-bands to deal with. The only wave-length range used in America is from 200 to 550 metres.

Reaction receivers are absolutely the wrong thing in America, and are never used. Where screen-grid valves are not used, the usual method of obtaining sufficient sensitivity is to adjust the H.F. stabilising devices until the set is practically oscillating.

Screening the Components.

The screen-grid valve has the grid (not the screening grid) taken to the top of the cap (which, by the way, is not a terminal as with our valves, but merely a round metal cap on to which a wire is fastened by a crocodile clip). Our method of placing a valve halfway through a shield is never used.

The whole valve is generally placed in a shielding can as, also, are the coils. In the newer models the tendency is not to place a valve and all its components in a shield altogether, but to shield each separate component.



not a sound upon the background

A dead silent background is the first thing you notice about the reproduction a Lissen Transformer gives; you get volume, you get purity, because the notes of music stand out with startling definition.

It is well worth while to replace any specified transformer in any circuit you are building with **THE LISSEN SUPER TRANSFORMER**

—with which you get almost perfection amplification—
 The laboratory curves taken of the Lissen Super Transformer prove that there is exceptionally even amplification over the whole band of audible frequencies, and it should be noted that these curves have been taken with ordinary standard valves. Two ratios . 3½ to 1 and 2½ to 1. **19/—** Each

a Lissen Transformer; and if you want to bring you old set up to date, the first step is to get a new Lissen Transformer for it. Because by doing this you get rid of the rustling background which less carefully-designed transformers always will produce; the notes of music, words of song or speech are amplified in a background upon which no other sound is heard.

The Famous 8/6 LISSEN TRANSFORMER

For all ordinary purposes this Lissen Transformer at 8/6 has proved itself the equivalent of many at double the price, and its popularity has been reflected in huge sales. In the two years since it was introduced it has earned the title of "The Transformer that never breaks down." **8/6** Ratio 3 to 1

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Obtainable of all Radio Dealers.
LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, Middlesex. Factories also at Richmond (Surrey) and Edmonton.
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EVERYTHING ELECTRICAL

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Go home and listen with

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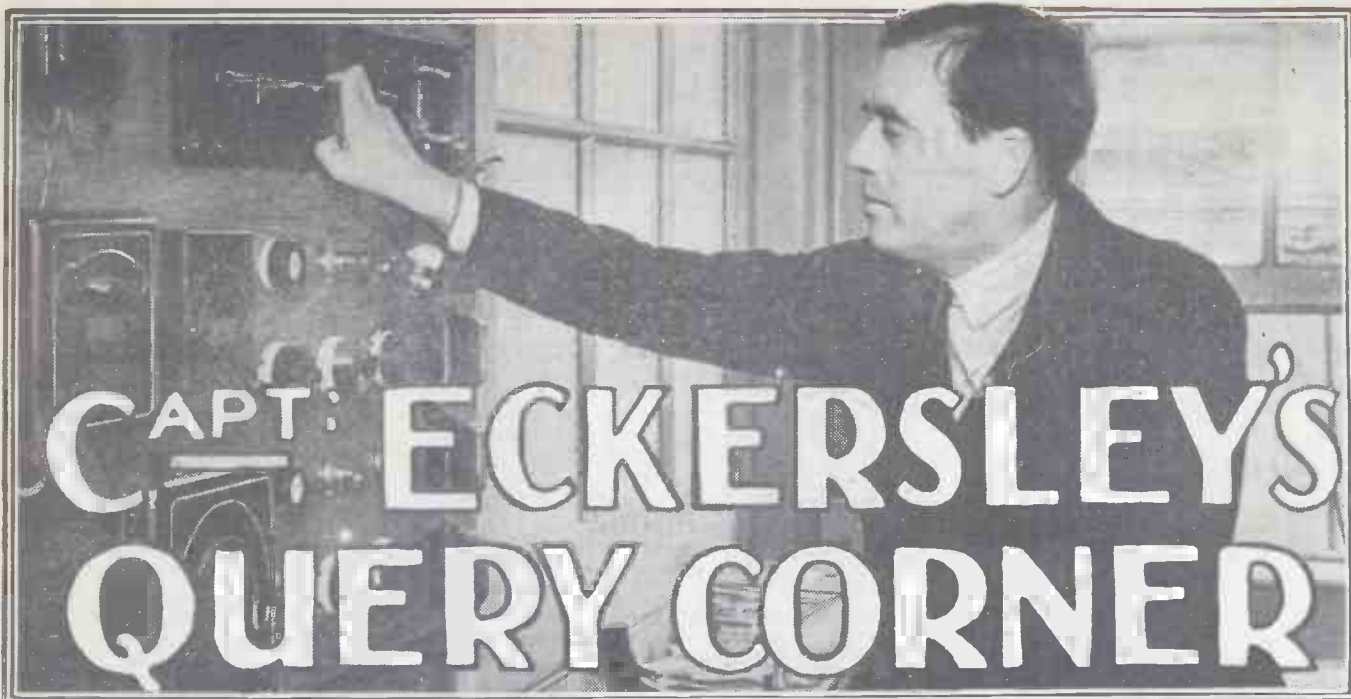
One of the famous
OSRAM
SUPER-POWER
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 will make
 the programmes
 louder, clearer and
 more life-like.

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"TENACIOUS COATING"

MADE IN
ENGLAND

Sold by all
Wireless Dealers



How Does An Electrolytic Condenser Work?

F. P. D. (Harlesden).—"Could you explain roughly what is the general principle on which electrolytic condensers (such as those used in L.T. eliminators) work?"

An electrolytic condenser is made up of metal plates suspended in an electrolyte, and works on D.C. voltage only. If a uni-directional voltage is applied a current flows from plate to plate. This makes a gas form on the electrode.

This gas forms a thin film between electrode and electrolyte, and this gas, being an insulator, stops further flow of current because, contrary to practice in primary cells, there is no depolarising substance present.

The thin layer of gas thus also forms an effective insulation and makes plate and electrolyte form a condenser. If the gas film is very thin the capacity is extraordinarily high, higher for given volume of container than if thin paper were used.

The condenser is only useful for D.C. current, and as far as I know cannot be used for very high voltages, when the gas film would break down.

Disconnecting H.T.

S. C. (Cobham).—"When the H.T. — is connected to the L.T. —, and the L.T. + goes through the "on-off" switch, is it safe to leave the H.T. leads plugged in without any fear of the H.T. current being consumed when the switch is off? If it is not safe, is there no other means of making it safe than by pulling out the H.T. + plugs?"

If the valves are cold, no current can flow from the H.T. + if that terminal is connected only through various circuits to the anodes of the cold valves. There may be, of course, some little leakage through the components of the set to earth, and sometimes electrolytic action is set up in the fine wire of transformers owing to a leaky current from the H.T. + to earth.

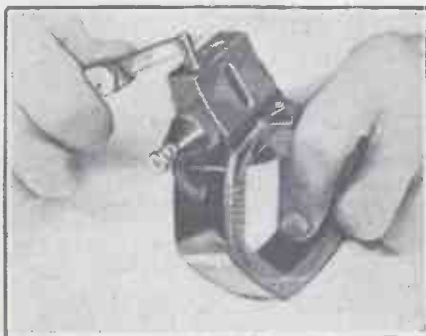
Some people prefer to "diss" H.T. before going to bed, by removing the neg. plug, but with modern components I don't think

* * * * *

Under the above title, week by week, Capt. P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Capt. Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

* * * * *

it's really necessary. The very careful person will diss both H.T. and L.T. (All this does not apply to mains units.)



YOUR 1930 RESOLUTION!
"I will always keep plugs tight in their sockets, by occasionally opening them with a penknife."

Howls When L.S. is Touched.

T. C. M. (Bradford).—"Why does my set squeal when I touch the loud-speaker terminal?"

"Apart from this annoying howl, the set functions perfectly well, and the quality of reproduction is excellent."

Probably a low-frequency reaction effect of some kind. The capacity of your body is sufficient to throw back energy into earlier valve stages.

This causes oscillations and these quench themselves, but having quenched they

restart . . . nothing forces them to stop except themselves! . . . and stopping and starting some thousands of times a second they throw in and subtract energy from the loud speaker some thousands of times a second and, of course, the faithful loud speaker howls at its treatment.

A Frame Aerial Puzzle.

H. F. S. (Lee).—"I am contemplating the construction of a portable receiver with a screened-grid H.F. stage. The frame aerial is to be built into the cabinet, and to prevent interaction with the H.F. circuits I am thinking of winding it astatically. Is there any objection to an astatic frame aerial?"

What do you mean exactly by an astatic coil? If you mean one which is wound a bit one way and a bit the other so that no appreciable external field is produced you'll get no pick-up on it as a frame aerial. Screen your H.F. stage, and use a conventional frame aerial.

Condensers in Series.

L. V. (Huddersfield).—"What is the formula for working out the value of two condensers in series? I desire to connect a .0003 reaction coil to a .0001."

Let C_1 equal the capacity of the one condenser and C_2 the capacity of the other, then C the final effective capacity is equal to

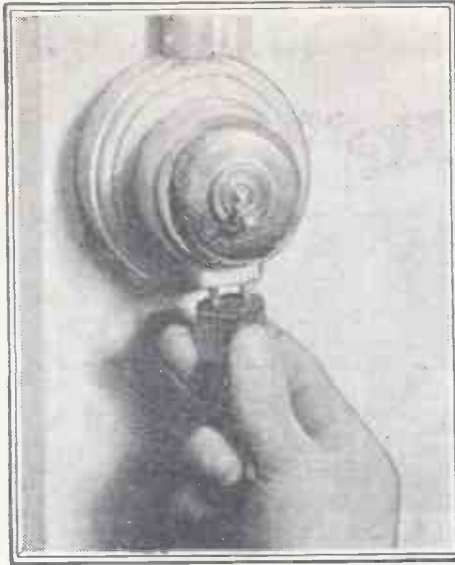
$$\frac{C_1 C_2}{C_1 + C_2}$$

I think your last sentence has gone a bit wrong but a 0.0001 condenser in series with a 0.0003 condenser is $3 \times 1 \times 10^{-8}$
 $\frac{(3 + 1) \times 10^{-4}}{}$
which equals 0.75×10^{-4} , or 0.000075.

Baffle-Board Dimensions.

J. D. U. (Wandsworth).—"Is it better to employ a box baffle of reasonably small dimensions or a flat baffle with a slightly larger frontal area?"

The larger the "frontal area" up to reasonable dimensions is theoretically the better. A flat 3 ft. by 4 ft. is good and reasonable.



The NEW "P.W." SAFE POWER UNITS

By G. P. KENDALL, B.Sc.

RADIO suffers from a difficulty which seems inevitably to afflict every art or science which has developed very rapidly: much of its current practice is based upon assumptions made in the early days which no one has since had time to examine critically.

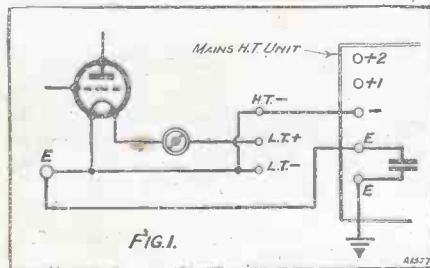
Those assumptions may be right, and they are very often, but things move so fast that most of us are too busy taking advantage of new developments to stop and inquire into them. The result is that those of them which happen to be wrong live on indefinitely and lead us astray in the same old way time after time.

In hopes of doing our bit in the direction of abolishing a few of these fallacious and misleading assumptions every now and again, it is the custom of the "P.W." Research Dept. to pick out some established practice whenever time permits and subject it to analysis and criticism in which nothing is taken for granted.

Urgent Review Required.

Often, of course, we draw a blank, but in a proportion of cases something useful results, and we are able thereafter to straighten out and rationalise our practice in relation to the particular bogey we have abolished.

As a rule we do not trouble the reader with any special account of these alarms



and excursions, but merely embody the new schemes we have developed in our future set designs, or what not, but now and again we come upon something which is interesting in itself, and seems to call for separate description.

Recently we have been sifting through the whole subject of the use of the mains

for the current supply to wireless receivers, and here we have found so many wrong, or at least incomplete, assumptions behind usual practice, that we think some account of our work would be welcomed.

The whole question seems to have been in urgent need of review, and the immediate result of our investigations is that we are now in a position to produce a line of designs for mains units which will be more efficient, safer to use, and more logically and economically arranged than those previously available. More of this later.

Let us take a few examples and show you how often the usual methods hitherto employed have been based upon ideas too hastily assumed to represent the one and only way of doing things. Consider, first of all, methods of making the earth connection to a set working on a D.C. mains H.T. unit

Mains units and sets are becoming more and more popular and their popularity will increase as the new electricity schemes are brought into operation. In view of this, the "P.W." Research Dept. has decided to carry out intensive investigations into the subject of radio mains devices with a view to the production of safe designs that will completely meet the requirements of modern times. Safety in installation and operation, and inexpensiveness in construction and low running costs are the main ideals at which we are aiming. Some indication of the measure of our success is given in the accompanying article, the second of a short introductory series.

2. MAINS UNIT FACTS AND FALLACIES.

(we propose to deal with D.C. problems first).

Now, the almost universal scheme has hitherto been that illustrated in Fig. 1. It is, of course, necessary to provide a large fixed condenser (usually of 2 mfd.) in series in the earth lead to eliminate risks of shorting the mains, and the custom has been to include this in the H.T. unit.

Unnecessary Complications.

One side of this condenser is then connected to the "E" terminal on the set, and the earth lead is taken to the other side.

But look at the wire running between H.T. — on the set and the "—" terminal on the H.T. unit. Do you observe that H.T. — in the set is wired to the L.T. circuit, which is bound to be earthed in any normal set?

A glance at Fig. 1 will show that the E terminal there is connected through the filament wiring to H.T. — and so across to the mains unit, and you can take this as being typical of practically any set. Fig. 1 is really just a skeleton diagram showing the filament, earthing and H.T. negative

connections of any set, although only one valve is shown.

Just observe that we have here two connections between the set and the H.T. unit which could just as well be combined in one. Why not arrange matters as in Fig. 2?

Here we have a single lead from H.T. — on the set to the negative terminal of the H.T. unit, and the series earth condenser is connected to this same point. The earth-lead then goes on the other side of the condenser, and there are your connections completed with one less lead between set and unit.

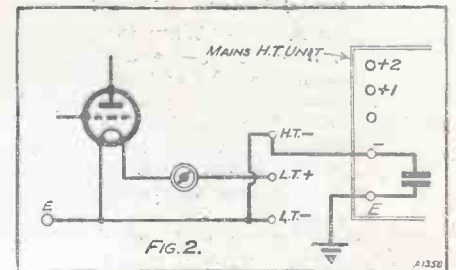
This is the scheme we have decided on as the standard arrangement for our new series of H.T. units. It is only a small point, but anything which will simplify mains working is welcome.

A Simpler Scheme.

A possible objection to it which may strike the more experienced constructor is this: In some sets a fuse is provided between H.T. — and L.T. —, and our scheme would bring this in series in the earth-lead, with probable ill-effects.

The remedy is very simple: Join the H.T. unit negative terminal to L.T. — on the set, instead of to H.T. — thereon. The fuse is thus cut out, and its safety effect is lost, but this point is one we shall cover in other ways in the mains unit itself.

The whole question of the earthing of sets working on D.C. mains has been reviewed, and we shall be making suggestions later as to special methods of earthing which we have found advantageous. In particular, we have experimented with different ways of using the mains themselves as an earth, and some of these have proved very successful.



The whole subject is full of interest, and we are sure that readers will enjoy this probing of conventional practice just as much as we have done.

We must content ourselves for this week, however, with just these introductory notes, and leave more detailed explanations of these and a host of other points for future articles in this series.

A BATTERY DRIVEN POWER PENTODE

for

ANY SET WITH ONE STAGE OF L.F.

Now that Lissen have produced this new battery-driven Power Pentode Valve, you can get fine loud-speaker volume from any set with one stage of L.F. amplification. In any 2-valve set this new Power Pentode gives double volume; in a 3-valve set—H.F. Detector and L.F.—it gives abundant power on distant stations that before were but a whisper.

The Lissen Power Pentode consumes only 7 milliamps of H.T. current. You can therefore run it economically off ordinary H.T. batteries—the only power pentode valve with anything like such a low consumption.

THE
VALVE
WITH THE
EXTENDED
GRID

There is no rewiring of your set—just a piece of flex and a wander plug from the pentode terminal of the valve to the highest H.T. tapping on your set (or + 100 volts, whichever is lower)—no alterations necessary at all, and no extra batteries.

AND A LIVELY
DETECTOR
VALVE

LISSEN 2 VOLT POWER PENTODE P.T.225 17/6

The Lissen Detector Valve is lively because of the Extended Grid, which controls every electron emitted from the filament. Every fraction of energy is utilised, every impulse definitely passed on. And the liveliness LASTS because the emissive surface of the filament is actually amalgamated to it and therefore does not disintegrate.

