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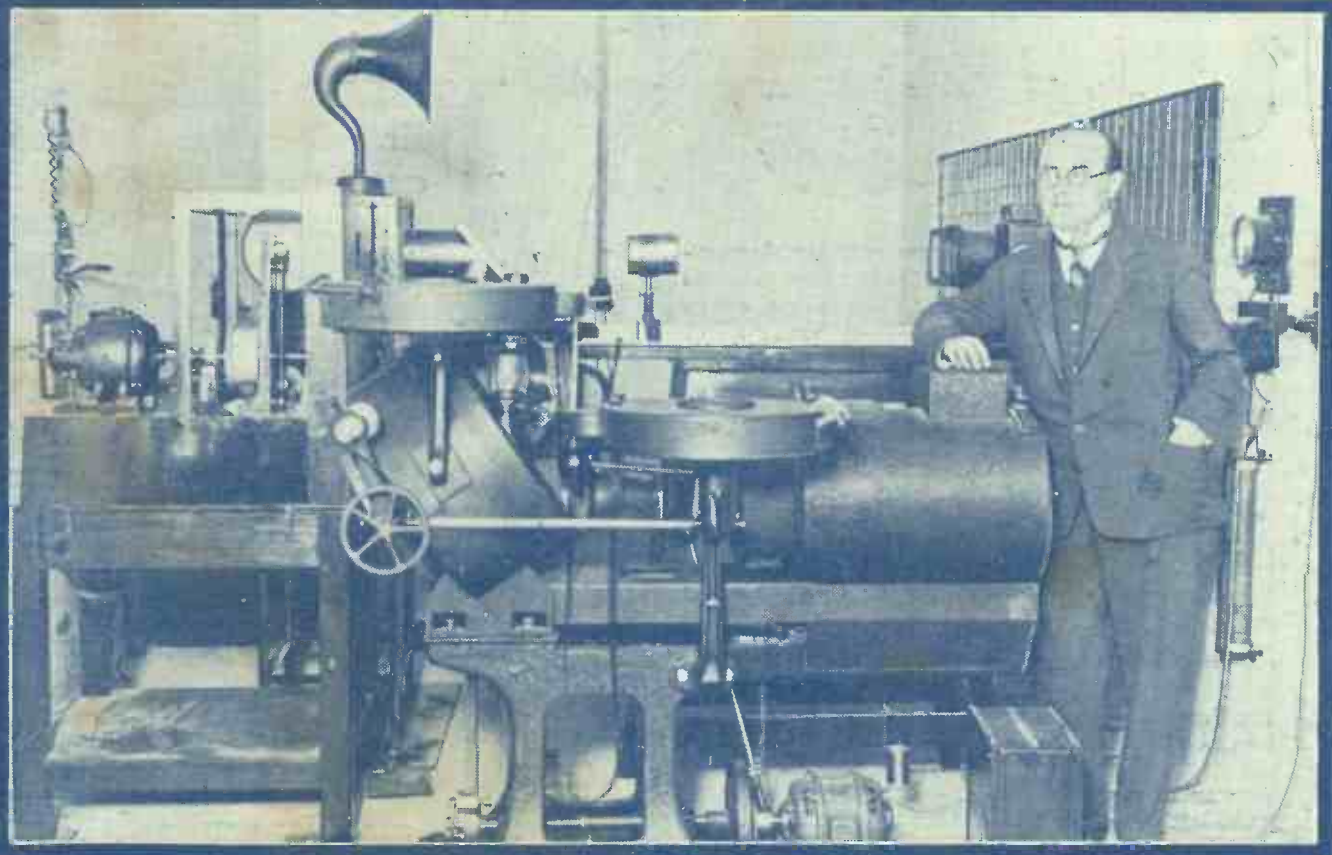
Every Thursday PRICE 3d.

No. 331. Vol. XIV. INCORPORATING "WIRELESS" October 6th, 1928.



Special Features in This Issue

"Memories." Latest Broadcasting News

For the Newcomer. What I Thought of Olympia

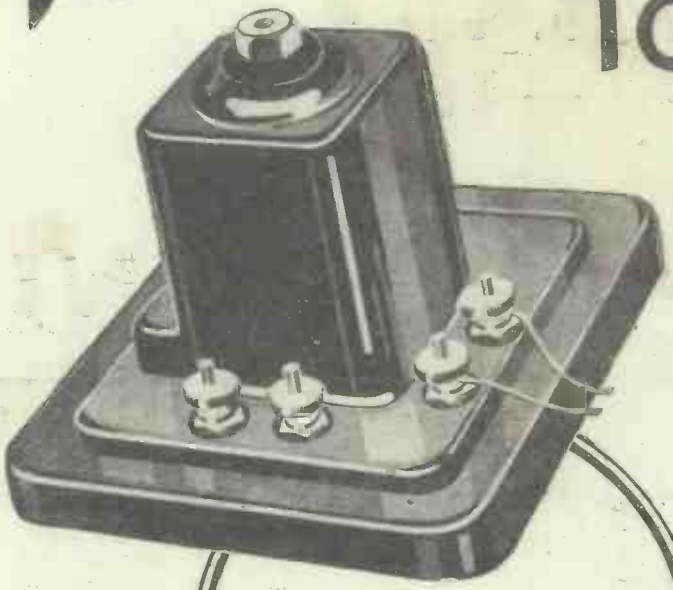
THE "P.W." SHORT-WAVE TWO

London's Regional Station. Are Rheostats Useless?

A Critique of the Exhibition

In the photograph is seen Prof. Karolus, the famous television experimenter, with some of his apparatus which was on show at the Berlin Radio Exhibition.

DON'T RESTRICT WIRELESS TO ONE ROOM



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IS YOUR wireless at every fireside—ready to switch on at the touch of a plug? The Lotus Remote Control provides simultaneous reception with independent control throughout the house. There's no interference—no weakening of signals—no extra current consumption. YOU can instal it, it is so easy. Neat, efficient, and reliable, the Lotus Remote Control is *the* wireless convenience of this winter.

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The Lotus Remote Control is made for every type of receiving set, as follows:

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Made by Garnett, Whiteley & Co., Ltd. Broadgreen Road, Liverpool.
Causton

valve creation

MARCONI achievement

THE new series of Marconi Point 8 valves is designed for direct heating off A.C. mains through a suitable transformer, thus dispensing altogether with High and Low Tension batteries.

The series embraces :

Type H Point 8, for resistance capacity coupling or high frequency.

Type HL Point 8, general purpose.

Type P Point 8, low frequency Power Valve.

All these valves use a moderately high current at a very low voltage, thus avoiding A.C. hum. For greater output than that given by Type P Point 8, a 4-volt Marconi Super Power Valve can be used in the last stage.

The Newest Refinements in Valve manufacture are to be found in Marconi Valves.

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Fil. Volts	0.8
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Anode Volts	150
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Fil. Volts	0.8
Fil. Amps	0.8
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Fil. Volts	0.8
Fil. Amps	0.8
Anode Volts	150
Imp.	6,000
Mag. Factor	6

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Type LS5A & LS5B each 25/-

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MVII

MAZDA

NICKEL FILAMENT *Steep Slope* VALVES

Sergeant Nickel says: "It's slope that matters"

A wonderful series of valves

The new Mazda Valves possess certain unique qualities—brought about by the use of the Nickel Filament.

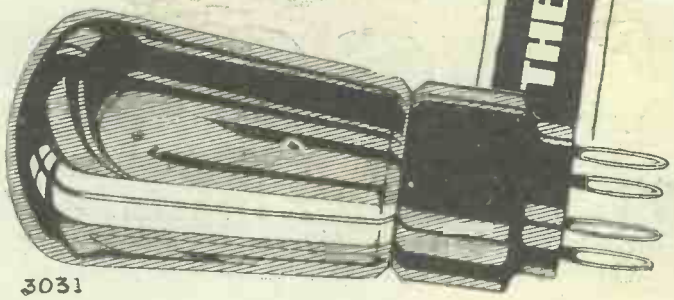
Nickel Filament means Steep "Slope"

The quality or "goodness" of a valve is indicated by its mutual conductance or "slope" figure. Nickel Filament Valves have higher slope value than any other valves of corresponding types.

Steep "Slope" means better results

"Slope" is the only measure of the essential goodness of a valve. Because of the higher slope value of Mazda Nickel Filament Valves they are better valves. To ensure better reception and the longer life of your valves, Mazda Nickel Filament Valve should be specified.

THE VALVE WITH THE STEEPER SLOPE



3031

The new Mazda valves are made in a complete range of 16 valves, covering every requirement of the 2, 4 and 6 volt user. Study the tabulation below and note the "Slope" figure.

TWO VOLTS

Type	H.T. Volts	Ampl. Factor	Imp.	Slope
			ohms	
G.P. 210	120	13	14,000	0.90
H.F. 210	150	20	28,000	0.70
R.C. 210	150	40	86,000	0.47
L.F. 215	120	7	7,000	1.00
P. 227	120	4	2,900	1.40

FOUR VOLTS

Type	H.T. Volts	Ampl. Factor	Imp.	Slope
			ohms	
G.P. 407	120	14	14,000	1.00
H.F. 407	150	18	21,000	0.85
R.C. 407	150	40	100,000	0.40
L.F. 407	120	8	5,700	1.40
P. 415	120	5.5	2,900	1.90

SIX VOLTS

Type	H.T. Volts	Ampl. Factor	Imp.	Slope
			ohms	
G.P. 607	120	14	12,500	1.10
H.F. 607	150	20	20,000	1.00
R.C. 607	150	40	90,000	0.45
L.F. 607	120	9	5,300	1.70
P. 615	120	6	2,600	2.30
P.X. 650	200	3.5	1,750	2.00

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RADIO NOTES AND NEWS.

"Sydney" Two Again—Dark Days and Distance—The Trials of a Waterside Dweller—The "Travellers' Three"—Station Identification—American Short-Wave Programmes.

"Sydney" Two Again.

REGULAR readers of these "Notes" will remember that I have upon sundry occasions in the past sung the praises of that dinkum little receiver known as the "Sydney" Two. And I am not the only pebble on the beach that believes in "Siddie." A Brussels reader (H.E.D.) sends me a postcard to say that he has been getting loud-speaker results from 2 X A F, P C J J, 2 X A D, and Bandoeng.

"Last week," he says, "2 X A D came through as early as 7 p.m., and it is as easy to tune it as to get 5 X X on the big set." Some set "Sydney"!

Is This a Record?

IN sending me a very attractive programme of the coming season, the secretary of the Hackney and District Radio Society mentions a very interesting fact. He tells me that although this society started before broadcasting was commenced it has, without a break, in winter or summer, held weekly meetings ever since. Radio men of Hackney are reminded that the Hon. Sec's. name and address is Mr. George E. Sandy, 48, Melrose Avenue, London, S.W.19, and the new name of the society is The Hackney Radio and Physical Society.

Radio for the Blind.

I HAVE just been reading through the thirteenth annual report of St. Dunstan's, and a wonderful report it is. In telling of the ways in which the sadly shadowed lives are brightened, it says: "Wireless, of course, is an absorbing interest to the men, and headphones at every bedside enable the bedridden and convalescent to share in this pleasure."

In order to carry on the good work, generous public support is still needed on behalf of war-blinded soldiers, sailors and airmen, and donations will be gratefully acknowledged by the Treasurer, St. Dunstan's Headquarters, Inner Circle, Regent's Park, N.W.1.

The Regional Scheme.

ACCORDING to the singers of Negro Spirituels, it is a fact that "everybody talking 'bout Heaven ain't going there," and according to my postbag, this regional scheme of the B.B.C. is not all it is made out to be, either. Many indignant letters are reaching me upon the subject, some of them containing points well worthy of serious consideration.

Sheffield Station Stays.

One Sheffield reader says: "With that part of the regional scheme which promises increased wireless services to the general body of listeners, Sheffield is in entire agreement." But he points out very clearly that the closing down of the Sheffield Station would result in complete deprivation of wireless programmes for thousands of Sheffield listeners who are dependent upon indoor aerials and crystals.

This gives me a chance to contradict that rumour about Sheffield being on the shut-down list. I did some strenuous Sherlocking at Savoy Hill recently, and found that Nottingham is absolutely the only casualty. The ultimate fate of Sheffield will, of course, depend upon the results of the Regional Scheme, but at the moment the supporters of both the "Wednesday" and the "United" are safe.

Dark Days and Distance.

THE B.B.C.'s announcements of Christmas concerts and so forth reminds me that winter draws on. But have you noticed how beautifully the dark days are encouraging the distant stations to romp in? The other Sunday afternoon, long before the B.B.C. people had finished their afternoon naps, I got a full strength first-class quality programme from one of the German stations, which lasted at really good strength without a sign of fading until 2 L O woke up and warbled at 3.30 p.m. After sunset, even a one-valve set will pick up a pandemonium of programmes.

DOT DASHES TO HEAR!

During the recent Army manœuvres the village children were greatly interested in radio. The above photograph was taken in a Sussex lane, near Pulborough.

Television on Five Metres!

IT is reported on good authority that the U.S. Federal Radio Commission will shortly authorise amateurs to experiment in picture and television transmissions on wave-lengths of 160 and of 5 *metres*. To me this latter seems rather like giving a lame man permission to run ten miles, provided he does it in less than 5 minutes!

An Amateur Record.

THE Japanese amateur, A J 1 A W, recently succeeded in achieving direct communication with the British amateur station G 5 C Y, on 20 metres. The owner of the Japanese

(*Continued on next page.*)

NOTES AND NEWS.

(*Continued from previous page.*)

station announces that this was the first direct amateur contact between Great Britain and Japan. I offer my congratulations to the parties concerned, and add my firm belief that you have got to get up early if you want to beat the lads from the Land of the Rising Sun!

Kaleidoscopic Correspondence.

THE B.B.C. people are understood to have stated that hundreds of letters were received in fulsome praise of that Kaliedoscope business they broadcast recently. I had some letters about it, too, and mine were a most uncommonly caustic, sarcastic and vitriolic lot.

Glasgow Readers! Attention!

MR. S. GOULD, 76, Abbotsford Place, Glasgow, deplores the winding-up of the Glasgow and District Radio Society and wants people to join with him in laying the foundations of a new Society, not necessarily upon the ruins of the first. We gladly give publicity to this matter and hope that a proper response will be made to Mr. Gould's proposal.

Trials of Waterside Dweller.

PROBABLY the most tried fan in the London area is my old and valued correspondent F. C., who hangs out at Greenwich in a house by the river. This poor chap's tuning alters with the rise and fall of the tide and even with the rise and fall of certain steel barges when they feel the swell. He has built the "Two Thirty-Five," as described in "Modern Wireless" for August, and has succeeded in roping in the U.S.A. and 3 L O. Not bad for 35s., eh?

The "Traveller's Three."

WE have to thank M. R J. (Swansea) for an ode to the beauties of this set, which has stunned him and even found favour with "the family"—indeed a triumph. We regret that the photograph of the 2½-year-old manipulating the set is too small for reproduction, though we are filing it against a rainy day. By the way, the best writers, so far as caligraphy is concerned, are Welshmen, and the worst are people in S.W. England—judging from my own post-bag. I am keeping as a curio a letter from Falmouth which has defied all Tallis House. We tried it on our oldest "comp." and he said he was no Egyptologist.

A Novel Idea

SO far as I know, Austria is the only country in which the broadcasting licence fee is graded according to income. There is a fee of 1s. 2d. a month on incomes below £20 10s. per month; and 3s. 6d. if above that monthly income. The matter is eminently arguable, but on the whole I think an equal fee all round is best, because the grading system introduces an additional means of fraudulence. "Pirates" are bad enough, without adding "fibbers."

Another DX Test.

I LEARN, curiously enough, through a note in an American radio magazine mentioning my name, that the Winnipeg station H C, owned by J. Richardson & Sons, Ltd., is an extraordinarily effective outfit, and has been heard on L. S. all over Geography. It transmits on 27 metres, but will at some date unknown change to a regular wave 25·6 metres long. At the end of this year its call will probably be C J R X. Has anybody heard it?

Station Identification.

F. C. (PALMER'S GREEN, N.13), improves upon my suggestion that stations should be numbered, by suggesting that the numbers should be announced in Esperanto. This "language" is simple enough to learn, and genuine "fans" would no doubt be prepared to go to the length of learning the numerals and the names of the countries, so that they could understand, for instance, that "Germanujo Dek-kvin" means "German station No. 15." I confess—and I believe Mr. P. W. Harris will do likewise—that the combination of radio and some international "language" is very attractive. But what will the "I do-ists" say?

SHORT WAVES.

When Doctor Brown's X-ray machine
Made static in our block,
The neighbours lost their patience, and
The patients lost their Doc.
—"Helmers Huebner."

* * *

"B.B.C. to Broadcast Pictures," says a headline.
This is where listeners get a look in.
—"Express & Star."

* * *

R. I. P.

D.: Jones looks rather sad.
X.: Yes, I heard him say he buried his "Aunt Enna" yesterday!

* * *

"Is he an optimist?"
"Is he? Why say, he took a course in foreign languages before he bought his one-valve radio set, so that he would be able to understand the foreign announcers."
—"Radio News."

* * *

For those who wind their own coils, remember,
One good turn deserves another.

* * *

It is stated that the B.B.C. are introducing a "Mr. Nobody" into wireless talks.
So don't be too optimistic if a friend tells you that nobody's talking on the wireless to-night.

* * *

Smith: What do you know about this? The paper says that a long-wanted criminal owes his arrest to the radio. Someone recognised his voice in a broadcast.
Jones: H'm. This isn't the first time the radio has squealed.
—"Radio News."

* * *

From seven o'clock till ten o'clock,
He tried to make it go—
Twisting this and turning that
To tune in 3 L O.

He decided that he'd give it up,
But something caught his eye—
He then "unearthed" his aerial
And had another try.
—"Popular Radio Weekly."

The "100 per cent Crystal Set."

MORE in sorrow than in anger, N. K. N. (Henfield) writes to say he hooked up this set, and having tested its quality at once he was moved to tell us all about it. But we ignored him. This is a grave indictment. The defence is that his letter must have come unstuck, and been destroyed by a Valve Bart. N. K. N. claims twelve stations, including French and German. The set is so selective that he asks if he had better introduce vernier tuning. By all means! High selectivity is a marked feature of this set, and we are grateful to him for confirming the fact.

A "Hit" by "Modern Wireless."

ANOTHER "hit," I mean. H. C. S. (Blackpool), having tried nearly all the short-wave sets described in "P.W." and "M.W.," gives the blue ribbon to the "Universal Short Waver." That is a tip for short-wave enthusiasts. H. C. S. has received written confirmations of reception on this set from 3 L O (Melbourne), 2 X A D, 2 X A F, W G X, and 7 R L, all of which he receives regularly. The American G.E.C. have sent him their latest short-wave schedule, which is as follows.

American Short-Wave Programmes.

2 X A D on 21·96 m. Sunday, 21.30–02.30; Monday, 18.00–20.00; 22.00–04.00; Wednesday, 22.00–04.00; Thursday, 18.00–20.00; Friday, 22.00–04.00. 2 X A F on 31·4 m. Monday, 22.00–04.00; Tuesday, 22.00–03.30; Thursday, 22.00–04.00; Saturday, 22.00–04.00. All G.M.T. Plenty of scope for burning the midnight watt.

Pilgrim's Progress.

FOR logical work, consistent progress, and belief in "P.W." and "M.W.," commend me to G. H. M. (Nr. Coventry). Here in brief is his tale. "Low-Loss Crystal Set." "Valve Unit for crystal set." "Old World Two," by P. R. Bird ("P. W." Aug. 14th, 1926), which did him "good service." "The Simple Simon," by P. W. Harris. "This was a real go-getter, if you like," says he. Finally he lighted on the "Progressive" Four. "Plenty of stations, easy to handle, and very quiet in behaviour." Readers, he says, should get on to this last set, and if not pleased should retire from radio.

The Thin End.

I UNDERSTAND that the Westminster Electric Supply Corporation has issued a statement to the effect that no authorisation has been given for the use of its power or lighting circuits for radio. Hoity-toity! Is authority needed? Has authorisation for the use of its current for electric-irons been issued? The Corporation is said to have stated that if it changes its supply to A.C. it will not pay for the necessary changes in radio sets. Well, if they are going to try to pull that off on the grounds that no authorisation, etc., I think they will have trouble. I am going to ask the Gas Co. for authority to toast cheese on the gas-stove.

Light Interlude.

LIST to the gentle Arian, who addresses "Ariel" from far-off Calcutta! Who, without a convulsive sob, could read this? "Honoured Sir, Your Honour not being more than esteemed commenter (*dirty dog!*)—your suppliant ever prayeth kind consideration of matter in *re* Indian telephony. Broading Kumpany to Bombay refrains to iterate per marcony system damnationable grievances Indian peepul as Gandhi tells. What of for I not awaring but grieve excellently. Thee god mend it, all British being sport."

A mere esteemed commenter can do nothing but hope for the best and grieve excellently.

ARIEL.

The "P.W." SHORT-WAVE TWO

The fascination of short-wave reception partly lies in the fact that excellent results can be obtained with simple, easy-to-make, inexsive, but well-designed sets. Here is one which fullfils all those conditions and which can also be adjusted to the reception of ordinary stations.

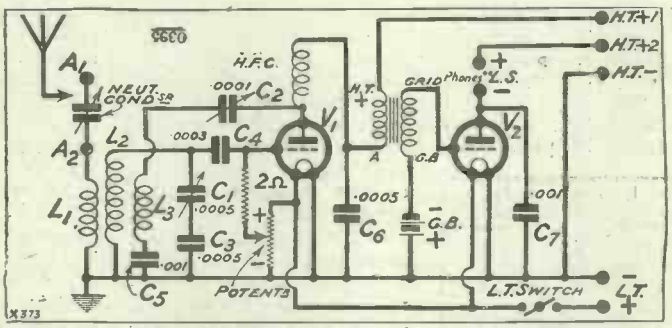
Designed and Described By the "P.W." RESEARCH DEPT.

THERE is one very pleasing thing about short-wave work which does not seem to be very well understood by those who have not yet made a set for the low waves, and that is that the comparatively simple set with which one makes a start often gives results which are not very far short of those obtained by one's expert friends with really elaborate sets.

Their sets may have all sorts of special refinements which your own lacks, but most of these will be intended merely to make the set pleasanter to work, and as far as actual results go they will not be as far ahead as their owners would like to think. You can safely reckon that if you build any two-valve short-waver, however simple, provided that it is properly designed, you will get results at least three-quarters as good as those of any other two valver, however special, and similarly with "threes."

A Cheering Thought.

The fact is that there is far less difference between simple and advanced sets in the short-wave class than there is on the broadcast band, where one may make a start with a two-valver capable of bringing in perhaps a dozen stations, and go on in the course of a year or so to a five with a log of forty or more. Short-wavers rarely use more than three valves, and so the possible difference in sensitivity between a simple and an advanced set is very much less.



Here is the circuit, in theoretical form, of the "P.W." "Short-Wave" Two. It is a perfectly straightforward arrangement, although it embodies every modern device necessary for successful operation.

This is really rather encouraging when one is thinking of making a start in the very fascinating field of short-wave reception, because you have the assurance that the comparatively simple set you build at first will not be very much inferior in actual results to the "de luxe" affair to which you will one day go on. Hence, you can feel certain that you will be content with your first effort for a considerable time, instead of growing dissatisfied after a few evenings of use as you might at first think after noting the extreme simplicity of the design of such a short-wave receiver as the one we are describing this week.

Ultra Long Ranges.

And it really *is* a very fascinating field for anyone with the taste for ultra-long-distance reception. There are now so many regular broadcast transmissions on waves between 20 and 70 metres, on quite high power, that it is really amazing how many different continents can be tuned in on a simple little two-valver. Even to the old hand there is still a real thrill in picking up one of the Americans on such a set, and it can be done on practically any night during the months between September and May.

(Continued on next page.)

COMPONENTS REQUIRED.

- 1 Panel, 14 in. × 7 in. × ¼ in. or ⅜ in. ("Kay Ray," Becol, Ebonart, Radion, Resiston, etc.).
- 1 Cabinet to fit, and baseboard 9 in. or 10 in. deep (Camco, Raymond, Bond, Artcraft, Makerimport, Caxton, Pickett, Gilbert, Peto-Scott, etc.).
- 1 ·0005-mfd. variable condenser, slow motion or with good vernier dial giving very smooth and slow drive (Lissen condenser and Utility dial in original. Any good makes).
- 1 ·0001 or ·00015-mfd. reaction condenser (Cyldon, J.B., Igranic, Bowyer-Lowe, Peto-Scott, etc.).
- 1 L.T. switch (Lissen, Lotus, Benjamin, Igranic, etc.).
- 4 Baseboard-mounting single-coil sockets (Lotus, Igranic, Burne-Jones, L. & P., etc.).
- 1 Baseboard-mounting potentiometer (Lissen, Igranic, etc., 200 or 400 ohms).
- 1 Baseboard neutralising condenser for use as series condenser in aerial (Any standard type).
- 2 Sprung valve holders of a good low-loss type (Burne-Jones, Lotus, Igranic, Wearite, Bowyer-Lowe, Benjamin, W.B., etc.).
- 1 L.F. transformer (R.I.-Varley general-purpose type in set. Any good make, Lissen, Ferranti, Igranic, Marconiphone, Mullard, Philips, etc. Note: choose a fairly high ratio of 4 or 6 to 1 if it is available in the particular make you decide upon).
- 2 Fixed condensers of ·001 mfd.
- 1 Fixed condenser of ·0003 mfd.
- 1 Fixed condenser of ·0005 mfd. (Any good make for these, Lissen, Dubilier, Mullard, T.C.C., Igranic, Clarke, Goltone, Burne-Jones, etc.).
- 1 Grid leak of 2 meg. with separate clips or holder (see photos) (Dubilier, Lissen, Mullard, Igranic, Clarke, etc.).
- 1 Terminal strip, 12 in. × 2 in. × ⅛ in. and 10 terminals (Eelex, Belling-Lee, Igranic, etc.).
- Wire, flex, G.B. plugs, screws, etc.
- 1 Set of short-wave coils (Igranic, Atlas, DX., etc.).
- A few ordinary plug-in coils, No. 35, 50, or 60, for use as H.F. choke.

THE "P.W." SHORT-WAVE TWO.

(Continued from previous page.)

sometimes quite early in the evening, but more usually from about 10.45 or 11 p.m. onwards. During the midwinter period, of course, it grows dark early, they are often heard quite early, say from 9 p.m. or at latest 9.30 p.m. onwards, with the exception of certain nights in the week when they actually start work later. (Remember that their time is five hours behind ours.) We will try and find space to give some details as to how and when to try for these stations at a later point in this article.

A Real Thrill.

Nearer home there is the Dutch station P C J J, which gives some very good programmes several nights a week during ordinary broadcasting hours, and usually comes in at very good strength and quality on a two-valver. (Three valves will generally put it on the loud speaker.) Once a week, too, there is a good chance of picking up 3 L O, Melbourne (7.30 p.m. to 9.30 p.m. on Sundays), and although this station does not as a rule come in every time you try, it is *some* thrill when you *do* get it.

After reading the last paragraphs you will have got an inkling of the interesting times to be had on short waves (we have only mentioned just a few of the star turns; there are plenty more) and will probably be prepared to agree that nowadays short waves are worthy of serious consideration. That being granted, what about trying the set you see illustrated on these pages? It is extremely easy to make (all standard parts and no coils to wind), not at all expensive (special care has been taken to arrange it so that you can use up many odd parts you may have, and there is no need to go to the expense of a cabinet unless you wish), and gives very good results indeed (see test report towards the end of this article).

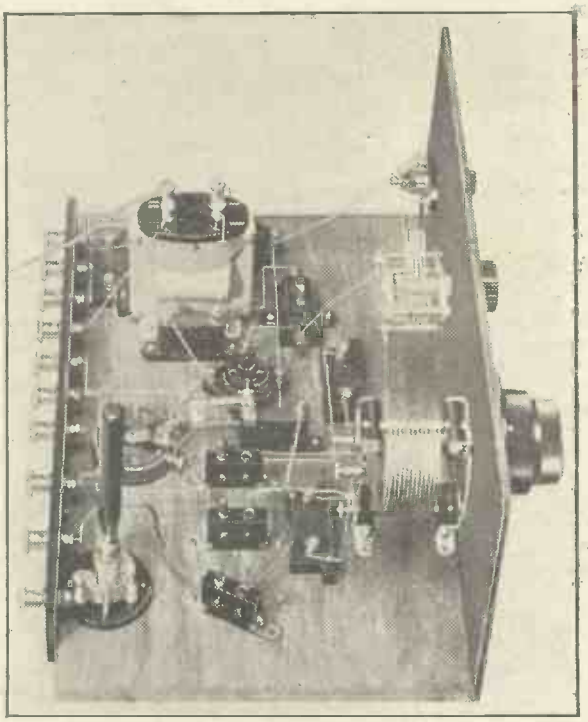
The tuning and reaction arrangements are very simple but efficient, consisting of plug-in coils of the special type now supplied by a number of firms (Atlas, Igranic, "DX," etc.) which makes it very easy to cover all waves (even the ordinary broadcast ones if you like), and also helps the comparative beginner to find out pretty accurately where he is as to wave-length, since the tuning ranges of these coils are known within quite useful limits. The efficiency of such coils is quite good, very much better, indeed, than is realised by the confirmed enthusiast who loves special coils with freak mountings.

The circuit is quite a straightforward one, for it is a fairly safe rule that the simpler it is the better it works on short waves. Three coils are used, one for coupling the aerial, one for the tuned circuit, and another for reaction. The reaction scheme is practically the standard capacity-controlled one, except that the reaction condenser is not connected into the circuit at quite the usual place. This, however, is a matter of detail with which we need not concern ourselves here, beyond pointing out that it was done intentionally and for a good reason

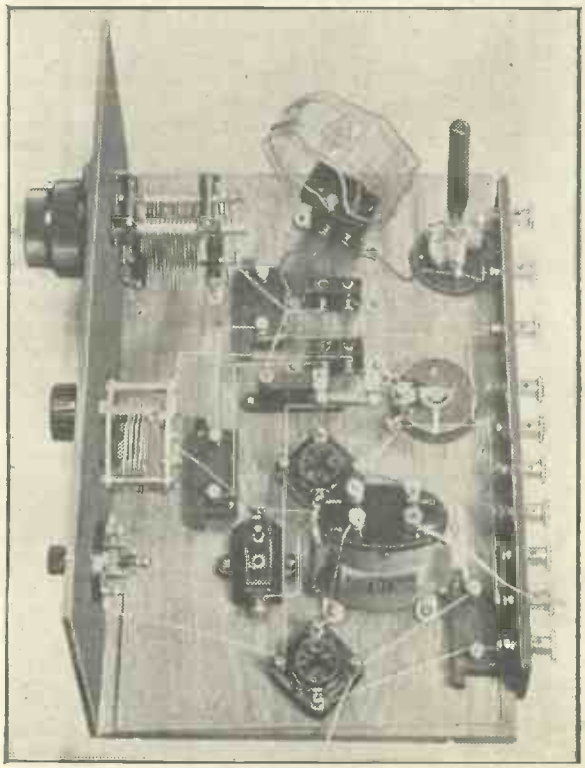
A potentiometer is provided to adjust the potential of the grid of the detector valve, in order that the smoothest possible reaction effects may be obtained. The "lower" end of the grid leak is connected to the slider of this, and it is a very simple matter to make the necessary adjustment. The second valve is an L.F. amplifier, transformer coupled, and there is little to be said here, except to draw attention to the presence of a fixed condenser of ·001 mfd. across the 'phone terminals. This is important, since it is very helpful in reducing body-capacity effects in tuning, which may be bad unless such a by-pass for H.F. currents is provided.

One more general point, and then we can get down to practical matters. You will see that there are two aerial terminals, and one of these brings into circuit a very small variable condenser in series in the aerial circuit, for use when difficulty is found in getting proper reaction effects at any point on the tuning.

Such points are commonly called flat spots, and are more likely to occur with a large aerial than a small one. The best remedy is to weaken the coupling between the aerial coil and the tuning coil, either by moving the first at an angle to the latter, or by using a smaller aerial coil. If this does not suffice, then transfer the aerial lead to A_1 and try various settings of the small series condenser. This component in the set under consideration is actually a neutrodyne condenser, but, of course, it has nothing to do with the ordinary process of neutralising, any other very small variable condenser (baseboard mounting) serving equally well.



This is a view of the set from the detector-stage end. The aerial coil holder can be adjusted to provide varying degrees of aerial coupling.



Here you see the set from the L.F. end. Note the H.F. choke holder for short-wave work. This carries a No. 35 or 50 plug-in coil.

Adjustable Coupling.

The actual construction of the set is a perfectly straightforward job, and all the information you need you will find in the diagrams, photos, and list of parts. Just one point must be explained, however. The holder for the aerial coupling coil (on the right as you look at the wiring diagram, marked L_1) must be fastened down with only one screw, so that the socket may be turned at an angle to the others when it is required to weaken the coupling when a flat spot is found.

Now we can turn to operating matters, which are of vital importance with a short-waver, for it is in the adjustments that we find the key to success. First of all, about valves. In the detector socket you really must use a good modern type of H.F. or special detector valve, and a few examples in the 2-volt range are these: P.M.1 H.F., H.L.210, D.E.L.210, B.T.H.210 H.F., Six Sixty H.F., Cossor 210 H.F., etc.

It most decidedly will not do to use any sort of cheap general-purpose valve here, if you want proper results on the really

(Continued on next page.)

THE "P.W." SHORT-WAVE TWO.

(*Continued from previous page.*)

short waves. You want a valve of medium impedance, say, 10,000 to 25,000 ohms, and as high an amplification factor in proportion to the impedance as you can get. The effect of using a poor valve here is simply that you will not be able to get enough reaction on the shorter waves to bring the set up to the proper adjustment just below oscillation, and so you will hear nothing at all.

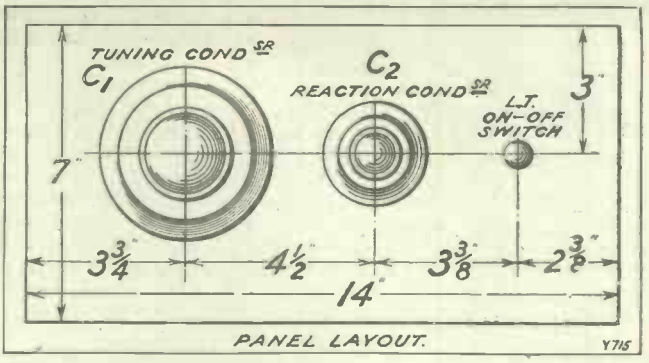
Good on Two-volters.

For the second socket you want a valve of the L.F. type, and here the requirements are not so strict. Naturally, a good valve will give you better signals than a poor one, but an unsatisfactory type will not stop the set from working, as it would do in the other socket. Of course, if you want super results regardless of running costs you will use 6-volt valves, choosing equivalent types to those mentioned, but the latest improved 2-volters introduced this autumn work quite well even on the very short waves around 20 metres, and were used for all the tests on the original set.

Now as to coils: you will find that if you buy a set of one of the well-known makes it will probably consist of coils of the following numbers of turns, 2, 4, 6 and 9. For work on the most interesting wave-band, namely, from 20 to 40 metres, you should use the 2-turn coil in the aerial (L_1), the 4-turn one in the secondary (L_2), and the 6-turn one for reaction (L_3). For the upper part of this wave-band, you may find the 9-turn coil better for reaction, but this should not be necessary unless you are using a rather poor valve for the detector.

For the next wave-band (40 to 60 metres, roughly) you should use the 6-turn coil as L_2, either the 2 or the 4 in the aerial (L_1), and the 9 for reaction (L_3). By the way, the wave-length ranges given are those over which the coils work most efficiently, and are not the complete extent of their actual tuning range. For example, the 4-turn coil will tune a good deal higher than 40 metres, but over this wave it is best to replace it with the 6-turn coil, and so work with a smaller amount of capacity across, i.e. with a lower reading of the tuning condenser.

Now, the most important adjustments in the whole set are those to get smooth reaction, since until you achieve this desirable state of affairs there is little chance of getting satisfactory results. First of all, you should apply about 30 or 40 volts to H.T.+1, and then, with the right combination of coils for the 20- to 40-metre band, set the potentiometer at about the middle of its travel, and test the reaction. It should be fairly smooth, and you can then see how far you can get the potentiometer slider round towards the positive before it gets "ploppy." This is the correct working adjustment, and you should aim at getting as much positive on the grid as you can (lower H.T. on the detector, i.e. on H.T.+1, will sometimes enable you to get the slider further round).



The H.T. on the other valve (H.T.+2) is not critical, and anything from 60 to 100 volts will serve, the higher voltages giving slightly louder signals and, of course, better quality if signals are strong. Grid bias should be in accordance with the makers' instructions.

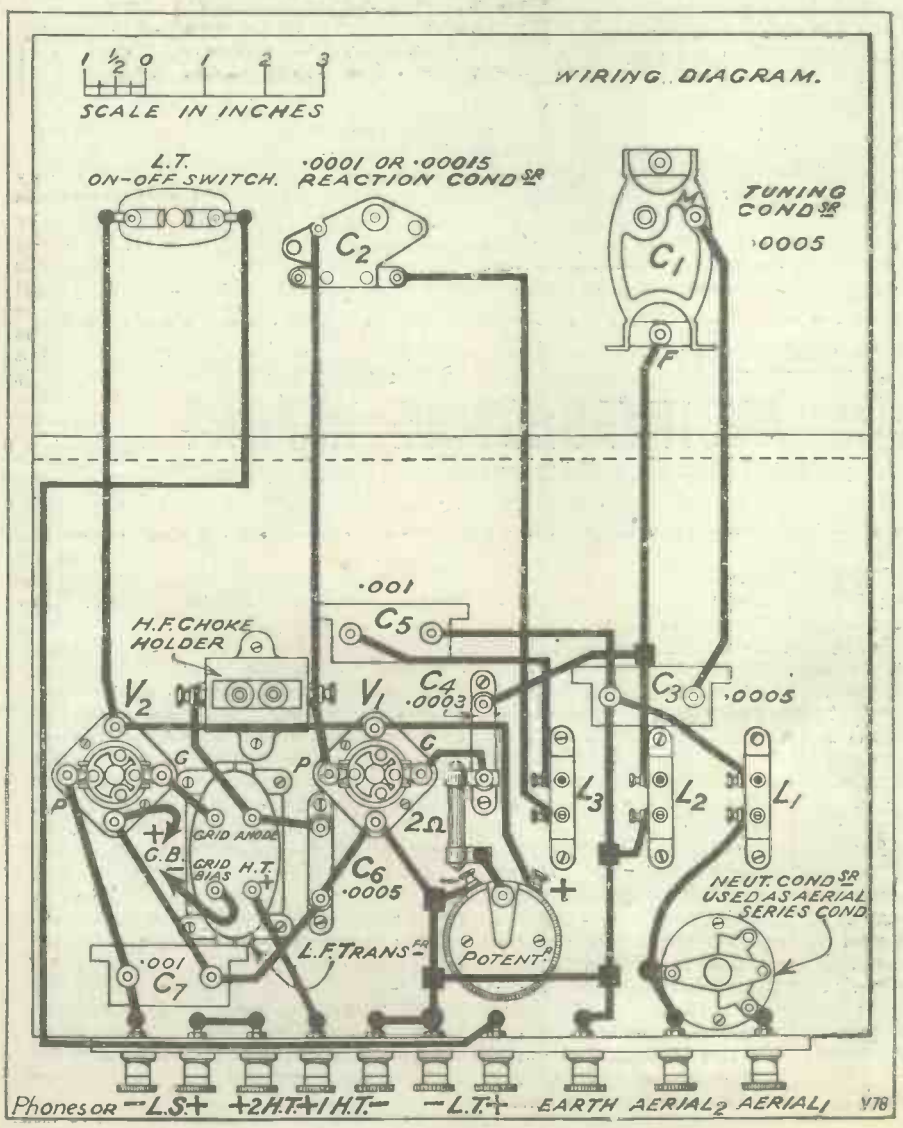
Some Useful Readings.

If you have any difficulty in getting proper reaction effects at some parts of the tuning scale, you should try varying the aerial coupling. Try swinging L_1 out at various angles to L_2 (you will have to retune also, of course), and if you still have trouble, put the aerial lead on A_1, instead of A_2, and try various settings of the small series condenser.

Now as to where to look for some of the more interesting stations. The original readings will probably be quite a useful guide if you use the same makes of components, and these were as follows. 2 X A D (relay of W G Y, Schenectady, on 21·9 metres) 30 degrees, 5 S W (short-wave B.B.C. station on 24 metres) 44 degrees, 8 X K (relay of K D K A, Pittsburg, 27 metres) 55 degrees, 2 X A F (W G Y relay on 31·4 metres) 90 degrees, P C J J (Hilversum) 90 degrees. All these are on a 0–180 degree dial. To find the equivalent settings for a 0–100 degree dial, and the same condenser, multiply them all by 5 and divide by 9.

Now, as to results. All the stations listed have been heard at good strength on every occasion on which they were transmitting (for times, see "World Radio") for a whole week, and on two occasions 8 X K was just loud enough to be heard on the speaker from 11 p.m. onwards.

(For instructions for use on the higher waves, see "Radiotorial" next week.)



LATEST BROADCASTING NEWS.

MORE "PEP" FOR TALKS.

ERNEST NEWMAN AND THE B.B.C.—ADMIRAL CARPENDALE IN GERMANY—BROADCASTING HOUSE—SIR JAMES BARRIE ON THE ETHER—NOTABLE SPEECHES TO BE BROADCAST—HALLÉ CONCERTS AGAIN.

(FROM OUR OWN BROADCASTING CORRESPONDENTS.)

More "Pep" for Talks.

THE brisk and violent reaction which followed the "after the capitalist-dinner-conversation" between the Rt. Hon. J. H. Thomas, M.P., and the Editor of the "Daily Express" is one further proof that talk is acceptable by radio if it is the right kind of talk. When Mr. Blumenfeld and Mr. Thomas got at each other in a studio at Savoy Hill, there was interest, both human and sporting, in their vigorous encounter.

It is understood that many more of these are contemplated. Names mentioned include Mr. Churchill, Mr. Maxton, Lord Birkenhead, Mr. Saklatvala, Mr. G. K. Chesterton, Mr. Hilaire Belloc, Mr. Lloyd George, and Mr. A. J. Cook. Curiously enough Mr. G. B. Shaw is not included. One suggestion is that Mr. Lloyd George and Mr. Ramsay MacDonald should be brought together in the Chinese studio at Savoy Hill in order that the general public might have an opportunity of enjoying Mr. Lloyd George's reply to Mr. MacDonald's attack on him in Canada.

Ernest Newman and the B.B.C.

The conversion to broadcasting of this famous critic is now complete. In addition to carrying on the series of talks outlining the week's music in advance, Mr. Newman is being asked to consider a permanent appointment as Music Censor or Critic for the B.B.C. Mr. Newman shares with Sir James Barrie and Sir Thomas Beecham the honour of "leading convert" to broadcasting during 1928.

Admiral Carpendale in Germany.

Comment in the German press leaves no doubt that Admiral Carpendale, Controller of the B.B.C., was a tremendous success during his recent visit to the German Wireless Exhibition, and the meeting of the International Union of Broadcasters in Berlin. It is reported that the Admiral extended the glad-hand of reconciliation with such effect that there was a rush of equally distinguished German naval officers to greet their former adversary. The Germans were particularly impressed with Admiral Carpendale's effective and graceful public speeches.

Broadcasting House.

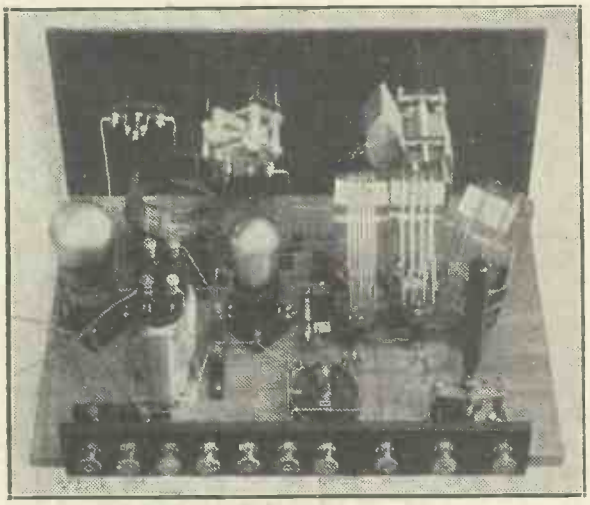
Now that it is as good as settled that Broadcasting House will be in Langham Place, there is much speculation in B.B.C. circles on the probable character of the building and of its decoration. The only information available at Savoy Hill is that the new building will be constructed mainly and primarily round its studios. In other words the offices are to be regarded as incidental to the studios. This attitude is the right one. There have not been wanting critics of Savoy Hill who have said that there the studios have seemed to be subsidiary to the offices!

Sir James Barrie on the Ether.

Sir James Barrie, one of the few remaining outstanding personalities yet to broadcast, has at last consented to appear before the microphone. The occasion will be when he receives the Freedom of Jedburgh on Monday afternoon, October 15th, and the ceremony is to be relayed by all Scottish stations. It certainly seems unfortunate that opportunity has not been taken to broadcast the function from London and other English stations, especially as Sir James' great oration some few years ago at St. Andrews will always be remembered as one of his greatest achievements. But perhaps the B.B.C. must not be blamed for this, since Sir James has, as yet, only allowed one of his works, "The Old Lady Shows Her Medals," to be broadcast, and that as a tribute from a great man to the Ardrossan and Saltcoat Players.

Notable Speeches to be Broadcast.

Two notable forthcoming outside broadcasts include the speech of the Prime Minister at the centenary dinner of "The Spectator," at Claridge's, on Tuesday evening, October 30th, and the speeches of Lord Derby, Mr. Ramsay MacDonald, M.P., and Lord Crewe at the dinner of the United Associations of Great Britain and France from the New Princes Restaurant on Wednesday evening, November 14th. Both broadcasts will be heard by 5 G B listeners.



This is a back-of-panel view of the "P.W." Short-Wave Two—described fully elsewhere in this issue.

Hallé Concerts Again.

The Hallé Concert Society opens its seventy-first season at the Free Trade Hall, Manchester, on Thursday, October 18th, when a programme in which the works of Schubert, whose centenary celebrations are to be a feature of this year's music, will find an important part. The concert, which will, of course, be conducted by Sir Hamilton Harty, will be relayed to all stations.

TECHNICAL NOTES. By Dr. J. H. T. ROBERTS F.Inst.P.

AN INTERESTING REPORT

REPRODUCTION—ADJUSTABLE QUALITY—TELEVISION EXPERIMENT—Etc., Etc.

An Interesting Report.

READERS will remember the great interest which was occasioned by the eclipse of the sun on the 29th June, 1927. It is not, perhaps, generally known that the opportunity was taken to make a series of important radio experiments. These were carried out under the auspices of the Radio Research Board and a full account of the experiments and the results obtained is now published by the Department of Scientific and Industrial Research, being the Radio Research Special Report No. 7.

The price is 1s. 3d., and the Report may be obtained from H.M. Stationery Office at any of the following addreses:—London, Adastral House, Kingsway, W.C.; Manchester, York Street; Cardiff, 1, St. Andrew's Crescent; Edinburgh, 120, George Street; Belfast, 15, Donegall Square, W. The principal observations were those upon the transmission and reception of long, medium and short waves, as well as some interesting direction-finding experiments and also observations on the variations in the strength of signals received in England from Norway.

Reproduction.

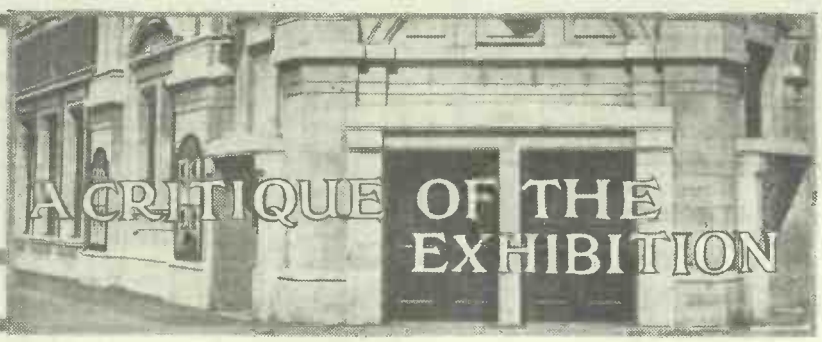
Since musical tastes differ so considerably, it is a moral certainty that no amplifier or loud speaker can ever be regarded as universally ideal. Some listeners prefer a sharp or crisp reproduction, whilst others prefer the rendition to be deep and mellow. The set manufacturer does his best to please all tastes by endeavouring to strike a happy medium.

It is easily possible, by the aid of a few small and inexpensive fixed condensers, to modify the musical quality of a radio set quite considerably.

Transformer coupling often gives fairly sharp, crisp reproduction, and if that is what is desired it may even be accentuated by a slight adjustment of the high-tension and grid-bias voltages.

(*Continued on page* 251.)

Both those readers who visited Olympia and those who did not will be interested in this review of the Radio Exhibition, showing up as it does the high lights of wireless progress during the past twelve months.



A CRITIQUE OF THE EXHIBITION

By our SPECIAL REPRESENTATIVE.

HOW great a success and how crowded was this year's "show," readers will already have learnt from the reports published by the Daily Press. But I do not think that one of the most striking aspects of the exhibition has yet been mentioned. I refer to the spirit of camaradarie that prevailed; the joyous comradeship that existed between the exhibitors themselves, among the visitors, and between both these sections.

Directorate Gets Busy.

Not as at some exhibitions were the stands decorated by languid and superior young men, rather tired and somewhat condescending. Everywhere was enthusiasm and cheeriness. And I wonder how many visitors realised that among the most cheery and helpful attendants were directors, and even managing directors, of some of the firms concerned? For instance, as I was passing one of the largest displays due to one of our greatest radio firms, I observed a leading wireless magnate engaged in spirited conversation with an amateur laden with the literature garnered on his round. I could give names, but it would be unfair to particularise, for this was but one isolated incident of many similar ones that occurred.

And don't imagine that these were merely examples of astute salesmanship and business enterprise; managing directors do not wear identity discs! Real enthusiasm seems to be the keynote of the whole radio world, and it was present in a concentrated form at Olympia. In every sense of the term it was a great show.

A Masterly Stroke.

One realised that one was getting somewhere near Olympia by many and various indications. Leaving the Kensington High Street tube station the first hint was immediately given by a number of mysterious-looking figures dressed in the robes of the Ku Klux Klan. Threading their way slowly and deliberately through the hustling passers-by, these objects of pageantry attracted considerable attention. Little boys backed affrightedly away from them, and old ladies gripped their umbrellas more tightly as they passed. But the "Klan's" mission was peaceful; it was only to ensure that all Olympians visited the "Six-Sixty" stand in order to gaze at the only receiver that has ever attained fame through complete mystery.

Mounting to the top of a bus, the glass-empanelled roofs of Olympia in the near distance came clearly into view. And together with these, one's vision was also assailed by mighty streamers and posters. No prismatics were needed to magnify the "Mullards," "Melody-Makers," and "Marconiphones" that informed all and sundry that there indeed was the Radio Exhibition.

Hundreds of people were proceeding, empty-handed, towards Olympia from every point of the compass, and as many more were streaming away laden with leaflets. More, they nearly all were carrying their literature in brightly-coloured carriers, every one of which bore the name of Cossor. A masterly stroke that! London that night must have been dotted with these artful advertisements.

One began to get that real exhibition thrill outside the building. People started to raise their voices just a trifle. Master Tommy commenced to forecast events for the benefit of his parents; quiet-looking young men stiffened, sparkle came to their eyes and they began to walk more and more at Marathon speed as they neared the turnstiles.

In the hope of getting cheap radio pictures the wireless set and loud speaker of this experimenter have been placed on a stand containing an ordinary electric fan, adapted to drive a "Television" disc. (Last week's "P.W." contained details for making a Radio-Picture Four.)

Everywhere one could hear a chattering of "screened grids," "pentodes," and other technicalities. Young ladies conversed with seeming intelligence on loud speakers; elderly men drew dignified diagrams in the air with their fingers. "P.W.'s" and "M.W.'s" were held forward invitingly by smiling vendors and were eagerly snapped up by the crowd.

Hot and Happy.

At last one was through the turnstiles, and the "Show" opened out before one's eyes in all its jostling, swirling, but nevertheless, surprisingly orderly actuality. "Hallo!" I heard one new arrival greet a friend, "how long have you been here?"

"Since half-past one," laughed the other. He looked a bit hot, but he was evidently supremely happy.

Blue was the prevailing colour, and it gave the New Hall a mystic, exotic kind of appearance. All the stands were fitted up and decorated by certain approved firms who, nevertheless, carried out their work under the directions of the exhibitors. Thus, while there was ample individuality to prevent monotony, the exhibition as a whole seemed to conform to one definite and attractive scheme.

Tuning Views!

To the immediate left of the main entrance was a small café at which a large crowd consumed refreshments the while they earnestly discussed their various adventures. Immediately opposite, another crowd was watching a visitor adjusting the dials of a wireless set. As he set the controls to conform with certain dial readings given on an adjacent chart, so coloured views of various localities were flashed on a large mirror. The injunction to "Watch this Mirror" was very thoroughly obeyed!

Close to this novelty was a large model of a boat complete with four funnels and an officer junior in years but very senior in gold braid. But no boat ever sailed the seven seas with quite as many M.P.A. loud speakers aboard, of that I am certain.

I had already noticed a number of pretty

(*Continued on next page.*)

A CRITIQUE OF THE EXHIBITION.

(*Continued from previous page.*)

young women dressed in white and wearing Mullard sashes threading their way to and fro through the avenues, but it was not until I had ended my round that I realised how completely the Mullard people had studded the exhibition with their attractive "banner-bearers." A stroke of genius indeed, for young men are radio enthusiasts and young men and even old men will turn their heads to see—Mullards!

The first large stand I stopped at was devoted to the mains units and mains components manufactured by E. K. Cole, Ltd. Four or five keen and courteous representatives of this well-known firm were hard at work dealing with all kinds of power-supply queries. It gave an excellent idea of the popularity of the devices displayed. Indeed, throughout the whole of Olympia mains units were most prominent.

Obvious "Portables."

Further along was the Westinghouse Brake and Saxby Signalling Co.s stand, where the now very well-known dry rectifier was to be seen. A novelty here was a small man symbolical of the rectifier holding out a tray on which were the golden letters "D.C."

We have heard a great deal about the portable sets at the show, but I must say that I consider that many displayed were disappointing, at least in regard to appearance. My opinion is that the first requirement of a portable set is that it should look like anything but a radio outfit when it is closed up. One does not like to attract attention as one peaceably wends one's way about the countryside and, personally, the more a portable set resembles an attaché case or portmanteau the better I can like it.

I noted, however, that the Ormond portables displayed had, when closed, a most unobtrusive appearance. You could not tell the difference between one of these and a small "week-end" attaché case. And when opened to reveal a large loud speaker in the lid and the controls it could be seen that every available cubic inch of space had been used to its greatest advantage.

It was warm in Olympia, with its packed avenues, and the exertion required to make headway through them, so that I was glad to break away for a moment into the comparative peacefulness of the "P.W." stands. I say "peacefulness," but I am referring to a space "behind the counters." Around the stands themselves was as big a crowd as anywhere, examining the various "P. W." sets on view, and awaiting their turn for a few words with one or other of our experts who were in attendance.

And it gave me a pleasurable thrill to see so many of our readers take this opportunity to "pay a call" on "P.W." What a crowd there would have been if every one of them had been able to "roll up"! Ten Olympias would not have held them. Needless to say I "eavesdropped" just as keenly as I could in order to glean helpful hints. And I was astounded to learn, among other things, that some of our readers had come hundreds of miles, mainly in order to speak to "P.W." One visitor, who informed another that he had travelled overnight from Wales with this intention, I buttonholed, and had a most enjoyable ten minutes' conversation.

Attractive "Robots."

Around the fountain in the centre of the hall the crowd surged in the direction of the R.I. & Varley stands, where magnificent sets and mains units were arrayed. A huge replica of the N.P.L. curve of the famous "Straight-Line" transformer attracted attention.

Not far away on another stand, a "sign of the times" in this mechanical age, was an excellent robot. Dressed as a town crier, this figure moved its head, waved an arm carrying a muffled bell, consulted a news sheet, moved its eyes and lips and then stentorously announced, "Oh, Yes! Oh, Yes!"

But even greater crowds were around the Graham-Farish robot. A dainty, challenging little robot this, bearing the invitation, "Won't you introduce me to your pals?" Can there be a thrill in a mechanical glad-eye? The crowd were evidently of the opinion that the saucy, roving optics of this feminine automaton were worth at least a few minutes of their valuable time.

Mullards distinguished themselves in many ways, several of which I have already indicated. But at their stands, which seemed to be dotted all over the place, there were attractions of sound technical interest. Screened-grid and Pentone valves were displayed which had their bulbs removed. Amateurs could pick these up and closely examine their intriguing "innards" at close range. They were also implored most earnestly to accept bulky envelopes containing blueprints and "Radios for the Million" which were lavishly distributed in every direction, and keenly accepted.

Probably because nearly every man is at heart a mechanic there was an eager queue at the Lissen stands waiting for turns at "try your hand at spot-welding." A small machine to which fat electric leads wandered made the fusing together of small pieces of metal a simple but fascinating operation. Two pieces of wire could be held in the device; there was a flash, an indeterminate haze of mechanical movement, and a joint resulted that would make soldering a comparatively poor affair. Many envious eyes were turned on the Lissen combined gramophone and radio outfit, and you could see people mentally weighing up their bank balances as they gazed at it.

The Fultograph.

I had intended making a systematic journey around the stands, but I found it more and more difficult to resist diversions provided, as it were, on the wayside. For example, proceeding down avenue "D" I should have been concentrating on the displays on my left, but I could not help wandering over to the right for a while in order to examine Messrs. Pye's large blue silhouette of Cambridge. This formed the background to their display, and as they are of that noble city, the scene was most appropriate. Messrs. Pye's products themselves attracted no small crowds, presumably for the reason that so many modern sets demand mains units' components and chokes and transformers of stalwart characters. Such items could be examined in quantities at the Pye stands.

Very good use was made of electric lighting at the exhibition, and many skilful signs were to be seen. Several stands had wonderful illuminated revolving disc affairs, letters upon which changed every now and then to provide alternative slogans.

At Jackson Brothers' stand there was a huge tuning dial in the centre of a large ground glass screen. At intervals the names of stations would flash in at different points around the dial.

A novel note in loud-speaker design was struck by a group of speakers exhibited by Burndepts. These instruments had cases of Erinoid. Most artistic is the effect and the colours ranged from tortoiseshell kinds to grey-blue-green varieties.

On the Burndept stand was a Fultograph radio picture instrument. It certainly seemed to be a simple sort of affair, and very reminiscent of an early phonograph. It is wound up like a gramophone.

Hidden by Crowds.

One of the most noticeable stands on the ground floor was the one devoted to "Lotus" productions. It was skilfully arranged, and its upper structure appeared to tower above those of many others.

As was only to be expected, there was a certain amount of congestion around the Graham Amplion stands. Although they were immediately opposite, one could not see these for people as one came through the main entrance. It was only when I had nearly finished my first rapid survey of the ground floor that I was able to approach within a reasonable distance of the display.

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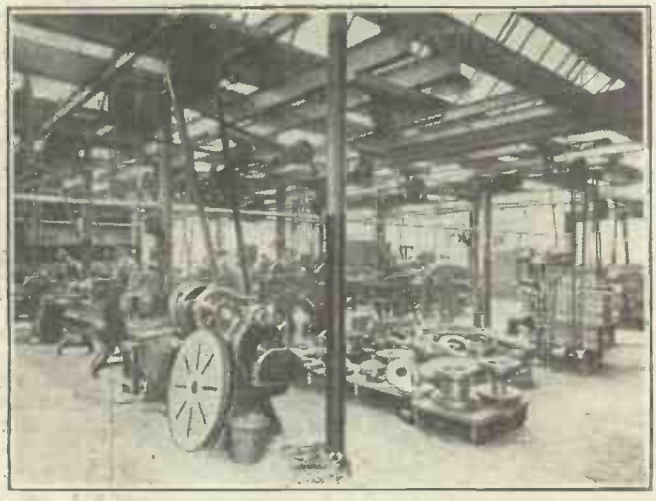
PREPARING FOR THE RADIO RUSH.