H.L. 210. Price 10/6

LISSEN

NEW PROCESS

VALVES

LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, MIDDLESEX (Managing Director: T. N. COLE)





POINTS READERS RAISE *by* "PENTODE"

THERE may be readers of "P.W." who are in standard 1 of the school of radio knowledge, but I refuse to believe that there is a single one that couldn't beat me hollow at something other than wireless.

Therefore, if anyone writes to me and says he cannot follow this or that point which I bring forward, then it is generally my opinion that I haven't expressed it clearly.

On the other hand, I have deliberately hastened past certain things simply because it would take too long to give these adequate treatment and because they are not relevant to my "story."

Take, for instance, magnetic lines of force, induction and current flow. It has been quite rightly pointed out that when I briefly discussed A.C. and lightly touched on magnetic fields and transformers, I said nothing about the direction followed by the current induced in the secondary winding of a transformer.

Facts for Physicists.

Now I maintain that the radio amateur need not worry about such a point any more than he need worry about the Atomic Structures, Weights and Numbers of chemical elements, and many other things that are the delight of the physicist.

Anyway, I don't mind admitting that I know little of these myself, although I have held down some fairly noteworthy radio jobs, and am reckoned moderately successful in this sphere.

If you wish to delve deeply into radio you must undergo a general scientific training, for radio is interlinked with all the sciences.

In the "Rapid Guide" I am addressing myself to the man who wants to know the general principles on which his set works, and who wishes to acquire enough theory to enable him to tackle the devising of circuit arrangements. But my little articles alone are not enough; they must be regarded purely as a guide to the other articles that appear in "P.W."

For this reason I would once more ask my readers to be patient with me until I write "Finis," and then ask themselves whether they feel they have found a key to a more intelligent appreciation of the work of Mr. Kendall, Mr. Randall, Mr. Dowding, and

From the large number of letters received, our popular contributor "Pentode" selects and discusses a few of the queries asked about his articles.

their colleagues. On the answer to that question the value of my contributions will rest.

In the meantime, here are some of the points raised by correspondents together with my comments.

"I find 'Impedance' a hard word to understand."

It is really quite simple; it is the Resistance offered in a circuit to Alternating Current, current that flows first in one direction and then in the other. It is expressed in Ohms, and Capacity and Inductance contribute towards it as well as the ordinary Resistance in Ohms that is the only factor that limits the flow of Direct Current.

The confusion probably arises in the use of the word Resistance. If you substitute "Limitation" for the first Resistance I have employed in the above paragraph it may help you to get the idea.

The mechanical analogy for Resistance is Friction. And sometimes you may say something like this: "This wheel offers a lot of resistance—it is very stiff to turn." Whereat you expend more energy in overcoming the friction of its bearings than you would in turning at a similar speed a similar wheel which had less "resistance in its circuit"!

Some Useful Rules.

An electrical circuit having a lot of resistance, demands a greater electrical pressure to drive a given current through it than a low-resistance circuit.

"You say the rule for capacities in series is the same as for resistances in parallel, and the rule for inductances in series is the same for condensers in parallel, etc., etc. Cannot you give us in a few words exactly how these things work out?"

Afraid not; but I can tabulate the lot here and now!

- When Resistances are Joined In Series, or—
- When Inductances are Joined In Series, or—

When Capacities are Joined In Parallel—
Just add the individual values together.

When Resistances are Joined In Parallel, or—

When Inductances are Joined In Parallel, or—

When Capacities are Joined In Series—
Use that Reciprocal business, i.e. the Reciprocal of the total value is equal to the sum of the reciprocals of the individual values.

You will see that Capacity is the "odd man out," and ruins an otherwise straight-forward arrangement!

"Why is it that metals of all kinds conduct electricity easily?"

What is a "Stage"?

This is a query that would take a long while to answer in full. All I can say is that it is because the constitution and nature of their atoms are different from those of substances such as mica and wood (which you will gather from the physical difference of these materials, which are of brittle character).

"What is that 'Skin Effect' I have heard of in connection with H.F. currents?"

The tendency for H.F. current to skim along the surfaces of conductors and not penetrate right through such as does Direct Current. The higher the frequency the less the penetration. A tube of thin metal can be as good an H.F. conductor as a rod of metal of the same overall diameter.

"Why can't you hear radio waves when you are very close to a broadcasting station?"

Because they are not air waves but ether waves, and ether permeates all substances. Your ear drums offer no resistance to ether waves, they pass as easily through flesh and bone as wind does through an open window. That is only one reason, but it is sufficient, I think!

"What exactly is a 'stage'?" "What is an L.F. 'stage'?"

The one valve detector circuit arrangement the series has just covered is a "stage." The word is used in this way. The detector circuit constitutes a definite stage in the handling of the energy developed in your aerial by the broadcaster. An L.F. valve and its intimate components constitute another "stage."

LISSEN ACCUMULATOR



Free
**CARRIER
SUPPLIED**

One more triumph of Lissen organisation—one more example of Lissen value for money—the Lissen L.T. accumulator. Here is a complete range of highly efficient accumulators, sturdily built to give absolute satisfaction in use and long life. These accumulators are designed to give absolutely trouble-free service. The plates are all very thick, the containers are strongly made, and the general appearance and finish of the Lissen accumulators is far in advance of usual standards.

All the Lissen accumulators listed below are supplied with strong carrier, free.

PRICES DULL EMITTER (Type G.M.)

L.N.503 2-volt. 20 amp. hours	4/6
L.N.504 2-volt. 20 amp. hours	8/6
Multiple plate type, glass containers.	
L.N.500 2-volt. 20 actual amp. hours	9/8
L.N.502 2-volt. 48 actual amp. hours	13/8
L.N.560 2-volt. 60 actual amp. hours	17/8

EXTRA CAPACITY

L.N.555 2-volt, 24 actual amp. hours	10/6
L.N.557 2-volt. 48 actual amp hours	14/8
L.N.559 2-volt 72 actual amp hours	18/8



H.T. ELIMINATORS YOU CAN USE WITH YOUR SET LIKE A BATTERY

The current you get from Lissen Batteries is the purest power you can get for radio. But if you want to use an eliminator, use a Lissen Eliminator. You'll then get H.T. current from your mains smoother, steadier, better than before. There are 4 types of Lissen Eliminator: one of them will almost certainly be just right for your set. Tell your dealer what voltage your mains supply is and whether it is A.C. or D.C.; tell him what output you require, or what valves you are using, and he will show you the Lissen Eliminator to suit your needs. Then you only have to take your battery out and put the Lissen Eliminator in its place. No need for special wiring. These Lissen Eliminators are cased in insulating material and the lead is heavily insulated cab-tyro flex.

TYPES AND PRICES.

D.C. MODEL "A" Employs 3 H.T.+ tap- pings: H.T.+1 giv- ing 80 volts for 8 G. valves; H.T.+2 giving 60 volts at approx. 2 m/A for detector valves; H.T.+3 giv- ing 120/150 volts at 12 m/A PRICE 27/6	D.C. MODEL "B" Employs 3 H.T.+ tap- pings: H.T.+1 and H.T.+2 are con- tinuously variable (by means of two control knobs) and capable of giving any desired voltage up to 120/150 volts at approx. 2 m/A; H.T.+3 giving 120/150 volts at 12 m/A for power valves PRICE 39/6
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Models working on 100/110 Mains Voltage give output voltages of approximately 80 per cent of above values.

A.C. MODEL "A"	
Tappings as in D.C. Model "A"	
LN 576 for A.C. Mains voltage	200-210
" 577 " " " "	220-230
" 578 " " " "	240-250
" 639 " " " "	100-110
PRICE	£3: 0: 0
A.C. MODEL "B"	
Tappings as in D.C. Model "B"	
LN 579 for A.C. Mains voltage	200-210
" 580 " " " "	220-230
" 581 " " " "	240-250
" 640 " " " "	100-110
PRICE	£3: 15: 0

LISSEN

ELIMINATORS

LISSEN LTD., Worples Road, ISLEWORTH, Middlesex.
(Managing Director T. N. COLE)



ADJUSTABLE BALANCED ARMATURE UNIT

The Lissen 4-Pole Balanced Armature Unit brings something approaching loud-speaker perfection within the reach of everybody who owns a radio set. You can build any type of cone loud-speaker with it; you can use it with a big baffle board, or put it in a cabinet. You can build a linen diaphragm loud-speaker with it, or you can buy it completely assembled and ready to connect up to your set. It has a fine adjustment, and you therefore get the utmost volume from it without chatter.

In brown moulded case with attachment for fitting to any type of cone
PRICE **12/6**

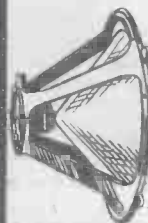
Cast aluminium Chassis, specially designed to give the best results from the Unit
PRICE **7/6**
13-in. cone for use with the above 2/6

COMPLETE ASSEMBLY

with which you get the nearest possible approach to moving-coil tone and fine full volume without chatter.

Ready for use or to mount in a cabinet. Price

22/6



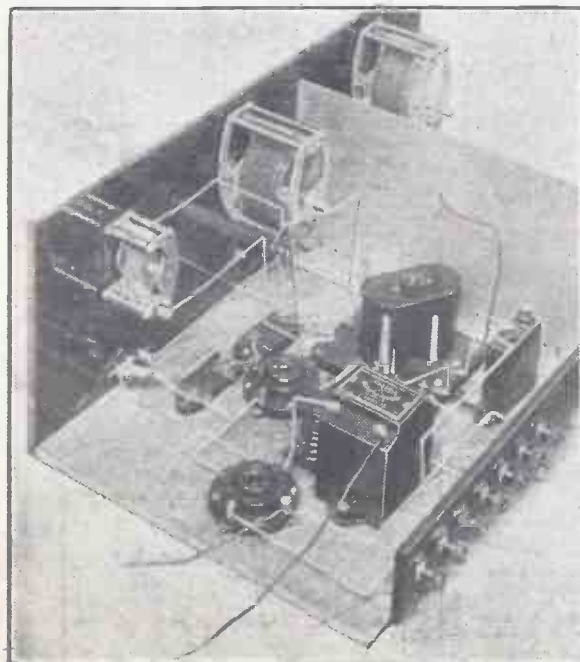
WE have recently been making one of our customary periodical surveys of the set designs published in "P.W." in the last few months. (We make a practice of doing this at suitable intervals as a check upon the correct "mixing" of the series of designs we provide for our readers.)

We aim, as the regular reader will no doubt have observed for himself, at the production each season of a well-balanced line of receivers incorporating the latest and best ideas and providing at least one specimen of each of the most popular and useful types of sets. In the more important types, of course, we usually succeed in producing quite a number of examples in the course of a season, with varying special features to suit them as closely as possible to the different needs of individual constructors.

Excellent General-Purpose Type.

Our survey this time showed us that it was time to turn our attention to one very valuable type of general-purpose receiver, namely, the three-valve set containing one high-frequency stage, detector, and one low frequency. This, as the more experienced reader will know, is one of the most useful of all combinations for general purposes, especially where the user is limited to a rather inefficient type of aerial, as so many of us are who live in towns.

Not merely is a good specimen of this type capable of giving really good volume from the local, 5 G B and 5 X X, almost anywhere in the British Isles, but the extra sensitivity conferred by a good screened-grid H.F. stage enables it to put up a good show on foreign stations even in very unfavourable circumstances of a small and poor aerial, and so on. Again, the fact that it usually incorporates two tuned circuits means that it will, if properly designed, provide to the full that higher degree of selectivity now so desirable.



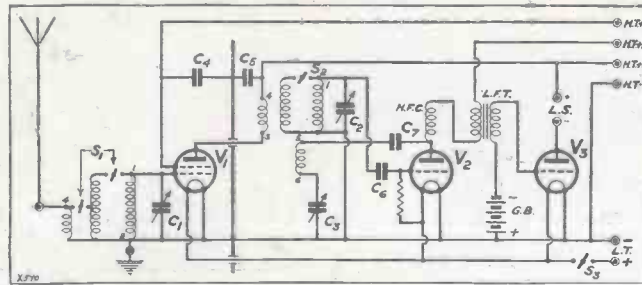
This is the Detector and L.F. end of the receiver.

We have produced the "Twin-Wave" Three as a representative of this type of receiver, and our special aim in designing it has been to secure the greatest possible simplicity and ease of operation and construction, combined with really high sensitivity and an efficient wave-change switching system.

Very Easy to Work.

This may seem a rather formidable list of requirements to combine in a single receiver, and so it is in actual fact, but it is by no means an impossible one to satisfy with the aid of modern screened-grid valves and the latest wave-change coil units now available to the designer. The "Twin-Wave" Three has amply met our requirements on actual test and we are placing it before our readers with every confidence in its power to meet their needs.

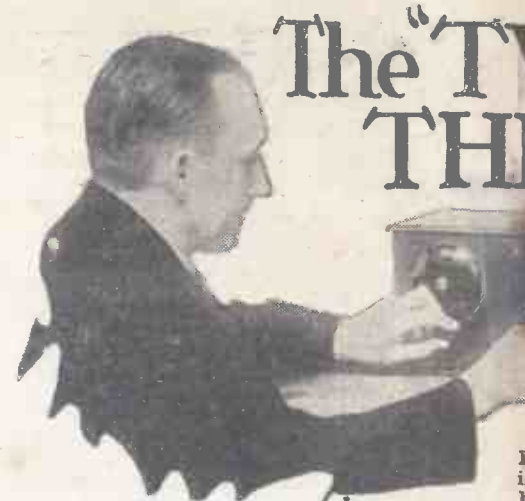
First of all, about its simplicity of operation. If you will examine the photograph showing the front panel, which you will see in the heading of this article, you will observe that there are very few controls indeed. There are two tuning



dials, and these are very easy to handle as a result of the fact that they keep together quite well over the tuning range, and when you have once discovered the correct small difference in reading between them you will find that this holds fairly constant for all stations, except those at the very bottom of the range.

Immediately below each tuning dial you will see a small knob projecting from the panel and these are the wave-change switching controls. When these knobs are pulled outwards the set is switched for the ordinary broadcast wave-lengths, and when pushed inwards it goes over to the long waves with no other alteration of tapings or coil changing of any kind.

To the right of the second tuning dial is the reaction control (marked C₃ in the diagrams), and immediately below this the on-off switch. This completes our list of panel controls. There are no other adjustments of any kind in the set, and we believe it is just about as simple to work as any set of its excellent standard of



sensitivity and selectivity very well can be.

Simplicity of construction is an item which really speaks for itself as soon as you look at the photographs of the interior of the set. The wave-change switching, you will discover, does not in any way complicate the construction of the set.

because it is obtained by means of some very neat and efficient special coil units which incorporate a built-in switch.

The connections to these units are just the standard ones for this type of coil, and the switch is actually an integral part which makes no difference whatever to the wiring. All that the provision of wave-change does is to

to operate. N bodies an efficient system and at high order of a kind of "house" you want dist loud speaker juggle the cont

Designed by THE "P.W." CONSTRUCTION

- 1 Panel, 18 in. x 7 in. (Resiston, Trelleborg, Becol, "Kay Ray," Paxolin, Goltone, etc.).
- 1 Cabinet to fit, with baseboard 10 in. deep (Camco, Raymond, Pickett, etc.).
- 2 .0005-mfd. variable condensers (Lissen, Lotus, J.B., Igranic, Bowyer-Lowe, Raymond, Igranic, Dubilier, Utility, Ormond, Burton, Formo, Polar, etc.).
- 2 Slow-motion dials, if condenser not of slow-motion type (Lissen, J.B., Igranic, Formo, Lotus, Utility, Brown, Ormond, etc.).
- 1 .0002-, or .00025-mfd. reaction condenser (Polar, Dubilier, J.B., Utility, etc.).
- 1 On-off switch (Lotus, Igranic,

- Benjamin, B. Raymond, Ju etc.).
- 3 Sprung valve h min, W.B., Ig Dario, Formo etc.).
- 1 D.B.A. and change coil u num, Leweos
- 1 H.F. choke Dubilier, Lis Igranic, Wea num, Leweos
- 1 Low-ratio L ley, Ferranti, Lotus, Telse Mullard, Phi etc.).
- 1 .0003-mfd.

require you to drill two extra holes in the panel and fit the extension handles which project through them.

Carrying on the idea of making the construction as simple as possible we have worked out the lay-out with a great deal of

A WAVE-CHANGE SET FOR I

TWIN-WAVE THREE



Here is a set which is extremely easy to construct and nevertheless, it maintains a wonderfully efficient wave-change sensitivity. Just the "hold" set needed if you have stations on the dial without having to retune delicately.

Described by
**RESEARCH AND
DEPARTMENT**

care to make the wiring very easy, and with this end in view we have aimed at rather open arrangement of parts on the baseboard, the net result being a set which is most exceptionally easy to put together.

Only very simple screening is required, the coils being of the semi-fieldless or binocular type, and the actual screen employed is of a standard variety

which you can buy ready made quite cheaply and just screw down upon your baseboard in the correct position. The use of such simple screening as this adds scarcely anything to the constructional work.

On test the "Twin-Wave" Three performed exceedingly well, and brought in on the speaker all the more important foreign

adverse local conditions, and so requires the aid of a good H.F. stage.

At the same time, special pains have been taken to keep it extremely simple to operate, because we particularly wanted to make it thoroughly suitable as a domestic receiver for the B.B.C. programmes.

Its selectivity is particularly good, even for a two-dial set. It is naturally very much better than that of any ordinary single-dial receiver, although such a specially selective specimen of the latter type as the "Magic" Three approaches it fairly closely.

Excellent Selectivity.

Our tests lead us to believe that it will be capable of separating the two Brookmans Park transmissions, and of cutting them out and receiving foreigners over a considerable part of the dials, at comparatively short distances. This question is a little difficult to estimate accurately, but we think we are safe in predicting that it will do this at distances of about seven miles and upwards from the new station.

such a combination, for example, as the "Magic" Four, and a comparatively small aerial. Brookmans Park at such ranges is really equivalent to an ordinary main station at a distance of perhaps one mile.

We are rather stressing this point, because we find that a lack of appreciation of the really acute nature of the difficulty is leading some of our readers to feel disappointed with their sets quite unjustifiably.

The fact is that if you live less than about 6 or 7 miles away from the new station you need something really phenomenal in the way of selectivity, unless you use a rejector.

So you see, we are really making pretty considerable claims for the present design in saying that it should deal satisfactorily with the new station at ranges of about 7 miles upwards, without a rejector. That really means that it will meet almost any demands likely to be made upon it.

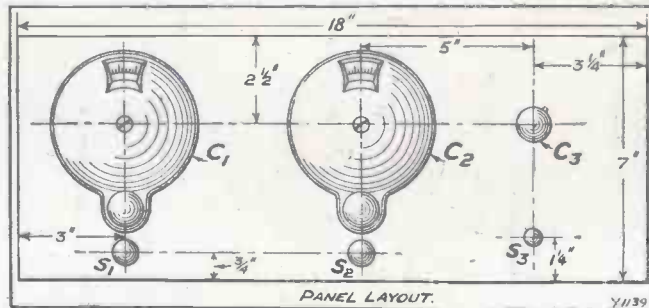
Simplicity & Efficiency.

The circuit of the "Twin-Wave" Three is very plain sailing, as you will see, and shows very clearly what a very simple type of set it really is. It really does not call for any detailed explanation, beyond pointing out that transformer coupling is used in the H.F. intervalle circuits. The ingenious system of wave-change switching used by the coil makers will interest the more advanced reader.

Just one point about the choice of your components. As used in this receiver, at any rate, the usual capacity of .0001 or .00015 mfd. for the reaction condenser does not appear to be sufficient for these coil units. We found that a capacity of .0002 mfd. was required, and so we are specifying a reaction condenser of .0002, or .00025, mfd.

Constructing the set you will find is quite unusually easy for an instrument of this size, and there are only a few points we shall need to mention. First, note that the holes for the operating knobs of the coil unit switches require to be drilled

(Continued on next page.)



This may not strike you as a very enthusiastic claim at first sight, but you must remember the tremendous power of the new Regional station. If you know anybody who lives less than seven miles from Brookman's Park, just ask him what he thinks, and he will probably tell you that we are confounded optimists, and he doesn't believe it!

It is really a tremendously difficult problem at shorter distances, you know, and something ultra-selective is needed,

COMPONENTS.

Wavelength, Ready Radio, Lissen, Wearite, etc.

Coil holders (Lotus, Benjamin, Lissen, B.T.H., etc.), Magnum, Wearite, etc.

One D.B.G. wave-coil (Lewcos).

Wave-coil (Ready Radio, R.I., etc.), Varley, Lotus, etc.

Wave-coil transformer (Varley, R.I., Cossor, etc.), Igranic, Brown, etc.), Marconiphone, etc.

Fixed condenser

(Dubilier, Lissen, Mullard, Graham-Farish, Clarke, Goltone, Igranic, T.C.C., etc.).

1 .001-mfd fixed condenser (T.C.C., etc.).

2 1-mfd. condensers (Dubilier, Lissen, Hydra, T.C.C., Ferranti, Mullard, etc.).

1 2-meg. grid leak and holder (Lissen, Igranic, Ediswan, Dubilier, Mullard, etc.).

1 Standard "P.W." screen, 10 in. x 6 in. (Ready Radio, Paroussi, Wearite, Magnum, Keystone, etc.).

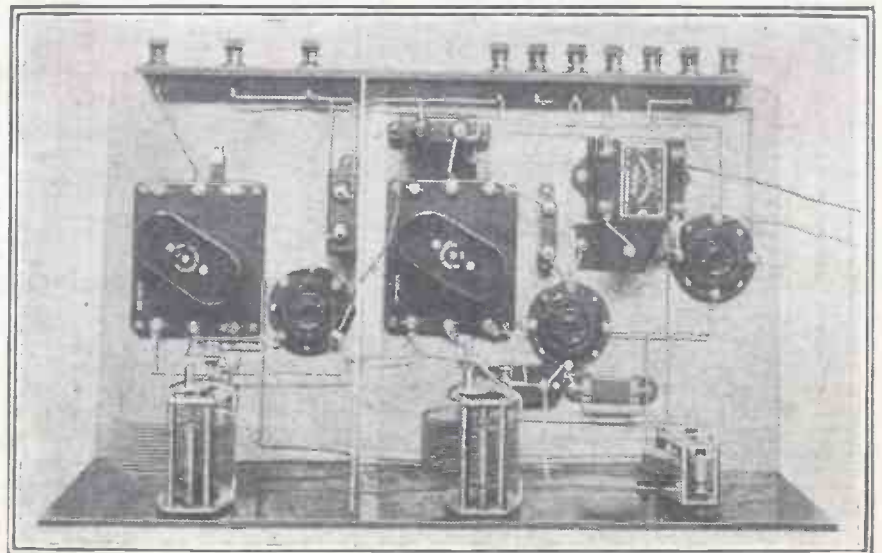
1 Terminal strip, 13 in. x 2 in. or 16 in. x 2 in.

10 Terminals (Belling & Lee, Eelex, Igranic, Burton, etc.).

Wire, screws, Clix plugs, flex, etc.

stations. It did this, too, without requiring the use of reaction to any very great extent, and altogether gave us the impression that it would form a very excellent set for the man who is particularly keen on long-distance reception, but is handicapped by

DISTANT STATIONS



A "bird's-eye" view of the set which very clearly illustrates its exceptionally simple character.

THE "TWIN-WAVE" THREE.

(Continued from previous page.)

rather accurately, so check up their positions carefully.

Then about the wiring; as in all sets employing screening, it is necessary to use some sort of insulated or covered wire for at any rate all those leads near the metal screen, and we suggest some such material as Glazite or ordinary tinned copper wire and Systoflex sleeving.

Note carefully that connection is made to the screen itself at two points, one near the V_1 valve holder, and one near the extreme rear of the set. An easy way of

making these connections is to put a small screw and nut through one of the perforations in the lower edge of the screen and solder direct to these.

Now for the necessary working data. Valves should be these: one upright type screened grid of one of the reliable makes (Cosmor, Ediswan, Marconi and Osram, B.T.H., Mullard, Six-Sixty, etc.) for V_1 , one H.F. type (impedance 20,000 to 30,000 ohms) for the detector (V_2), and a power or super power for V_3 .

Working Voltages.

By the way, if you happen to have a valve of the R.C. type, give it a trial in the V_2 socket. Some of them make very good detectors.

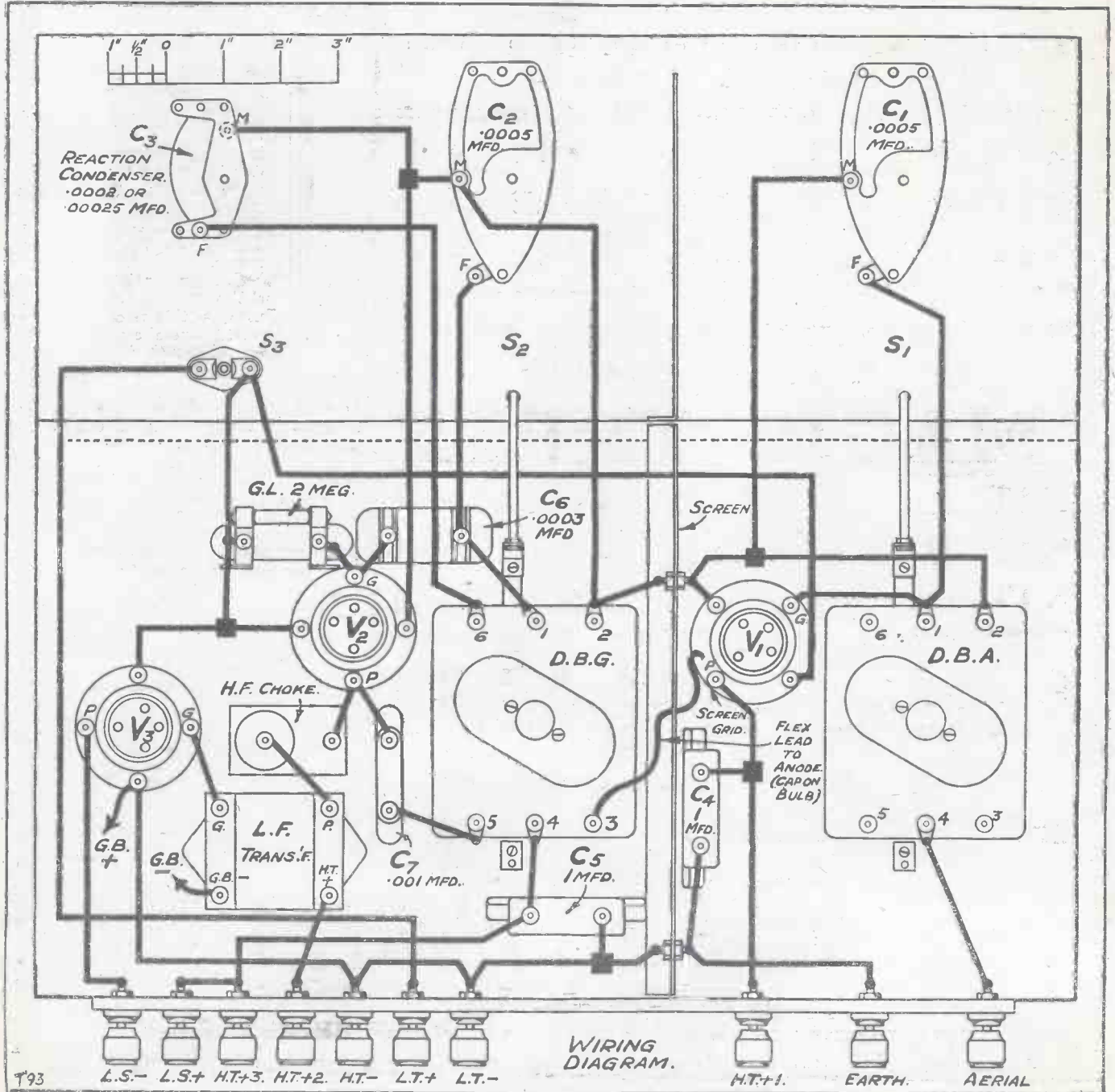
The H.T. voltages should be as follows. Terminal H.T. + 1 requires 60 to 80 volts (adjust for maximum volume on a weak

station), terminal H.T. + 2 should be given about 60 volts (adjust for smoothest reaction), and H.T. + 3 needs 120 volts (much less than this means very poor results from the S.G. valve).

Controlling the Volume.

We were going to add some notes about the operation of the set, but really there is nothing we can say! There are no preliminary adjustments, apart from H.T. voltages, and all you do is to revolve the two tuning dials in step and add a spot of reaction as required on weak stations.

The use of the wave-change knobs we have already explained, and it merely remains to add that to control the volume of the local it is only necessary to de-tune one dial a little one way, and the other in the opposite direction, keeping reaction right back to minimum.



The "MAGIC" FOUR



ALL KITS ARE OFFICIALLY APPROVED
By "POPULAR WIRELESS"

READY FOR IMMEDIATE DESPATCH

KIT A less valves and cabinet £9:19:6

KIT B with valves less cabinet £12:15:6

KIT C with valves and cabinet £14: 8:0

Short-Wave Coils (20-50 metres) can be supplied separately if desired. Price 7/10.

For full list of approved components see issue dated November 30th. All kits include special Ready Radio connecting links.

NO SOLDERING REQUIRED!

"MAGIC" THREE

KIT A less valves and cabinet £6 : 13 : 0

KIT B with valves less cabinet £8 : 6 : 6

KIT C with valves and cabinet £9 : 16 : 6

Deduct 10/6 from each kit, if Short-Wave Coils not required. All kits include special Ready Radio connecting links.

THE OFFICIAL BLUEPRINT WITH FULL WIRING AND OPERATING INSTRUCTIONS IS INCLUDED WITH ALL "MAGIC" THREE KITS.

NO SOLDERING REQUIRED

Owing to extreme pressure of business we have been unable to thank individually all those customers who have written appreciative letters regarding the "MAGIC RECEIVERS." We hope to be able to reply to their letters personally at a later date.

IT PAYS TO BUY EFFICIENCY!

DON'T BE PERSUADED TO BUY A CHEAP AND USELESS ARTICLE

FOLLOW A GOOD LEAD

MR. PERCY W. HARRIS actually incorporates the **READY RADIO SELECTIVITY UNIT** in his most successful Set of this Season—The "Chassis" Three.

A complete Unit which is guaranteed to **BLOT OUT BROOKMANS PARK** or any other interfering station. A turn of a switch and your Aerial is automatically earthed.

THERE IS **NO** SUBSTITUTE FOR A



Ready Radio

SELECTIVITY UNIT
PRICE 20/-

READY RADIO IMMEDIATE DESPATCH SERVICE

When you buy radio parts you naturally want them quickly. You also would be happier with the knowledge that in the event of subsequent difficulties you can obtain technical advice without trouble.

TO HOME CUSTOMERS

Your goods are despatched post free in sealed cartons or carriage paid by rail. Note.—You can if you desire, avail yourself of the C.O.D. system.

TO OVERSEAS CUSTOMERS

All your goods are very carefully packed for export and insured, all charges forward.

Telephone No.
Hop 5555
Private Exchange.

Ready Radio

Telegrams:
Ready Hop 5555
London.

159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1

ADOPT ADAPT IMPROVE

You have heard this message given to British Industry; you know who gave it. At Progress Works it is our constant aim to adopt, adapt and improve, as, indeed, the name of our factory indicates.

Adopt BurTon Components, adapt your set and you will improve your reception!



Burton L.F. Transformer
Highest efficiency, high grade finish. Price 10/6

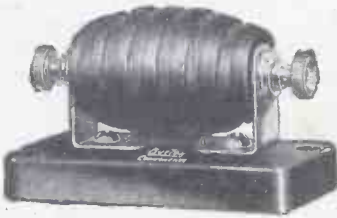


Burton Differential Condenser

A new addition to the famous range of BurTon Condensers. Scientifically designed, brass vanes, interleaved with Bakelite leaves, this condenser makes shorting an impossibility. It means easier tuning, better selectivity and better detection. The price is only **5/-**.



Burton Mid-Log Condenser
Aluminium End Plates with BurTon Friction Brake. Price without dial, '0005, 5/3
" " " '0003, 5/-

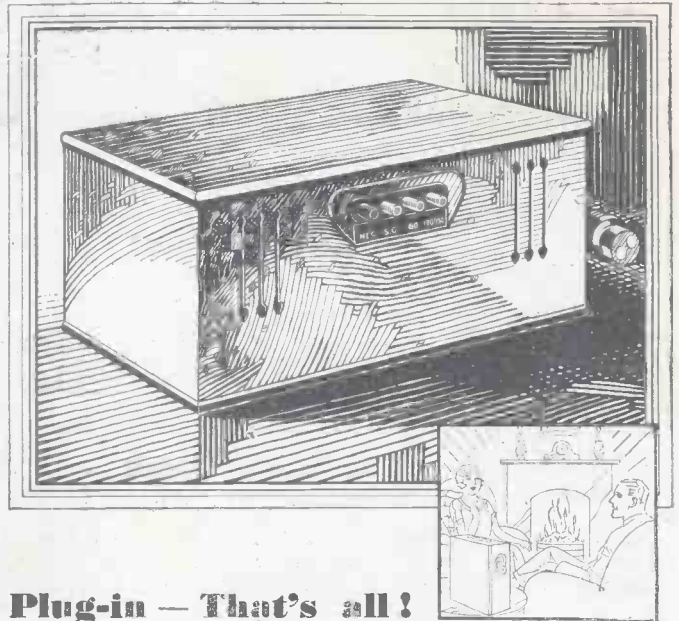


Burton H.F. Choke
Wave band of 20—2,000 metres. Price 3/9
Binocular choke, wave band 50—3,000 metres. Price 5/9

BUY BURTON COMPONENTS

G. F. & H. BURTON, Progress Works, Walsall

No more batteries in your Portable ... run it off the Mains with an "Ekco" H.T. Unit



Plug-in — That's all!