Although Olympia inaugurates the red-hot wireless season, preparation for this goes on steadily all the year round. This photograph shows a corner of the Benjamin Electric Co.'s works.

A CRITIQUE OF THE EXHIBITION.

(Continued from previous page.)

The main attraction was, of course, the "Mystery" loud speaker. Although it is not now so much of a mystery as a type, this (the "Lion" by name, and lion of these particular stands) was the subject of a great deal of excited comment. It was a pity that it could not be heard in operation although demonstrations were, of course, arranged at an outside "annexe" by the Graham Amplion people.

"Something of a Fraud."

In a sense, the Exhibition itself was something of a fraud, for no radio could be heard at it! Of course, it could not be otherwise, for if a couple of hundred loud-speaker sets had been doing their best—or worst!—the noise would have been startling. Many of the larger firms had special show-rooms close at hand where their receivers could be demonstrated. Messrs. Philips Lamps were among these Their stands in Olympia itself were mainly devoted to their seven-cornered loud speaker.

It will be remembered that last year the stands in the main hall were arranged in

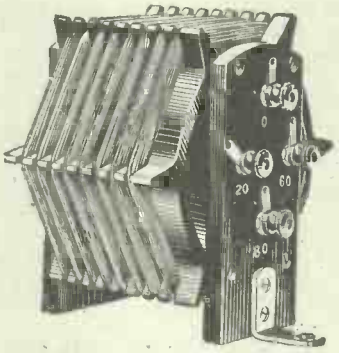
The Brown "Cubist" is a moving-coil loud speaker that requires no battery to energise it.

circles. This year they were distributed in straight avenues. This made it very much easier methodically to cover the show. And passing from display to display it was forced on me that this is more than ever a constructor's year.

As an example, I can instance the Ediswan stands, where a large crowd gazed at and murmured about the Ediswan sets for home constructors. That the Ediswan people themselves have considerably revised their existing designs and introduced new ones are proofs of these facts.

Again, the fact that mains-operated sets are becoming exceptionally popular was proved by the animated groups of enthusiasts to be seen around the Metro-Vick stands. Here, also, was a novelty in the form of a model aerial which automatically lengthened and shortened itself. It was provided to show mechanically the electrical action of the Met-Vick Elastic Aerial Unit, which was shown for the first time.

Everywhere one kept coming across moving-coil loud speakers, and these figured among fine sets on the large group of stands occupied by the Marconiphone people. The fact that the Marconiphone moving-coil loud speaker is contained in a somewhat smaller cabinet than is usual with these instruments aroused interest. No doubt occurred to anyone's mind that the results it gives are every bit as good as if a huge cabinet were used.



The "Wearite" version of our Standard Loading Coil.

Discouraged from proceeding farther around the ground floor, for the time being, by some considerable congestion of intrigued amateurs around the Ripaults stand (I think they were examining the lateral action condenser), I slipped through the throng and made my way upstairs.

The B.B.C. exhibit occupied the whole of one side of the gallery. An admission fee of 2d. was charged (the proceeds were devoted to charitable purposes), and it was just as well that this was the case, for the whole time I was in the building there was a queue of two or three hundred people waiting. As fast as the queue thinned down so was it added to by new arrivals.

A Graceful Tribute.

It was amazing to watch the orderly forming and reforming of the queue without the aid of police or attendants. After about half an hour's waiting one arrived at the entrance to the long covered-in sort of passage. Progress down this was in single-file fashion, the speed of movement of which was regulated by the departure of visitors. As the most interesting exhibits were at the end nearest the exit the journey became very tedious. For two or three minutes, or perhaps more, one would be forced to remain stationary opposite a very small table. The series of tableaux entitled "B.C. to B.B.C." started with one entitled "The Dawn of a Musical Sense." It depicted a primitive man sitting down rapturously listening to the rippling streams and the song of a rather bedraggled-looking yellow bird perched on a tree.

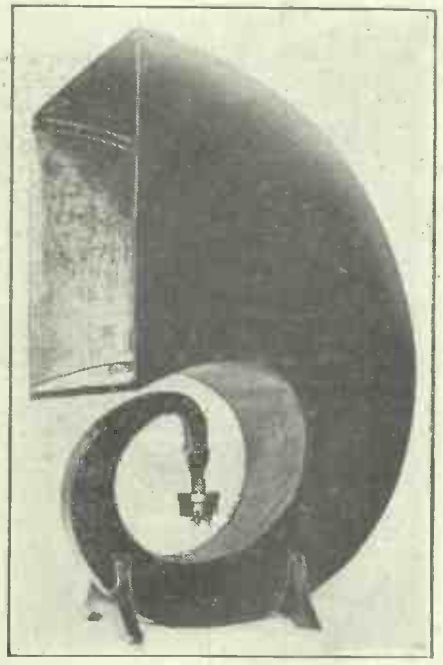
Then came "The First Music Performed By Man," a group of Chinese producing just the sort of stuff that makes the modern radio set sit up and take notice, percussion effects on gongs and drums. Tableau Three gave us an insight into the musical performances of the ages of classical antiquity when Grecian girls danced to the strains of the lute and lyre.

The travelling minstrel of the Middle Ages delighted the occupants of a real Baronial Hall in the fourth scene, while number five was devoted to Music at the Court of a French King. "Music As a Fine Art" was represented by Beethoven playing his piano by candlelight. I did not quite agree with the next step, Tableau Seven, which, entitled "Mechanical Music," was a scene showing a musical box in use in a nineteenth-century house. It was stated by the B.B.C. that "The first step in mechanical music was the musical box." Perhaps so, but did not this *precede* Beethoven?

Tableau Eight introduced the Phonograph and showed a group of people listening to one each with a separate earpiece. And then came, finally, "Modern Wireless," a graceful but no doubt unconscious tribute to our leading monthly radio magazine. This last tableau showed a group of people in a room listening, a group on the sands outside dancing, and a lightship. I could not see a radio set!

Downstairs Again.

Arranged along the front of these tableaux were pieces of apparatus of historical interest, including various early microphones and transmitters used in broadcasting the description of the boat-race. Turning a corner one came to models of a studio and control room at Savoy Hill, and various "propaganda" models, such as a group of men of different sizes illustrating how wireless licences have increased in number. Including waiting in the queue, it took me over an hour to pass from entrance to exit of the B.B.C. exhibit.



This exponential horn loud speaker was made by a P.W. reader.

By this time the gallery had cleared a little, and I was able to complete the round of it moderately quickly, albeit I was frequently tempted to linger overlong at such stands as those of Wright & Weaire, Ltd., Paroussi, General Electric, Eastick, Belling-Lee and others. Subsequently, I returned to the ground floor and revisited some of the stands and searched out others that,

(Continued on next page.)

A CRITIQUE OF THE EXHIBITION.

(Continued from previous page.)

according to my carefully-prepared itinerary I had missed. Of these latter I must mention the "Six-Sixty" stands. It was there, of course, that one would see the "Mystery Receiver." Arrived at this point I found myself in error. The Mystery Receiver was still a mystery. On a tall, artistic stand stood a small box affair covered with black velvet.

With others similarly minded, no doubt, I waited patiently for one of the attendants to flick off the cover and expose the wonder to view. But this simply did not happen, so I approached one of them and asked him if he would mind letting us see what he had concealed on the stand. With a sinister smile (it was not really sinister, but it should have been as he had one of his Ku Klux Klan tribesmen silently and immovably standing at his elbow) he handed me a form, "Fill this up and we will post full particulars to you," he said.

A Magnificent Array.

I had to locate the Television stands. My exploration successful, I, with many others, gazed with intense interest at the combined television and broadcasting receiver; a truly magnificent outfit in appearance. At the last "show" the Television receiver displayed didn't have any "works."

This Marconi combined receiver and transmitter was recently presented to Pitcairn Islanders to keep them in touch with the rest of the world.

It was merely an empty shell, but, no doubt, this one was better equipped. Anyway, from a leaflet I obtained, I noted that the price was £150; but I must admit that it was an exceptionally fine piece of gear in appearance.

The stands of the Igranic Co. had to be revisited for, on the first occasion, I could only see the heads of other enthusiastic visitors! But this time I was able closely to examine the magnificent array of sets, accessories and components.

Some five hours after entering the building I staggered out, hungry and tired, but happy. In no other way could I have gathered such a complete impression of the stability, enterprise and amazing growth and advance of our radio. We all knew that the industry was healthy and progressive, but it takes an exhibition of the nature of this last Olympia affair to bring full realisation of these facts.

Simplicity the Keynote.

It was a fine show. The first radio exhibition held in this country was good, and it was interesting. The second was distinctly better and the third an advance even on that. And so it goes on. This year's registered a bigger step forward than ever. The show was brilliantly organised and exceptionally well supported by exhibitors and visitors alike. In comparison, many other shows I have been to could not hold a candle to it.

One could not help noticing how greatly improved are the designs and workmanship of the various producers. The receivers are now becoming works of art. A radio set is no longer a mass of knobs and wires, but is now an artistic instrument worthy of a prominent place in a drawing-room. And this applies just as much to the majority of the cheaper outfits as to the handsome cabinet and console models exhibited in profusion. Loud speakers, similarly, are actually ornamental these days, and not ungainly trumpets.

Components are cleanly executed pieces of apparatus and the day of the crude assembly of rough cast metal and badly-aligned fittings seems to have passed for ever. Simplicity is a keynote of design in modern sets, and an easy finger control and a switch are as much as many instruments carry in the way of dial projections.

Realistic Radio Results.

Mains units were on every other stand, and the designs of these seemed invariably to be of a safe and neat variety. The most timid listener need have no fear that explosions and fires would follow the hooking of one of these devices to his supply mains. Much was made of the screened-grid and Pentode valve at this year's show, but it should be pointed out that while these are in many ways revolutionary, they each have their snags. Maybe these are of a minor character, but they should be carefully noted.

The screened-grid valve, for instance, demands fairly high H.T. voltages. One hundred and fifty volts is not a high pressure where these are concerned. True, it might be argued that such H.T. is, any way, needed for quality results on the L.F. side, but nevertheless, it should be remembered that where the S.G. is concerned, one must eschew the small 72 or 99 volts battery which so many amateurs use.

Again the Pentode. This is in the nature of a current-eater. Fifteen milliamperes is the kind of consumption it indulges in. True, again, this tube gives wonderful amplification, but it is out of the province of the user of dry battery H.T.'s. A large-ish accumulator H.T. or a mains unit is needed. And the prices of these new valves are high. I am not attempting to discount their virtues, but such points as those above mentioned require to be appreciated.

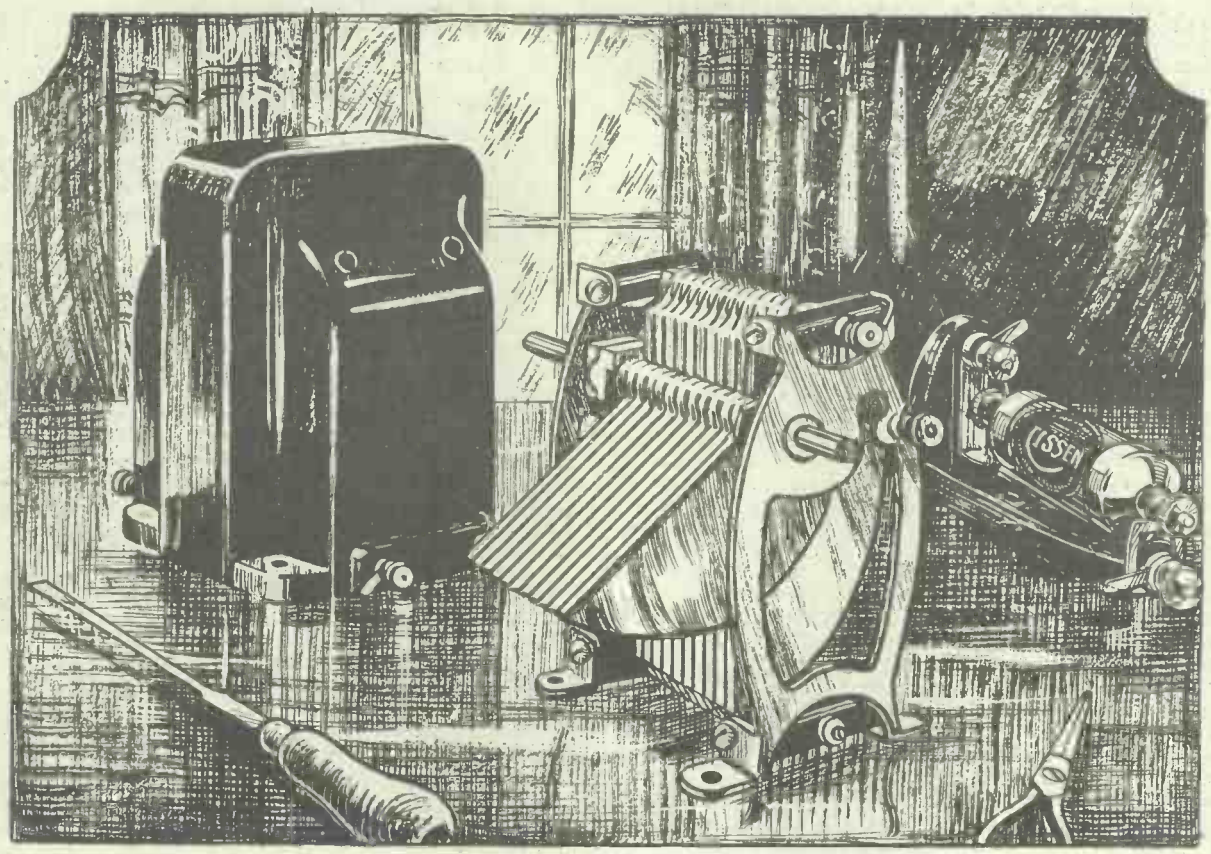
Of all the many peaks of interest at Olympia, I do think that that representing the multitude of moving-coil loud speakers stands out alone. Some I saw that I knew were good; one or two I noticed that I know to be rather poor, But every now and then a moving-coil speaker would

A moving-coil loud speaker typical of the range now marketed by The Epoch Radio Manufacturing Co.

come to my notice that I have never seen before, let alone tested. I wonder how many of these are really up to standard?

However, they at least do their bit in showing that there is now a wide demand for quality of reproduction and that the times when "distance" was the main radio requirement are now so much history. It is all to the good. The sooner the public as a whole learns that radio can provide results that challenge or even beat the best modern gramophone—marvellous though it is, with its electrically-recorded records and scientifically-designed sound-boxes—the better it will be for all concerned.

It is a fact that for many years our broadcasters have been providing us with better transmissions than the average set deserved. The relative positions of the parties is still the same, but the gap between is rapidly closing up. The lesson taught us by Olympia is that the same old enthusiasm for radio is present as intensely as ever if not more intensely and in a greater quantity, but that it is now directed towards quality and not quantity in results.



Newcomers to the Lissen Range which will appeal to home constructors

Here are three additions to the Lissen Range of Radio Components, which will be welcomed by all who, in the course of construction, desire a complete range of balanced and interchangeable components. Each is a distinct advance on previous commercial components—each is designed to be of universal utility and to ***replace any similar specified component with added efficiency*** in any published circuit.

LISSEN VARIABLE CONDENSER

You can use it as a standard condenser in any circuit.
You can gang it—two or three of them together.
You can use a drum control for it instead of a dial.
You can mount it on a panel and it has feet for baseboard mounting, too. One hole fixing, of course.

·0001	mfd. capacity	5/9
·0002	,, ,,	5/9
·0003	,, ,,	6/–
·00035	,, ,,	6/3
·0005	,, ,,	6/6

LISSEN SUPER TRANSFORMER

Only now has the depth of radio technique yielded the knowledge which has made the Lissen Super Transformer possible. It represents a big saving in price to the transformer-buying public, in comparison with every other high-priced transformer available. Ratio 3½ to 1.

Price 19/-

LISSEN WIRE-WOUND RESISTANCES

Suitable for use in power amplifiers—unaffected by current density or atmospheric changes. Made in the following values:

Ohms.	Price.	Ohms.	Price.
10,000	3/6	80,000	4/–
20,000	3/6	100,000	4/6
25,000	3/6	150,000	5/6
50,000	3/6	200,000	6/–
250,000			8/6

LISSEN RESISTANCE BASES

Price 1/–

7 DAYS' APPROVAL. You can get the new Lissen components from practically every radio dealer.

LISSEN COMPONENTS

LISSEN LIMITED, Friars Lane, Richmond, Surrey

Managing Director: Thomas N. Cole

MORE ABOUT THE "P.W." RADIO PICTURE RECEIVER.

Some further details concerning the operation of the special set described last week.

By THE TECHNICAL STAFF.

LAST week we gave a general description of the procedure for operating the Radio Picture Four, but there remain quite a number of details yet to be discussed. For example, there is the question of neutralising, and it may be as well to explain just how this can be done by what is called the "reaction demands" method.

It is as well to do this out of broadcasting hours, since it involves letting the set oscillate for a few moments at a time. Alternatively, be very careful to see that it is not tuned to a station while you are carrying out the adjustment. The exact procedure is as follows: With the correct coils inserted (L_1, No. 25 or 35; L_2, No. 60; L_4, No. 60, centre-tapped), place the wave-change switches to the low-wave position (knobs pulled outward) and set the neutralising and reaction condensers at minimum. Now set the left-hand tuning condenser to a mid-scale reading and revolve the right-hand one. You will probably find the set will oscillate as the two come into step, and you should note whether you chance to be right on top of a station. If so, shift the left-hand dial a few degrees and try again.

Finding the Correct Point.

If the set does not oscillate, increase the reaction setting a trifle until it just does when the two tuning dials are in step. Now increase the setting of the neutrodyne condenser very carefully, re-tuning slightly on the right-hand dial as you do so. You will presently find that the set stops oscillating, and you should carefully note the setting of the neut. condenser. Now go on gradually increasing the neut., and you will find another point at which oscillation begins again when the two tuning dials are in step (keep swinging the right-hand one to make sure of this).

When you find that oscillation is just beginning again, note the new reading of the neut. condenser, and then turn it back *half-way* towards the previously-noted setting at which oscillation ceased. This will locate the correct setting with quite a fair degree of accuracy, since with this receiver the stopping and re-starting points are fairly close together, and it is easy to estimate a setting half-way between.

The only difficulty likely to be met with in this operation occurs in the case of 2-volt valves, with some of which the neutralising point is very near the minimum of the condenser, and so is a little hard to find. There is, however, a simple remedy for this which makes the set perfectly well-behaved once more, and should always be adopted with these valves, which incidentally work excellently in this receiver.

The remedy in question is to add artificially to the capacity between plate and grid of the H.F. valve by placing a very small capacity externally between plate and grid on the valve holder itself. A very easy way of doing this is to put another neutralising condenser on the baseboard beside the H.F. valve, and wire it to plate and grid. These connections, of course, are the dotted ones marked x and y on the wiring diagram. Set this extra condenser to about a third of its maximum capacity, and then neutralise exactly as has been described. You should then find the correct neutralising point somewhere near the middle of the capacity range of the neut. condenser, and it will no longer be as critical as before. Also, reaction effects on the *long* waves will be much improved.

Easily Improvised.

If you do not happen to possess the necessary extra neutrodyne type condenser for the purpose, there is no need to go to the expense of buying one, for you can easily improvise the required little fixed condenser with two bits of wire and some Systoflex tubing. Cut two pieces of tinned copper wire about 4 in. long and slip a piece of tubing over each, leaving a little wire projecting at one end only, the other being covered. Now twist them together tightly, as though to form a twin lead, and join an end of one to plate and an end of the other to grid, the opposite ends being the ones covered by the tubing. These ends, of course, must not touch, or a short-circuit will occur.

Now proceed to neutralise, and if you find you have added too much capacity, you can untwist the wires for a little of their length and so reduce it. If, on the other hand, you find the neutralising point is still rather near the minimum of the neut. condenser, you can easily try again with slightly longer pieces of wire, say, 5 in. long.

Transmitting pictures from the air. The picture sounds are first "recorded" on wax records, and then broadcast in the usual way.

Now as to valves. For the first two sockets (H.F. and detector) you will want a couple of valves of the H.F. type, with impedances from 15,000 to 30,000 ohms. You will find that suitable types can be obtained in all the well-known makes (Mullard, Cossor, Marconi or Osram, Ediswan, Mazda, Six-Sixty, Cosmos, etc.), and in either 2-volt or 6-volt filament rating.

For Large Outputs.

For the third socket (first L.F.) a similar valve can be used, but one of rather lower impedance is somewhat better in most cases, and a suitable one can be chosen from amongst those described as L.F. or general-purpose valves. These have impedances ranging from 12,000 to 20,000 ohms, and anything between these limits will serve the purpose. For the last stage you can use either a single power or super-power valve, or two in parallel if you want a particularly large, undistorted output. The necessary two sockets, wired in parallel, are provided on the design.

If your H.T. supply is capable of standing up to the extra load, by all means use the second valve, but remember that the current will then be considerable. As a matter of fact, to run two super-power valves in parallel you really want an H.T. accumulator, mains unit, or very large capacity dry battery (an extra large-size wet H.T. battery is another expedient).

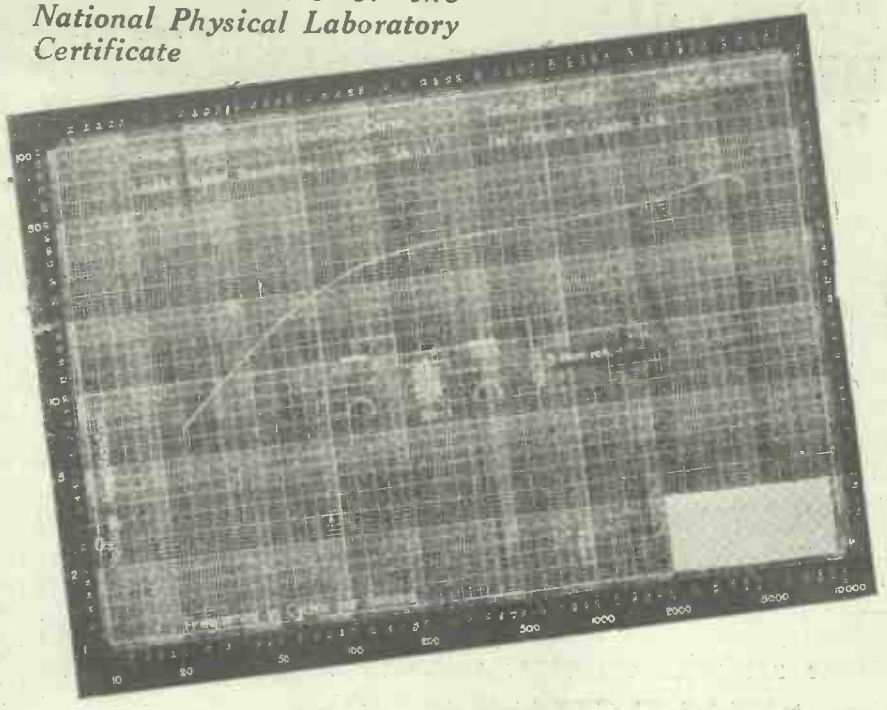
Another point arising from the anode question concerns the method of connecting the loud speaker to the set. You will notice that no output filter is provided in the design, and it must be explained that this is done in consideration of two facts: *a*, the picture recorder requires a plain output circuit, and *b*, most of the more advanced constructors who are likely to build this receiver will probably already possess a filter output unit which they can use to couple their loud speaker to the set when conditions require it. It was, therefore, felt best not to render the design more expensive by incorporating a filter therein.

Where to Use a Filter.

As to whether a filter unit will be needed, it must be understood that this depends very largely upon the size of the last valve. If only a medium or small power valve is used, the anode current will be comparatively small, and there is little to be said against the direct connection of the loud speaker to the L.S. terminals, provided that you are careful to connect the tags the right way round.

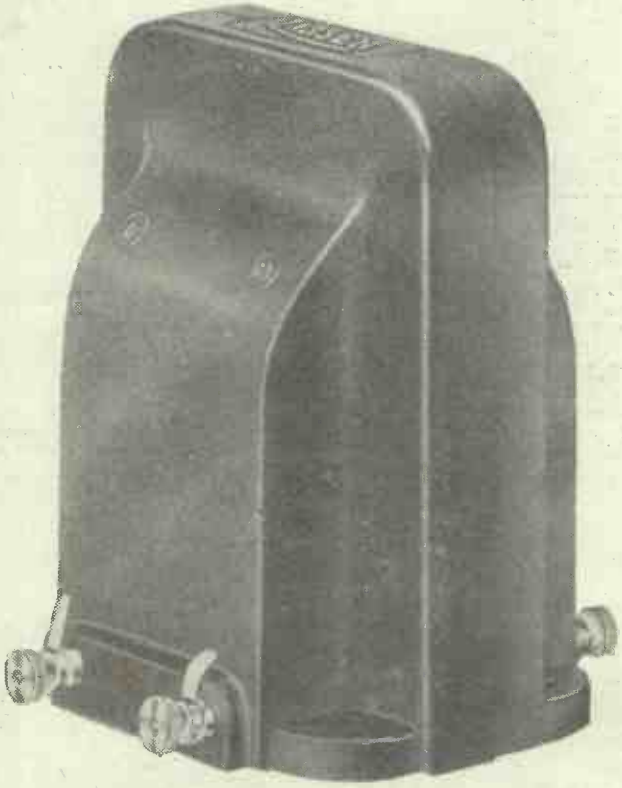
Where a good-sized power or super-power valve is used, on the other hand, the anode current will be rather too large to put straight through a loud speaker, and the output filter unit should be added on.

Actual Facsimile of the National Physical Laboratory Certificate



The VITAL CURVE that CANNOT LIE

It proves the claims that LISSEN make for the NEW SUPER TRANSFORMER



THE curve which we reproduce above is a photographic facsimile of the Report of the National Physical Laboratory upon the Lissen Super Transformer. The original was exhibited at Olympia and may also be seen at the Lissen factory upon request.

Study it well—for it proves conclusively that the Lissen Super Transformer has no superior at any price. It is a distinct advance in transformer design. In its amplification it retains the deep sonority of the bass notes to a degree hitherto unknown and gives crystal clear reproduction of the high notes.

(See the exceptionally gradual drop in the curve for the lower frequencies and the almost perfect uniformity in the higher.) Many manufacturers in showing curves of their transformers cut off part of the curve in order not to show any reproduction below 100 cycles.

No transformer, however high in price, can claim comparison with this latest Lissen product unless that transformer has been made within the last few months. Because only now has radio knowledge revealed the means by which such even amplification can be maintained at all frequencies.

This Super Lissen Transformer is made in two ratios, namely 3½ to 1 and also 2½ to 1. The 3½ to 1 ratio is suitable for use in either the first or second stage of an L.F. amplifier or can be used in cascade for both stages, and with practically any valve. The 2½ to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios - - **19/-**

7 days' APPROVAL

You can get the new Lissen Super Transformer from most radio dealers. If you have any difficulty order on a postcard and transformer will be sent C.O.D. by return of post. Kindly give dealer's name and address.

PRICE 19/- Ratio 3½ to 1.

LISSEN LIMITED, FRIARS LANE, RICHMOND, SURREY *(Managing Director: Thos. N. Cole.)*

NEXT WEEK

FOUR SIXPENNY BLUE PRINTS FREE!

NEXT WEEK

A Valuable and Practical Two-Shilling Gift for Every Reader of "Popular Wireless."

The "P.W." blue prints are famous wherever amateurs foregather, and they are generally recognised as really practical presentations for our special gift numbers. Two such numbers are now to be published, one next Thursday and the other the week after. Next week's four blue prints consist of:—

1. A "REGIONAL" CRYSTAL SET.

This circuit covers 250-550 metres and also the 5XX wave-band. No coil changing. An easy-to-make set with excellent selectivity.

2. THE "WAVE-CHANGE" ONE.

A good sensitive set for long-distance work. Covers all broadcast waves without coil changing. Different wave-ranges merely by pressing a switch.

3. A SIMPLE A.C. H.T. UNIT.

Supplies H.T. from any A.C. mains. Adequate supply for large sets. Gives 1 fixed H.T. tapping and 2 adjustable ones. This unit is silent in operation, inexpensive, and absolutely reliable.

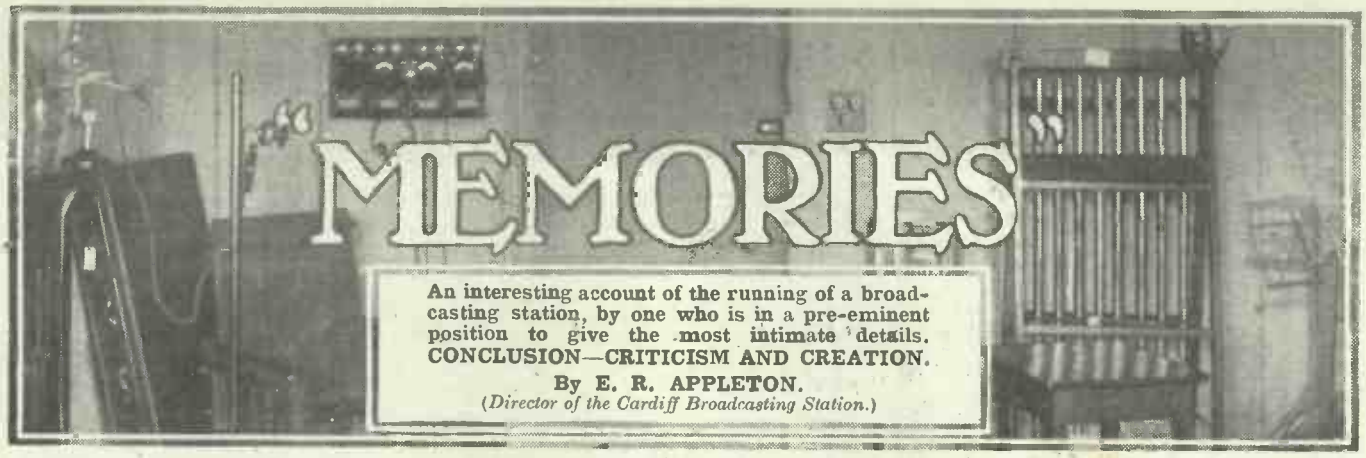
4. THE "REGIONAL" THREE.

A powerful loud-speaker set, using ordinary plug-in coils. Change from ordinary to long waves by simple switching. Can be used for short waves as well as long with no loss in efficiency.

SPECIAL NOTICE.

Blue Prints 1 and 3 in next week's issue will be fully dealt with editorially. The "Regional" Crystal Set and the simple A.C. H.T. Unit will be explained in detail. The Crystal Set and the Unit may both be constructed with ease and small expenditure. Full constructional details, with diagrams and photos, will be given. Other Blue Print Sets will be dealt with in subsequent issues.—THE EDITOR.

Order Next Week's "P.W." Now and Do Not Miss FOUR 6d. BLUE PRINTS FREE



MEMORIES

An interesting account of the running of a broadcasting station, by one who is in a pre-eminent position to give the most intimate details.
CONCLUSION—CRITICISM AND CREATION.

By E. R. APPLETON.
(Director of the Cardiff Broadcasting Station.)

A CERTAIN dealer was asked by a lady to instal a set and tune it in to Daventry. He did so and left the set in working order. Some time later a furious message came to him: "Please come at once and put my set right. I asked you to tune it in to Daventry and I can only get Paris. The music, I suppose, is all right, but I want Daventry."

He was very much puzzled and thought she must have been tampering with the knobs, but when he called at the house, he found that the set was working on Daventry as he had left it. The reason she thought it was on Paris was because she switched on the loud speaker without looking at the programme, and it just happened that she got M. Stephan's French Talk on two or three occasions.

Publicity Puffs Perceived.

The same dealer told me somewhat ruefully that he had been asked to instal a set for a rather morbid family, and when he switched on the loud speaker for a demonstration it happened that a programme of the light, fluffy variety was in progress, and they were so dreadfully shocked that they told him to take it away at once.

These two cases are typical of much of the criticism received at a broadcasting station. The rarest kind of letter comes from the intelligent broad-minded person who has taken the trouble regularly to study the B.B.C. programmes. Such a letter, whether of praise or blame, is always welcome.

Listeners do not often write to us unless they are tremendously keen on a certain type of programme or unless they have some troublesome complex of their own. It would be fairly easy to forecast our correspondence each day and even to write the letters that are to come in.

We have always with us the listener who hates jazz, the listener who cannot understand music unless it has a tune, and who writes a violent letter demanding the dismissal of the musical staff after every serious programme, and the artist who whips up all his friends to write in his praise after his performances. It becomes easy to detect these "puffs," however carefully disguised, and we know when to expect them.

An Unseen Friend.

People who say that the B.B.C. must not judge listeners' opinions by the post bag, need have no fear; the postbag is watched with discrimination. We can generally tell during the broadcast whether the programme is a "winner" or not, and the corroborative evidence comes the next morning.

But unexpected letters do come at times—letters from some stray listener who has appreciated a subtle point which others have missed, or from someone who offers a useful piece of advice, or else from an unknown person whom broadcasting has benefited. Perhaps my most cheering letter was sent by a man who had originally a strong prejudice against me and who now looks upon me as a close friend. Incidentally, I have never seen him.

There is no doubt that although a real artist in broadcasting prepares his work for an invisible audience, he does value appreciation. Stage artists depend a great deal upon their audiences. The audience opens its arms, the artist rushes forward, and then skilfully retreats, but not too fast or too far for the pursuers. He plays the game long enough to satisfy the manager, but at the end of each performance he lets himself be caught, and his captors go home in high good humour. The collaboration between artist and audience is a very different matter in broadcasting, but it must exist.

To this end I have always tried to establish a personal relationship between listeners and the Station, and I am happy in my friendships with a vast number of people of very different kinds. Sound criticism or advice from specialists is available whenever I want it. Of course, I am always introduced to the wireless set, and I know now why some people do not like broadcasting! One interesting point I have discovered is that the Bishop of Bristol is an expert constructor of sets and a highly-skilled cabinet maker; his own set is one of the best and handsomest in the Cardiff area.

A Civic Radio Week.

To assist listeners in the construction of sets, in the avoidance of oscillation, and in the collaboration with the local station, wireless societies and clubs are our most helpful allies. I advise all listeners to join a society, to take in a technical paper, and to watch the "Radio Times." It is impossible to enjoy broadcasting without being properly equipped to receive it.

To develop the right use of broadcasting we made an interesting and successful experiment in Bristol. We called it the Bristol Radio Week and we ran it with the co-operation of wireless retailers, factors and wholesalers, and our Bristol Advisory Committee, which is thoroughly representative of the civic and social life of Bristol.

(Continued on next page.)

A group of B.B.C. officials at a recent carnival. Left to right (standing) Mr. W. N. Settle (Assistant Station Director, Cardiff), Capt. P. P. Eckersley, two Hospital Representatives, Mr. E. R. Appleton (Station Director, Cardiff), Mr. C. Parsons (Station Director, Swansea), Mr. Sydney Evans and Mr. Warwick Braithwaite (Musical Directors, Cardiff).

"MEMORIES."

(*Continued from previous page.*)

The outcome was a general advance in wireless affairs in Bristol, and the formation of a Traders' Association. I had the honour of presiding at the inauguration ceremony, when interesting speeches made by Major Mullard and Mr. Lynas (formerly of Messrs. Amplion) confirmed my belief that co-operative work of this sort would be a real help to British broadcasting. We hope to do much more of it in the future.

Right Kind of Criticism.

Whilst making these sallies within the area served by the station, it is found practicable to do much for local charities and for the sick and impoverished would-be-listener. Our greatest success has been at Weston-super-Mare where we have the help of an energetic committee (the listener again!) and where annually we leave more than a thousand pounds for the hospital as the result of our Sunshine Carnival.

In the winter we give concerts in the industrial centres and meet our listeners there. We find them a happy family; and the criticism we get is the good-natured, well-taken criticism given within all good families and kept there.

Professional Producers.

There is one form of criticism which is always cropping up in the Daily Press and which needs speedy dissolution: the B.B.C. is told that it needs the help of professional promoters of entertainment. The assumption is that because a man is able to choose a pretty chorus or a clever stage comedian he is able to provide entertainment in speech and music. There was never a greater fallacy.

How much witty speech (without gesture) and how much consistently good singing do we get in the usual musical comedy? And do we recruit our film producers from the ranks of the popular novelists? The matter was well summed up in "The Times" of June 18th: "The greatest entertainers, masters of crowd psychology as they may be supposed to be, not only make bad mistakes at times, but are peculiarly liable to fall into a fixed belief that there is only one public. If they had to supply matter for that public for as many hours of the day as the B.B.C. they would probably perceive their error." On the whole, the chances are that the B.B.C.'s policy is on the right lines.

WHY WE USE SCREENING.

PROBABLY some of those who read the title of this note may be inclined to mutter darkly "But we already know why; they do it to make the life of the conscientious constructor a bitter one." Well, if anyone feels like that, and I am afraid there are a number who do, let me assure him that his constructional troubles with screening in the past have been due to the fact that the whole business was in a more or less experimental state.

Nowadays the use of screens is a pretty well standardised affair, and everything can be bought very cheaply ready made and even drilled, so that it really does *not* involve the constructor in any dirty work at all. No longer need he scrape the skin off his knuckles trying to cut a refractory piece of copper to shape with the garden shears, for he can depend upon it that any set he is now likely to build will call for a screen which he can buy for a few shillings all ready to screw down on the baseboard, and perforated so that wires can be passed through without drilling.

Anyway, it really is worth while to take a little trouble to secure the benefits of screening, you know, and even in the knuckle-scraping days it was still worth while, for those benefits are quite considerable. Now, screening is used almost always to prevent inductive interaction between the plate and grid circuits of an H.F. valve, and we may desire to do this for two different reasons.

Two Typical Cases.

In the first place, in the case of a set of the "parallel feed" type we do it in order to be sure of proper stability, for if there were a considerable amount of feed-back due to stray coupling between the plate and grid coils, capacity between plate and grid wiring, and so on, the set would very likely oscillate uncontrollably.

Provided that such feed-back is kept down to small proportions and the usual arrangements made for placing the parallel feed tap on a suitable point on the detector grid coil the circuit will be quite stable, so you see what a valuable thing a bit of copper or aluminium can be in a set like this.

The other main case in which we use screening is that of a neutrodyne type set. Here it might at first appear that stray feed-back would not matter, since we can neutralise it, but this is not really true. The trouble is that there are two main kinds of feed-back in an unscreened set, i.e. that due to the plate to grid capacity of the valve itself, and capacities between leads, and that due to stray fields between the coils.

The former can be balanced out pretty accurately with the neutralising condenser, but the latter varies so widely over the different portions of the tuning range that it may completely upset the neutralising adjustment at some points, and here again a screen is obviously a great help.

Norah Blaney and Gwen Farrar giving a farewell performance at 2 L O.

HELPFUL HINTS.

THERE is no objection to using a large size tuning coil for an H.F. choke, providing it has a low self-capacity.

* * *

Humming-interference may very often be cured merely by reversing the secondary leads of the L.F. transformer.

* * *

Do not run the lead-in along a gutter-pipe, wall, etc., as it should be kept three or four feet from all surrounding surfaces if possible.

* * *

If you have a small fixed condenser on hand try putting this in series with the aerial lead. (It cannot do any harm and may improve selectivity.)

* * *

It is always an advantage to have the set as near to the lead-in as possible.

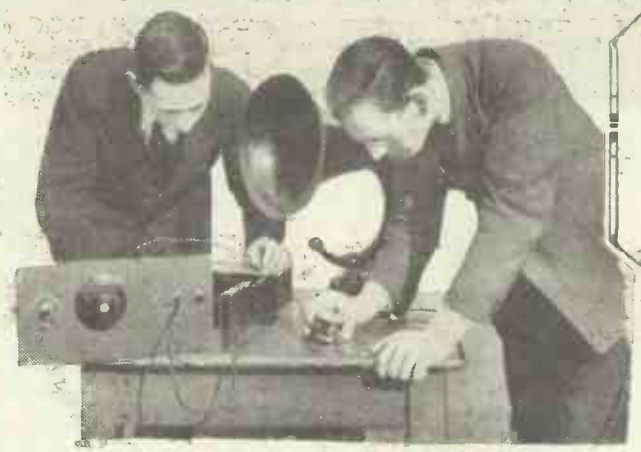
* * *

Poor reception and howling are often due to an old H.T. battery.

* * *

An old valve may give dud results even although its filament is not broken, because its filament may have lost its emission.

THE NEWCOMER TO RADIO

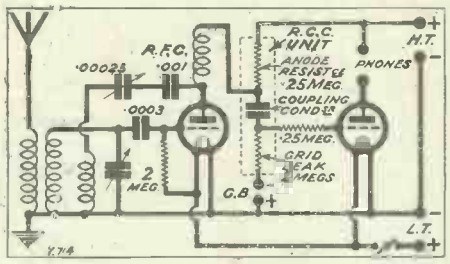


The "progressive" receiver is now rapidly reaching completion, and this week it becomes a full two-valve instrument. Readers can commence the building of the set this week, as a full list of parts needed is given, together with all the necessary diagrams and photographs. The author also continues his fascinating how-it-works chat, as he takes the reader step by step through the work.

6.—CONSTRUCTING A TWO-VALVE SET.

By G. V. DOWDING, Grad.I.E.E.

IF you have been attentively following this series of articles, you now know how a one-valve receiver works, and if you are actively interested in the constructional details given, you will have a complete outfit of this nature in your possession.



But a one-valve receiver can only give you telephone results. To work even a small loud speaker, on your local station, another valve to provide amplification will be necessary, and this week I am going to deal with the addition to our circuit of what is known as "one stage of L.F." The term "H.F." applies only to currents such as those which dash about (oscillate) in the tuning system of the receiver. But H.F. currents actuate the detector valve and cause varying pulsations of electricity to flow in the anode circuit of the valve, which includes, in our one-valve set, the telephone receivers.

Such pulsations are "L.F." "H.F." means high frequency, and you will gather that "L.F." currents are currents which rise and fall in strength at comparatively low speeds. Their actual frequency will depend upon the notes they represent. If the broadcasting station were transmitting a steady note from one of the high strings of a violin, this would be represented in the anode circuit of the detector valve by L.F. currents of greater frequency than if the transmission were a series of very low organ notes.

There might be, as in the case of a military band transmission, a complexity of different frequencies, but they would all lie between about 50 and 10,000 vibrations per second. And these figures represent (in comparison with the oscillating current developed in your aerial tuning system, and which are in the million class), Low Frequencies (L.F.).

We can pass the low-frequency currents to the grid of another valve (instead of to the telephone receivers for direct sound reproduction) in order to magnify them. The coupling between the two valves, in the case of the two-valve arrangement we are dealing with this week, is known as resistance-capacity coupling. Instead of the plate of the detector valve (through the H.F. choke) being joined to the telephone receivers, it is now taken to one terminal of a resistance-capacity-coupling unit. In this unit are three components: two resistances and a fixed condenser. These are clearly shown in the diagram. The dotted line surrounds the parts relative to the unit.

How Energy is Passed On.

Let us see how the energy is passed on to this new valve: The same H.T. battery

(*Continued on next page.*)

The complete two-valve set. Note the spaces left for an L.F. transformer and another valve holder. These two items will be added next week and will bring the set into its full three-valve power. The components embodied in the R.C.C. unit are those enclosed within the diagram's dotted lines.

YOUR COMPLETE SHOPPING LIST.

This week, for the benefit of new readers, we are giving the complete list of parts needed for the two-valve set.

1 Panel, 14 in. × 7 in. × ¼ in. or ⅜ in. (Any good branded material, Radion, "Kay Ray," Ebonart, Becol, etc.).

1 Cabinet to fit, with baseboard 9 in. or 10 in. deep (Raymond, Artcraft, Camco, Pickett, Caxton, Bond, Makerimport, Peto-Scott, Gilbert, etc.).

1 ·0005-mfd. variable condenser, with slow-motion movement, or subsequently fitted with a special dial as indicated in text (Lissen in original. Any good make, J. B., Igranic, Cyldon, Raymond, Bowyer-Lowe, Ormond, etc.).

3 Baseboard-mounting coil holders suitable for standard plug-in coils (Lotus, Raymond, Burne-Jones, etc.).

1 Terminal strip, 12 in. × 2 in. × ¼ in., with 8 terminals as described. (Indicating terminals such as Igranic, Belling-Lee, Eelex, etc., give a neat finish.)

1 Valve holder, baseboard type, anti-microphonic (Benjamin, Lotus, Igranic, W.B., Burndept, Redfern, Burne-Jones, B.T.H., Marconiphone, Bowyer-Lowe, etc.).

1 Grid leak and holder, 2 megohms (Lissen, Dubilier, Ediswan, Mullard, Igranic, etc.).

1 Fixed condenser, ·0003 mfd. (T.C.C., Igranic, Dubilier, Lissen, Mullard, Clarke, Burne-Jones, etc.).

1 On-off panel-mounting switch (Lotus, Lissen, Benjamin, etc.).

1 Variable condenser for reaction control, ·00025-mfd. capacity (·0002 or ·0003 will serve also, either an ordinary variable condenser or one of the special small reaction type, such as Igranic, Cyldon, J.B., Bowyer-Lowe, Peto-Scott, etc.).

1 Fixed condenser, ·001-mfd. capacity (Dubilier, Lissen, T.C.C., Mullard, Clarke, Igranic, etc.).

1 High-frequency choke (Lissen, Cosmos, R.I.-Varley, Colvern, Igranic, Dubilier, Lewcos, Climax, Burne-Jones, Wearite, Bowyer-Lowe, etc.

The additional parts needed to extend the one-valve set to two valves are:

1 Valve holder (as above).

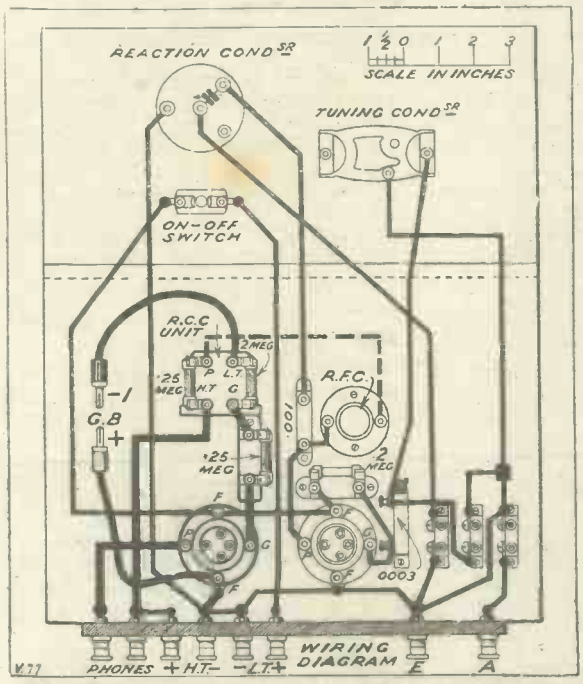
1 R.C.C. unit (Lissen, Dubilier, R.I.-Varley, Marconiphone, etc.).

1 Grid leak and holder, ·25 meg. (as above).

THE NEWCOMER TO RADIO.

(Continued from previous page.)

is connected to both valves. The anode resistance enables a steady current to flow from the H.T. battery to the original valve, but tends to offer a barrier to L.F. impulses generated in the circuit. In effect these are diverted through the coupling condenser on to the grid of the L.F. amplifying valve.



The wiring diagram of the two-valve arrangement described this week. The new components and wiring are shown in heavier lines. The dotted line indicates the lead which has to be altered.

You will notice they have to pass through another resistance. The purpose of this is to prevent any high-frequency oscillations of current getting through from the H.F. end of the set.

If any were allowed to do this, distortion of the final reproduction would result. All sets do not include an "H.F. stopper" of this nature. It is a refinement which is generally found only in the better class of sets.

You will notice that this new valve is also provided with a grid leak, but this grid leak is not for the purpose of enabling rectification to be carried out (that has already been done)—although its function is similar to that of the first grid leak, in that it keeps the grid clear of excessive accumulations of electrons.

A Simple Alteration

You will notice that one end of this new grid leak is connected to a point marked "G.B.–1." This is actually the terminal of another battery, one which we have not yet dealt with. It is the grid-bias battery. The lead from the grid leak is joined to the negative terminal of the battery, the positive terminal of this being connected to the minus terminal of the L.T. You will notice that two flexible leads figure in the wiring diagram, and these form the connections concerned.

Perhaps you will gain some inkling of what the grid-bias battery does from its name, for as this suggests, it gives the grid of the valve—the L.F. valve in our circuit—an initial charge of electricity. It biases it or, in other words, adjusts its initial condition. I am afraid I cannot deal with this point in detail, but you will find that it is covered by an article entitled "An Idle Battery," which appeared in "P.W." No. 328.

The anode circuit of the second valve is completed by joining one lead from a pair of telephone receivers to the plate of the valve and the other to the positive terminal of the H.T. battery. The broadcasting station energy tuned in and rectified by the detector valve circuit is now reproduced in amplified form in the telephone receivers.

Now for the technical details concerning this added valve. Only one of the connections hitherto made will have to be altered. You will have to disconnect that lead which goes from the H.F. choke to one of the telephone receiver terminals at the latter point. As it is a long lead, you can use it for making the new connection, i.e. to join the terminal of the H.F. choke to one of the terminals of the R.C.C. unit.

Only three new components are needed. These are described in the accompanying list. There is nothing more to mount on the panel and, indeed, the components on this and their connections are not affected by any of the further work of extending the receiver. As a matter of fact, you have already done the hardest part of the work, and with regard to the addition of the second valve and the third valve, this is only a matter of screwing down a few more components on the baseboard and adding one or two more wires. Exactly how simple the addition is this week, for instance, you will be able to judge by looking at the new wiring diagram. The new components and new wiring are drawn in heavy black lines.

The new valve-holder is placed in line and near to the first one, as you will see in the drawings and photographs. Note that its grid terminal is pointing at the other valve-holder. You must fix your valve-holders the right way round, otherwise the wiring will be confused.

There is ample room for the R.C.C. unit and the grid-leak resistance, although you should get them as closely as possible to the positions of those in the original model as illustrated in the photograph. Again, the fact that the wiring diagram is drawn to scale, will help you. It does not matter which way round the grid leak is, or which of its terminals is taken to which point of the points indicated in the wiring diagram, but this is by no means the case with the R.C.C. unit. The four terminals on this article are allotted separate connections in the set, so, as with the valve holders, you should see that it is screwed down the correct way round.

Next week the complete Three-Valve Set is described. Order YOUR copy of "P.W." NOW.

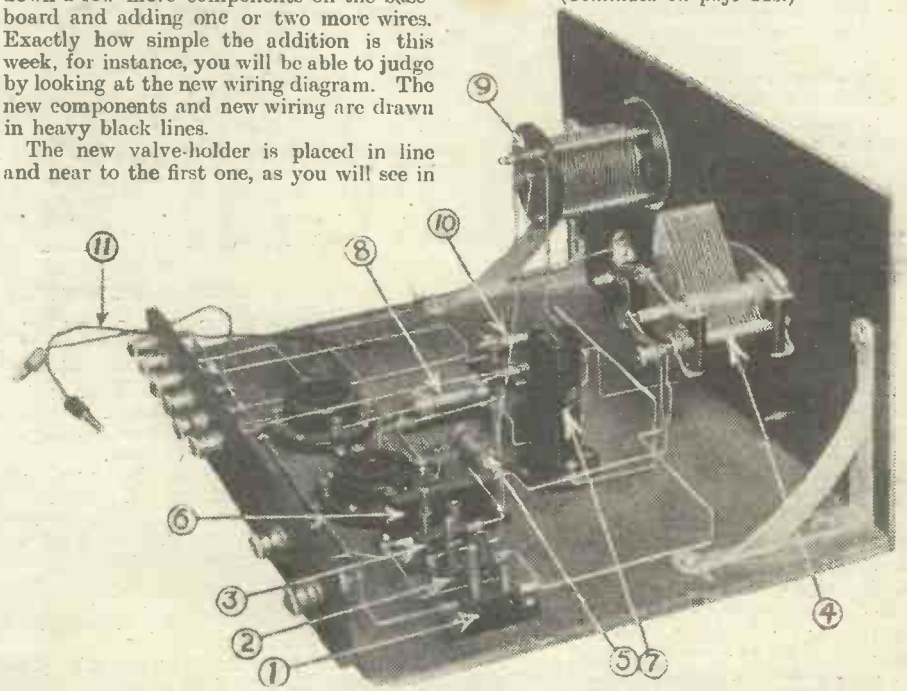
The first step in the wiring up of this new section of the set must obviously be to remove that lead from the telephone terminal to which I have already referred. You need only disconnect this lead at the telephone terminal end, and then it can be shortened and joined to the appropriate terminal on the R.C.C. unit.

The Flexible Leads

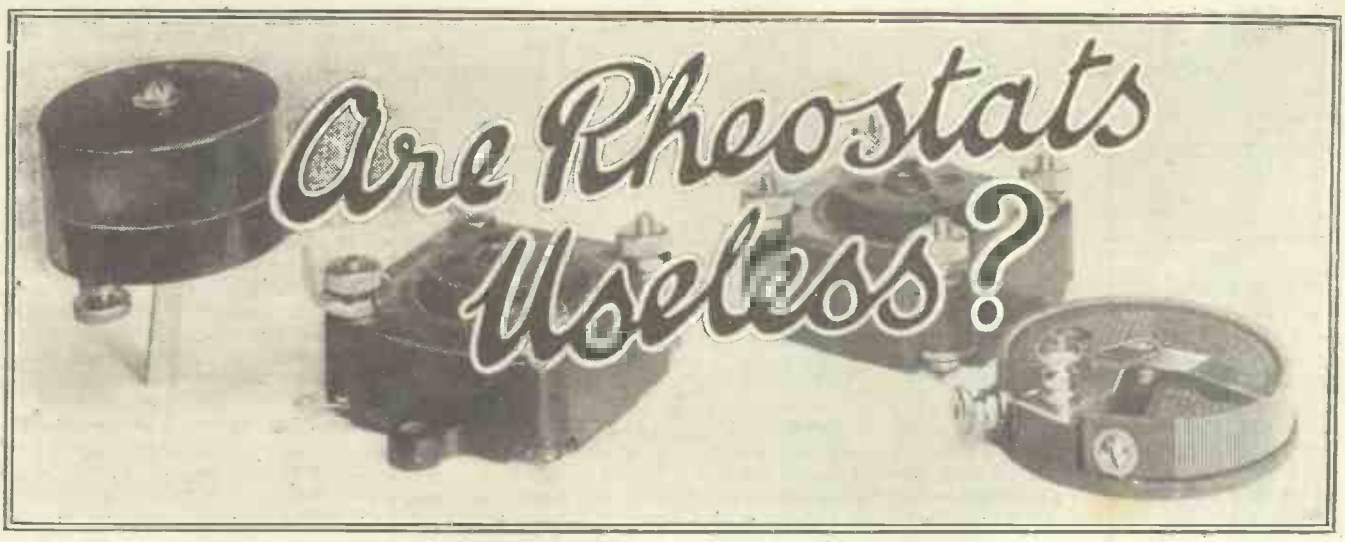
Wire joints obviously have to be soldered; a good enough connection would not result if you were to twist the one piece of wire around the other. If you are dodging soldering, instead of taking the lead to the piece of wire, follow this along to the nearest terminal and join the lead to that. The wiring is concluded by providing two pieces of flexible wire, fitted with plugs for the grid-bias battery.

Single cables, untwisted from flexible

(Continued on page 248.)



Perhaps you can identify all the parts without reference to the numbers. Try to do so, and then check your results by the following: (1) Aerial coil holder, (2) grid coil holder, (3) reaction coil holder, (4) tuning condenser, (5) grid leak, (6) grid condenser, (7) H.F. choke, (8) H.F. "stopper" resistance, (9) reaction condenser, (10) R.C.C. unit, (11) flexible grid-bias leads.



Are Rheostats Useless?

Set builders and those with spare rheostats on hand will be glad of this article, which tells when rheostats must be used, and when they can be omitted.

By D. GLOVER.

THE main purpose of a filament rheostat is to enable the current through the filament of the valve or valves to be varied so that exactly the correct working conditions can be maintained. And the main point to be settled is whether or not these conditions can be pre-arranged and relied upon to remain constant without the assistance of a variable resistance which is, after all, another control.

Two or three years ago the answer would have been easier, for a variation of filament current was regarded as an essential sort of control. Many receivers were so inherently unstable that dimming one or other of the valve filaments was one of the means employed for ensuring successful reception.

An Obsolete "Control."

The modern set does not need such inefficient "damping." It can run "all out" with complete stability even when all its valves are receiving an excess of filament current. The receiver which includes a filament adjustment as a primary control is quite rightly reckoned to be either abnormal or obsolete. But where the L.T. supply is an unknown quantity filament resistances are essential, for though the modern valve can stand a little overrunning this practice is not to be commended, as it is liable to shorten its life.

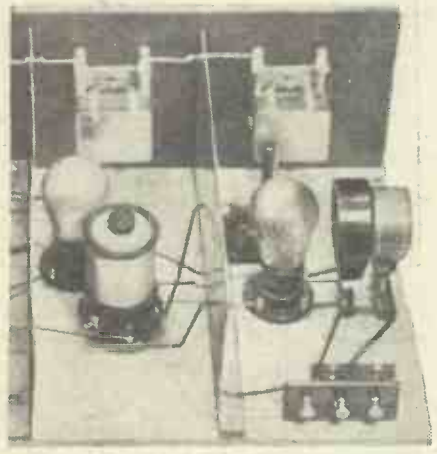
A valve may be rated as taking exactly a certain current at a certain definite voltage. If a supply of exactly this voltage can be ensured then no additional resistance other than that already existing in the filament circuit by virtue of the filament of the valve itself and the accompanying wiring is necessary. But unless the power mains are used this is impossible.

A 2-volt accumulator cell has, for instance, a voltage of 2·2, or thereabouts, directly following its being charged, but this voltage will drop slowly to 1·8, or lower if it is allowed to, although 1·8 is the lowest it should in any case be allowed to fall; after that the cell needs recharging.

Accumulator Voltage Variations.

You will see, therefore, that a so-called 6-volt accumulator battery, consisting of three cells joined in series, will vary in voltage between 5·4 and 6·6 volts. And a filament resistance of a variable character would be essential to keep the current flow from it at a constant figure.

Most "Two-Volt" valves were at one time designed to operate efficiently at 1·8 volts, this being the lowest accumulator cell voltage that should be met with in practice. The additional rheostat resistance enabled the conditions to remain correct from the time of the cell being charged until it "ran down" and required recharging. Most modern 2-volt valves can be quite safely relied upon to act reliably at 1·8 volts and function safely at a slight overrunning of ·2 volts or so.



The omission of panel rheostats certainly makes for great simplicity in lay-out and wiring.

If a primary-cell battery is to be used a filament rheostat is indeed a necessity, for one primary cell of the Leclanché type will give a voltage of 1·5, and two in series 3 volts. Further, their pressures are liable to rather considerable variations "on load."

But even in a case such as this individual rheostats for each of the valves in use are quite unneeded. One master rheostat to govern the supply will be quite sufficient. As I have already indicated, filament control is not these days regarded as an essential adjustment of working conditions. The only L.T. control is that necessary to ensure that approximately the correct current is flowing through the valve filaments.

I have purposely dodged from point to point in order that the mosaic of circumstances is laid before you, but the whole problem can very easily be summed up. First of all, let us examine the alternatives to filament rheostats. Failing them, one can use fixed resistors, Amperites, or nothing at all.

Fixed Resistors.

Fixed resistors are only of use if one wishes to limit current flow to definite approximations, such as if one has to arrange about the right conditions for 5-volt valves working from a 6-volt L.T. supply, 2-volt valves from a 3-volt primary battery source, and so on.

Amperites, on the other hand, are ingenious devices which provide compensation for a varying source of supply as well as supplying a "breaking down" resistance.

The third alternative, i.e. that of having no rheostats or resistances at all, can be summed up first. For a set designed purely for listening purposes and for use with 2-volt valves operated from a 2-volt accumulator cell, no provision for L.T. current control at all is really needed. I am backed up in this opinion by at least one of our prominent valve makers, who adopt this premise in their own three-valve set design.

The Experimenter's Set.

If the set is to operate from a primary battery L.T. source (or any other battery wet or dry, other than an accumulator) then a master rheostat should be supplied.

Fixed resistors or, better still, Amperites, can be used if valves of an unusual voltage (such as 3 volts, 5 volts, etc.) are to be employed with accumulator supplies.