Fit an "EKCO" H.T. Unit to your portable in place of wasteful, troublesome batteries. Its upkeep is much cheaper; it is no bother and lasts a lifetime. All you do is plug the "EKCO" Adaptor into any electric light or power socket and then — Switch — on — That's all!

Illustrated is Model 3F. 20, for A.C. Mains, 3 tappings: — S.G. Valve, and two fixed at 60 and 120/150 volts. For sets consuming not more than 20 m/a. (size 7 $\frac{1}{2}$ " x 6 $\frac{1}{2}$ " x 4 $\frac{1}{2}$ ") **£3 19. 6.**
D.C. Model (size 5 $\frac{1}{2}$ " x 3" x 2 $\frac{3}{4}$ ") . . . **£1 17. 6.**

There are "EKCO" models to suit any type of set and eliminating either batteries or accumulators, or both. Ask your Dealer or write to us for Free Booklet on "All-Electric Radio" and Easy Payment Terms.

E. K. COLE, Ltd., Dept. A, "Ekco" Works, Leigh-on-Sea

"EKCO"

POWER SUPPLY UNITS



THE use of visible indicators for reading incoming signals dates back to the early days of ordinary telegraphy when Morse impulses sent over a line were first recorded by a vibrating needle. The change-over from sight to sound came with the introduction of the telephone and its greater sensitivity.

In wireless signalling, owing to the relatively small amount of energy picked up by the receiving aerial, there would at first sight seem to be no possible alternative to the use of the earphones. In these days of broadcasting, the valve amplifier and the loud speaker, the term "listener" has, in fact, stuck fast.

At the same time there are certain circumstances in which the ear cannot function efficiently, so that the use of headphones

 A short article describing some unusual methods of radio reception.
 By **SEXTON O'CONNOR.**

less, but this could be made good by suitable amplification.

It is a well-known fact that a peculiar and characteristic taste is experienced if two wires at slightly different potentials are applied to the tongue. To a minor extent the sensation is felt when strips of two different metals, such as copper and zinc, or a copper and silver coin, are placed together and applied lightly to the tip of the tongue. The combination, when moistened, forms a miniature voltaic cell, and the resulting E.M.F. is "tasted."

This effect was utilised in the aeroplane tests mentioned above. The incoming signals are fed to two electrodes, preferably made of strips of silver so as to prevent the formation of injurious

salts. The electrodes—separated by a thin sheet of insulating material and fastened together—are held lightly in the mouth, with the tip of the tongue pressing gently on the end, so as to bridge over the insulating strip between one silver electrode and the other.

The incoming signals could not only be definitely detected by their taste, but they also gave rise to a curious effect on the sight. At first the operator thought that a lamp nearby "flickered" each time a signal was received. It was subsequently found that a definite "flash" accompanied each signal, which could be "seen" even when the eyes were tightly closed.

In these days of television and still-picture transmission the idea of visible reception has lost most of the flavour of originality. At the same time some ingenious applications have been made of this principle outside the transmission of pictures.

One, for instance, is that due to Mr. Watson Watt, who utilises the cathode stream from an oscillograph to make a visible track of the direction in which "atmospherics" travel through the ether.

By a further development of the same principle he has also produced an extremely

ingenious system for preventing interference between signals of different frequency, allowing a high degree of selectivity.

The latter arrangement is illustrated in the diagram, from which it will be seen that signal voltages received on the aerial A are applied after amplification at B to two plates 1, 2 mounted outside the bulb of an oscillograph tube, C.

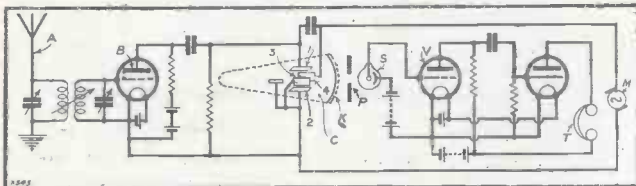
Signal Deflects Stream.

Normally the path of the discharge stream flowing through the tube will be a straight line. The effect, however, of the signal voltages is to deflect the stream to one side or other. At the same time a local oscillating voltage from a valve generator M is applied to the opposite pair of control plates 3, 4.

The resultant path of the discharge stream through the tube C will now depend upon the relative frequencies of the incoming signal and of the local oscillations from the generator M.

By suitably adjusting the frequency of valve generator M, the path of the cathode stream can be made to trace out any desired pattern, either a straight line, or an ellipse, or a circle, across the flat top of the tube C.

A fluorescent screen K is fixed inside the flat top of the tube C and the impact of the electron stream is thus indicated by a continuous path of light.



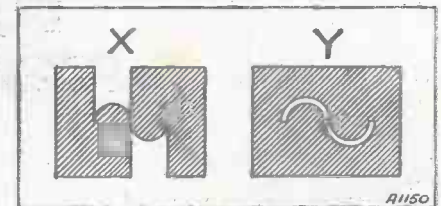
An unconventional method of obtaining selectivity.

becomes unsatisfactory. For instance, in an aeroplane the noise of the engines is sufficient to deafen any wireless signal.

In practice this difficulty is overcome by wearing a sound-proof helmet with the earphones snugly encased inside. Although effective in allowing wireless signals to be received, the use of a sound-proof helmet has certain decided drawbacks. For one thing it cuts out all other external sounds, a fact which is not altogether desirable when the helmet is worn by a pilot who is in sole charge of the machine. Also the headgear is cumbersome and cannot easily be discarded in case of sudden emergency.

Reception By Taste.

As an alternative, it has been suggested that, for aircraft work, wireless messages should be received by taste instead of by ear. This may at first sight appear rather far-fetched, but the proposal has been thoroughly tried out, and as the result of a series of tests was favourably reported on by Professor Goldsmith of the Radio Corporation of America. He found that it was perfectly feasible to substitute the tongue for the ear, and to detect incoming signals by taste. The sensitivity was considerably



The templates used in the special separating circuit.

In order to separate one signal from another, a template P, cut out to particular shape (such as that shown separately at X or Y), is placed between the cathode tube C and a light-sensitive cell S in the input circuit of a valve amplifier V.

If the light path corresponds exactly to the cut-out part of the template, i.e. to the frequency of the required signal, then that signal will be heard continuously in the earphones, T. Signals of any other frequency will not create the same light track, and cannot, therefore, pass through the interposed template P, so that they are not heard in the earphones.

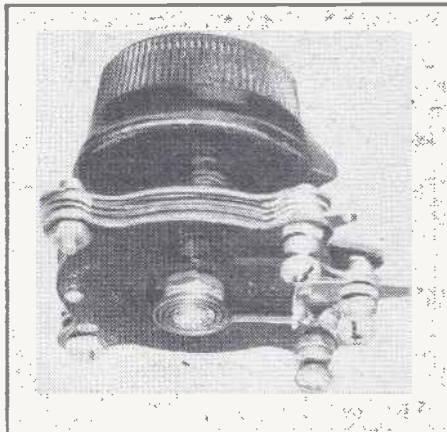
FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found-?



FOR "MAGIC" ENTHUSIASTS.

IT has been stated that the differential reaction condenser made by the Ready Radio people has been approved by us for use in all "Magic" circuits. This certainly is the case, so that there remains nothing much for me to say in regard to the sample submitted for test purposes. But I would draw the attention of "P.W." readers to the very reasonable price of 5s. and the robust and neat construction of the component. For the particular purposes for which it



The Ready Radio Differential Reaction Condenser.

was designed, there is no more suitable type, while it will undoubtedly find its way into many future circuits.

WIRELESS FOR MODERN HOMES.

This is the title of the revised edition of the new catalogue issued by the Marconiphone Co., Ltd. In an accompanying letter the Marconiphone people say:

"You will note that components are not shown, but we are still able to supply the majority of transformers, condensers, etc., in last year's list. The demand for the 'Ideal' has been such that we are continuing its manufacture for the present." Loud speakers, valves, H.T. units, H.T. batteries, and a new gramophone pick-up are among the items listed.

A CHANGE OF NAME.

The official title of the Standard Wet Battery Co. has been changed to The Standard Battery Co.

ATLAS BATTERY ELIMINATOR.

I recently received one of Clarke's Atlas battery eliminators for test. The particular

model is the A.C.16. It is for A.C. mains, and it gives a maximum output of 25 milliamps. There are three tapings of which two are fixed at 120 and 150 volts, and the one variable which gives anything up to 100 volts. The unit is very compact in design, and is substantially built. The price of the unit is £4 10s.

One of the first questions I ask myself when testing a mains unit is "Is it safe?" In the past there has been quite a large number of mains devices on the market that one could not pass in this respect. In these "P.W." "write-ups" I have, of course, always brought this point well forward.

By "safe" I mean that the unit is housed in a casing that prevents "shocks" from being imparted to the operator or short-circuits caused, and that the general design is such that over-heating cannot occur.

Many of us can stand 200 volts, and even much more, but few like the experience, and if there is a danger of over-heating and sparks flying, the apparatus is best left entirely alone.

But the Clarke's unit is, in my opinion, quite safe—as safe as a vacuum cleaner of good make. And it operates quite well. It does not impose a liability to motor-boat and its outputs are up to specification.

THE WATMEL WAVE-TRAP.

The wave-trap has undoubtedly come into its own. It is not so long ago that to use a wave-trap was an admission that one had a not-too-good set. But the adequate selectivity of yesterday is easy meat for Brookmans Park at every degree of the tuning dial. That nasty "local" has an uncanny way of breaking through even barriers of tuned circuits.

One solution of the problem is found in the wave-trap. Watmel Wireless Co., Ltd., have produced quite a good wave-trap at the reasonable retail price of 8s. 6d. You connect it in series with your aerial, and Brookmans Park is confined to a narrow dial range. I tested it where this powerful transmitter in the usual way occupies a good half of the tuning dial of a straight-forward Det.-L.F.

The Watmel wave-trap limited the station's activity to three or four degrees. Various tapings on the device are provided to suit various

types of aerials. The base and all the insulated parts are made of bakelite and, altogether, the wave-trap is a neat and attractive article. The small condenser is provided with an engraved scale which facilitates adjustments for various stations.

BEAUTIFUL BAKELITE MOULDING.

Until quite recently America led the way with bakelite moulding, and one could not help making comparisons between the various radio productions embodying these and their British equivalents. We are now very easily holding our own in this bakelite business.

One of the best samples of the new art is to be seen in the new W.B. Cone Speaker,

Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

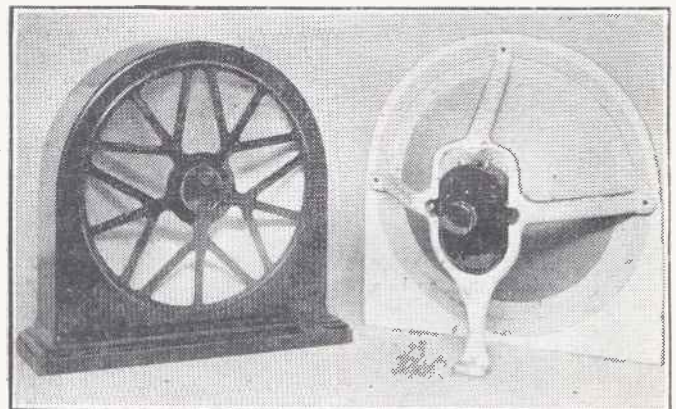
a production of Whiteley, Boncham & Co. This instrument is built into a bakelite casing constituting one of the best mouldings I have seen. One wonders how such can figure in an instrument costing no more than two guineas.

However, appearance is far from being everything, and had the W.B. productions stopped short at the bakelite cabinet it would still not have been a bad speaker. Happily nothing of the sort happens. In my opinion, it is one of the very best instruments at anything near its price which has made its appearance this season, and I would certainly advise all loud-speaker enthusiasts to get their local dealers to let them hear W.B.s in operation.

Another interesting W.B. production is a Cone Chassis and Stand which sells at 10s. 6d. This will take any unit and comprises a five-ply wooden frame with a cone made of special paper. The cone is excellently mounted and the stand is of polished aluminium.

The outfit enables you to make up a loud speaker of really modern design for a wonderfully modest outlay.

NEXT WEEK IS RADIO WEEK.



The W. B. Loud Speaker and the W. B. Cone Chassis.

For 1930 VARLEY ALL-ELECTRIC RECEIVERS



In London—in Yorkshire—in Lancashire—in Scotland—in Wales—on the South Coast—in the West Country—everywhere come the same glowing reports of the excellent performance of the Varley All-Electric Receivers. Provincial newspapers all over England—the leading Journals of the Wireless



Varley All-Electric 3-Valve Receivers, List Nos. AP3 (A.C.) and AP4 (D.C.)

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25 Gns.

Technical Press—all recommend these Sets in the strongest terms.

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Write to-day for Section A of our new Catalogue, which gives full particulars of Varley All-Electric Receivers and Radio-Gramophones.



Radio Week, January 12-18. A real pleasure if your set is a VARLEY All-Electric.





All Editorial communications to 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 receivers. 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 specialities described may be the subject 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.

QUESTIONS AND ANSWERS.

IS SOLDERING WORTH THE TROUBLE?

L. N. (Bexley Heath).—"I have always been satisfied with the results from screw-down joints, but am a little mistrustful of this now that I am starting short-wave work. Is the extra efficiency really worth all the laborious effort and difficulty and messy task of soldering all the joints?"

Soldering is worth while for short-wave work—or, indeed, anywhere where good contact is essential—but we are unable to agree with you in your description of it! There is no earthly need for it to be messy, or laborious, or difficult at all, and if you have an experienced friend, or know anyone skilled at the job, you can soon have proved to you how easily and quickly it can be carried out.

The main idea, of course, is to heat the two surfaces which have to be joined together to that necessary temperature when solder will "run." In this condition it will adhere to them and, on cooling, will set as one mass, thereby joining the two metal surfaces together.

A point to remember is that both the soldering iron itself and the working surfaces must be kept perfectly clean. The iron itself must be "tinned" first of all, by heating it to the requisite temperature in a clear flame, such as a gas jet.

Have ready a shallow tin-*lid* into which a little flux has been placed with a scrap or two of solder, and, when the iron is sufficiently hot to burn with a green flame, remove it, file it quickly till its faces are bright, and dip it into the flux and solder.

If sufficiently hot the molten solder will immediately coat it with a nice bright skin on all its faces, and the first step—the tinning of the iron—has been accomplished. Place it in the flame again to warm up for the next operation and, whilst it is reheating, thoroughly clean with a file or emery cloth the two surfaces which are to be joined together.

Clean them until the bright metal shows, spread just a little flux so that it will run over the bright surfaces, and then "tin" each surface also in turn. This is done by waiting until the iron is hot again (when it starts to burn with a green flame), and if should then be brought into contact with the clean surface until this, too, is sufficiently hot for the solder to run over it.

Heat Both Surfaces Equally.

If there is not quite enough on the surface of the iron, just a little more solder may be added, and it will be found that it will run easily to any desired extent over the iron when this is sufficiently hot, and if it has been well-tinned. Each surface should be attended to in turn until you have ready the nicely-tinned iron and the two surfaces both tinned.

Now fix them in the desired position for joining, heat the iron again to the necessary temperature, get your solder ready in case you need a little more, and then place the hot iron on the two surfaces so that it can *simultaneously* and *equally* heat them. Do not place the iron anyhow over the joint so that one wire is hot and the other cold, or comparatively cold, or you cannot possibly make a good soldered connection. Both surfaces should be equally heated if the solder is to run easily over them.

The work should be held perfectly steady, and, when hot enough, the blob of solder on the iron will run smoothly over the two surfaces as though they were one. Remove the iron, still holding the work steady, and almost immediately the solder will solidify and give you a perfect joint.

If only a little flux is used, there is no need for "mess" at any stage, but do not forget that immediately the solder has set, and before the joint has had time to cool, it should be wiped with a clean cloth so as to remove all traces of superfluous flux. This will have been liquefied by the heat, so that it can be removed quite easily and instantly whilst hot; but if left for a little while it will get cool and become greasy and sticky, and then be exceedingly difficult to clean off.

(Continued on page 970.)