The amateur experimenter's set, with which any kind of valves or varying L.T. supplies are liable to be used, should have separate filament rheostats for each valve socket. These rheostats should be of a robust, high-resistance variety.

The constructor need never take the filament circuit arrangements of a set design absolutely for granted. A set designer has to endeavour to arrange his production so that, in his opinion, it answers the purposes of as many prospective operators as possible. This rheostat problem is not the only compromise he has to make.

WHAT I THOUGHT ABOUT OLYMPIA.

The impressions of a visitor who went round the recent National Radio Exhibition on Opening Day.

By AN AMATEUR.

OLYMPIA was an entertainment and an education. It combined amusement with instructiveness, and for that alone, I suppose it must be counted as a success. Certainly, no one, whether he was interested in wireless or not, could honestly begrudge the eighteenpence he paid for admission and say, "It was not worth it." It was *well* worth it. To begin with, the radio amateur who takes a keen interest in building his own sets was, of course, in his element. "Man's nature is greedy of novelty"—and there were plenty of novelties at the National Wireless Exhibition.

An Agreeable Surprise.

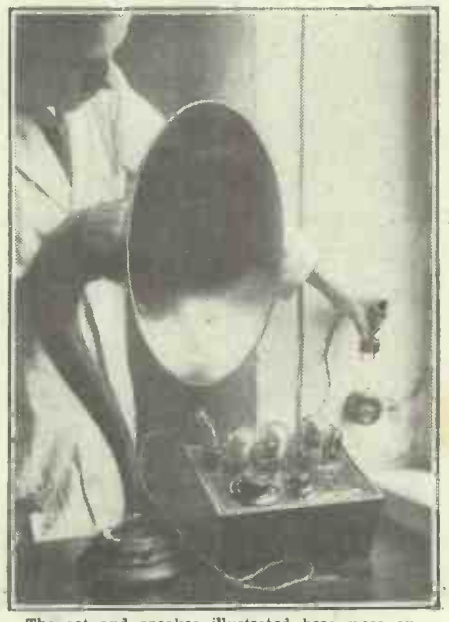
For the past twelve months I had read in "P.W." of the latest in radio and kept in touch with its growth. But when I got to Olympia, and saw the result of its progress, I was agreeably surprised. Not so much, perhaps, at the outstanding innovations—for, after all, there were not so *very* many of these—but at the general improvements in design and efficiency. The best example of this was probably seen in the valves exhibited. (Already, I am sure I should feel terribly behind the times if I had only 1927 valves to use!) The improved characteristics of the new power valves combined with the reduction in their prices are most acceptable, while the pentodes and the "S.G.'s" should prove a real boon. It is a pity, though, that the pentodes take as much "juice" from the H.T. as they do. I should think they are rather fragile internally, too.

While on the subject of valves, I may as well say that, personally, I am looking out for something "better than a valve." No doubt I shall have a long way to look, but I am sure I should see it if I could get a glimpse over the horizon. After all, the modern valve is not so beastly efficient that we can afford to regard it as the "last word." From a point of view of its input to output efficiency (including power from batteries) I suppose it is only about 15 or 20 per cent. On the whole, however, the valve manufacturers have well merited any praise they may get. But I do wish some of them would start packing their valves in respectable, strong boxes again!

Those Terminals!

Six years ago I used to spend half my time running around to ex-Government surplus shops buying up such things as L.F. chokes, smoothing condensers, and even large-sized ebonite knobs. It was gratifying to see at the show all such components in abundance. There is no lack nowadays of smoothing condensers or chokes, while manufacturers seem to have realised that if a set must have an ebonite knob or dial on it, they might just as well put on one large enough to catch hold of while they are about it.

I have found that such parts as fixed condensers, resistors, valve holders, and other small components have, generally speaking, fairly hopeless "arrangements" which some may call "terminals." With few exceptions, Olympia did not show us any great improvement in this respect, but as some firms are gradually beginning to put reasonably large terminals on their components, I suppose the remaining firms will at least be good enough to supply microscopes to assist constructors! In most instances, the radio manufacturers seem to show considerable intelligence, but when they begin to lack in this abstract quality, they do so wholeheartedly. I think this question of terminals is a good instance,



The set and speaker illustrated here were exhibited at the Berlin radio show, and their appearance is distinctly old-fashioned compared with the Olympia exhibits.

while another point which struck me in that connection was the foolishness of some of the advertisements to be seen at the Exhibition. Surely, at what is in effect a trade show, one would expect to see attractive advertisements with plenty of facts in them. Not necessarily technical, but, at all events, informative. Many of the Olympia stands, however, were covered with advertisements of a most irrelevant nature; a lot of them not even artistic.

Was It a Leg-Pull?

The biggest disappointment to me at the Show was the "P.W." stand. Not that it was no good—far from it!—the trouble was that there was such a crowd round it that I couldn't get near! While talking of crowds, it was interesting to note the exhibits that attracted the largest number of people. The psychologist would probably find it fairly easy to explain why the Siemens' automatic S.O.S. recorder and alarm as used on ships should intrigue such a large group of onlookers, but why *should* there be such a mob round the Exhibition's Interpreter? He wasn't even an exhibit!

Before I finish I must give vent to my feelings in connection with the so-called "special exhibit" of the British Broadcasting Corporation. Was it a leg-pull? Let's hope it was, anyway, and as the twopence one had to pay to see it was for charity, I suppose we must not grumble. I do think, though, that the B.B.C. would have made a lot more money out of their tableau if they had got up a competition: "£100 for whoever guesses what each caricature is supposed to be." The £100 would have been quite safe, too!

Taken all round, however, there was nothing much to find fault with at Olympia, and for my part, I found it a bigger, brighter, busier, bolder, and, in fact, a *better* wireless show than I had ever seen before.

WILL IT OSCILLATE?

By G. T. K.

IT is probably no exaggeration to say that the majority of failures with short-wave receivers are due entirely to absence of oscillation.

In this respect, a short-wave set is very different from a broadcast receiver. With the latter it is often possible to hear the local station even though it may be impossible to obtain a reaction effect, but when it comes to short-waves, it is extremely doubtful whether any signals will be heard at all if the set cannot be made to oscillate.

To obtain successful ,or shall I say any results, on short waves, therefore, it is essential that the detector valve should oscillate, and in the following notes it is proposed to deal with some of the more common reasons for absence of oscillation.

On wave-lengths below 45 metres the aerial coupling has a very important effect upon oscillation. If this coupling happens to be tight, the damping caused by the aerial is often quite sufficient to prevent the set oscillating.

The Aerial Coupling.

The remedy is, of course, to reduce the degree of coupling, but as to how this can be done is a matter depending upon the type of coupling in use.

In quite a number of short-wave sets, a separate coil is used for coupling purposes, and with a set of this type it is only necessary to increase the distance between the aerial and the grid coils in order to reduce coupling.

If this should not have the desired results, the effect of removing a few turns from the aerial coil should be tried.

Your set may be one of those in which one continuous winding is used for both aerial and grid coils. This being the case, to alter the degree of aerial coupling it is merely necessary to reduce the number of turns between the filament and aerial tapping clips.

There is just one other common type of coupling which should be mentioned, and that consists of a small variable condenser, such as a neutralising condenser joined between the grid coil and the aerial terminal. The degree of coupling in this case is reduced by decreasing the capacity of this small condenser.

LONDON'S REGIONAL STATION.

Some interesting data concerning the B.B.C.'s latest transmitter.

From A CORRESPONDENT.

SOME interesting information is given concerning the B.B.C.'s technical progress in its new Handbook, which has just been published. It also includes a very excellent description of the first B.B.C. Regional Station which is now in the course of construction at Brookman's Park estate on the Great North Road, some fifteen or twenty miles outside London.

Some thirty acres of field land have been purchased for the site of this station. When the station is complete there will be installed four 300 high-power engines of the Diesel type, each of which will be coupled by a direct-current dynamo generating 220 volts. The output of the dynamos will be taken to a large 2,000 ampere-hour battery close by.

D.C. Supply.

The idea of using direct-current supply with the battery is to ensure absolute reliability because, if anything happened to the engines, the battery would carry on for a quarter of an hour supplying adequate power to the station until a new engine was in readiness.

The most interesting of these electrical machines will be those for the high-tension supply. They are three in number, one working on each transmitter, and one spare one, each capable of an output of 160 kilowatts at 10,000 volts D.C. Direct current is being used because, according to the B.B.C., it represents a substantial economy over the older methods, and power costs are an important factor in the economic running of a station.

The filament lighting machines are also a very interesting item in the gear at the new station. When one considers that the average loud-speaking wireless receiving set takes about ½ ampere to light the valves, the difference between such a set and the filament lighting apparatus in this new station is significant—the valve transmitters absorb 2,600 amperes. This sounds extravagant, but distribution in terms of high power require such an absorption.

The rest of the engine-room space is taken up by fifteen machines doing various auxiliary and low-power jobs, such as running the drive panel, putting 3,000 volts negative on the grid of the main magnifiers, energising the modulating magnifier, and so on.

Arrangement of the Station.

Through the engine-room a door leads into the transmitting house, and on either side of this room the transmitter panels will be seen. The biggest panels house the high-frequency condensers and inductances, and on either side there are the valve panels. In the same room there are the panels for magnification, for modulation, and for frequency stabilisation. An engineer will sit in front of each panel at a table containing the essential controls, energy switches, etc.

It is pointed out in the article in the Handbook that the effect upon the London listener when this new station is in operation will be twofold. To begin with, a change in signal strength, and also a necessity for having a sufficiently selective set to take full account of the new facilities offered.

Change in Signal Strength.

As to the change in signal strength, it is promised by the B.B.C. that this will be for the majority of people in the direction of more strength, not less. If a circle is drawn about three miles around the present Oxford Street transmitter, then those within that circle will get weaker signals from the new station, while others outside the circle will get stronger programmes.

The author of the article points out that this is a qualitative statement, as, owing to all sorts of vagaries of field strength in large cities, it is not possible to define exactly the boundary enclosing those listeners who will get weaker signals when the change is made.

But, for a general statement, the above approximate account of the position will suffice.

It is also pointed out that those listeners who have weaker signals will still have strong signals if they like to take a little more trouble to get them.

At present, where a very short bit of wire draped round the interior of a room, and using no earth, will permit crystal reception of ample strength for, say, somebody living near Park Lane, a few modifications will be necessary when the change-over is made. In North London the signal strength will be very much greater—for example, in Barnet listeners may have to cut down the size of their aerials to avoid saturation, and South London listeners will also get some comfortable extra strength, as also will listeners in the east and west.

More or less, every listener will be affected; but as any change means complaint, it is quite likely the B.B.C. will get complaints until listeners realise that they must do their share in order to facilitate the B.B.C.'s laudable desire to progress as regards modern transmission methods.

After all, the aim of progress is to leave the majority better off, and the object of the new London Regional Station is, first, to cover larger and wider areas without interruption; in fact, to give all south-east England listeners, sooner or later, an alternative programme.

The B.B.C. are quite right in saying that it is up to the listener to prepare for the change, and when the change is made, to help the B.B.C.—not by complaining, but by making the slight alterations necessary to meet the changed conditions. Obsolete sets are no excuse for bad reception.

Get Ready Now.

The B.B.C. is confident that listeners will help, not only for their own, but for other people's good. More and more detailed advice is promised as the time for the change approaches, but in the meantime, while the station is being built, and while the plans for the other Regional Stations are in progress of being put into actual practice, the listener should make himself familiar with these changes, and not plead ignorance when he finds the change is effected and there is some alteration in his previous experience of receiving 2 L O.

WORLD'S LARGEST SPEAKER.

The loudest loud speaker at the National Radio Show at Los Angeles was this enormous one, with a voice that could be heard three miles distant. It is only intended for use in large halls, and consists of a thin diaphragm, three feet and a half in diameter, and resembles a cartwheel.

THE "SYDNEY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a constant reader of your paper, I feel that I must drop you a line from this distant outpost of the Empire and let you know that there is at least one in China who appreciates the "Sydney" Two. I hear 5 S W-any morning that I care to listen in, between the hours of 02.00 and 07.00, and receive the station at good 'phone strength, also P C J J, but curiously enough have never heard Australia. I have also made coils as per description in "Modern Wireless" ("Sydney" Two De Luxe) and receive our local station, 300 metres, on loud speaker, but I have not made any alteration to the choke.

I trust that your paper will continue to advocate Empire broadcasting and wishing your journal every success.

Yours sincerely,
ALAN B. ALLAN.

P.S.—I heard an address from London at about 04.30, Tuesday, August 21st, that would be about 21.30 B.S.T., 20th, the subject being Africa.

If the gentleman who was making the speech had the intention of stopping people going abroad, I am sure he must have succeeded. It was morbid.—A.B.A.

H.M. Naval Dockyard (2 Naval Terrace),
Hong Kong.

NOVEL INDOOR AERIAL.

The Editor, POPULAR WIRELESS.

Dear Sir,—In the Technical Notes of a recent week's "P.W." there was a paragraph describing the make-up of a novel indoor aerial, which was read by me and, I daresay, by thousands of other "flat dwellers," with great interest. If there is any foundation for the claims made by your correspondent this aerial is what we have been looking for for years. But we have heard of these wonderful aerials before and I, for one, am tired of trying these weird and wonderful arrangements which all "give results equal to a good outdoor aerial." I have tried many kinds of indoor aerials but I have not yet found one which will compare favourably with an outdoor, and I still have to use the old one, consisting of wire slung across the ceiling from picture rail to picture rail, which, to say the least of it, is unsightly. The aerial described in "P.W." would solve all our problems if it worked. As about 300 ft. of bell wire would be required to make it, besides the special formers, it can hardly be described as inexpensive to make up. Won't "P.W." come to our rescue and give this gadget a thorough trial and then tell its keen but unfortunately situated readers all about it? Surely it will. Anyway, here's looking forward with even greater interest than usual to the next issue (or the one after, perhaps) of our journal.

Yours faithfully,
Sydenham, S.E.26. E. BUCKOKE.

THE 100 PER CENT CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am sure you will like to hear what results the "P.W." readers got with the 100 Per Cent Crystal Set.

I am, like a great number, very interested in all things wireless, and among the first readers of "P.W." I have three and four-valve sets, but I never discard the crystal. I always thought my other crystal was extra good, with six and seven stations, but I must give you laurels on the 100 Per Cent.

CORRESPONDENCE.

THE "SYDNEY" TWO IN CHINA

NOVEL INDOOR AERIAL—THE 100 PER CENT CRYSTAL SET.

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.

I started winding the coil at 9.45 p.m. one Saturday, and I hung on to a station until 1 p.m. Sunday morning, I logged eight stations. If any reader has any doubt on this I am open for them to hear the set (although only a hook-up) with wooden panel, 3-ply.

The tapped coil former is only one made of cardboard, with spirit varnish for insulation.

The stations I logged were Daventry, London, of course I mean separate 5 G B, the rest German and French.

Taking into consideration weather conditions during the week-end, I think this a real 100 per cent set. I find the tuning very sharp. I should suggest either a vernier or slow-motion dial.

So, wishing you every success in the future as you have had in the past, and trust other "P.W." readers will have as good a show as I have had with the 100 Per Cent Crystal, a confirmed crystal result getter.

Yours truly,
N. K. NEWMAN.

Vergator, Henfield,
Sussex.

P C J J.

The Editor, POPULAR WIRELESS.

Dear Sir,—I, like "H.H.O.R.", have also found that during the last month or so P C J J has not been worth listening to. It used to come in here at quite the same strength as my local and could nearly always be relied upon.

While fixing a pair of L.S. leads in Fahnesteck clips the other day I suddenly found I was hearing music without the L.S. being connected in any way. I then found that I could produce signals whenever I pressed one hand on one clip and rubbed the other on the other clip. Only when I was *rubbing* my hand over it would the signals come.

Can any of your readers explain this?

Please give us more and more short-wave articles.

Yours faithfully,
M. BARNETT.

Southport.

HE LIKES HIS JOKE!

The Editor, POPULAR WIRELESS.

Dear Sir,—I noticed that another correspondent has been in difficulties with a screwdriver inside his set, and thought my experience might be interesting.

When endeavouring to tune in 3 L O (Australia) last Sunday evening, I noticed a screw loose inside my receiver. While tightening it with a screwdriver there was a bright flash in the valves, after which they remained glowing as brightly as 40-watt lamps. The Australian station simply roars in now and I am only able to listen to it when the loud speaker is placed on a feather bed and covered with three eiderdowns. I dare not tune in any station less than 1,000 miles away, for fear of shattering the windows of the house. I am thinking of soldering the screwdriver permanently into the set.

When not in use for wireless reception I take out the valves and put them into adaptors, which I have made, plugging these into the electric-light sockets for house illumination.

Yours faithfully,
C. G. SALIS.

P.S.—If "Ariel" cares to offer me a dukedom, I may be graciously pleased to accept it.

London, N.13.

USES FOR DISCARDED FLASH-LAMP BATTERIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I suggest, with a possible hope that other readers may benefit, a method by which dismantled components of the above may be advantageously utilised.

The smaller brass contact is of a suitable size for using as a grid-leak clip on an ordinary fixed condenser, in this way: a hole is already provided at one end of the contact, and this is slipped over the screwed terminal of the condenser and fixed in position by screwing down the locking nut usually provided on fixed condensers, by suitably shaping the other end of the contact an excellent substitute is obtained for the ordinary grid-leak clip, which latter are not always available at the required moment.

These same contacts may also be used to make up series grid-leak clips, and separate grid-leak units by drilling, say, a 5-in. hole at the opposite end to the one already in the contact, then bending the contact at right angles and bolting on to an ebonite base.

There are, of course, other uses to which these handy little strips of brass can be put, both the positive and negative contacts forming useful scrap for the experimenter's junk-box.

To complete the process of dismantling, the carbon pencil to be found in the centre of each cell can be filed to size and ends tapered to form home-made grid leaks of various ratings.

Trusting that the foregoing may be interesting.

Yours faithfully,
SYDNEY R. PHILLIPS.

London, S.W.9.

SHORT-WAVE NOTES.

By W. L. S.

I HAVE often written at some length on the subject of "local conditions" and so far-reaching and important does the whole matter seem, that I make no apology for returning to it once more. If I ever make a definite statement, as I did a few weeks ago, to the effect that 2 X A D was very good throughout one particular week, while 3 L O or some other station was rather poor, I can be fairly certain of a swarm of correspondents who disagree with me entirely, and say that the exact opposite was the case. If, among my own circle of friends and fellow short-wavers in the neighbourhood in which I live, I make a similar statement, I am almost certain of contradiction. What these "local conditions" can be due to I simply dare not attempt to say! So many and varied are the effects they produce that one almost despairs of ever finding a scientific explanation for any of them.

Wrong Theory?

I have suggested before that the slope, direction, and general characteristics of a receiving aerial may be the cause of one person habitually receiving certain stations at greater strength than other receivers quite close by, but this has been upset by some tests I have been carrying out with an indoor aerial of quite different direction and slope from my usual outside one. I find that I receive exactly the same "sets of stations" on any particular night whichever aerial is in use.

Some nights back I was testing out a new transmitter, and on 23 metres after 10 p.m. I called several U.S.A. amateur stations whose signals were coming in particularly well here. No luck resulted, so that I called "test U.S.A." for about three minutes, and then had a good hunt round for replies. Still not hearing any at all, I called a Brazilian station and immediately established contact, signals being reported good at both ends. Next night a friend asked me why on earth I hadn't replied to any one of the "swarms of Yanks" that he had heard calling me. When I told him I had been working the Brazilian, he confessed that he hadn't heard a sound of him! Yet on another night *he* will be receiving the South Americans while I can only hear the U.S.

I have, by the way, found yet another cure for threshold howl, or, as they now say in the States, "fringe noise." This cure, consisting of connecting the shroud of the L.F. transformer to H.T. positive, works perfectly in my case, but I am quite sure that there will be many in which it has no effect at all! Why it works, again, I can't say, but it does. This makes in all five different adjustments, each of which will cure the trouble, and any two of which, made simultaneously, bring it back again!

Other Cures.

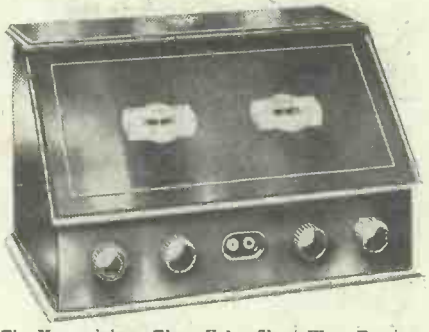
The others are, lower value grid leak on detector, reduce filament voltage on detector, place high resistance across transformer primary or secondary, and place H.F. chokes in the 'phone leads. These seem, between them, to embrace a fairly large portion of the receiver! Will anyone else who has struck a *certain* cure (even if only in one particular case) please send me his experiences for tabulation. We shall then be able to compile a grand table of results and perhaps inaugurate a "threshold howl" week!

FROM THE TECHNICAL EDITOR'S NOTE BOOK

MARCONI SHORT-WAVE SET.

WE have recently had on test one of the new Marconi short-wavers. It is a three-valver, and its general appearance can be gauged by the accompanying photograph. The sloping front panel carries indicating dials for tuning and reaction controls. On the lower vertical panel are the adjusting knobs and telephone sockets. The left-hand knob controls a potentiometer for the detector valve, and this is very helpful in obtaining perfectly smooth reaction.

The condensers have velvety, slow-motion drives quite free from backlash. The set employs three valves. The case is completely lined with copper, and this and the general design renders the receiver remarkably free from capacity effects.



The Marconiphone Three-Valve Short-Wave Receiver.

Indeed, these are only just perceptible on the shortest waves from 10 to 25 metres.

Four interchangeable coils are used, and these enable one to cover adequately the range of 10 to 100 metres. The set is remarkably well behaved, and there is no "threshold" howl whatever, and the smooth reaction permits an easy oscillation.

There is only one H.T. lead, which is common to all valves, showing that the H.T. on the detector is not critical. The set was tested on a 30-ft. aerial which is badly screened. Nevertheless, 2 X A D and 2 X A F came in at excellent strength. P C J J operated a loud speaker comfortably. At the moment of writing, short-wave conditions are not particularly good, and, in the circumstances, the Marconi Short-Waver acquitted itself remarkably well.

EDDYSTONE VARIABLE CONDENSERS.

I recently had on test an Eddystone variable condenser of .00015 mfd. capacity specially designed for short-wave sets. It has cut-away metal end-plates of a more than usually stout nature, and rigid brass vanes. Ball-bearings give the device a very mooth movement free from backlash.

A point which the constructor will appreciate is that there are two terminals each for the moving and fixed vanes, and these are widely spaced at each side of the component. The whole variable is well above the average, both in design and construction, and I have no hesitation in recommending it to the attention of "P.W." readers.

CASON VALVE HOLDERS.

I am greatly attracted by the design of the new anti-microphonic valve holder produced by Cason Mouldings. By applying a patent scheme of valve springing excellent "anti-pong" qualities are achieved, and it is noteworthy that the springs are continuous from a portion which forms the valve socket to the soldering tag.

The soldering tags are placed towards the base of the component, the terminals projecting from the top. The plate socket is at its upper rim, brightly coloured red, and this colouring shows up vividly against the black bulk of the article. I seem to remember many holders in the past having plate sockets so coloured, although it is a feature one seldom sees in modern types. It can certainly help one considerably when inserting valves in "baseboard" sets, and I cannot help wondering why it is not adopted as a universal practice. The Cason holder costs 1s. 6d.

There is another type of a similar make available at 10d. This variety is not of anti-microphonic design, but has all the other good points of the senior model.

"EKCO" MAINS UNITS.

I recently examined with considerable interest all the forms and leaflets concerned with the "Ekco" hire-purchase system. It seems that all the mains radio devices listed at £2 10s. and upwards by Messrs. E. K. Cole, Ltd., can now be obtained on a hire-purchase scheme. The business can be completed through approved retailers, and certainly it seems to be free from "snags," and a simple and attractive affair both from trade and buying points of views.

GRID-BIAS BATTERIES FREE!

I have had a sample sent me of the 9-volt grid-bias battery which Messrs. Ripaults, Ltd., are giving away in accordance with the offer recently advertised in "P.W." It is an excellent battery tapped at every 1½-volts, and has its sockets set in hard composition. The makers say that this grid-bias battery receives the same care and attention as the rest of the batteries in their well-known range. I can believe that.

R.I.-VARLEY "ANTI-MOBO."

By the time these words appear in print no doubt every reader of "P.W." will have gathered that the new R.I.-Varley "anti-mobo" device obviates the nuisance known as motor-boating. They will have learnt this through the advertisements in which the purposes of the device have been clearly stated, but many will have wondered how the component operates.

The common cause of motor-boating is a coupling effect in the H.T. supply. In a sense this affects feed-back, or L.F. reaction, and a popping or other similar noise results. It is this that the R.I.-Varley "Anti-mobo" effectively stops. It incorporates wire wound resistances of the well-known Bi-duplex type, and a fixed condenser. It can be joined up to a set in a few minutes.

The resistances are brought into series with the H.T. leads, and the condenser provides a low impedance path to earth.

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.

It is therefore quite a straightforward H.T. shunt system that is introduced, although resistances take the place of the chokes which more usually figure in such systems. The "Anti-mobo" cannot help being effective. A high resistance is offered to L.F. impulses that would normally pass to the H.T. battery, and they are shunted by the fixed condenser. This offers a comparatively low resistance path.

The "Anti-mobo" is a neat unit. It can be connected to practically any set. It has

The R.I. "Anti-Mobo" Device.

been proved that the mere by-passing of the H.T. battery by large fixed condensers is not always a cure for motor-boating, but it would be a queer motor-boater that was not silenced by an "Anti-mobo"!

RADIOTORIAL

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 and 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 trade would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

LONG-DISTANCE TUNING.

E. F. S. (West Riding, Yorks).—"It is a two-valve set, and on the front there is a switch to put it on and off. Besides this there are the two dials, one marked tuning and one marked reaction.

"I do not understand how to operate these, and I should be glad of some hints before the winter comes, as we are miles away from anywhere here, and a wireless set is simply a god-send. I understand enough to know that turning the tuning dial round should bring in the different stations, and that these can be strengthened up with the reaction. As a matter of fact, I have got two or three German stations already, but I can never be sure of getting anything, because I make the set squeak or else it does not seem sensitive enough. What is the proper way to tune in?"

Your best plan is to proceed as follows: Having connected up and seen that everything is O.K., set the reaction condenser at 0 (minimum capacity position), and then slowly rotate the tuning condenser, listening carefully for any sign of a broadcasting station.

Whilst the reaction remains set at zero you will not find many, but you may find one or two, and the dial readings for these should be noted. Having gone all round the dial slowly, and made sure that you have all those down which are receivable without reaction, and having become thoroughly accustomed to the sound of the set when no reaction is applied to it, you are ready to try a little long-distance work.

The Signs of Oscillation.

Choose a time when no broadcasting is on from the B.B.C. stations, such as late at night or else on a Sunday outside programme hours. First of all set the tuning dial at, say, 100, then slowly and carefully advance the reaction condenser. As reaction is increased the set gets more and more sensitive, and presently this becomes apparent because you will be able to hear that the multitudes of little noises which denote the set is "alive" are becoming louder.

Presently, as reaction is slowly advanced still further, there will be a sort of "plop," and then a gentle "breathing" or rushing sound, denoting that the set is oscillating. If you wet your finger and touch the aerial terminal you will find that there are very loud double clicks every time you touch. If you keep on tapping with one hand, and with the other gently slacken off the reaction condenser you will find that there is a very definite place at which the set oscillates and the taps become very loud. When reaction is *below* that point, the taps are still clear, but nothing like so loud as formerly. When you are *above* the oscillation point, the tap is absolutely loud and clear, and every time the finger is removed from the aerial terminal the rushing sound is heard.

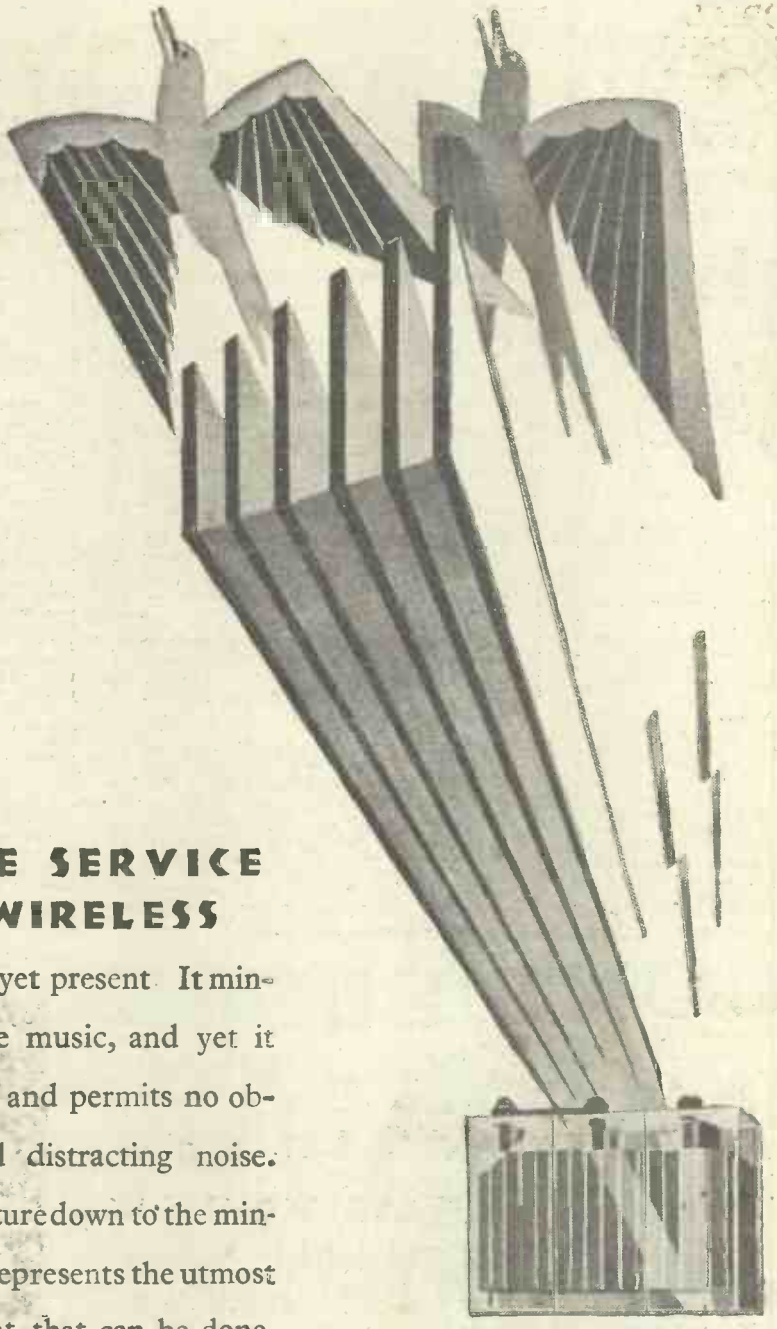
Now, in tuning for long-distance the great thing is to adjust the set so that it is nearly, *but not quite*, oscillating. Supposing the tuning dial is still set at 100, and we start off on the reaction condenser, listening carefully to the results. At first the set sounds normal, but presently when reaction gets stronger the set sounds livelier.