P.R. VALVES

BRITISH MADE

LIST OF P.R. SUPER GOLDEN SERIES.						
	Type	Fil. volts.	Amp.	Imp. ohms.	Amp. fac.	
4/6 EACH Post 4d.	GPR 2	2	.095	24,000	13.5	H.F. Det.
	GPR 3	2	.095	12,000	9	L.F.
	GPR 4	2	.095	40,000	32	R.C.
	GPR 9	3.5-4	.09	22,000	14.5	H.F. Det.
POWER 7/6 EACH Post 4d.	GPR 10	3.5-4	.09	10,000	9	L.F.
	GPR 11	3.5-4	.09	44,000	41	R.C.
	GPR 17	5-6	.14	20,000	17.5	H.F. Det.
	GPR 18	5-6	.14	11,000	9.5	L.F.
SUPER POWER 12/6 EACH Post 4d.	GPR 20	2	.15	6,000	7	Power
	GPR 40	4	.15	6,000	7	"
	GPR 60	6	.15	6,000	7	"
SCREENED GRID 15/- Each Post 4d.	GPR 120	2	.3	3,000	4.5	Super Power
	GPR 140	4	.2	3,500	4.5	"
	SG 25	2	.2	220,000	150	S.G.

ABSOLUTELY ASTOUNDING

The new Golden Series of P.R. Valves give the most astounding results. The amplification is simply enormous and the selectivity abnormal. This is due entirely to the new filament coating, which is applied with scientific exactitude. It does not matter how much you pay for a valve you will not get better than a P.R. Golden Series at 4/6. Send for one NOW. You are protected by a "straight" Guarantee that fully covers any possible failure.

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All postal breakages replaced free. Each valve has attached to it a written guarantee covering 7 months. In the event of the valve losing emission or becoming inefficient in any way during this term, a new valve will be supplied under the terms of the guarantee. If not fully satisfied that the valves received are equal to any they should be returned within a week, full refund will be made by return of post.

THE AMAZING P.R. SPEAKER

All British Made. Full balanced armature powerful cobalt steel permanent magnets. Special P.R. Cone floats against the baffle; Cabinet of oak heavily reinforced by special frame designed to prevent sympathetic resonance. Finished in highly french-polished natural oak, and measures 13 1/2" x 13" x 6" with 11" cone. Test it at your leisure against ANY Speaker at ANY price. We know it is the qual of any

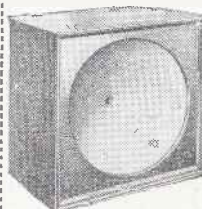
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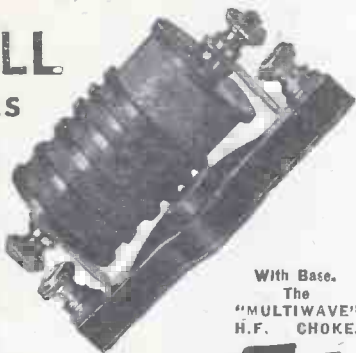
Some amazing figures!

Report of test by the FURZE HILL LABORATORIES

A thorough test was made of the Graham-Farish H.F. Choke by Mr. Heyner of the Furze Hill Laboratories. The following figures are extracted from his report—

Wave length.	Impedance.
200 metres.	43,500 ohms.
245 ..	50,000 ..
380 ..	80,000 ..
480 ..	147,000 ..
500 ..	150,000 ..
880 ..	255,000 ..
1,460 ..	385,000 ..
2,400 ..	126,000 ..

The Graham-Farish H.F. Choke was designed to obtain high impedance with low D.C. resistance, and these figures will show the success that has been achieved by careful research and scientific design.



With Base.
The "MULTIWAVE" H.F. CHOKE.

5/-



The famous "OHMITE"—a moulded Anode Resistance with a value that remains constant. Infinitely better than wire-wound. Hermetically sealed in Bakelite. Noiseless and efficient. Negligible self capacity, so that the high notes are retained. Also fitted with terminal ends. All values, 1,000 to 500,000 Ohms. Holders, Horizontal or Vertical, 6d. each

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each



The New "MICRO-FICIENT" Condenser, a brass-vaned log-mid-line variable condenser using Bakelite as a dielectric. Robust in construction, and ideal for portable sets. Can be mounted for either drum or ordinary dial control.

4/6
each

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Sir,—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time. I enclose 2d. stamp for postage. Print your name and address boldly in capital letters on a plain sheet of paper and pin this Coupon to it. "Popular Wireless" 11/1/30

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 968.)

SHORT WAVES ON A TITAN.

J. H. v. Z. (Cape Town).—"In your 'Radiotorial,' of 26th October, under the heading 'Short-Wave Titan,' you refer R.C.A. to an article by a correspondent in 'P.W.' No. 375 of 10th August, but this article deals with a 2-valve set and, not being an expert, I find some difficulty to adapt this short-wave contrivance to my 'Titan' Three which I built exactly as set out in your issue No. 348, with the omission however of the central loading coil from the 'Titan' coil, as there are no long-wave stations in South Africa.

"Now my problem is this: The set, which has a screened-grid valve, gives excellent results for the local station, and when using a wave-trap Johannesburg and Durban can be heard. Would a coil as described by your correspondent in No. 375 be suitable for the 'Titan' Three circuit so as to enable me to get oversea short-wave reception, using the switch under the reaction condenser for changing over from medium to short waves?"

"Or would it be better to use two or three short-wave coils for this purpose? I shall be obliged if you could indicate how in each case the connections should be made with the remainder of the set, using the 'Titan' Three blue print as a basis."

To adapt an existing three-valve "Titan" set in the way you suggest would not be very easy, and we think a far, far better plan would be to build an "Antipodes" Adaptor.

This ingenious unit enables you to plug a short-wave tuning unit straight into an existing valve set—it works admirably with the three-valve "Titan." If you have back numbers of "P.W.," you will find we have published several different versions of it.

It is very easy to make, extremely inexpensive, and uses the set's ordinary valve, batteries, etc., so

there is no expense for accessories. Its popularity may be gauged from the fact that since it appeared first in "P.W." it has been very widely copied, all over the world, and has been quite the rage in America. (Another indication of its popularity is the fact that all our issues containing details of it are out of

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good" ?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

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

Full details, including scale 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 free and 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 in person at Fleetway House or Tallis House.

print, but in answer to another reader's query the circuit diagram will be reproduced in "Radiotorial" very shortly.)

COILS FOR CHOKES.

P. T. S. (Port Sunlight).—"It is often recommended that tuning coils can be used as H.F. chokes instead of specially purchased chokes, but I have never seen any remarks on what sizes could be used for this purpose

What coil should be used for 5 X X, for instance, and what size for the ordinary wave-length?"

When the Davenport 5 X X range is being received the coil used for an H.F. choke should be a large one, say 500, or possibly 400 turns, but on the lower wave-lengths a No. 250 plug-in coil will serve quite well as an H.F. choke.

"GRAMMY" CONTROL.

W. E. (Lancs.).—"The set has no volume control and in the ordinary way does not need it, but when I use a gramophone pick-up I get overloading on certain records. Is there any other simple way out of the difficulty?"

Apart from a volume control you can try the effect of experimenting with various types of "soft" needles to see if they give the desired effect. It is worth while also to ascertain whether there is any method of adjusting the sensitivity of the pick-up which you are using, as sometimes there is a small adjustment screw provided.

USING A LOUD SPEAKER.

M. B. T. (nr. Chester).—"What are the advantages of a filter-output circuit for use with a loud speaker?"

One of the chief advantages of the loud-speaker filter-output circuit is the fact that it confines the high-tension voltage to the set itself, and thus any long loud-speaker leads to other rooms in the house are not at high potential voltage and there is no risk of shock or of leakage. Another advantage is that the filter circuit enables the maximum magnetic load to be given to the loud speaker by the "speech" currents, as it removes the loading due to the steady current of the last valve.

Other important advantages of the system are the prevention of a wasteful drop in voltage applied to the plate of the last valve through comparatively high-resistance L.S. windings, the protection of loud-speaker windings by relieving them of anode current, and finally the chance it gives of adjustment of output impedance.

POSITIVE OR NEGATIVE MAIN EARTHED?

R. S. M. (Huddersfield).—"When running a mains unit from D.C. for a three-valve set, (Continued on page 972.)



Send for the Polar Catalogue (P.)

Polar "Ideal"

They all place Polar behind their panels

When it is a question of efficiency and economy there are no condensers more worthy of being placed behind your panel than the Polar "Ideal" (for Tuning) and the Polar "Volcon" (for Reaction).

THE POLAR "IDEAL"

Fast and Slow Motion Tuning Condenser. This is one of the most popular types of condensers because it can be used most effectively with practically any modern circuit. Gives both fast and slow motion. Remarkably smooth and silent. It makes just that difference in selectivity that adds a few more stations to your list of those "worth hearing" and improves the quality of reception by giving you "dead-on" tuning.

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Phosphor Bronze Balls 6d. extra. Drum Control Type 2/6 extra.

THE POLAR "VOLCON"

A compact condenser for reaction control where slow motion is not essential. Solid brass throughout. Can be used with metal panel or screen. Specially suited for Ultra-short waves. Silent in operation. Smooth, easy control.

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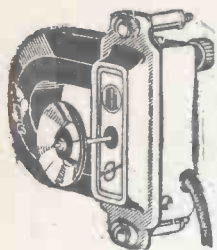
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GET THEM BOTH TOGETHER

66K UNIT 25/-



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

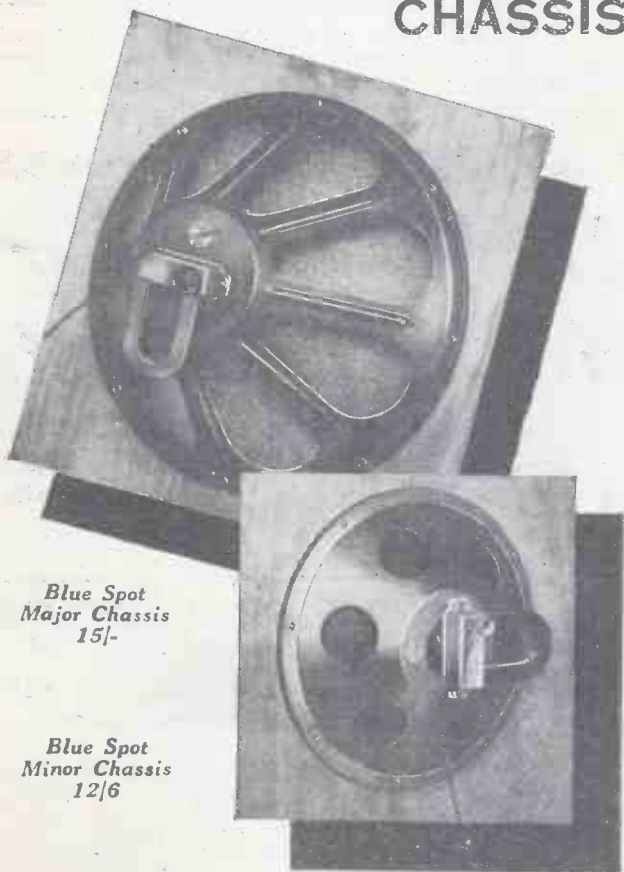
You will then hear what the 66K Unit really can do—for it is working under ideal conditions, driving a chassis specially made for it.

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

The Major (13" cone) 15/-
The Minor (9 1/4" cone) 12/6

Both Blue Spot and both the finest value obtainable.

BLUE SPOT CHASSIS



Blue Spot Major Chassis 15/-

Blue Spot Minor Chassis 12/6

FERRANTI COMPONENTS

are recognised by critical designers as essential for RECEIVERS and AMPLIFIERS where quality is the first consideration.

Inferior components may give temporary satisfaction, but with good components the first cost is the last cost.

Unrivalled knowledge is behind the design.

Great resources are behind the manufacture.

And a great firm stands behind the product.

That is your security

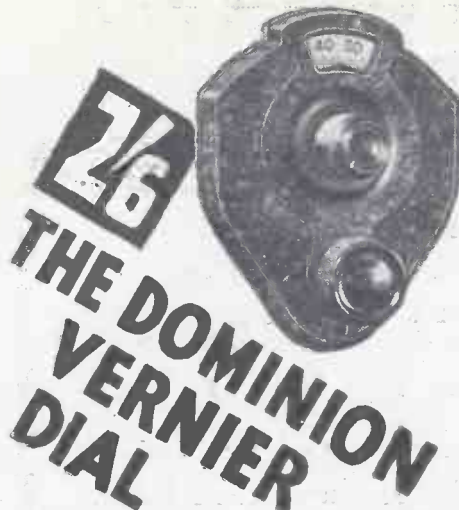
F. A. HUGHES & CO., LIMITED

204-6 Gt. Portland St., London, W.1. Phone: Museum 8630 (4 lines)
Distributors for Northern England, Scotland and North Wales,
H. C. RAWSON (SHEFFIELD & LONDON) LTD.,
100 London Rd., Sheffield. (Phone: Sheffield 26006.) 22 St. Mary's
Parsonage, Manchester. (Phone: Manchester City 3329.)

FERRANTI LTD. HOLLINWOOD LANCASHIRE

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 970.)



2/6
**THE DOMINION
VERNIER
DIAL**

Only Brownie's huge production enables them to offer this really splendid dial for 2/6. The special non-backlash design makes hair-breadth tuning a matter of delightful ease, while its handsome appearance (black or beautifully grained mahogany bakelite) will add to the good looks of that new set you are building.

BROWNIE WIRELESS COMPANY (G.B.) LIMITED,
NELSON STREET WORKS, LONDON, N.W.1.

BROWNIE
WIRELESS.

what difference does it make if the negative main is earthed, or the positive ?

The important point of difference is the fact that the listener himself is always earthed, because he walks about on the earth or on something which is connected to earth. Especially is this the case if he is walking on a damp surface when his body from an electrical point of view can often be considered quite well connected to the earth.

If he touches electrical apparatus which also is earthed there will be no difference of potential (or only very little) between him and it. Consequently he will feel no shock. But if he touched electrical apparatus which is at a high voltage above or below earth potential, the current will tend to flow through him to earth, and he will feel a more or less severe shock according to the circumstances.

Thus in the case of a D.C. unit, if the negative main is earthed, the earth terminal on the set and all connections to it will be absolutely safe for the constructor to handle, for he too is at earth potential. Filament, accumulator connections, the earth and aerial lead, in fact all the ordinary connections on the set will be free from the possibility of trouble, the only place where the shock would be felt by him is touching the H.T. positive wiring, or anything connected to the plates of the valve.

Quite Different Conditions.

Sometimes for reasons of its own the electrical supply company earths the positive main, and where this is done the conditions from the point of view of the owner of a mains unit are completely reversed.

Now it is the H.T. positive wiring which is safe to handle, and he may with impunity touch the plates of the valves of the H.T. positive terminal on the mains unit without experiencing any shock worth mentioning. But all the H.T. negative wiring is now "alive."

The aerial or earth wires, the earth terminal, the filaments, the L.T. battery leads, are all liable to give a shock when touched because they may be relatively as far negative to the listener, as formerly the H.T. positive wiring was positive to him. Obviously, apparatus of this kind should be used carefully, and purchased from a reputable firm that understands the possibilities of these potential differences and lays down designs on safety-first principles.

NEXT WEEK IS RADIO WEEK!

ONCE every year there is a big "gather-round," and all the heads of radio get together to make one supreme effort for the listener. Here are some of the special items arranged by the B.B.C.:

SUNDAY, 12TH.—St. Martin's Service and Albert Sandler.

MONDAY, 13TH.—"Should the Speed Limit Be Abolished" (A. P. Herbert versus Gerald Barry), and Milestones of Musical Comedy.

TUESDAY, 14TH.—Flotsam and Jetsam and Tommy Handley.

WEDNESDAY, 15TH.—Gracie Fields in excerpts from "The Show's the Thing," and Play, "The Wrecker," by R. L. Stevenson.

THURSDAY, 16TH.—Vaudeville: Ronald Frankau, Marie Burke, Wish Wynne, Jack Hulbert and Cicely Courtneidge.

FRIDAY, 17TH.—Symphony Concert from the Queen's Hall, with Szigeti (violinist).

SATURDAY, 18TH.—Pantomime from the Theatre Royal, Leeds—"Mother Goose." Wales versus England at Cardiff, by Captain Wakelam.

Why not let your friends share in the great "goings-on"? Get them interested in the great radio game, too. Convert their cold indifference into the frenzy of the "fan." Show them what they're missing! Make them realise, in fact, that NEXT WEEK IS RADIO WEEK.