Presently, as reaction is increased, there is a sort of click or plop, and the oscillation-hiss sets in, showing that the set is oscillating (and causing interference with others.) The reaction condenser is now at, say, 58, but if it is retarded to about 55 degrees, perhaps, the oscillation ceases, and the set, though very sensitive, is not causing interference with other listeners. Being now in a very sensitive condition, it might be thought that it could be left, and this is all that is necessary for tuning. Alas! No!

Handling the Two Dials.

Unfortunately, in such a case, as soon as one alters the tuning dial the set either starts oscillating or else it begins to lose its sensitivity, according to whether the tuning dial is turned down or up. The trouble is that more reaction is required for the longer waves than for the shorter waves, so that

(*Continued on page* 238.)



IN THE SERVICE OF WIRELESS

It is absent yet present. It ministers to the music, and yet it effaces itself and permits no obtruding and distracting noise. Its manufacture down to the minutest detail represents the utmost and the best that can be done.

Wherever wireless has to satisfy the sensitive musical ear—wherever it is responsibly carrying on the momentous business of life—the Exide Battery almost as a matter of course.

Exide

BATTERIES FOR WIRELESS

Exide Batteries: Clifton Junction, Near Manchester

E.8.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 236.)

every time the tuning dial is altered the reaction dial has to be altered with it, if maximum sensitivity is to be retained.

In this instance we are supposing that the tuning dial was originally set at 100, and that the set oscillated when reaction was brought up to 58, but stopped oscillating when reaction was retarded to 55. If the *tuning* dial is slowly turned down from 100 towards 90 it will not have travelled many degrees before the set starts oscillating again. Consequently, it is generally necessary to turn the tuning dial with the left hand slowly, keeping the right hand upon the reaction condenser ready to slacken off a degree or so as soon as the set starts to go into oscillation.

Having once mastered the signs of oscillation and the method of controlling reaction so that the set can be kept near the oscillation point *without actually "going over"* the most convenient way of turning round the dial is the following: Set the tuning condenser at maximum, and then bring up the reaction until the set is nearly, but not quite, oscillating. Keeping the right hand over the reaction knob, slowly turn the aerial condenser with the left hand, moving it as slowly as possible and listening carefully.

If, as the tuning is slowly altered downwards, the reaction tends to get too strong, turn it off carefully, but not too far or the set will lose sensitivity.

The Final Touches.

The great thing is to keep the two dials "in step" with the set breathing very, very quietly, and only just on the verge of oscillation. When you hear a station, try to "hold the tuning" with the left-hand dial, whilst you adjust the reaction with the right hand to the required degree. Remember that *too much reaction is absolutely fatal to success.*

The set is in its most sensitive and best long-distance-getting condition when it is on the verge of oscillation, but if it is allowed to oscillate, not only will the required signal be lost or become merely a chirp, but you will be wasting your own H.T. and rendering yourself liable to a rebuke from the Postmaster-General, for oscillation is an offence against the conditions of your receiving licence. With a little patience you will soon acquire the knack of balancing the tuning and the reaction so that as one is moved the other follows on, and keeps the set at that required pitch where it will pick up very, very weak stations, but will not make a sound in any neighbouring listener's set. Finally, do not forget that reaction causes distortion of the received programme, so that the less reaction you can use the better. For really pure loud-speaker reproduction no reaction at all should be employed, and if the set is not powerful enough to give this, an extra valve or valves are required, it being hopeless to expect real volume and clarity if an inadequate number of valves is employed.

THE AMERICAN DEBT.

"FED-UP" (Farnham).—"Even if America did invent the valve, is that any reason why we should lie back and do nothing? Why, they are putting out their programmes every night up to half-past one in the morning, and I can get them on a two-valve set, and sometimes they are nearly as loud as Daventry, after travelling all across the Atlantic, and what I want to know is, why are we lying down like this, and why do not we get busy, and do something?"

We hope you will not mind us saying so, but it seems to us that what you really need is a large liver pill, number one size, double strength. We all have our little troubles, and we all know that "here we suffer grief and pain—over the road it is just the same," etc.

But do not imagine that everything British is thoroughly dud and deplorable, just because the British Broadcasting Corporation do not always give out the programme you require at a strength you would like it. Has it not occurred to you that the reason we tune in American programmes better than they receive ours may not be the actual transmission, but the super-excellent reception at the British end! Think of the way that *you* can bring them in, "Fed-Up."

Seriously though, there is no need for you to worry about the British progress in radio. Though you think that America invented the valve, the first man who ever connected a thermionic valve to a wireless set was Prof. J. A. Fleming, of University College, London (London, ENG.). It was long after he invented the valve and had acclaimed its workings and its importance in radio that an American improved that valve by inserting the grid into it.

Whilst this was a very important development, it should not be forgotten that it was an Englishman who used the first valve in wireless and pointed out its great possibilities. Wireless owes as much to Britain as to any other country on earth and a good many travellers confidently express the opinion that nowhere in the world is broadcasting on so satisfactory a footing as in this country.

By the way, the reason that you get such loud results from America sometimes is that you are listening to the *short*-wave stations which, generally speaking, do not provide a satisfactory service for listeners in their own locality, but which freakishly reach out and scatter their signals at very great distances from the starting-point. You will notice, too, that whilst on some nights they are fairly deafening, at other times you cannot hear them at all. As for late transmissions—well, American time is five hours behind ours, so that is why they are up when most of us are snugly in bed!

(Continued on page 240.)

"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 a revised 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.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 238)

WHICH IS THE BEST AERIAL?

"Ajax" E.—"I do not know what to do about the aerial. I cannot afford one of those with six or seven wires and hoops, but I can put up a two- or perhaps a three-wire. Which do you think is the best kind?"

If your aerial is to be a very short and cramped one you may find it necessary to use three or more wires. But if, like most of us, you can get it up twenty-five feet or so, and then run a stretch along for forty feet or so, you will probably find that one wire is better than two or three. A multi-wire aerial is only worth while when the aerial must be very short, such as indoors or in a small yard. If you have an ordinary long run from a pole on the house to a pole in the garden so that the total length of wire, including the lead-in, is 70 ft. or so, you will find one wire gives wonderfully good results.

TOO MANY H.T. BATTERIES.

D. B. (Harwich).—"What I cannot understand is why I have to use so many H.T. batteries. The set is a four-valver, H.F., Det. and two L.F., and the last valve is an ordinary power valve, the other being ·1 filament. About how much anode current should a set of this description take, and why is it that the batteries do not last several months like they do on smaller sets?"

If you are using the proper grid bias (which, by the way, is essential if you are going to keep the valves' plate current down to the most economical level) the total plate current for the whole receiver should be about 12 milliamps. With such a set the ordinary small cell type of H.T. battery should not be used, as the output of the cells is much below that required by the set.

Generally the cell's limit is in the neighbourhood of about 5 milliamps, whilst in some cases the set will require much more than twice this current.

Consequently, it is more economical to use one of the large capacity types of battery, and if we were in your place we should use a triple-capacity battery which, being capable of supplying rather more current than you want, would always be working well within its limits, and, consequently, would have a very much longer life than if called upon to supply more current than it is intended to give.

FREQUENCY AND WAVE-LENGTH.

S. A. (Forfar).—"Since taking up short-wave listening I have become interested in the frequency of stations instead of speaking of them only in terms of wave-length. What is the rule for finding the frequency when the wave-length is known?"

To convert frequency to wave-lengths or vice versa, all that is necessary is to divide the number of kilocycles or the number of metres into 300,000.

USING CHOKE INSTEAD OF TRANSFORMER FOR L.F. COUPLING.

D. J. (Bromley, Kent).—"Recently I had a large L.F. choke given to me, and I should like to try this form of coupling if it can be done fairly easily without much alteration to the set. I understand that the only new parts required are a coupling condenser and a grid leak. These I have, provided that an ordinary grid leak is O.K., and a ·1 mfd. coupling condenser. What would be the alterations required?"

To change over from an L.F. transformer to a choke-coupled stage is very easy, the alterations being as follows: Disconnect all the leads to the L.F. transformer, and remove this from the set. Now join the L.F. choke across the two wires which previously went to the primary of the transformer—that is to say, connect one end of the choke to H.T. positive and the other end to the reaction coil or H.T.+.

The next step is to join the grid leak to the two wires which previously went to the secondary of the transformer—i.e. connect the grid of the valve to one end of the grid leak, and the other end of this to the grid-bias negative plug. All that now remains is to put in the coupling condenser. One side of this is connected to that end of the choke which is nearest to the plate of the valve (that end which is now joined to the reaction coil) and the other end of the coupling condenser is joined to the grid of the second valve at any point on the lead from the valve-holder to the grid leak.

The value of the coupling condenser you have on hand is quite suitable, and we think that with this arrangement you should get good results.

THE 100 PER CENT CRYSTAL SET.

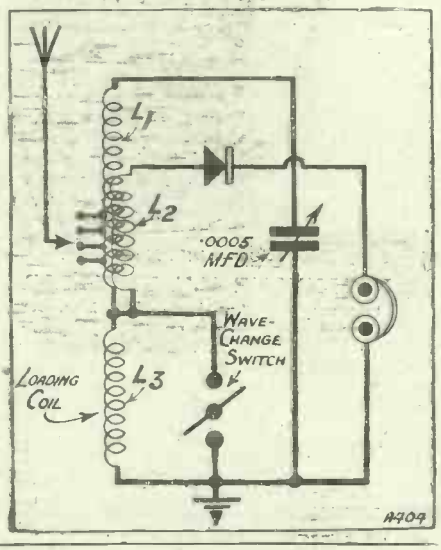
E. S. (Cumberland).—"He told me it was the 'P.W.' Hundred-Per-Cent Crystal Set, and I think I could make it from memory except the coil-turns, which I have forgotten. I gather these must be 'just so' to get the full volume out of the 'phones like he did, so please let me know the number of turns, wire, etc., if possible."

There are three "coils," as shown by the accompanying diagram. L_3 is the loading coil for 5 X X, and should be an ordinary 150-turn plug-in coil.

L_1 consists of 60 turns of No. 24 wire, whilst L_2 is 40 turns of 32 wire (D.S.C.) interwoven with L_1, upon a 3-in. diameter former, 3½ in. long.

To get full strength from this remarkable little set the coil must be made properly, so we advise you to read the full description of the set (which appeared in "P.W." No. 325, Aug. 25th, 1928, issue).

(Continued on page 242.)



MARCONIPHONE

radio simplicity for all

No replacements, no recharging, always ready at the turn of a switch—such is the convenience *and economy* of the new Marconiphone Power Units. New models especially designed for two and three-valve receivers bring all mains power operation at a cost low enough to suit everyone's pocket. Or, if you want only to eliminate accumulator troubles, instal the new, low-priced Marconiphone Trickle Charger.

Model D.C. 4.

Model D.C.4. All-Power Unit for Direct Current Mains.

Designed for the two-three valve receiver, it entails little or no alteration to existing circuits. Wiring and resistances are entirely enclosed.

Outputs available:
H.T. 60 v. 80 v. 120 v.
L.T. up to .35 amp.
G.B. + 1½ v. — 1 v. — 6 v. — 12 v.

One Model only. Model B1154 for 200-250 volts - - - **£5 5 0**

Model A.C. 4.

Model A.C.4. All-Power Unit for Alternating Current Mains.

May be used in conjunction with Marconi Indirectly Heated Cathode ("K") valves, or new Point 8 series for small receivers. New system of connection renders it absolutely safe in use. With power supply costs only 2d. per week.

Outputs:
H.T. 80 v. and 120 v. 15 milliamps.
L.T. 4 volts, 2 amps. and 1 volt 2 amps.
G.B. — 1v. — 6v. to 12v. + 1½ v.

One model only, 100-125 v. and 200-250 v. 40 cycles or over. Price (including valve and royalty) **£4 15 0.**

Trickle Charger.

Marconiphone Trickle Charger.
(Incorporating Westinghouse Metal Rectifier.)

The low-tension accumulator need never be run down when a Marconiphone Trickle Charger is installed. There is no need to debate whether to iustal a 0·1 amp. valve or one of the new 0·25 Marconi Super Power Types which gives such improved quality and volume. Enclosed in a strong metal case with moulded top, this unit will deliver half an ampere to 2, 4 or 6-volt batteries from mains of 100-125 or 200-250 volts.

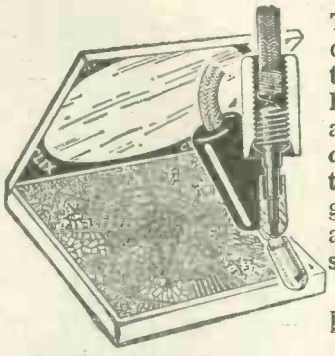
No. B.1146, Model A for 200/250 volt A.C. mains.
No. B.1145, Model B for 100/125 volt A.C. mains.
Both at frequencies of 40 cycles and over.
Price (either type) **£2 9 6.**

Send now for full particulars.

THE MARCONIPHONE COMPANY, LIMITED,
(Dept. P), 210-212, Tottenham Court Road, London, W.1.
Showrooms: 210-212, Tottenham Court Road and Marconi House, Strand, W.C.2.

CLIX-LOX

The Wonder Wander Plug.



There is no risk of burn-outs or shorts if you use the Clix-Lox Wander Plug. It is adjustable and will fit the socket of *any* H.T. Battery. One turn of the insulator gives perfect contact and another locks it securely in position.

Price 2½d. each.

The Clix-Lox is one of the eight Clix practical aids to perfect contact displayed in the Showcase to be seen on your dealer's counter.

Look out for this Showcase.

The Showcase includes:—

Clix Parallel Plugs .. 2d.	**Clix Parallel Sockets 1d. & 1½d.**
Clix Coil Pins .. .. 2d.	**Clix Pin Terminals .. 2d.**
Clix Spiral Wander Plugs 2d.	**Clix Lox Wander Plug 2½d.**
Clix Spade Terminals 2d.	**Clix Terminal Brackets 1d.**

CLIX ACCUMULATOR KNOBS

Clix Accumulator Knobs kill corrosion caused through the creeping of acid. By using these knobs perfectly clean L.T. connections are always assured.

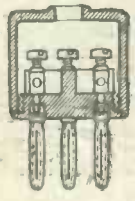
Sockets are provided for connection by plug which allows speedier contact. Supplied in Red and Black.

Price **5d.** each.

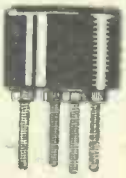
CLIX-LOX CONNECTORS

For all wire extensions. Can be connected or disconnected in a moment - - Price **5d.** each.

CLIX MULTI-PLUG AND SOCKET



An extremely useful 4/5 way plug. Enables one to discard all terminals for Aerial, Earth, Batteries, Loud Speaker, etc., and gives instantaneous make or break connection. Multi-Plug, price **2/-**. Multi-Plug Socket, price **1/-**.



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254, Vauxhall Bridge Road, S.W.1.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 240.*)

BACK NUMBERS OF "P.W."

"BACK NUMBER" (Chislehurst).—"Where can I send for back numbers, and how much?"

Back numbers of "P.W." are obtainable from: The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4. Price 4d. per copy.

OVERCOMING HUMMING.

G. H. G. (Manchester).—"On the ordinary set the humming is bad enough, but when I try short-wave work it is nothing more nor less than appalling. It is quite hopeless to try and receive weak Morse signals through a loud roar of this kind, and, do what I can, I do not seem to be able to overcome it.

"I have tried a counterpoise, but as I do not know much about these, perhaps I did not try the right kind. Can you give me details of this, and of anything else I can do to overcome a humming of this kind?"

Such loud humming is usually caused by induction from the electric light mains, and the first precaution to take is to make sure that none of the leads to the set are carried close to the house wiring.

Power cables or wiring may be at the root of the trouble, so the aerial should be kept clear of external wires or conduits.

Another prolific cause of the trouble is a broken earth lead, and the remedy to this is fortunately both obvious and easy. (In the proximity of a power-station it is often found that humming or crackling noises are caused by a poor connection between the earth wire and the buried earth plate, or earth-tube.)

When using a counterpoise instead of a direct earth the great thing to remember is that the counterpoise must be as efficiently insulated as an aerial. As a matter of fact, it may be regarded as a kind of aerial, the only difference being that it should be erected near the ground instead of up in the air. A very usual height for a counterpoise is 7 ft. above the ground, but if the wires will not be in the way it may be as little as a couple of feet over the ground. In all cases it must be carefully insulated, like an aerial.

Apart from trying a counterpoise as an earth, a simple but well-worth-trying remedy is to use a different earth. That is to say, if the connection now goes to an earth plate outside, it may be removed from there and taken to a water-pipe, or the earth plate may be supplanted by one of the tube types, driven as deep into the ground as possible.

Try to avoid a common earth—that is to say, try not to take the earth to a water-pipe which is already connected to someone else's set. This sometimes gives rise to a humming trouble which would not otherwise be noticed.

Apart from the actual earth connection, much may often be done by overhauling and altering the method of coupling the earth aerial system to the receiver. Instead of taking the aerial and earth leads direct to the aerial coil, for instance, take them to a coil which is one of a pair in a variable coil holder, the other coil in the holder being of about the same size. The two ends of one coil may be connected to the aerial and earth terminals of the set, and the ends of the other coil to the aerial and earth wires.

In such a case the input to the set can be regulated to a certain extent by varying the magnetic coupling between the two coils, and it will often be found possible to loosen out interference and humming noises which, without the magnetic coupling between the two coils, would interfere with reception. Yet another dodge is to connect a small fixed condenser of ·0002 or ·0003 mfd. capacity between the earth and the earth terminal.

Finally, in very bad cases, it may be necessary to use a frame aerial, though this generally means that extra amplification will have to be used to make up for the loss in signal strength.

WORKING A MOVING COIL FROM THE MAINS.

L. W. (Becontree, Essex).—"If I put in a moving-coil speaker to be worked from the electric-light mains, does it mean that the field of this is actually connected to the electric-lighting system, and, if so, how much current does it take?"

Yes, the field winding on the speaker can be operated from direct-current mains, and this is a very convenient method for operating it, as it can be connected direct to the mains without any trouble for smoothing, etc. Usually the current taken is very small, being much less than that taken by an ordinary lamp.

When obtaining the loud speaker be sure to mention the correct voltage of your mains, as there are many different types of field windings for the various voltages, and for successful working it is imperative that you should get a speaker expressly designed for working on mains of the kind you have.

FOR THE NEWCOMER.

"BEGINNER" (Woolwich).—"I find a good deal of trouble because I cannot keep the soldering iron properly tinned. What is the best way of doing this?"

The soldering iron may easily be tinned by the following method. Place the iron in a clear flame (a gas flame is almost ideal for the purpose) and heat it until the appearance of a green flame around the iron indicates the iron is hot enough.

Quickly remove it and then well file each surface with a clean file until a bright surface is exposed. Then quickly dip it into a tin in which you have previously placed flux and small pieces of solder. If necessary, reheat the iron, and when it is covered over all surfaces, the solder will flow easily over it, and subsequently soldering will be easy.

SHOULD AERIALS "SWING?"

"NEWCOMER." (Chatham).—"Should an aerial be rigged up so that it is tight from post to post, or should it be allowed to swing a bit in the air? One sees so many kinds that it seems there is no general rule, and I should be glad of advice on this point."

There is no need to have the aerial absolutely tight unless short-wave work is being indulged in, when it is an advantage, because a swinging aerial may then affect reception. The advantage of a certain amount of "give" in the aerial wire is that there is less strain upon the mast, supporting stays, etc., particularly with a high aerial, and for ordinary reception a certain amount of give is in no way detrimental. It is, however, important to see that the aerial does not kink anywhere, and if this happens it is sure to break sooner or later, which may give rise to noises in the set.

WHAT IS A BLOCKING CONDENSER?

By G. P. Kendall, B.Sc.

IS a blocking condenser the same thing as a "stopping" condenser? If not, what is the difference? Some such questions as these must often occur to the beginner when he hears fluent references to such gadgets by his more experienced friends, and it is always annoying to be puzzled by the terminology of one's chosen hobby.

Let us see if we cannot get a clear idea as to just what is meant by these two expressions, and as we do so, perhaps we can find out what a blocking condenser really does in the set. Well, the terms "blocking" and "stopping" really give us a clue, since they indicate that the condenser in question is used to stop some kind of current from taking a path from which we desire to block it out.

This really summarises the matter completely, but we may as well go into details a little, and see just what we are trying to do in cases where stopping condensers are used. The use of such devices depends upon one simple fact, namely, that a direct current cannot pass through a condenser, whereas an alternating one can do so.

Hence, if we want to stop direct currents from taking a path through which it must yet be possible for alternating ones to make their way, all that we need to do is to place in series a fixed condenser of suitable capacity. Then, if the condenser is of large enough capacity, alternating currents will be able to pass through quite freely, whereas direct ones will be effectively blocked. Just how large the condenser needs to be depends on the particular conditions, and into that we cannot go very far. Suffice it to say that the higher the frequency of the currents the smaller the capacity needed.

For example, a stopping condenser is often placed in series with a Reinartz reaction condenser, and since we are dealing here with high-frequency currents, quite a moderate capacity is all we need. Actually, a capacity of .001 mfd. is ample for most circuits.

By the way, it may not be quite obvious why a "stopper" should be used here, since we already have a condenser of the variable type in the circuit, and it might appear that this would be enough to prevent the passage of direct currents, but the point is that the fixed and moving vanes of a variable condenser sometimes touch as a result of rough treatment, wear in the bearings, and so on, and if this happens in a Reinartz reaction circuit, the H.T. battery will be shorted from the detector plate circuit to filament. Hence a stopping condenser in series is a valuable precaution, and is included as a matter of course in practically every set turned out by the "P.W." Research Department.

Another very good example of a blocking condenser is the grid condenser of a resistance-coupled L.F. amplifier. Not many people realise it, but this condenser is not at all necessary, so far as the theoretical working of the circuit is concerned. It is included simply because the steady H.T. potential from the plate of the preceding valve would otherwise be communicated to the grid of the valve and upset its working. Accordingly, we place a fixed condenser of suitable capacity here, which effectively blocks off the H.T., but allows the alternating voltages set up by the signals to pass on quite freely to the grid.

There are numerous other applications of the "stopper," of course, but the ones just given should enable the reader to get a pretty clear idea of its uses.

SENATORE MARCONI AT THE R.M.A. DINNER.

PRACTICALLY all the leading British radio manufacturers were present or represented at a dinner given by the Radio Manufacturers' Association at Olympia on the eve of the Exhibition, at which Senatore Marconi was a surprise guest of honour. Sir William Bull, M.P. (President of the R.M.A.), was in the chair, and many listeners heard thepart of his speech that was broadcast.

Major Gladstone Murray, proposing the toast of the National Wireless Exhibition, said he disagreed with those who thought that the number of listeners had reached its saturation point. He admirably expressed the progressive policy of the B.B.C. in remarking that even when every house had its wireless set, the B.B.C. would say "build more houses." The Chairman (Sir William Bull) paid tribute to the genius of Senatore Marconi, and said that he felt sure that when his great-grandchildren read the entry in his diary saying that he had spoken to Marconi, they would be tremendously impressed. "Marconi," he said, "is one of the greatest men in the world."

When Sir William suggested how pleased the trade was about the Royalties decision, he was loudly cheered, and it was noticed that Senatore Marconi good-humouredly joined in the clapping.

Later, Senatore Marconi in a speech, said that he thought the future was full of promise for wireless. "We are a long way from being able to use the electric wave to anything like its fullest extent and are only gradually learning how to use it," he said.

THE NEWCOMER TO RADIO.

(Continued from page 226.)

wiring is concluded by providing two pieces of flexible wire, fitted with plugs for the grid-bias battery.

Single cables, untwisted from flexible wire, such as is used in electrical lighting circuits, and which can be obtained at 1½d. or 2d. per yard at any electrical shop, can be used. One flexible lead—the one joined to the R.C.C. unit—will have to be about 8 in. or 9 in. long, and the other 6 in. to 7 in. The shorter one is for the positive socket of the battery and should be joined to either the H.T. or L.T. minus terminal. Similar plugs to those employed for making connections in the H.T. battery can be used. They are generally referred to as "wander" plugs.

The Grid-Bias.

You will want two new accessories for this enlarged set, viz., another valve and a grid-bias battery. A grid-bias battery of 4½-volt size will be big enough if you are not going to add the third valve. Otherwise, one of the 9-volt size will be necessary. Perhaps you are wondering where this grid-bias battery is accommodated. It will have to be fixed on the inner side of the back of the cabinet.

At least one make of grid-bias battery is fitted with a flap at its top, enabling it to be fixed in such a position by means of two drawing-pins. Failing the purchase of this particular type of battery (Siemens), you will have to purchase or make a couple of metal clips. These you screw to the cabinet. But they will hardly be worth while making, for grid-bias battery clips can be purchased at a cost of but a few pence each.

"Power" or "Super-Power?"

An ordinary L.F. type of valve is required for this new holder. You do not want what is known as a "power" or "super-power" variety. Don't be led by these names to think that such valves will give you greater volume. As a matter of actual fact, they will probably give you less than an ordinary L.F. valve. The use of the

(Continued on page 250.)

THE NEWCOMER TO RADIO.

(Continued from page 248.)

word "power" and "super-power" as applied to a valve, means that they will deal with and amplify powerful impulses.

All you need is an ordinary L.F. type of a 2-, 4-, 6-volt rating, according to the size of your filament battery. You will not need to use the whole of the voltage of the grid-bias battery. The one plug—that connected directly to the L.T. or H.T. minus terminal—you insert in the socket marked "positive" on the grid-bias battery. You will probably find that best results will be obtained when you insert the negative grid-bias battery lead in the very next socket. The two plugs will then be in adjacent sockets. They will be separated by 1½ volts, providing the battery is tapped at each of its cells.

The Aerial Equipment.

I purposely said very little about the tuning of this set last week, in order that I might devote greater space to other points. I argued that even if you were going straight on with the building of the receiver you would not have completed the one-valver and got all its accessories together before the arrival of this number of "P.W." Then, again, you have got to get your aerial erected. I haven't yet explained what an aerial is, because there are so many about nowadays that you will only have to go into your garden in order to ascertain for yourself, but there are one or two points I must bring to your notice.

There is no great advantage in having a very long aerial. A wire of anything from 35 ft. to 75 ft. will be ample. Height and wide clearance from such objects as trees, walls, and so on, are the factors that count. A very good earth connection can be obtained by joining a wire to a water-pipe.

Having connected the set to the aerial and earth, and joined up the batteries and telephones, you proceed to switch on by pulling out the filament switch. You must not expect to be able to tune in dozens of stations at first. You can consider yourself lucky if you find three or four. Later on, and after you have acquired a little experience, you may be able to increase this number by two or three times.

Handling The Set.

Looking at the front of the set, the left-hand dial controls the tuning condenser, and this is the station selecting device. The right-hand dial is the reaction control, a device which you can regard as a sort of strengthener. You don't swing this dial backwards and forwards when you are searching for a station.

Work first of all with the reaction condenser at zero position, i.e. with all its moving vanes out of mesh. A rotation of the tuning variable condenser dial will enable you rapidly to locate your local station, providing you have the appropriate coils in their holders. Then advance the reaction gently and again rotate the tuning variable and see if you can locate another station. Keep away from that point where a movement of either dial produces squeaks in the telephone receivers, for this indicates that the set is oscillating and broadcasting signals of its own.

You will find further tips on tuning in the "Radiotorial"-column this week.

TECHNICAL NOTES.

(Continued from page 212.)

Adjustable Quality.

Some experimenters may, however, wish to have an arrangement by which they can instantly adjust the quality of the reproduction in this respect so as to suit the subject matter of the programme which is being received: for instance, crisp reproduction may be considered preferable for speech and mellow reproduction for orchestral selections.

A simple way in which this can be accomplished is as follows:

A series of fixed condensers is provided, having capacities of, say, ·00005, ·0001, ·00025 and ·0005 mfd. One terminal of each of these condensers goes to a common conductor which connects to the negative terminal of the grid-bias battery, whilst the other terminals of the condensers are connected to the studs of a selector switch.

The selector arm of the switch is connected to one of the secondary terminals of the second low-frequency transformer, whilst the other secondary terminal of this transformer is connected to the negative terminal of the grid-bias battery—which, as already mentioned, connects to one terminal of each of the condensers. Expressed shortly, the arrangement comprises a set of condensers arranged in capacity steps and shunted across the secondary winding of the second low-frequency transformer.

I have not the advantages of illustrations with these "Technical Notes," but if you sketch out the arrangement in accordance with the above description you will see that it is quite simple. Switching in more or less capacity by means of the selector switch will enable the quality of the reproduction to be adjusted instantly.

Television Experiments.

With the development and introduction of the Kino lamp or neon tube for television reception and the Foto cell for television transmission, the Raytheon Company (U.S.A.) has started a campaign of research and specialised production in co-operation with television experimenters.

"We do not assume for a single moment that television has arrived at the commercial stage, or anything even approaching such refinement," stated D. E. Repogle. "However, we do believe that the time

(Continued on next page.)

TECHNICAL NOTES.

(*Continued from previous page.*)

is ripe for television experiments, both at the transmitting and receiving ends, on an extensive scale. Therefore, as headquarters for gaseous tubes of all kinds, we are prepared to co-operate with experimenters and others in the development and production of special tubes for television requirements.

"Our research staff, headed by C. G. Smith, inventor of the Raytheon tube, and its predecessor the S-tube, has had long experience in gaseous conduction. Experiments have been conducted with every conceivable gas, electrode, spacing arrangement, insulator and so on. We have studied the effects of gas pressure until to-day we can produce tubes of a given starting voltage, luminosity, responsiveness, and so on.

Co-operate with Amateurs.

"We therefore wish to co-operate with television experimenters in the development of the necessary neon tubes and photo-electric cells of regular or special design, to the end that this young art may receive the maximum co-operative effort of amateurs in repeating the spectacular development of radio broadcasting."

Testing Receivers.

For testing the quality of radio reproduction it is essential that absolute quietness prevail—a condition which is very difficult to obtain in the present-day factory.

One large firm of radio manufacturers has, therefore, built a special soundproof room of unique design. This room is in reality "a room within a room." It has double walls, double ceiling and a double floor. The space between is filled with wood chips. The room is supported on cork to cut out the vibration of the building. The inner door is suggestive of the entrance to a refrigerator.

The soundproof room has among its equipment oscillators, amplifiers, radio receivers and measuring equipment of several kinds. It is easily apparent that in a soundproof room of this sort development work progresses to advantage in all phases of radio research requiring the most delicate measurements and testing for absolute quality.

Fault Tracing.

The tracing of faults in a radio receiver is not always an easy matter. There is a tendency to delve at random into the vitals of the receiver rather than to follow a systematic procedure by which the fault may generally be more quickly and easily located. In locating and remedying faults the systematic testing of the circuit and the apparatus in the receiver is essential.

A Handy Device.

Measuring instruments are frequently helpful in making these tests, but a great deal may be done with a simple and inexpensive device. In the testing of the component parts in a receiver a pair of telephones connected in series with a small battery is useful in determining where the fault lies. The windings of a transformer may be readily tested by means of this simple circuit.

When the free ends are connected across the transformer winding a click will be heard if the circuit is continuous. Fixed condensers may also be tested, and here a click should be heard when the leads are placed across the terminals of the condenser, but no click will be heard when the ends are removed, unless the condenser is defective. If the insulation in the condenser is poor, however, or the condenser is definitely short-circuited, a click will be heard both when the circuit is closed and when it is opened.

Testing Transformers and Chokes.

Ordinary radio-frequency transformers and super-heterodyne intermediate-frequency transformers, audio-frequency or radio-frequency choke coils, etc., may also be tested for continuity by connecting the above device across the terminals of the component under test. If the component under test has a high resistance, the click will be of less intensity than that obtained when testing a low-resistance component. In any case, no click at all will indicate an open circuit.

When a radio receiver fails to operate, such tests as outlined here can be applied to the various components of the receiver to determine whether or not a piece of the apparatus is at fault.

Did you see all our new products at Olympia?

H.T. BATTERY ELIMINATOR, £12 : 10 : 0. Write for particulars of our new range of Battery Eliminators.

Bi-duplex L.F. INTER-VALVE TRANSFORMER, 27/6.

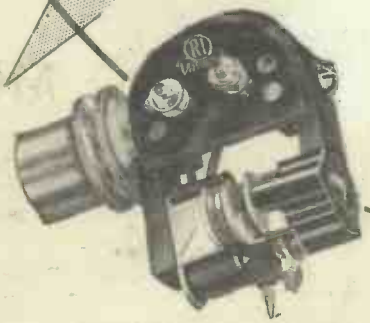
OUR new season's products created a big stir at Olympia this year. Time after time one heard the remark, "Have you seen the real engineering jobs R.I. and Varley are marketing this year?" To attempt to pick out any particular components which attract more attention than others would be a difficult task. It is only fair, however, to say that our new shrouded L.F. Intervalve Transformers and L.F. Chokes were singled out as being really high-class scientific jobs, quite on their own as regards design and construction.

Our range of Bi-duplex Wire-wound Resistances and their companion products—R.C. Couplers, H.F. Choke, and the new Anti-mobo R.C. Couplers—are always the centre of attraction, for they are regarded in this country as *the standard* of high-class design in radio components.

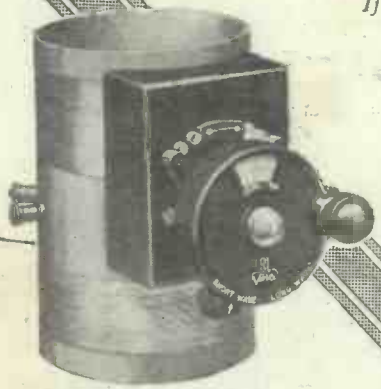
We have made considerable additions and improvements to our existing range of complete eliminators and eliminator components, and the Radio Exhibition at Olympia proved that the months of research spent in perfecting these products had not been in vain.

Lastly, everyone simply made a bee-line for our new Gramophone Pick-up. In conjunction with the rest of our Gramophone Electrical Reproduction Apparatus it eclipsed everything at the Show, and, owing to the enormous orders taken, we regret it will be a few days before fresh orders can be executed.

If you were unable to come to Olympia, see our Stand at the Manchester Radio Exhibition, or write for that particular section of our 1928-29 Catalogue in which you are interested.



Compound Mass Suspension GRAMOPHONE PICK-UP, £3 : 3 : 0.
We regret, owing to the enormous demand, that there may be a few days' delay in executing fresh orders.



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POPULAR WIRELESS, October 13th, 1928.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

7

A 2/- GIFT THIS WEEK—AND NEXT WEEK TOO!

Popular Wireless

Every Thursday PRICE 3d.

No. 332. Vol. XIV.

INCORPORATING "WIRELESS"

October 13th, 1928.

4 Sixpenny BLUE PRINTS Free!

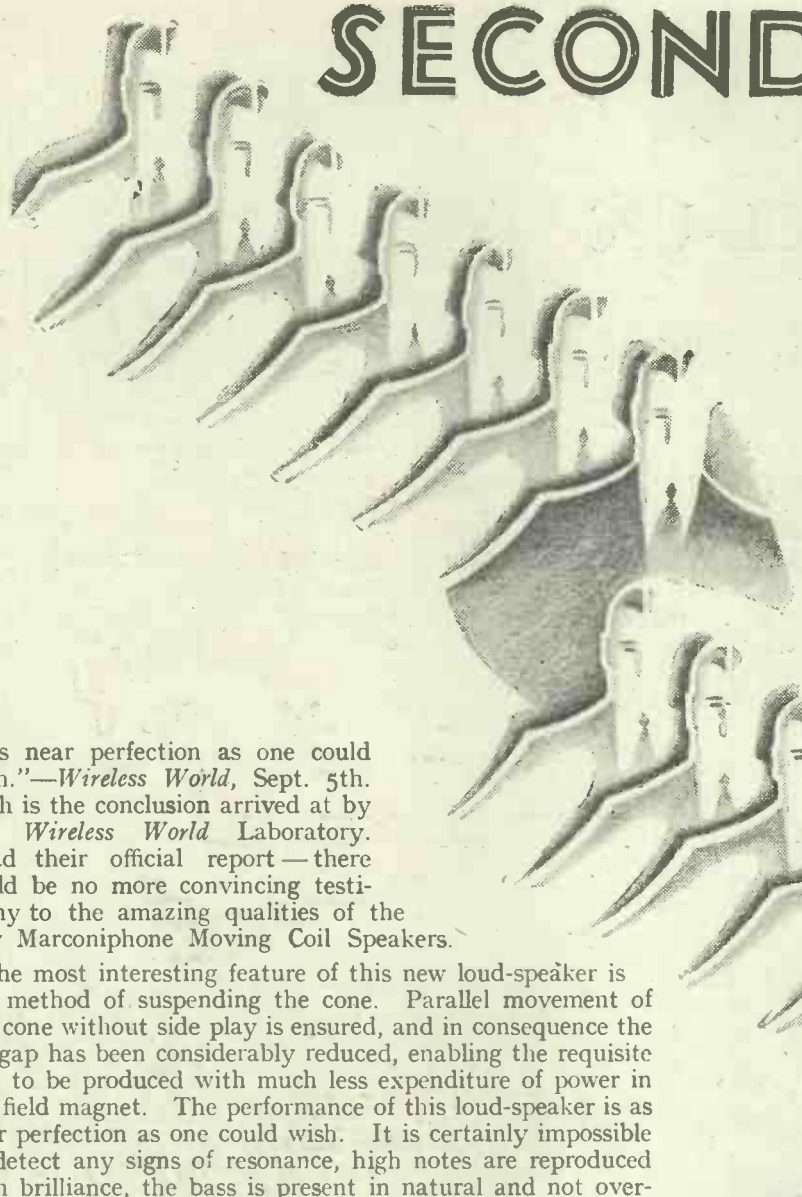
Illustrated articles dealing with the "Regional" Crystal Set and a Simple A.C. H.T. Unit appear in this issue.

❀ ❀

ANOTHER 2/- GIFT NEXT WEEK

A

SECOND SIGHT



Are you the Seventh Son of a Seventh Son? Or have you installed a Marconiphone Moving Coil Speaker? If so, you will know what "second sight" is; you will see the pianist's agile fingers ranging the keyboard, and every movement of the conductor's baton as he sways the music of a distant orchestra, each note from the highest treble to the deepest bass reproduced in its natural purity of tone, unspoiled by the slightest resonance. Nor need you move out of your comfortable armchair at home—The Marconiphone Moving Coil Speaker gives you the "second sight" that makes hearing seeing.

"As near perfection as one could wish."—*Wireless World*, Sept. 5th. Such is the conclusion arrived at by the *Wireless World* Laboratory. Read their official report—there could be no more convincing testimony to the amazing qualities of the new Marconiphone Moving Coil Speakers.

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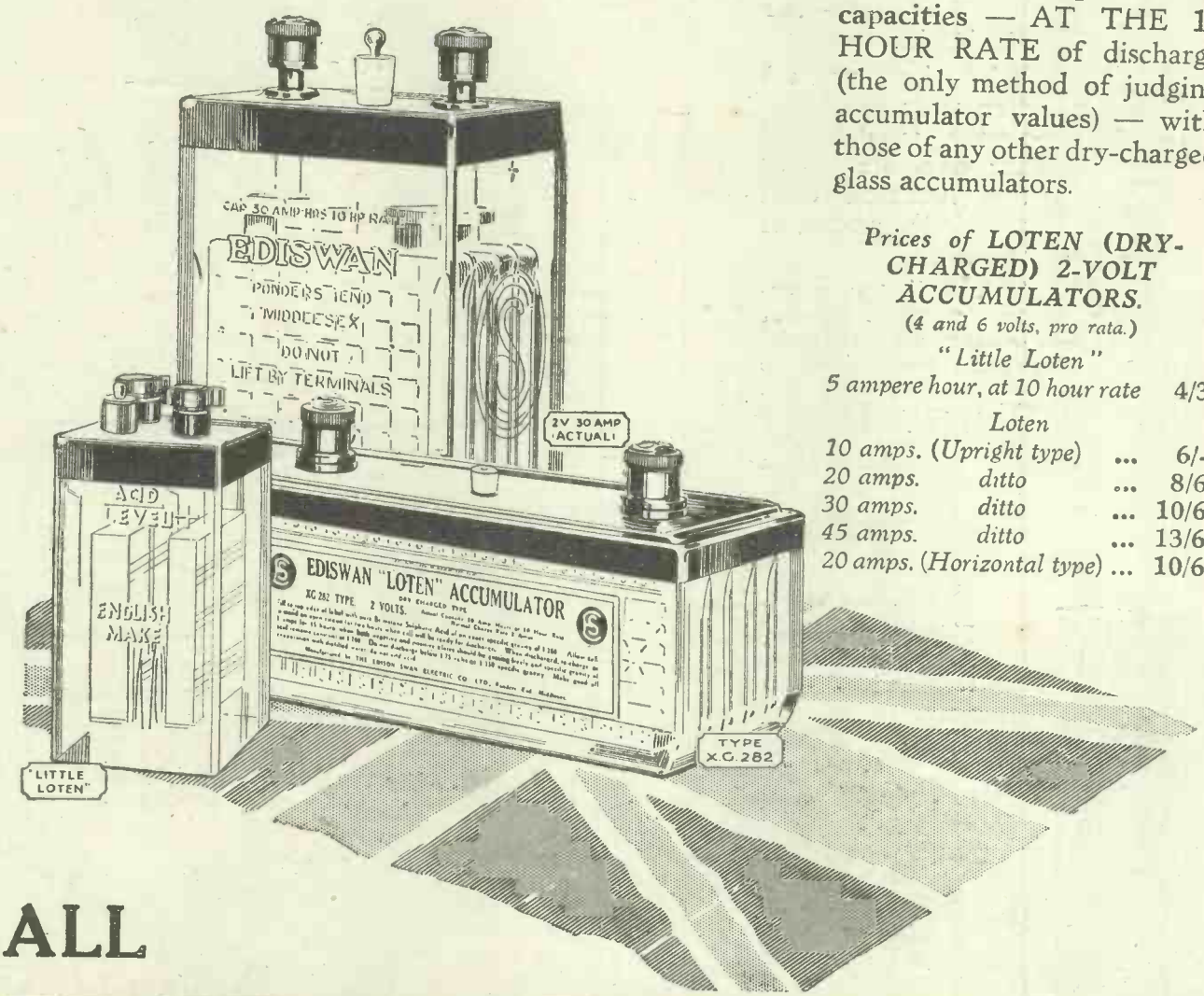
A

British even to the terminals!



Compare these prices and capacities — AT THE 10 HOUR RATE of discharge (the only method of judging accumulator values) — with those of any other dry-charged glass accumulators.

Prices of **LOTEN (DRY-CHARGED) 2-VOLT ACCUMULATORS.**

(4 and 6 volts, pro rata.)

"Little Loten"

5 ampere hour, at 10 hour rate	4/3

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10 amps. (Upright type) ...	6/-
20 amps. ditto ...	8/6
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RADIO NOTES AND NEWS.

Whooping Ladies—A Trap for the Unwary—The Editor's Latest—The Sceptic's Three—Getting Down to Short Waves—Money Talks—A Big Pot—Tuning in Creation.

These Whooping Ladies.

I TIMIDLY venture to agree with the suggestion of a writer to one of the best-known "dailies," who complains that the B.B.C. give too much solo singing, especially by ladies. We do indeed get a surfeit of "Miss So-and-so will now sing five songs." After that there is one orchestral piece and then Mr. X sings four songs. My idea of a properly-balanced programme is two songs during the whole evening—unless it is "variety," when the problem is quite different.

"Along Came a Spider."

J. M. T. (Deal) solemnly relates the following incident. His four-valver, which has to be detuned from 5 X X to prevent the plaster falling, became ga-ga overnight and would not talk above a whisper. After an exhaustive but fruitless overhaul of the various well-known sources of trouble, J. M. T. found a spider's web connected between his lead-in wire and the outside wall. The web being removed, all was hunkydory once more. Extraordinary conductivity of spider's web! Ought to be used for submarine cables! Young man, are you sure there is not a hornet's nest in your loud speaker?

Trap for the Unwary.

A SADDER and wiser reader of Brondesbury kindly describes a rapid method for "conking" valves, to which he makes no patent claim. It seems that he has a three-valver similar to the "P.W." Four, except for the H.F. stage. He added that stage, and put the L.T. switch in the negative lead. He says: "Switching off, for safety, as I thought, I altered the connections to the neut. condenser and in doing so shorted it and saw my four valves 'go west.' If I had *not* switched off only the H.T. battery would have been shorted, as also would have been the case if the switch had been in the positive lead." Beware!

The Editor's Latest.

THE Editor of "P.W." has just handed me a copy of his new book which has the engaging title of "Through a Young Man's Eyes," and if you want a really provocative book to read, get a copy—or ask for it at your library. (It's not a wireless book, but a series of timely articles on "Education," "The Theatre," "Sailors," "Places Abroad," "Famous and Infamous People—including a Murderer!—whom the Editor has met.")

Sir Oliver Lodge has written the introduction, in which he says of the author: "He seems to have cultivated experience at first-hand, and is willing to record his impressions. I know of no other man of the same age who could have written about them so frankly, explicitly, and well."

This is a striking tribute, but you will realise it's well deserved when you have read "Through a Young Man's Eyes." The publishers are Heath Cranton, Ltd.

2 N M to Continue.

MR. MARCUSE keeps on keeping on, doubtless to the delight of Britons in all the numerous corners of the earth. He has had his broadcasting licence renewed until November 31st. "And then some," I hope. Mr. Marcuse, if he is not very careful, will be embarrassed by the offering of a canteen of quite cutless but stainless cutlery, or a clock, the most precise feature of which will be its engraved inscription—from gratified listeners, through the medium of the International Amateur Radio Union.

The "Sceptic's" Three.

THOSE readers who have followed the history of this set, from the primal Elstonian stratum to the modern set which turned Mr. Elston from agnosticism (or worse) to a penitent at the stool—and not so penitent, as saucy—will be interested in a letter I have received from W. A. M. (Great Bookham). W. A. M. has a three-valver (1 det., 2 L.F.) which receives at full loud-speaker strength Radio-Paris, 5 X X, Imperial Airways, 5 G B, Langenberg and 2 L O, and various Continentals at lesser

(*Continued on next page.*)

HAVE YOU HEARD LAUSANNE?

The dynamo room of the Lausanne broadcasting station. In the foreground can be seen the converter and charging board for the 16-volt 300 amp.-hour filament batteries. The H.T. generators are driven by a 8-10 h.p. petrol engine, and supply the plate current for the valves at a pressure of 2,500 volts.

NOTES AND NEWS.

(*Continued from previous page.*)

volume. Total cost of set, including valves, batteries, etc., £7. Our friend is a war-blinded St. Dunstaner, and his wife read to him the Elston saga. All happiness to them. "Ariel" is theirs to command.

Allahabad Not So Bad.

W. M. (Allahabad, India) sends me a copy of a letter he wrote to the B.B.C. about his reception of 5 S W, the most "clear and constant" of all the stations he gets. On a "P.W." "Sydney" Two 5 S W comes in R5 to R7 on telephones, in spite of gratuitous signals from sparks made by the scores of motors roundabout operating punkahs and fans. "P. W." sends best wishes to W. M. and the 1st Battalion of the Worcesters. May the canteen never run dry!

Could It Happen Here?

I MUST say I admire the practical minds behind 3 L O's (Melbourne) operations. First they start their listeners off into a frenzy of flower-growing, distributing seeds and broadcast advice. Next, an egg-laying competition—said eggs being laid by hens. I now learn that 3 L O is lending its powerful assistance to a scheme of Melbourne's Lord Mayor for helping the workless. An odd job bureau has been formed and 3 L O gets into thousands of homes with a request that odd work around the house may be made available. Excellent!—but could it happen here?

A Surrey Show.

I HEAR that the Guildford and District Radio Society is getting up an exhibition. It is to open on October 16th, and to close on October 20th.

Getting Down to Short Waves.

I AM getting an awful lot of requests for information about how to "get down" and listen on short waves—and I know the guilty parties, too! They are mostly tennis and cricket fiends, who forget all about "P.W." in the summer time, and then can't understand why they are back-numbered and behindhand when they start turning the old dials again.

Listen, you slackers! If you want to convert *any* ordinary loud-speaker set into a short-waver, all you have to do is to build the "Antipodes Adaptor," after which you can tune in all creation. (It's the simplest, smoothest, and slickest little stunt imaginable, so if you want to do your bit on short waves, don't hesitate. Get next week's blue-print and build it.)

6 U M Calling.

IF you should hear 6 U M calling one day drop a line to the Leeds Radio Society and tell 'em frankly what you think of him. It is a portable short-wave station, constructed by some of the society's enthusiastic members in an attempt to show the rest of Yorkshire that Leeds Leads.

Money Talks.

AN American magnate (he *must* have been a Magnate!) recently called up from a London hotel, and asked to be put through on the transatlantic 'phone to America. When he established contact he yarned away for *over an hour and a half!*

Communication was perfect. The bill came to £285. And the P.O. accounts people are hoping that this kind of thing is infectious!

A Real Big Pot.

THE largest electromagnet in the world has recently been installed in Paris, where it is expected it will render considerable assistance in the investigation of some of radio's side problems. Built to the order of the French Academy of Science, it really is quite a Big Pot, weighing a mere matter of 115 tons! If only they could put a moving coil in front of it, and a baffle board round it, it would be the Eiffel Tower of R.K.'s, wouldn't it?

Life on the Ocean Wave.

IF, when you brave the morning air these days, you think that the said air is unnecessarily nippy and chilly, spare a thought for the lads on the new deep sea fishing trawlers just launched at Selby. This type of vessel does a three-thousand mile trip in Arctic waters, and has been built heavier than usual to withstand the pressure of the ice in Iceland and the White Sea. The crew, however, are not quite cut off from England, Home and Beauty, for the vessel is fitted with a neat little wireless set which will be a little godsend when the bottom drops out of the thermometer and the Arctic ice fields start to get a grip on.

SHORT WAVES.

He: "I often sing on the radio."
She: "Coward!"
—"News of the World."

* * *

"Silent Radio Show. Loud speakers seen but not heard," runs a headline in the "Sunday Chronicle."
Peace, perfect peace!

* * *

A (RADIO) CRIME WAVE.
Verniere: "Did you hear about the daring robbery down below last night?"
Coyle: "No, what was it?"
Verniere: "Why, the two Brackets held up the Panel!"
—"Radio News."

* * *

"'Why?' is the general heading of a new series of talks to be given from Cardiff Station," we read in the "News of the World."
And a very apt heading, too.

* * *

A foreign correspondent asks us why some of our announcers sound so grave. We're afraid we can't say; as far as we know none of them have ever been undertakers.

* * *

"Record Crowd at Radio Show," runs a headline in the "Daily Telegraph."
We thought it was wireless, not gramophones, that was being exhibited.

* * *

Teacher (to geography class): "What was Columbus trying to find in 1492?"
Bright Pupil: "A short-wave hook-up to India."
—"Radio News."

Seeing and Hearing the World.

IN the days of my palmy but rapidly receding youth, the only way in which a young man of poor but honest circumstances could see the world was to join the Army or Navy. But nowadays things have altered. The lads of the Forces do not merely go out and see the world, but in whatever part of it they happen to be they sit down and tune-in the rest of it! At least, those in the signal branches do.

It must be a great life! Apparently, incomparable aerials erected upon masts of dizzy height for purposes of high political strategy are used by these R.E. signal people for pure personal radio joy. High upon the Himalayas, or on top of Table Mountain, they listen in not only for the good of the service, but for the sheer gol darn fascination and fun of it.

Tuning-in Creation.

I VERILY believe that some of the War Office people would die of sheer indignation if they realised how much enjoyment some of the wireless operators in the Services extract from their profession. I have just received a Rhapsody on Blue paper from Egypt, and the list of stations which this chap receives on the service aerial would make the brain of a keen globe-trotter reel with geographical superfluity

The Service Grouch.

FROM far Japan to New Tuckerton, U.S.A., from Java to Buenos Aires, and from Beirut to Babylon, this boy tunes in the world with a turn of the wrist. But do you think he is satisfied? No! Like a true Serviceman he has his grouch, and his grouch is about 5 S W. "*Why can't they broadcast on Saturdays and Sundays?*" he says. But on the whole, he's a very cheery soul, extracting much fun out of life, and I envy him and hope he never gets confined to barracks.

Another George Washington.

I NOTICED that one of my fellow scribes, writing for a contemporary, has had the nerve at the end of the article to sign himself "Oscillator." I do not know which I admire most—his truthfulness, his fine contempt for the feelings of the P.M.G., or his utter indifference to what his readers think of oscillators.

Hurricane Havoc.

THE devastating hurricane which recently swept over the West Indies and then flung its force upon Florida has emphasised once more the importance of amateur radio. With the whole world tumbling about people's ears, motor-cars blown over in the streets, cable and telegraphs uprooted and wrecked, there remained only one simple certain means of communication—and that was wireless. It has been the same in all these calamities recently, and before it passes into a commonplace let us pause for a moment to give credit to the fact that the radio link has alleviated the loss of life enormously, and without it the catastrophic effect of these great cyclones would be incredibly greater.

Historical Note.

AMONGST the most distinguished and gifted of the Italian madrigal writers was Jesualdo, the Prince of Venosa, who, besides being a born musician, was an accomplished murderer. He was not only one of the most adventurous of the bad lads of his time, but whilst not engaged in thinning down the population he managed to write nearly one hundred and fifty madrigals!

Jesualdo, of course, has long since joined his victims on the other side of the vale, but *you* may have heard one of those very madrigals broadcast recently. Queer how things get round in this queer old world, isn't it?

ARIEL

The "REGIONAL" CRYSTAL SET

Here is the very set you are looking for. It covers long and short waves, is easy to make and inexpensive, and is designed for sharp tuning, so that programmes do not overlap.

Designed and Described by the "P.W." TECHNICAL STAFF.

THERE are two essentials in a modern crystal set. The first is that it shall be capable of being switched straight over from the short to the long waves without any of the coils being changed.

Half the pleasure of listening to the broadcast programmes is lost if one has to take out one set of coils and insert another.

Good Selectivity.

This is, of course, quite excusable in a set which has certain features prohibiting the use of wave-change switching, but not in a simple crystal receiver.

The second essential is a degree of selectivity which will ensure good clean signals from the local station, 5 G B and 5 X X, without interference from one of them.

The "P.W." Research Department has spent considerable time on this problem and the results of this work are to be found in this special blue-print design.

The scheme employed is very simple.

The ordinary shorter wave-lengths are catered for by a home-wound coil. With this coil and a variable condenser of the value specified it is possible to cover a wave-length range of from well below 2 L O to above 5 G B. The crystal detector is tapped off half-way along the secondary winding, and the aerial circuit is coupled by a semi-aperiodic winding to this secondary coil. The aerial coil is tapped so that the best adjustment may be found for any particular size and type of aerial.

For instance, with a small aerial the whole 25 turns will be required, but with large aerials it may be advantageous to use, say, 15, 20, or even 10 turns in order to obtain the necessary degree of selectivity.

Coil Details.

When the receiver is switched over to the long waves the small primary winding can be neglected and the flexible lead from the centre point of the wave-change switch should be tried on the 60 and 80 tappings of the loading coil (L_3) to see which gives the best results.

Incidentally, full details of the standardised loading coil used in this set appeared in No. 315 of POPULAR WIRELESS in the article describing the "Sceptic's Three."

They can, of course, be obtained from a number of firms which list the sets of parts for "P.W." receivers.

The coil for the ordinary broadcast band (L_1, L_2) can be home-wound quite easily.

It consists of a 3-in. diameter former of good insulating material, such as Pirtoid, Paxolin, Waxed Cardboard, Ebonite, etc.

The secondary winding L_2 contains 60 turns of No. 24 D.C.C. wire. The length of the former is 3½ inches, and the winding can be commenced about ½ in. from either end. The turns are wound unspaced, and after 30 have been laid on a loop is made in the wire for the centre tap, which goes from the coil to one side of the crystal detector, as shown in the wiring diagram.

A BLUE PRINT of the "REGIONAL" CRYSTAL SET is GIVEN AWAY with - this issue of "P.W." -

Seven strips of wood rod ¼ in., or thereabouts, in diameter are then spaced at intervals round the secondary winding.

The primary or aerial winding L_1 is then wound over the strips and nearer the bottom than the top end of L_2.

This winding consists of 25 turns of No. 24 D.C.C. wire, and tappings are taken at 10, 15, and 20 turns, and also at the end of the winding.

A simple method of taking any of these coil tappings is to twist the wire at the desired point so as to make a loop and then to remove the cotton covering with the aid of a safety razor blade or sharp penknife.

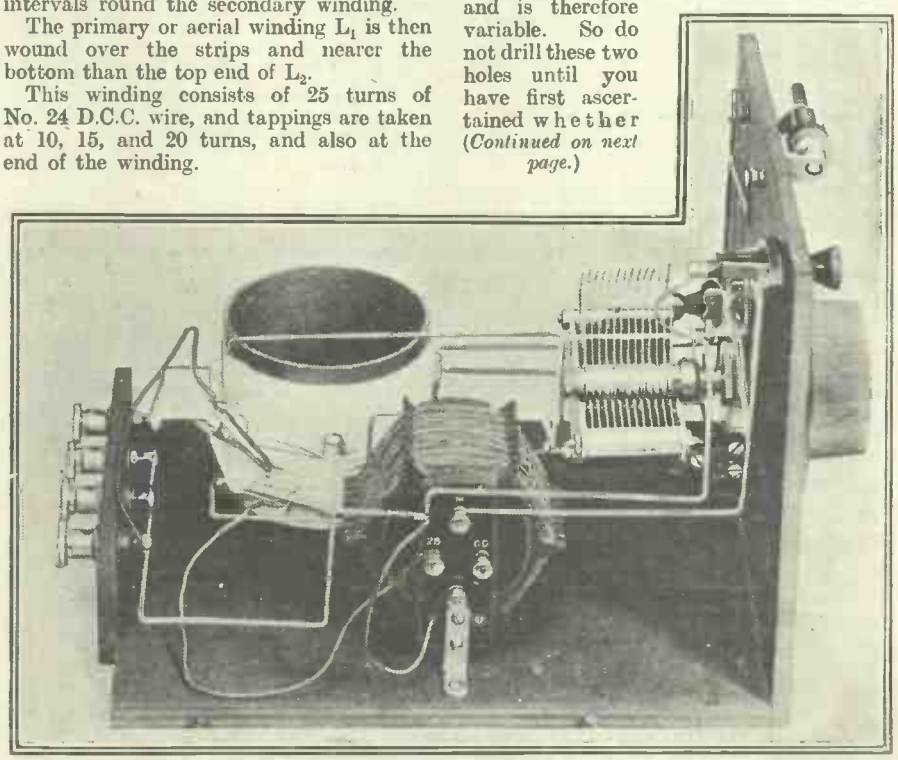
In the case of the centre tap on L_2, the stiff lead to the crystal detector can be soldered direct on to the loop.

Building the Set.

The coil can be secured in a vertical position on the baseboard by pushing a short length of wood about ½ in. × ¼ in., shaped at the ends, into the inside of the former and screwing it to the baseboard with a ¾-in. wood screw.

Now for some constructional details. Very few are necessary owing to the simple nature of the set. All the panel dimensions are given on the blue print. It will be noticed that the distance between centres for the crystal detector is also shown. This dimension depends upon the make of detector used, and is therefore variable. So do not drill these two holes until you have first ascertained whether

(*Continued on next page.*)



The nearer coil is the loading coil, and behind it, standing on end, is the short-wave coil. The method of attaching the aerial clip is clearly shown.

THE "REGIONAL" CRYSTAL SET.