TOUR EUROPE

ONE STATION AFTER ANOTHER

WONDERFUL RESULTS. With the MULLARD "ORGOLA" 3 Circuit using

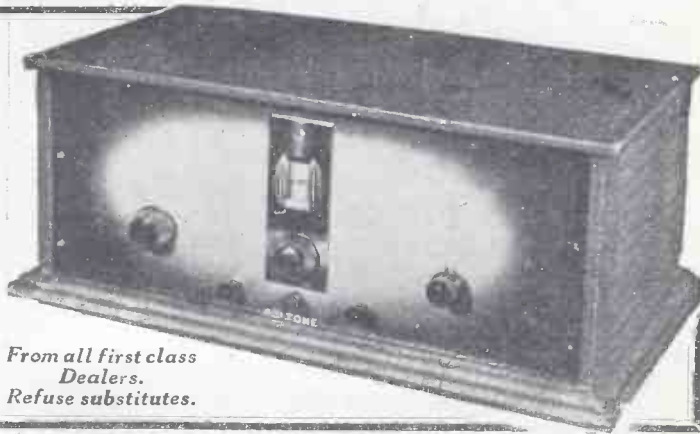
"GOLSTONE" COMPONENTS and MULLARD VALVES. Supplied in sealed Kit with diagrams of wiring and instructions for easy assembly. Do you realise the extraordinary range and volume of this set, combining three mighty valves, Screened Grid, Detector and Pentode. "Orgola" Kit including superb cabinet as illustrated. Price **£6 : 15 : 0**

Full particulars on request.

Radio catalogue with particulars of Kit on request.



From all first class Dealers. Refuse substitutes.



The type H.T.3



METAL RECTIFIER

21/-

Output 120 volts. — 20 milliamps.

Suitable for incorporation in eliminators to work sets of the popular 3-valve types such as Cossor Melody Maker, Mullard Master Three, etc., etc.

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



Our 32-page booklet "The All-Metal Way, 1930," shows how to make any type of eliminator or charger for A.C. Mains—Full description, circuits and components required.

Send 2d. stamp with your name and address for a copy.

DURING RADIO WEEK

Will Day Ltd., as always, are co-operating with British Radio manufacturers and all wireless receivers, component parts and accessories can be obtained immediately. Deal with a firm that has a *real* British reputation second to none.

ALL MAINS RECEIVERS

- Dubilier - (3-valve) £25
- 39. Marconi (3-valve) £21
- Lotus - - (3-valve) £21

ALL TYPES OF

LOUD SPEAKERS
PORTABLE SETS
RADIO-GRAMS

supplied on easy payments.
Details and catalogue on request.

WILL DAY LTD.

19, LISLE STREET, LONDON, W.C.2.

Phone: Regent 0921-22.

CAUTION

There is **ONLY ONE**
GENUINE FORMO-DENSOR "G"

(See name on Article and Carton.)

used by designer
and specified for

- THE BROOKMANS REJECTOR**
- THE WAVE-CHANGE REJECTOR**
- THE KENDALL REJECTOR**

BE WISE!

Refuse Unspecified Substitutes and
thus Avoid Disappointing Results.

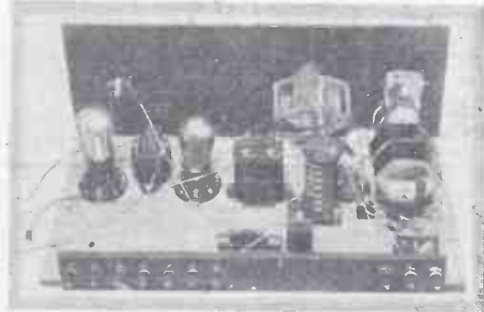
Full Catalogue sent post free on receipt of post card.

THE FORMO CO., CROWN WORKS,
CRICKLEWOOD LANE, LONDON, N.W.2.

YOURS FOR A FEW SHILLINGS DOWN! MAGIC 2" MAGIC 3" MAGIC 4'

Build one of these great sets in time for Radio Week! You can have the complete guaranteed Kit for only a small first payment down. Simply fill in and post the coupon and WARNER'S will send the Kit. That's all—no fuss—no references. And the set is just as easy to build.

WARNER'S are noted for their keen terms—the best in the trade. Three convenient kits for each set—choose which you require, and send now.



THE MAGIC THREE—Reproduced by permission.

MAGIC 2	MAGIC 3	MAGIC 4
KIT A 7/10 less valves & cabinet DOWN and 12 monthly payments at 8/1.	KIT A 10/9 less valves & cabinet DOWN and 12 monthly payments at 11/-.	KIT A 16/1 less valves & cabinet DOWN and 12 monthly payments at 16/4.
KIT B 9/8 with valves less cabinet DOWN and 12 monthly payments at 9/11.	KIT B 13/6 with valves less cabinet DOWN and 12 monthly payments at 13/9.	KIT B 20/8 with valves less cabinet DOWN and 12 monthly payments at 20/11.
KIT C 11/6 with valves & cabinet DOWN and 12 monthly payments at 11/9.	KIT C 15/10 with valves & cabinet DOWN and 12 monthly payments at 16/1.	KIT C 23/3 with valves & cabinet DOWN and 12 monthly payments at 23/6.

WARNER'S

Radio Corner, 12, Norton Folgate, Bishopsgate, E.1. Phone: Bishopsgate-8010.

POST THIS COUPON NOW

To WARNER'S (Dept. P.W.), 12, Norton Folgate, Bishopsgate, E.1.

I enclose P.O. value being first payment for guaranteed Magic Kit and agree to pay the balance in twelve monthly instalments of

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ADDRESS

PLEASE WRITE IN BLOCK LETTERS.

SERVICE MODEL STEEL MASTS

THE JOY OF SURPLUS POWER

NO HOLES TO DIG

26 Feet high. In 3 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 1/6; Midlands, 2/6; elsewhere, 3/6. Weight 24 lbs. **15/-**

34 Feet high. In 4 sections of 1 3/4 in. Steel tube tapering to 1 in. Carriage, London, 2/-; Midlands, 3/-; elsewhere, 4/- . Weight 46 lb. **21'6**

The "SUPER" MAST.

42 Feet high. In 5 sections of heavy 1 3/4 in. Steel tube tapering to 1 in. A real bargain. Carriage, London, 2/6; Midlands, 3/6; elsewhere, 4/6. Weight 46 lbs. **29'6**

P.R. No bother. These masts are easy to erect, damp and rot proof. Made of sturdy British steel tubing tapering from 1 in. to 1 1/2 in. in 9 ft. sections complete in every detail. Cast iron bed plate, steel ground pegs, stay rings and galvanized wire stays cut to length, pulley bolts, washers, etc.—**No Further Outlay.**

P.R. PRODUCTS, M.18. P.R. HOUSE, NEWGATE STREET, LONDON, E.C.4.
(Opposite G.P.O. Tube Station.) Telephone: CITY 3788.

CORRESPONDENCE.

The "MAGIC THREE"

A FLOATING BATTERY

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—**EDITOR.**

THE "MAGIC," THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Just a few lines to let you know how I appreciate the "Magic" Three. And I think it has been rightly named, for I tune in station after station.

About a week ago I managed to get London and at loud-speaker volume. Seeing that I reside a few thousand miles from London, in Pretoria, Transvaal, S.A., to my mind it is jolly good, as my aerial is only 16 ft. above the roof and 40 ft. in length. And I am sure you agree with me that it is possible with a "Magic" Three.

Hoping that all the constructors of the "Magic" Three are as well satisfied as I am.

I remain,

Yours faithfully,

A. MOSZ.

Pretoria, S.A.

A FLOATING BATTERY

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read with interest Mr. Young's article on page 601 of POPULAR WIRELESS for November 23rd, 1929, and would suggest that "floating" batteries should be avoided. In 99 cases out of a 100 they are perfectly safe, but in the odd case of a dirty terminal there is a risk of getting the full mains pressure across the set. To get over this difficulty I use two switches, as shown in the attached sketch.

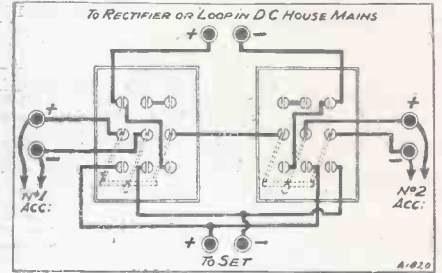
Two 3-pole double-throw switches are mounted on a mahogany board (which, incidentally, also carries a voltmeter and an ammeter). This was used originally for charging from D.C. mains from a fuse to one of the principally used circuits in the house, and now

used for charging from a "Tungar" rectifier. The accumulators and set are permanently connected to the appropriate terminals and the switches save interfering with accumulator connections and, at the same time, satisfactorily carry out the purpose for which they were originally intended—viz. to prevent the house mains pressure ever reaching the set even through a "floating" accumulator.

I doubt if the idea is so necessary with me now that a valve rectifier is in use; but the scheme is, to my mind, essential when using D.C. mains.

When No. 1 switch is down and No. 2 up No. 1 accumulator is available for use by the set, and No. 2 is available for charging if the rectifier is turned on (or if any lamps are on in the D.C. mains circuit) and vice versa. If both switches are up the accumulators can be charged in series, and if both are down they are available for use in parallel.

This method has been in use with me for some seven



years, for the first four of which the accumulators were charged from a loop taken out of the main fuses of the D.C. mains, and for the last three years they have been charged by a "Tungar" rectifier. The use of two accumulators and two switches is not essential.

Yours faithfully,
KEITH SCOTT.

Newcastle-upon-Tyne.

NEXT WEEK IS
RADIO WEEK!

DUBILIER

H.T. BATTERY

66 Volts
7/9

Fit this long-life Battery — it will improve the quality of your reception

SUPERIOR (Single Capacity)
 9 volts - - - 1/6
 63 " (with G.B. Tapp ngs) - 7/11
 99 volts - - - 11/9
 108 " - - - 12/9

SUPREME (Triple Capacity)
 60 volts - - 13/6
 88 " - - - 14/6
 100 " - - - 22/-

DUBILIER

H.T. BATTERIES

BRITISH MADE

DUBILIER-CONDENSER CO. (1925) LTD
 Ducon Works, Victoria Road, North Acton, London, W.3. B.14

Ask your dealer for a copy of "A Bit about a Battery."

A Sample of

"HARBROS" EASYFIX

Patent

CAPACITY REDUCING FLEX

together with illustrated literature will be sent Post Free on application to the manufacturers.

HART BROS. ELECTRICAL MFG. Co., Ltd.
QUEENSWAY, PONDERS END, MIDDLESEX

Superfine Quality

Trelleborgs

GUARANTEED GENUINE EBONITE

25% REDUCTION ON RETAIL PRICES

THE BEST PANELS — NOW THE CHEAPEST!

NEW 25% REDUCED PRICES.							
Highly Polished	6x9	7x14	7x18	7x21	8x12	8x16	
1/8" Black or Wavy, 1/8 d. sq. in.	2/6	4/6	6/-	7/-	4/6	6/-	
1/8" Mahogany, 1/8" Black or Wavy, 1/8 d. sq. in.	3/6	6/3	8/-	9/3	6/-	8/-	
1/8" Mahogany, 1/8 d. sq. in.	4/6	8/2	10/6	12/3	8/-	10/8	

TRELLEBORG EBONITE WORKS LTD., Union Place, Wells St., London, W.1

ALL ELECTRIC - 2

A SET WORTH LISTENING TO

£13



£13

The Igranic All Mains 2 operates entirely from A.C. Mains. Compact design. One knob control. Dual wave switch to eliminate coil changing. Perfect reproduction.

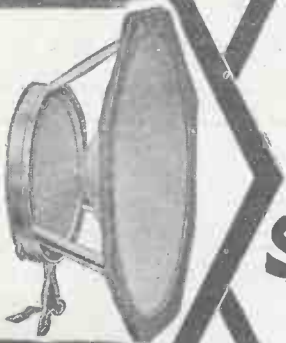


Supplied in attractively designed oak or mahogany table cabinet. Price £13.0.0 complete with valves and royalties.

Please state exact mains voltage when ordering.

Write to Dept. R.139 for details.

INVEST IN A SQUIRE



SQUIRE Cone Speakers are a good investment from all points of view. For a very small expenditure, they will bring you in reproduction that is only equalled by the most expensive speakers on the market. We make this claim with the utmost confidence because it has been tested and proved true.

There is a Squire Speaker to suit every purse and every requirement. Ask your dealer to demonstrate one and prove our claims for yourself.

The No. 101 is illustrated above.

FREDK. SQUIRE LTD.

10, Leswin Place, Stoke Newington, N.16

Price of Cradle complete with Cones, Octagonal front and enamelled backstand **2 gns.** (including Royalty)

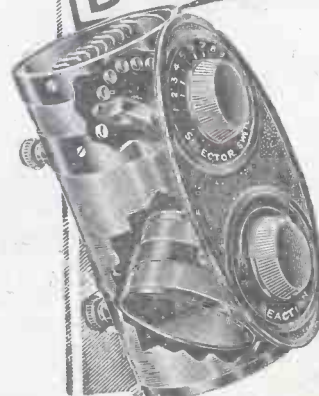
Set of four oxy silver chains ... **3/6**

Art Silk lampshade fringe ... **4/-**

Kit for making two cones ... **7/3**

CUT OUT THOSE COILS! BRITISH GENERAL

A.T.U



This new Tuning Unit gives you all wave lengths between 220 and 2,000 metres on one dial. Easy to fix, simple to connect and fool-proof in operation. You need no plug-in coils at all, and the price is—

NOW ONLY **14/6**

From all dealers of repute or direct from the manufacturers—
BRITISH GENERAL MANUFACTURING CO., LTD., BROCKLEY WORKS, LONDON, S.E.4.

YOU CANNOT GET BETTER QUALITY



and why pay a higher price?

You will not get better results from the most expensive valve on the market than from the Tungram Barium Valve. Yet it costs you nearly 50 per cent less. The Barium filament gives these valves efficiency, richness of tone, greater volume.

They are made by the makers of the famous lamps and they have the same reputation for reliability.

2-, 4- and 6-volt types from **5/6 to 10/-**

TUNGSRAM BARIUM Valves

Factories in Austria, Czechoslovakia, Hungary and Poland.

TUNGSRAM ELECTRIC LAMP WORKS (Gt. Britain), LTD., Commerce House, 72, Oxford Street, London, W.1.

Branches: Belfast, Birmingham, Bristol, Cardiff, Glasgow, Leeds, Manchester, Newcastle, Nottingham.

"CALLED UP"

A few of the radio war tales told by readers in response to our recent invitation. Will correspondents note that we cannot accept any further contributions for this feature after Monday, January 20th, 1930?

A DESERT CALL.

The Editor.

Dear Sir,—I was attached to the Royal Engineers and was on the staff of a small radio station planted in the Syrian desert.

One night I was staggered to hear, very plainly, the dramatic S.O.S. call which came in very clearly and loudly.

We were miles from the coast and with 1915 apparatus we seldom if ever heard a "dot" from shipping.

But that pitiful call for help came in as though the ship was riding across the very desert itself.

"S.O.S. S.O.S. HELP, HELP, WE ARE SINKING."

The message was repeated a large number of times, but no ship's name or bearings were given.

For half an hour this went on, the call becoming more and more frantically desperate.

"S.O.S. S.O.S. SAVE US, WE ARE LEVEL WITH THE RAGING OCEAN."

I passed these messages on to Headquarters, who told me to try to get in touch with the sender. I had tried, of course, but was quite unsuccessful.

At last came the following tragic finale, "S.O.S. S.O.S. WE ARE SINKING, SINKING, SINKING (a pause)—WE HAVE SUNK!"

I believe the man who so deplorably misused the ether and made a mockery of the S.O.S. was an R.A.F. man, but am not sure. Did any "P.W." reader hear these messages?

Yours faithfully,
L. K. R.

London, N,

BREAKING REGULATIONS.

The Editor,

Dear Sir,—Regarding your request for stirring or amusing tales of wireless in the Great War, the following was amusing to me after the event.

It happened when I was senior operator on an oil tanker, position about 200 miles west of Port Nolloth Naval Wireless Station. Direction-finding was then being carried on by the enemy with a fair amount of success, so much so that only transmissions of an important nature were allowed.

A switch was fitted in the master's room, so that no transmission could take place without his authority; on our undertaking strictly to observe the rules and regulations the master kept the switch constantly in the closed position so that we could transmit at any time we thought fit. We carried an emergency aerial.

I was on watch one afternoon (my last entry in the log was, "All quiet") when I heard "CQ, CQ, what ship on port bow?" I at once looked out on the port bow, but saw nothing. I decided to take pot luck in

(Continued on page 978.)

ENGINEERS! Can't we get together?



WRITE FOR THIS BOOK TO-DAY IT'S FREE!

All we ask is the chance to prove that you can earn £300, £400, £500, per year or more. Other men are doing it, and you can do the same.

We have an unrivalled and world wide organization, waiting to help you whether you be novice or expert. If you wish for something more than a "bread and butter" job you owe it to yourself to investigate our Service.

Our handbook "Engineering Opportunities" has pointed the way to better things to over 20,000 of your fellows. It contains details of A.M.I. Mech. E., A.M.I.E.E., A.M.I.C.E., A.M.I.A.E., A.M.I. Struct. E., London Matric., C. & G., G.P.O., etc., Exams., outlines home study courses in all branches of Electrical, Mechanical, Motor and Wireless Engineering, and explains our unique guarantee of **NO PASS—NO FEES.**

In a Brilliant Foreword Prof. A. M. Low shows clearly the chances you are missing.

"Engineering Opportunities" and our advice are quite FREE. Don't neglect this offer—give vent to that "upward urge" and send a postcard NOW, stating Branch, Post or Exam. which interests you.

British Institute of Engineering Technology, 101, Shakespeare House, 29-31, Oxford Street, W.1

EASY PAYMENTS

The first firm to supply Wireless parts on easy payments. Five years advertiser in "Popular Wireless." Thousands of satisfied customers. Send us a list of the parts you require, and the payments that will suit your convenience, and we will send you a definite quotation. Anything wireless. **H. W. HOLMES, 29, FOLEY STREET** Phone: Museum 1414. Gt. Portland St., W.1

MAKE YOUR OWN HIGH-TENSION ELIMINATOR AND ALL-POWER UNIT

RADCROIX

Mains Unit Components.

KITS OF PARTS FOR:	
H.T. A.C. Unit, SG60, SG80, Det. 60.	£1 16 6
450 max.	
All-Power A.C. Unit, 6 Variable Voltages	£2 2 6
D.C. Unit, 5 Variable Voltages	19 9
Battery Charger, complete with valves, charging current 2 amps.	£1 15 6
Wiring Diagrams Free. State A.C. or D.C.	

From your dealer or direct from **THE WHOLESALE WIRELESS COMPANY, 103, Farringdon Road, London, E.C.1.** Telephone: Clerkenwell 5312

TWIN CONE KIT OF PARTS 21/-

an all steel Chassis double lined die-cast with adjustable damping attachment.

Size: 20 ins. square x 5 ins. wide

Built in half-an-hour. Takes any popular movement.

List on request

GREEN & FAULCONBRIDGE, LTD., 11, QUEENS ROAD, COVENTRY

KAY'S CABINETS

This Cabinet soundly constructed of Oak and equipped with Baseboard Runners, Fall Front, Hinged Top. Polished rich Jacobean. 36" high. For panels 45/- up to 18" wide

Also made to accommodate any Popular Set. Greatest Range of Wireless Cabinets.

Illustrated Lists Free.

M. KAY, Cabinet Manufacturer, Mount Pleasant Road, London, N.17 Phone: WALTHAMSTOW 1626.

APOLOGY

To The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2.

With reference to the recent advertisements appearing under my name in Wireless Journals wherein I have used the words "Mullard Master 3* Circuit (Simplified)" I regret that I have caused such advertisements to appear and appreciate that such advertisements would lead the public to believe that these sets were manufactured by you, which is contrary to the fact.

I undertake that I will not in future repeat these advertisements, or any similar advertisements, nor sell any goods under your name, unless they are manufactured by you, and I apologise to you and to the public for having published advertisements which I now realise were entirely misleading.

K. Raymond.

Trading as **RAYMOND'S**
27-28, Lisle Street, London,
W.C.2.

WARNING

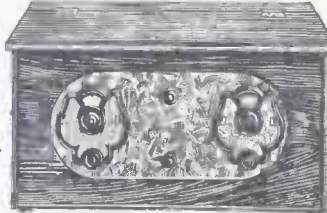
All Goods manufactured by the Mullard Company are clearly marked "Mullard," and the Trade and the Public generally are warned that proceedings will be taken against anyone attempting to pass off other goods as being of "Mullard" manufacture.

RAYMOND'S

27 & 28a, LISLE ST., LONDON, W.C.2
Come to LEICESTER SQUARE TUBE
This address is at the back of Daly's Theatre
Phones: Gerrard 4637 and 2821

AMAZING VALUE IN 3-VALVE LOUDSPEAKER RECEIVERS

RECEIVES
LOCAL
BROOK-
MAN'S
PARK,
NEW
ALTER-
NATIVE,
5 G B,
AND MANY
CON-
TINENTAL
STATIONS.



DE LUXE MODEL ASSEMBLED IN CABINET
READY TO FIX TO AERIAL

SEND
YOUR DETAILED
LIST OF PARTS
YOU REQUIRE

SPECIAL
QUOTATION **25/-**
IF OVER
(Where possible).

MAGIC H.F. UNIT DEC. 21

.0005 Variable, 8 M. Dial, L.T. Switch, 2 Sockets, .001 Fixed, 1 V/Holder, P.W. Screen, B.B. Coil Socket, Raymond Special Choke (as used in set, 6/-), B.B. Neutralising Two 1 mfd., 600-ohm Resistance, 30/- Strip, Terminals, Wire, Clip, Screws, Panel, etc. Post 1/3

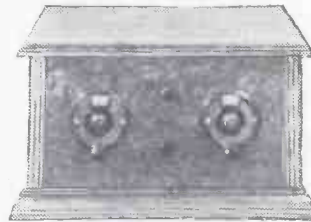
DARIO VALVES

2 or 4 volts.
Universal, R.C., or Super
H.F., each 5/6; Super
Power, 7/6; Hyper Power,
9/6. (Postage, please.)

TRIOTRON VALVES

New Dark Emitters.
Power, 7/6; R.C. H.F.,
each 6/-, 2 volt. Post 3d.

WHY PAY MORE?
OUR LATEST
DELUXE "SUPER" 3-VALVE MAP NOT
LOUD SPEAKER RECEIVER GUARAN-
IS JUST WHAT YOU WANT TEED, BU
IT GETS
THOSE
THAT
MATTER.



READY TO FIX TO YOUR AERIAL.
ASSEMBLED IN CABINET.

Built for Tone, Power and Selectivity.
Extremely efficient, Lissen Power Pen-
tode supplied, giving marvellous results.
New type of dual wave panel mounting
coil incorporated with switch, 2 fine
Tuning Dials, Telsen and Super L.F. Trans-
formers, H.F., I.F., Dull Emitter Valves
with Lissen Pentode (only 100 volts H.T.
needed), Grid Bias, Coloured Battery
Leads. Range 200 to 2,000 metres.
SWITCH ON—THAT'S ALL!

CASH PRICE

95/-
Carr. ex. 5/-

Or 12 monthly
Payments of

9/11

Batteries and
Speaker NOT
included.
H.P. FORM
FREE.

MAGIC TWO KIT OF PARTS.

Panel 14 x 7. .0005 S.M.
Condenser, Differential Re-
action, o/o Switch, 2 Spring
V.H., 2 B.B. Coil Holders,
H.F. Choke, Lotus or
Telsen Radiogrand 12/6
(add balance any other
make), 400-ohm B.B. Pot.,
Neutralising Condenser,
.0003 and .0005 Fixed,
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10 Terminals, Wire, Screws,
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100-v. H.T. only 17/6
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Dual Panel Coil, 8/6 (Switch
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Dual Range Coil 200,2000,
Battery Leads, and 9 volt
Grid Bias.

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KIT OF APPROVED
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COILS 10/- SET.

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WAVE COILS 2, **6/6**
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EASY TERMS

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CABINET, MULLARD
S.G. Valve, 2 D.E. Valves,
Wiring Diagram.

12 monthly
payments of **10/11**

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Cone on baffle board,
Aluminium chassis,
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J.H. TAYLOR & CO.
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"CALLED UP."

(Continued from page 976.)

breaking the rules, and reply. I sent out on full power, "Ere bnd east." The reply was, "Are homeward bnd."

We then exchanged a few signals, and both agreed to call later. No sooner had I finished than I was called by Port Nolloth. "You have committed a serious breach, request name of ship and operator."

After due consideration I gave the desired information, and got the reply, "R O.K., will report to the Admiralty immediately."

Until the following afternoon I had views of spending the next 15 years of my life in a naval prison, when the junior operator informed me that the ship on the port bow was no other than *he*, with a testing buzzer connected to the emergency aerial on the bridge; to represent Port Nolloth he used a high-toned buzzer. He opened the inspection door of the leading-in insulator case on the bridge and was able to read my transmission from the spark, which could be heard quite plainly. After all, it WAS amusing!

Angus.

ROBERT E. THOMSON.

MYSTERIOUS MUSIC.

The Editor.

Dear Sir,—It was in France early in 1916, when wireless telephony was scarcely out of the laboratory stage and broadcasting unthought of.

We were keeping a look-out for Jerry's wireless stations, using a "Round" valve and circuit and the results we obtained after our previous crystal experience were marvellous.

It was the practice for two of us to keep watch together, but one night my half-section—a Jock—went over to the canteen, where a pal was celebrating his promotion.

He apparently had "one over the eight" and, on his return to the station, he put the 'phones on and promptly dozed off.

The orderly officer was due on his rounds, so I endeavoured to wake him. Just as he was trying to pull himself together, I was amazed to hear the strains of a band playing "Alexander's Rag-Time Band" in the carphones.

I listened spellbound, and tried to tune it in stronger, and my companion sat upright with a jerk and in an agitated voice asked: "Did ye hear that?"

"Hush," I snapped back, carefully moving the controls, "But did ye no hear that?" he entreated, apparently thinking I was on the track of an elusive "Jerry."

"Oh, do be quiet!" I replied.
"For goodness' sake tell me what you are hearing?" he begged, tugging at my sleeve.

When I told him he just managed to stammer out, "Thank heavens, I thought I had the 'D.T.'s" and was hearing things."

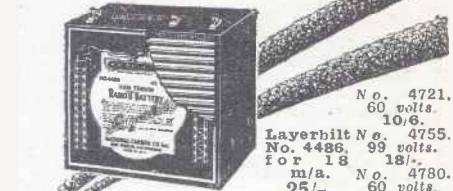
I found out afterwards one of our officers had been making a few experiments.

C. F. GILBERT.

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"Layerbilt"

The "Layerbilt" is unbeatable for smooth reception. It is crammed full of electricity and lasts half as long again as any other battery of the same size and weight in the world. This is assured by the Columbia patented process of building layer upon layer of flat cells. The "Layerbilt" Heavy Duty Battery is the best and most economical battery in the world. Use it always. 25/-



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PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS.

NEXT WEEK IS RADIO WEEK

FOR THE LISTENER.

(Continued from page 950.)

No doubt you could arrange the programmes better; we all could! No doubt "Your Programme" would be the best ever. Good man! But for the moment it is their job. They may call you in one day. Meanwhile give them a fair chance. They will take it, anyhow!

"I will not gobble!" Don't vex yourself by listening to what you don't want to hear. You needn't. The switch moves both ways.

Be a good boy, like Jack Horner, and pull out your own plums. It's a big pie. Every now and then, however, pick out a plum that you don't quite recognise, and nibble it; for there may be "rare and refreshing fruit that you haven't heard of, and will like.

But for the land's sake don't switch on for the sake of hearing what to you may be only noise or tommy-rot! That will only make you angry, and it isn't worth it. Wireless was made for man, not man for wireless.

"I will remember that I'm not the only pebble on the beach!" Everybody is somebody's darling, and everything is somebody's favourite.

One of our contemporaries, the "Radio Times," asked its readers for "postcards

NEXT WEEK IS RADIO WEEK

giving their favourite item in the programmes last year; and adroitly printed a selection of the postcards so that every blessed item in the pack, including the joker, got a pat on the back.

I am sure that if the editor had asked for postcards giving our pet aversion, every item would also have received a nasty biff in the eye!

The world is like that. It's made up of all sorts. You hate Chamber music; somebody adores it. Poetry bores you stiff; somebody languishes for it. And they have all paid their ten shillings.

Take it all round, last year was a good year. I think that solid progress was made in two of the main branches of entertainment; orchestral music, and the plays.

I also recall with much pleasure the "Points of View"—a very promising idea which should be further exploited. Naturally, certain items in the programmes tend to become stereotyped; we get tired perhaps of the sight of a concert with orchestra and two singers; in pre-wireless days, if we got a concert once a week we were lucky, and now we get one, two if we like, every night; so there's bound to be a sameness.

Considering the enormous amount of detail required, what amazes me is that there is any freshness at all. Why! there is scarcely a night but what there is something new and piquant. And 1930 will go one better! That's a certainty!

The
MULLARD "PERMACORE" TRANSFORMER

You can take it from us—secure in the knowledge that you get a good job for your money. It's compact. That means simplified assembly and wiring. It's efficient. It does its work properly because of its special core, the silver wire of the primary, and the nickel-wound secondary. Hear its performance and you'll remember its name—the Mullard "PERMACORE" L.F. Transformer. It has a step-up ratio of 3:1.

PRICE 25/-

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CLIMAX RADIO EARTH

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DEFINITELY HELPS TO ELIMINATE MAINS HUM on All-Electric Receivers

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BUILD WITH THIS COMPLETE CHASSIS

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ULTRA AIR CHROME SPEAKER

Baldry Ad. U 131.

By Dr. J. H. T. ROBERTS, F. Inst. P.

TECHNICAL NOTES.

Quiet Mains Reception.

I HAVE lately been carrying out a number of comparative experiments with various types of all-electric receivers. I have already mentioned in these notes a number of general observations for the guidance of any of you who may be thinking of going in for a set of this kind, and in view of the interest shown in this subject, I should like to refer to one or two further points which may be useful.

First of all, I have been asked whether the A.C. hum has now really been eliminated in the modern type of all-electric set. My view on this is that, with any really good type of all-mains receiver, the answer is decidedly in the affirmative.

There are still sets on the market in which the A.C. hum is decidedly irritating, but on the other hand there are now several sets by the best makers in which this effect is quite imperceptible. The use of the indirectly-heated A.C. valve has, of course, largely contributed to this very desirable result.

Many of the better types of all-electric receiver are now extremely simple to operate and are ideal for those who are only interested in listening to broadcast programmes from stations comparatively near.

At the same time, it is easily possible, with just a little extra care in manipulation, to receive a variety of European stations, since the selectivity of these sets is as a rule excellent.

A Simple Precaution.

I would just like to repeat, however, a word of warning with regard to the sensitivity. The all-electric sets, owing to their necessary connection with the electric-light mains, are much more liable to pick up interference than the battery-operated sets, and consequently if you are aiming at distant reception and, therefore, have to use a fairly sensitive receiver you must take care that your local conditions are such that it is possible to operate the sensitive receiver to proper advantage.

Otherwise, you may find yourself with a wonderful receiver, quite capable of doing all you require, but placed under conditions which do not give it a fair chance of proving its mettle. It is like bringing home a beautiful new car, only to discover, when you get it home, that it is too big to go in the garage!

Anode-Bend Hint.

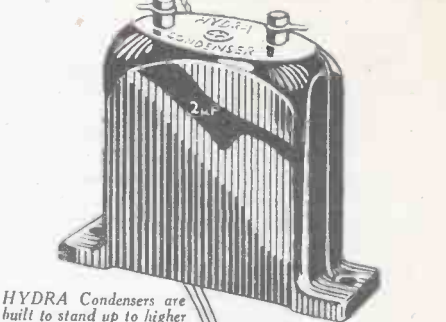
When using anode-bend rectification it is generally a good plan to put a bypass condenser in the anode circuit of the detector, the effect being not only to improve the signal strength but also, as a rule, to increase the selectivity of the set.

If the reaction condenser and this bypass condenser are removed and a fixed condenser of, say, .0001 mfd. is connected between the filament and anode, generally an improvement in the signal strength will be obtained.

(Cont. nued on next page.)

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Solves all H.T. Troubles. SELF-CHARGING, SILENT, ECONOMICAL. JARS, (waxed) 2 1/2" x 1 1/2" sq. 1/3 doz. ZINCS, new type 10d doz. SACS 1/2 doz. Sample doz. (18 volts), complete with leads and electrolyte, 4/1, post. 9d. Sample unit, 6d. Illus. booklet free. Bargain list free. AMPLIFIERS, 30/- 3-VALVE SET, 25. P. TAYLOR, 57, Studley Road, STOCKWELL, LONDON

GRAMOPHONES. Latest Horns and parts. Catalogue free. Cash or terms. Build £12 model for £3. Instructions 3d. **V. BURT, 185, High St., London, S.E.8**

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TECHNICAL NOTES.

(Continued from previous page.)

Now the capacity of the condenser may be increased (by removing the first condenser and substituting a fixed condenser of larger capacity or putting a second condenser in parallel) and again it will most probably be found that there is still further increase in signal strength. In this way you can continue trying higher capacities until you get the best results.

These remarks apply, of course, as I mentioned, to the anode-bend type of rectifier and in order to carry out your tests with certainty it is preferable to tune-in a fairly weak signal. If the signal is very strong the effect may be masked and in any case it is on weak signals that you require any increase of sensitivity which may be obtainable in this way.

Microphonic Troubles.

In the early days of valves we were greatly troubled by microphonic effects, and in some cases valves were so bad that it was impossible even to touch the table upon which the set was standing without producing a loud ringing from the speaker.

Then came the anti-microphonic valve-holders, which certainly made a great improvement. But at the same time valve manufacturers were seeking, quite rightly, so to design the electrodes that the valve should be inherently non-microphonic, even when used with an ordinary rigid holder.

NEXT WEEK IS RADIO WEEK

Most of the better types of valves to-day are scarcely microphonic at all. The resilient mounting of the electrodes has a further advantage in that the electrodes, particularly the filaments, are protected and so are less liable to damage when the valve is in transit. Broken filaments caused in transit are much less common to-day than they were four or five years ago.

Outside Disturbances.

There is another type of microphonic interference, however, which is still liable to arise in certain circumstances, and this is due to sound-waves—usually from the loud speaker, but sometimes from other sources—impinging upon the valves themselves.

For instance, if the loud speaker is facing the valves and close to them, there is the danger of the valves being set into minute vibration, according to the sound-waves impressed upon them, and this effect, particularly in the case of the detector, will be picked up and magnified by the usual regenerative process.

This type of interference, however, is very easy to overcome by simply having the loud speaker and the valves in such relative positions that the sound-waves are prevented from reaching the valves or are, at any rate, very much weakened by the time they reach the interior of the receiver,

(Continued on next page.)

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COMPLETE KITS OR FINISHED INSTRUMENTS.

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Double linen-diaphragm Air Chrome speakers in oak or mahogany table model cabinets of handsome appearance.

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EXIDE 120-VOLT H.T. ACCUMULATOR, Type W.J., 2,500 m/a. In Crates. Cash £3 15s., or 12 monthly payments of 6/11. Type W.H., 120 volts, 5,000 m/a. In Crates. Cash £4 13s., or 12 monthly payments of 8/6.

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4-VALVE POLAR SET. Listed £28. 1 H.F., 1 Det. and 2 L.F. with Polar Coil Holder and Coils for B.B.C. and 5 X X. In Vert. Pol. Mahog. Cabinet, £4 10s. Carriage, 4/- A Bargain.

STERLING Anodeon, Desk Type, one holder Varia and Vernier Condenser Rhes. Wave switch, and unused in Walnut cabinet. Room for coils and 2 holders to convert to 3-valve set. Listed £9. Few available at 25/-.

SUPERSONIC HETERODYNES. For Stenode Experiments. The cheapest is the R.A.F. 7-valve, 600/5,000 metre H.F. Trans. and 3 L.F. Plug switching, beautiful mahogany cabinet. These Sets cost £40 and are a snip. At Sale price of £4 10s. Carriage, 4/6.

3-VALVE POWER AMPLIFIERS for Gramos. W.D. Portable type to fit in small Gramo. cabinets, transformer for Pick-up, cost £15. Sale 40/-. D.C. Mains Panatrop model, 65/-.

GRAMO. PICK-UPS. Magnetic Earpiece Units for making your own 40/- reproducer. Adapted with a little work. Only 1/2 each. Adapted Brown A Pick-ups, 10/6.

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TECHNICAL NOTES.

(Continued from previous page.)

The type of interference set up in this way is generally in the form of a howl, very similar to that which you can make by placing the receiver of an ordinary Post Office telephone against the transmitter. Valve Specifications.

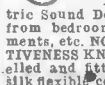
A reader refers to the charts or specification sheets supplied by valve makers, and wants to know whether the H.T. voltage as being necessary for the valves refers to the voltage actually reaching the anode or—in the case of an H.T. supply unit—the voltage delivered, or stated to be delivered, from the terminals of the unit.

The answer to this, I think, is fairly obvious. It is clearly impossible for the makers of the valve to know what loss of voltage there may be between the output terminals of the H.T. unit and the H.T. terminals of the set and they can only specify the voltage which is intended to be applied actually to the anodes of the valves.

As a matter of fact, there is often a considerable loss of voltage before the H.T. circuit is reached—much more than is commonly supposed. This is why it is a good plan to check up the actual applied voltages by means of a fairly reliable voltmeter—which must, of course, be of the high-resistance variety, otherwise it will give spurious readings.

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A RAPID GUIDE TO RADIO

A JUMPING-OFF SERIES FOR THE NEW AMATEUR

By "Pentode"



I HAVE described the filament circuit of the valve. It consists merely of the filament itself, a battery and a switch for turning the current on and off (Fig. 2). Current flows from the battery through the filament, and this gets hot and throws off a cloud of electrons like boiling water throws off a cloud of vapour.

The stream of electrons shoots through the grid of the valve and impinges on the plate, as Fig. 1 indicates.

If you connect another battery between the plate and filament (Fig. 4) the electron stream will complete the circuit. And as

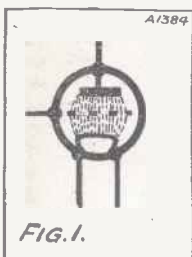


FIG. 1.

the electrons leave the filament there will be others flowing in from the negative terminal of the battery. On arrival at the Plate the electrons will rush to the positive element of the battery in an attempt to reduce the electron instability of this device.

The electron stream in the valve acts as a bridge and completes a circuit, and the bridge is at the same time made larger by the joining of the battery across it. Without the battery to make the filament very negative in regard to the plate, many of the electrons stray off in other directions than that of the Plate. The Grid is liable to accumulate electrons and even impede the flow between the Filament and Plate.

Explaining H.T. and L.T.

But when the new battery is connected up (Fig. 4) it is the ambition of every electron released from the filament to get over and

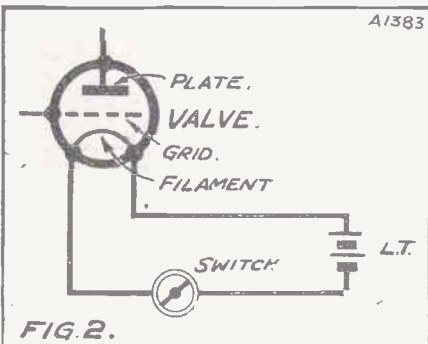


FIG. 2.

help to make up for the lack of electrons on the Plate caused by a migration from here to the positive of the battery.

For a battery to have much effect on the Plate of a valve it must be of a somewhat high-voltage type. Only a 2-, 4-, or 6-volt supply is needed for the heating of the filament; thus the term Low Tension (Low Voltage) and, again, thus the term High Tension as applied to the battery of

comparatively high voltage that is met with in radio.

Supposing the Grid of the valve were made negative (overcrowded with electrons) in respect of the filament by joining up yet another battery. If a sufficient charge of electrons were given the Grid, the electron stream between the Filament and the Plate would cease altogether (Fig. 3).

The filament electrons would accumulate between the Grid and Filament, and many would be reabsorbed by the Filament.

If you made the Grid very positive (deficient in electrons) by reversing the Fig. 3 battery, a stimulus to the electron flow would be given.

Although this series of "how it works" articles is in itself quite complete, readers will find it interesting and instructive to examine the "Close-ups for Constructors" feature overleaf after reading each week's instalment. Here they will see the various component parts referred to and may frequently trace their circuit connections.

14.—MORE ABOUT THE VALVE.

Thus by varying the potential of the Grid in respect of the Filament, you can vary the electron stream between the Filament and the Plate from a condition of no stream at all to one of a maximum width, as it were.

Another way of influencing the Grid is to feed energy on to it from our old friend the oscillating aerial circuit.

Instead of passing some of the energy through a crystal-phones path, you can take the "taps" to the Grid and Filament of the Valve (Fig. 4).

The Grid is then made alternately Positive and Negative in respect of the Filament in exact time with the swinging to and fro of the current in the aerial circuit.

Varying the H.T. Current.

The electron stream is made alternately larger and smaller. And the current flowing from the battery marked "H.T." rises and falls in exact time with these variations.

The alternations of current at high speed in the aerial are now followed by alterations in the current flowing through the Plate or Anode Circuit of the battery. In this way the valve can be said to act as a relay rather than a "valve," because the energy of the form of Anode Circuit current alterations will be greater than the energy fed on to the Grid.

Let me remind you that we have now got four circuits in operation. There is first the aerial circuit which is tuned to the ether waves of a broadcasting station and in which an oscillating current has been generated by these waves.

Secondly, there is the Grid Circuit of the Valve comprising the coil, the Grid and the Filament. Then, thirdly, there is the Filament Circuit embodying a battery, a switch and the Filament itself.

The fourth circuit is the Anode Circuit or Plate Circuit comprising the Plate and Filament of the Valve and the H.T. battery.

The variations in current occurring in the Anode Circuit are of High Frequency, so that we cannot use these for working telephone receivers. Even if telephone receivers were added (placed in series in the Anode Circuit) Fig. 4 would not be a complete detector or rectifier circuit. Such a circuit will be discussed next week.

In the meantime, here are a few general facts for you to memorise if you feel so disposed.

Four Interesting Points.

The Anode Current (Current flowing from H.T. battery) in ordinary valve sets ranges from a milliampere or so up to perhaps 20 milliamperes. This current directly depends upon: 1. The emission of the valve, i.e. the electrons emitted by the valve filament—this varies with types of valves. 2. The sizes, shapes, and relative positions of all three electrodes. 3. The potential difference between the Grid and

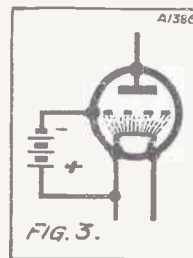


FIG. 3.

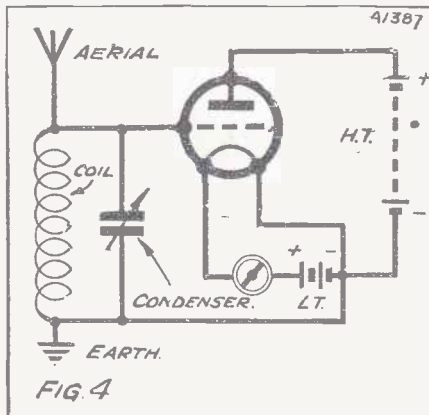


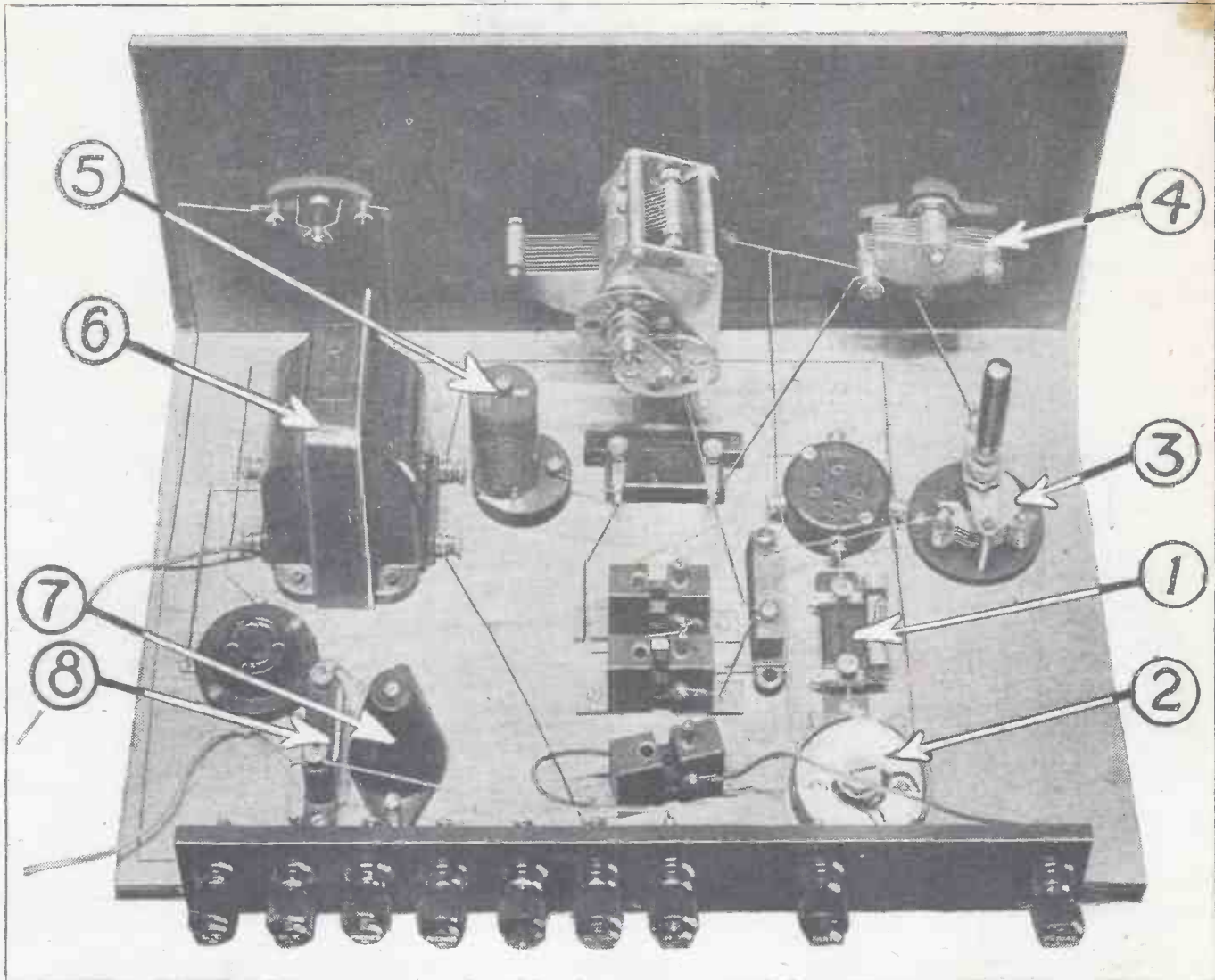
FIG. 4

Filament. 4. The Voltage of the H.T. battery.

If you want to reconcile your Ohm's Law with this valve business, you can say that the Valve has a Resistance that depends upon the first three points. You won't go far wrong if you grab hold of Ohm at every possible opportunity.

CLOSE-UPS FOR CONSTRUCTORS.

THE FOURTEENTH OF A PICTORIAL SERIES FOR SET BUILDERS.



THIS, for the time being at least, is the last of the Close-ups, and we have chosen a two-valver designed especially for all-wave reception. There are certain items introduced and the component values are arranged to make the receiver as efficient as possible on the very short wave-lengths as well as for ordinary broadcast reception.

For instance, the grid leak (1) is taken to the potentiometer (2) instead of direct to L.T. plus, as is usual with a detector valve. By adjusting the grid voltage with this potentiometer the reaction can be rendered smooth and free from "ploppiness."

Adding a Potentiometer.

The potentiometer is joined across the L.T. and the grid leak goes to the slider of the potentiometer. This component should be of the 300- or 400-ohm type, and not the very high-resistance volume-control variety. We add these details because any set that has a rather inferior reaction control on any wave-band might, with advantage, have such a refinement added.

At (3) is a neutrodyne condenser connected between the grid of the detector valve and L.T. minus. This addition proves

valuable only on the short waves. (4) is the reaction condenser having a maximum value of .0001 mfd.

Now (5) is the ordinary H.F. choke figuring in the detector valve anode circuit. Obviously a good make must be used if the set is to operate over such a wide wave-band.

Minimising "Hand-Capacity" Effects.

At (6) you can see the L.F. transformer, (7) and (8) are an H.F. choke and a .001-mfd. fixed condenser respectively, and these two items comprise a sort of H.F. filter in the anode circuit of the last valve. These are the connections: Plate of valve to one side of H.F. choke and one side of fixed condenser, remaining terminal of fixed condenser to L.T. minus. Remaining H.F. choke terminal to 'phones (or loud speaker), loud speaker to H.T. plus.

The object of this filter is to exclude H.F. currents from the 'phone leads in order to minimise those nasty "hand-capacity" effects on the short-waves.

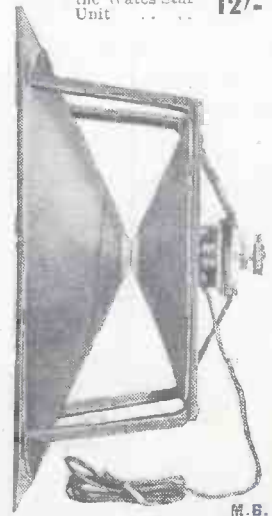
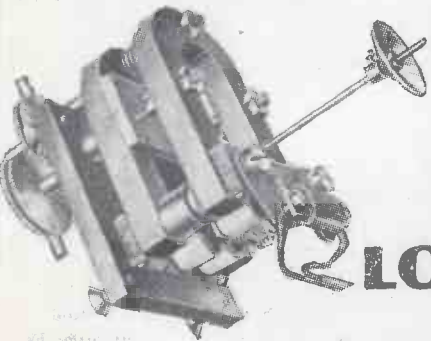
The grid condenser (detector circuit) is made small (.0001 mfd.) and the neutralising condenser at (3) figures in the outfit for a similar reason.



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It is impossible here to give more than a brief survey of the many points which are of interest to every Radio listener, but you can learn all about the instrument by asking your dealer for one of the artistic coloured folders of the "Madrigal." That you will ask for a demonstration after reading it, is inevitable.

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