(*Continued from previous page.*)

they are correct for your particular type of detector.

There are practically no other special points to note, and it is simply a question of following out the lay-out on the blueprint diagram. All the flexible leads are marked, and the remainder of the wiring can be No. 16-gauge tinned copper wire, or one of the insulated types such as Glazite.

Some Operating Hints.

The operation of the set is quite straightforward if the following hints are observed. Connect up your aerial and earth leads, and join a pair of 'phones to the terminals so marked. The 'phones incidentally should be of the high resistance type (2000 or 4000 ohms).

Connect the tapping clip for L_1 on the 25-turn point of the aerial winding. Pull out the wave-change switch so that the loading coil L_3 is short-circuited, and rotate the tuning condenser until you hear your nearest station.

Now adjust the crystal detector, if it is not of the permanent type, until you obtain the most sensitive spot.

Then change over to the long waves and retune on the .0005 condenser until you hear Daventry (5 X X).

Try the flex lead on both the 60 and 80 tappings on the loading coil.

The effective range of a receiver of this type is 80-100 miles from either of the Daventry stations and 15 miles from a main station. These figures are based on the assumption that a good outside aerial is employed.

It may be just as well to say a few words about the range which one may expect from a crystal set under different conditions. Provided the listener resides in a good locality, an efficient outside aerial is one about 30 ft. high and 100 ft. in length. Of this, 70 ft. will be the horizontal portion and 30 ft. the down lead.

Now some readers may not be in a position to erect an aerial of this type, owing to lack of space. Perhaps they will only be able to use an indoor aerial stretched across one of the rooms in the house. If so, the range of this set will be decreased very considerably, because the "pick-up" of an indoor aerial is not so great as that of one of the outdoor type. In these conditions it is probable that the range will be cut down to seven miles from a main station and fifty miles from 5 X X.

Therefore if you can possibly put up a really good aerial, do so. You must bear in mind that you have no means of magnifying the weak impulses which your aerial picks up, hence it behoves you to make sure that the crystal really is adjusted to its most sensitive state, and that the tuning condenser is rotated to the position where signals are as strong as you are able to get them.

Using a Loud Speaker.

A crystal set will not work a loud speaker. If your signals are very strong indeed on the telephones you can build them up to sufficient volume for a small speaker by adding a single-valve amplifier, the amplifier being coupled to the crystal receiver via a 4 or 6-1 ratio L.F. transformer.

If, on the other hand, you wish to work a speaker at a distance of about ten miles from a main station you will need a two-valve amplifier.

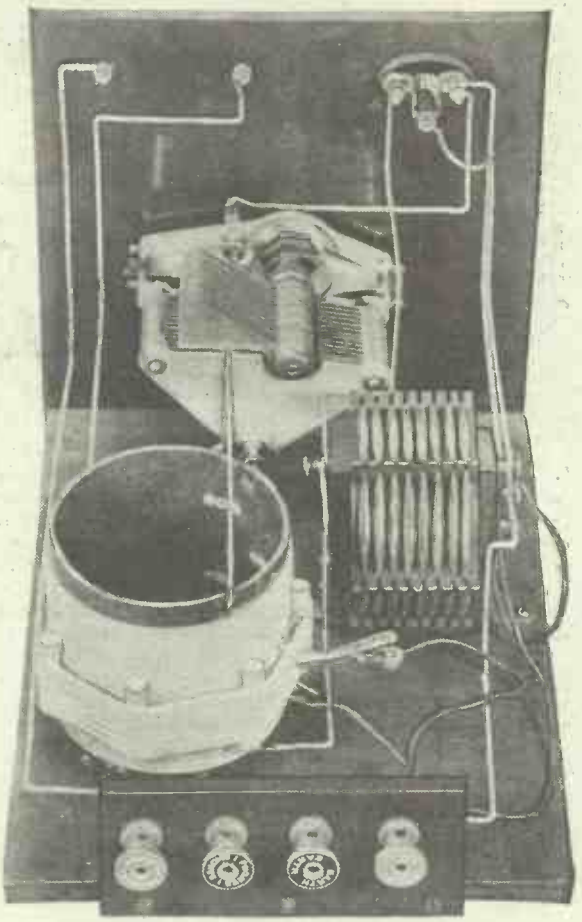
Amplifier to Use.

This amplifier could be constructed as a separate unit and connected to the 'phone terminals of the set.

Some readers may prefer to employ two transformer-coupled stages, while others may wish to use a combination of resistance-capacity and transformer coupling. This, of course, is entirely a matter of individual choice. The first arrangement will give the greatest volume, but possibly the reproduction will be better with R.C.-transformer coupling.

In case some constructors are puzzled as to the type of wave-change switch to employ it will be as well to state that one of the type shown in the photographs is advisable. This class of switch can be obtained in various makes, and you will note that it contains two tongue contacts which connect up with the metal projection at the end of the moving spindle when the arm is withdrawn.

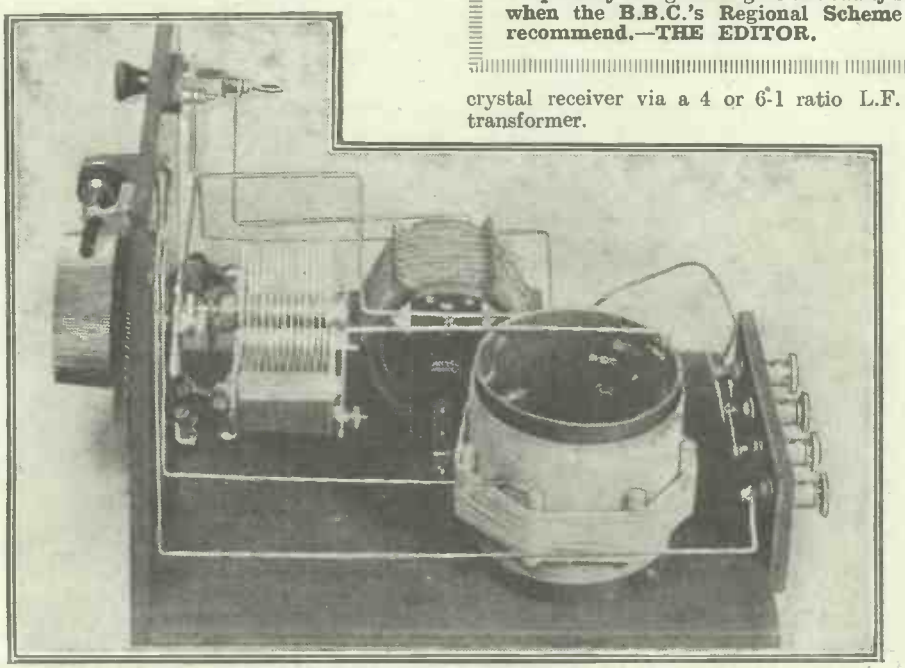
HOW THE FINISHED SET WILL LOOK.



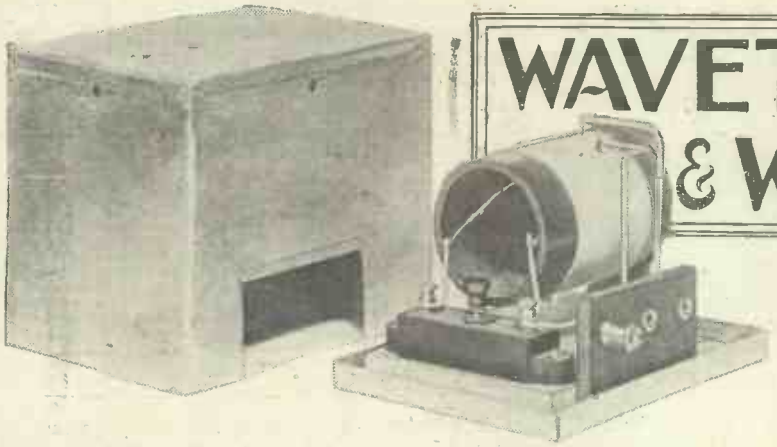
The switch shown in the top right-hand corner cuts out or puts in the 5 X X loading coil as desired, and thus saves all the bother of coil changing.

THE "REGIONAL" CRYSTAL SET

is specially designed to give unusually selective reception such as will be essential when the B.B.C.'s Regional Scheme is working. It is a set we specially recommend.—THE EDITOR.



Here is a view of the completed set ready to go into its cabinet. You will see from the photographs that the placing of one coil outside the other is really quite easily managed.



WAVETRAP WHYS & WHEREFORES

Some practical details of well-known wave-traps, and hints on how to choose and use various arrangements of these to cope with varying conditions.

By C. P. ALLINSON, F.Inst.P.Inc., A.M.I.R.E.

"I KNOW there are various kinds of wave-traps," said a friend to me, the other day, "and I know their circuits all right, but what I do want to know is just what are the practical requirements of each type and why. I get them to work more or less, but I feel sure they don't do all they should because I don't know some little point about them."

To give the "why" of each wave-trap would take rather a lot of room, and would also involve a fair amount of theory if dealt with at all accurately. We can, however, get quite a good idea of how a wave-trap works from quite a simple outline. By doing this, moreover, it makes it much simpler to indicate the best conditions for each type of trap to work under.

The Two Types.

Broadly speaking, as you know, there are two main types of trap. They are the rejector and the acceptor. The rejector can be used either in parallel or in series, it is also available in a slightly different form known as the auto-coupled trap. This is however, a rather curious case which I will go into later.

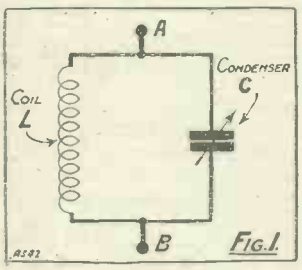


FIG. 1.

Briefly, the rejector consists of a parallel tuned circuit, i.e. a coil with a condenser connected in parallel with it. Fig. 1 shows a simple rejector circuit. Now, if we apply an alternating voltage, such as would be provided by a radio signal, to the points A and B a certain current will flow through the circuit. If, however, we vary the tuning of the rejector circuit till it is tuned exactly to the frequency of the source of energy no current at all will flow, providing always that the resistance of the circuit is zero.

What Happens In Practice?

Actually a very high current will flow internally within the circuit itself, but no current will be drawn from the source of energy. This heavy current flowing inside the circuit gives rise to a high voltage across the ends of the circuit and this voltage is equal and opposite in sign to the voltage of the supply, so obviously no current can be taken from this supply.

If, however, the resistance of the circuit is appreciable, then a certain value of current will be taken from the supply even when the rejector circuit is tuned exactly to it.

Now, supposing we feed to a circuit of this description a large number of different frequencies, then current from all of them will flow through with the exception of the one frequency to which it is tuned.

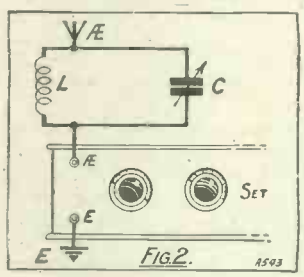


FIG. 2.

It will now be clear how this trap works in practice. In Fig. 2 I show the trap connected in series in the aerial lead. In this position, it will pass all frequencies except the one to which

> "We can get quite a good idea of how a wave-trap works from quite a simple outline. By doing this it makes it much simpler to indicate the best conditions for each type of trap to work under."

it is tuned. Now this is all very well in theory, but what happens in practice? We find that several things happen.

Firstly, owing to the H.F. resistance of the trap coil L, instead of the rejector completely preventing the flow of energy of a particular signal to which it is tuned it actually allows some to pass, so that if it is used close to a broadcasting station it does not entirely cut out the signal. Further the aerial damping is also applied to the trap circuit, thus still further emphasising this effect. The result of this resistance also has the effect of spreading the trapping effect over a wide band of frequencies instead of its being confined to a narrow band.

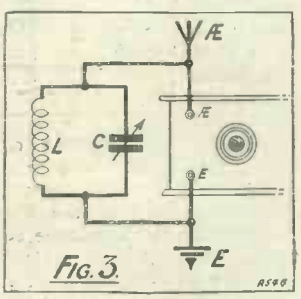


FIG. 3.

Thus, not only is the interfering signal cut out, but also all signals within a fairly wide band of frequencies. This is a result that has been experienced by many experimenters with this type of trap, and it has led many of them to condemn all wave-traps.

Some Queer Effects.

Another effect is that with the usual coil and condenser the latter, shown at C in Fig. 2, acts as a series condenser in the aerial lead, as well as a parallel condenser for the trap, and all kinds of queer tuning effects are found. For instance a sudden frequency jump will be found to occur when the tuning of the receiver is altered, while the interfering station may be found to come in again at a totally different setting of the tuning condenser dial. To prevent this series effect, the trap condenser C should not be less than ·002 mfd. This will require quite a small coil, about seven turns on a 3-in. former for the ordinary broadcast frequencies.

Fig. 3 shows the same rejector trap connected in parallel with the receiver. Here its function is to let pass all signals except the wanted one to which it is tuned, which therefore has to "go through" the receiver, and this is what I think to be the only really satisfactory way of using a plain rejector trap of this description. Its disadvantage is, of course, that it has to be retuned for every station you want, and therefore introduces a further control. Also, if used with a set employing plain aerial tuning, which consists of a similar circuit connected to the detector or amplifying valve; or a very tightly coupled circuit, then a large amount of interaction between the two condensers will be found to result.

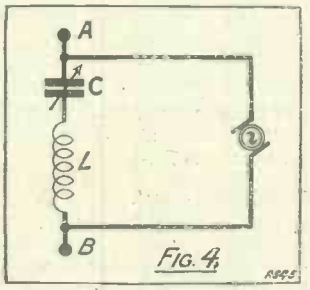


FIG. 4.

The Tuning Circuit.

The tuning circuit in the receiver should preferably be a loose-coupled circuit or else possibly be a series-tuned circuit where the tuning condenser is in series with the coil and not in parallel.

Now we know that the presence of resistance in this type of trap flattens the trapping effect. A second requisite for a

(Continued on next page.)

WAVETRAP WHYS AND WHEREFORES.

(Continued from previous page.)

sharp trapping effect, however, is that the inductance should be small and the capacity large. Reducing the inductance also makes it easier to keep the resistance of the circuit down. With a large capacity, when used as a series trap, the tuning of the trap will not affect the tuning of the receiver. Care must be taken in the choice of the condenser used, however, as the usual cheap high capacity condensers have a high resistance.

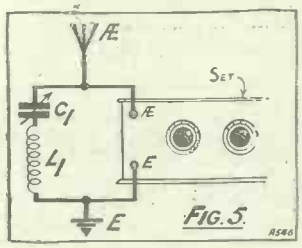


FIG. 5.

Next we come to the acceptor trap. Fig. 4 shows an acceptor circuit, the source of energy being connected across A and B.


Here is the author of the accompanying article testing a receiver of his own design.

In this case, when the circuit is correctly tuned the *greatest* amount of energy will be drawn from the source of supply, which, it will be seen, is exactly the opposite of the rejector action. In a like manner, if fed with a supply containing different frequencies it will accept one frequency only, and let it pass.

Sharp Tuning Effect.

Fig. 5 shows how this type of trap, consisting of the coil L_1 and condenser C_1, is used. When adjusted to the frequency of the interfering signal, it lets it pass direct to earth, other frequencies having to go through the receiver. Here again the presence of resistance flattens the trapping effect, thus allowing other nearby frequencies to go to earth. Unfortunately also, this trap when tuned to a given frequency presents zero impedance to it (this is a form of resistance that applies in the case of alternating currents, and also, of course, to wireless signals), and even when slightly off tune it presents a very low impedance, so that it must be used with a tuning system in the receiver itself, of which the aerial portion has a naturally low impedance compared with other forms. Fig. 6 shows the kind of arrangement usually considered suitable for use with this type of trap.

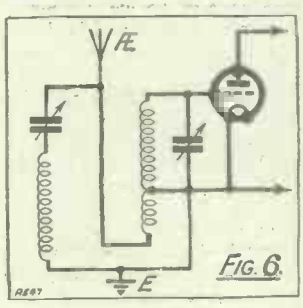


FIG. 6.

To get the sharpest trapping effect with an acceptor circuit, the coil should be as big as possible (without unduly increasing the H.F. resistance), and the condenser should be small, not so small, however, as to limit the frequencies covered by the trap too much—say about ·0002 max. for the condenser and about 300 to 400 microhenries for the coil, depending on the frequency of the interfering signal.

An Absorption Wavetrap.

There is also another form of acceptor trap, which at first sight appears to be a rejector. This is shown in Fig. 7. A parallel tuned circuit, L_1, C_1, is variably coupled to the tuned circuit, L_2, C_2, of the receiver itself. When this circuit is brought into tune with an interfering signal it dies out as if it were absorbed by the trap circuit. This therefore is often called an absorption trap.

It can be shown theoretically that when two circuits are coupled together so that a transfer of energy takes place from one to the other, the source of energy can be considered as being connected in series with the circuit. This, it will be seen, is equivalent to the Fig. 4 acceptor circuit, and therefore the conditions obtaining for an acceptor trap apply as regards the proportioning of inductance and capacity. In operation the coupling should be kept as loose as possible. The looser the coupling the sharper the trapping curve.

This is an efficient kind of trap, but has the disadvantage that it has really to form part of the tuning unit, while it is desirable for the coupling to be variable so as to allow it to be suited to varying conditions.

Lastly is the coupled trap. This may be either loose or auto-coupled, and it is a kind of trap I have done a lot of work on. The two different forms are shown in Fig. 8, at A and B respectively. Either of these traps can be used as a series or a parallel trap, its actual effect being that of a rejector circuit, in that it rejects one frequency and lets all others pass. Unlike the rejector trap, it has the sharpest tuning effect when the inductance is *big* and the capacity *small*, like the acceptor, while also the looser its coupling with the aerial the sharper the trapping curve.

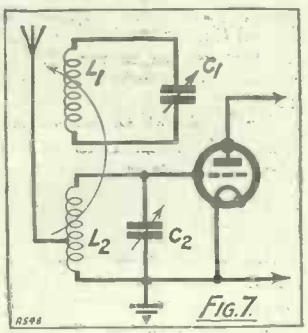


FIG. 7.

With this trap again it is most important that the coil should have a low H.F. resistance, otherwise the trapping effect is reduced, and broadened over a band of frequencies. It is desirable that the coupling be variable so as to adjust it to suit particular conditions, and this is easily done by providing tappings, as shown in Fig. 8.

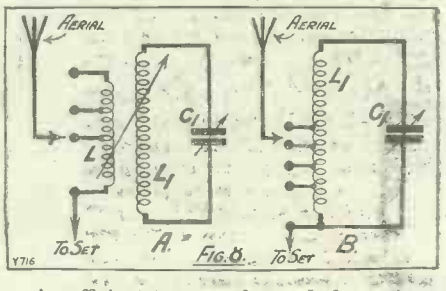


FIG. 8.

An efficient trap can be made by winding 22 D.S.C. copper wire on a 4-in. Paxolin former, tapping at 10, 14, 18 and 22 turns with a total number of 80 to 90 turns. It should be tuned with a good low-loss low minimum condenser having a maximum capacity of ·00025.

Constructional Details.

A super-trap of this description can be made by using gauge 10 wire spaced about half a diameter apart on a 12-in. diameter former (about 12 to 15 turns only will be required for the broadcast band of frequencies) and providing tappings at the 2nd, 3rd and 4th turns. If used very close to a transmitter it may be necessary to take a tap at the 5th turn. Turns should be put on till a ·0002 condenser will trap out the station it is desired to eliminate, when set about half way in.

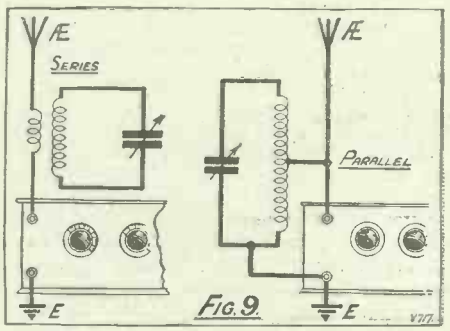


FIG. 9.

When the coupled type of trap is used as a parallel trap it may be necessary to tap on to the coil rather higher up than in the case of where it is used in series in the aerial lead. Both ways of connecting this type of trap are shown in Fig. 9.

NOISY CONDENSER CONNECTIONS.

MECHANICAL parts which have become worn often cause noises in receiving sets. The vernier drive shafts of condensers often become worn; sometimes this also happens to the bearings of the vernier plates. When this occurs the contact between the shaft and the condenser may seem to be perfect, yet the set when critical tuning is necessary will not respond properly. There is a scraping noise or scratching sound heard that is often wrongly blamed on a loose connection in the wiring. Condensers having proper "pigtail" connections do not suffer from this trouble.—H. B.

WHAT'S WRONG?

Sets which have been put aside all the summer have a knack of not working properly when recommissioned. But before condemning them owners should read the following practical tips.

By P. R. BIRD.

THIS is the time of year when many an old set is brought out of the cupboard, and when many a non-technical listener starts pondering over the problem of radio reception. Although regular readers of "P.W." will not be caught napping, many newcomers to radio will be wishing that they had made better preparation for getting the B.B.C. programmes.

Sets neglected all the summer have a knack of not working properly when recommissioned, but before condemning them the owner should read the following tips. If he has forgotten the lessons of last year, or if his radio experience is nil, he may be able to do his own doctoring without either expense or difficulty. Whatever sort of an old set you have, if it is connected to an aerial and earth which look all right, and suitable coils are plugged in, you should be able to hear *something* when the 'phones, etc., are connected.

Crystal or Cat's-whisker.

Before connecting up the batteries the wiring should be tested with a cautious finger to make sure there are no breaks or unsoldered joints, and if everything appears in order, you can be pretty sure of getting some kind of reception when properly connected up. (If nothing at all is heard a novice had perhaps better get expert advice upon such a "patient," as the set may require radical treatment.)

Generally the local station can be picked up all right, but the programmes may be weak. Where shall we look for the trouble? If it is a crystal set the cat's-whisker may be "rusty," or perhaps the crystal surface may be dirty. A snip with a pair of scissors will cure the former, and the crystal itself can be broken to expose a new surface or replaced. (In any crystal set the contents should be really clean and bright, so that a little metal polish may work wonders.)

Rust and Dust.

Another possible cause is rust inside the telephone diaphragms. This can be removed by any careful listener, with a soft oiled cloth. Dust is another snare to watch for, as if this settles between contact plugs, between the sockets of a valve holder, or on any other small insulating surface, it may easily weaken reception.

The trouble may lie also out of doors in the form of soot or dirt on the insulator, or a dirty contact at the lead-in, this being especially true of sets where no valves are used. Another common cause of weak results is a poor earth connection, outdoor efficiency at this point being particularly important with a crystal set. Another possible cause is an inefficient L.T. battery which may be run down or connected up wrongly.

Faulty 'Phones.

Sometimes the cause of weak signals lies in the telephones or loud speaker, even although these do not appear rusty or damaged in any way. But if they have been dropped to the floor or otherwise roughly handled, it is quite possible for such treatment to have demagnetised them (especially if they have been purchased a year or so ago), or connected for a time the wrong way round in a valve set, which will have the same effect. If this fault is suspected, however, it can easily be checked by borrowing a good pair for a short while, and trying them out, when improved reception will show that it is not the set itself which is at fault.

One rather common fault is fluctuating programmes, i.e., when the set has an irritating habit of "going off." If it is a valve set the first thing to look for is the accumulator connecting bar, which may be making loose contact and thus causing the filaments to be partially starved. 'Phone leads, or indeed any flexible leads in the set may give rise to this fault if the wire inside has become frayed, thus making intermittent or loose contact.

In both the above cases the remedies are obvious. Another cause of this kind of fading lies out of doors, for it may be caused by the aerial or the lead-in swinging against some obstruction. If the wire happens to touch a gutter pipe or some such thing, your programmes will go thence to earth instead of through the set, so do not run the leads too near buildings, walls, etc., but have them sufficiently tight to make sure there are no stray contacts.

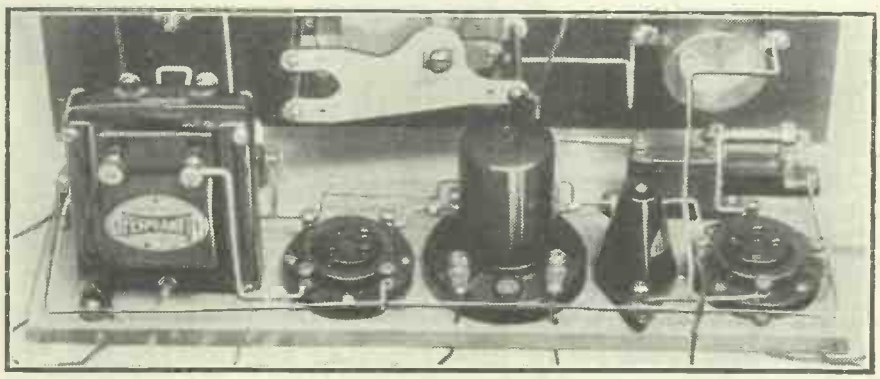
A steady humming noise may be due to electric light in the house, and in such a case care must be taken not to run the aerial or the earth lead parallel to, or anywhere near, the electric-light wiring. (Remember that this may be concealed in the wall.)

If the set starts howling, probably the reaction coil is too large or you have the wrong H.T., L.T. or grid bias in use. Dud batteries are a common cause of this trouble, too, whilst if the set embodies a neutrodyne condenser, do not forget that this may need resetting. If you get loud scraping noises when connecting up, you probably have a bad contact somewhere, and the whole set should be examined, as it may be in the rheostat, 'phones, H.T. plugs, coil sockets, or any part of the wiring.

Cause of Scraping Noise.

Dust or dirt between condenser plates is another cause of scraping, but is easily located because the noise corresponds with the movements of the condenser.

Very weak and distorted signals accompanied by a scraping sound is one sign of a broken-down L.F. transformer, so that the windings of this should be tested with 'phones and dry cell (as frequently described in "Radiotorial.") There are, of course, many other causes which might give rise to unsatisfactory reception, but the foregoing covers most of the easily-corrected ones. If none of them appear applicable in your case, you had better call in an experienced friend, or write to the Technical Query Department of "P.W.," as explained in the "Radiotorial" section.



Even in a simple set there are many joints that might go wrong, though compared with its predecessor the modern receiver is simplicity itself.

OUR BLUE PRINT GIFTS.

The famous "P.W." Blue Prints are unique in that each incorporates not only a wiring diagram, but full working details for building a set. At 6d. each one is extraordinarily good value for money, and every week of the year hundreds are sold to satisfied amateurs. But to every reader of this and next week's "P.W." we are giving free a 4/- collection of entirely new "P.W." Blue Prints not old ones in no great demand. A magnificent gift which you must not miss.

By THE EDITOR.

ONCE again we present to our readers a series of four sixpenny blue prints free. These blue prints are very well known now wherever wireless men foregather, for they certainly represent a practical gift which appeals to all amateurs interested in the building of wireless sets.

Before going any further, let me say that next week we shall give away another four sixpenny blue prints, and so, with two issues of POPULAR WIRELESS you receive a 4s. gift. The production of these blue prints, as you may guess, is not inexpensive, and it is only owing to the excellent circulation and support which we receive from our readers that we are able to start off this winter season, as in past seasons, by presenting these two-shilling gifts.

Two of the sets covered by the blue prints in this issue are described in the editorial pages, but in due course, I have made arrangements with our Technical Editor, Mr. Dowding, that all the sets shall receive editorial attention in succeeding numbers.

Editorial Description.

Consequently, these blue prints are not isolated gifts. They are linked up with the editorial pages, and if you keep them by you for a week or two you will be able, in due course, not only to have eight blue prints but with them full constructional details which will enable you to build up the various sets and units with the greatest of ease.

* * *

The interest aroused at the Wireless Exhibition this year indicates that, instead of waning, the hobby of radio, and especially the home construction of wireless receivers, is growing steadily.

The popularity of radio as a hobby often surprises many people because, bearing in mind other hobbies, they always think that interest sooner or later will die and give place to a new hobby. But of all the hobbies the world has ever known, radio is the most persistent; and it is unique in that instead of dying away it persists in growing and growing and growing. And when you come to think about it this is all because the science of radio offers infinite variety.

Rapid Advance.

There is never anything dull, and things do not stand still in the radio world. In other words, the hobby is not a stagnant one.

The exhibition proved it this year with the development of the new Pentode valve, the moving-coil loud speakers, the Fultograph picture apparatus, the Baird Television apparatus, and a hundred other things too numerous to mention here.

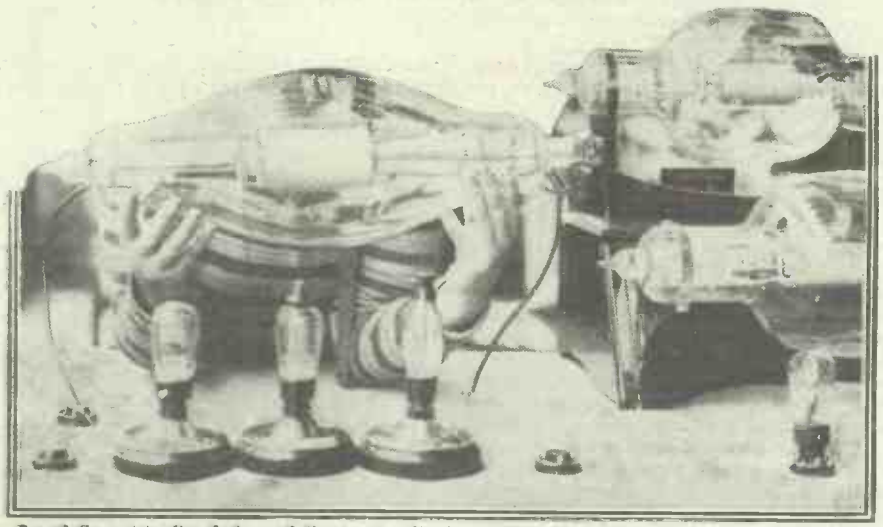
Anyway, over 100,000 people went to the exhibition this year, and it was certainly a sight for the gods on the last night of the exhibition when, a few minutes before closing time, hundreds of people were still trying to get in, planking down their money at the box offices, well knowing that they would have only a few minutes when they got inside the exhibition.

Buy British.

Let a word be said here about the British radio manufacturer. If ever an industry has made gigantic strides in a short period of time, surely it is the radio industry. The difference in quantity and quality of the exhibits this year compared with last year's was indeed amazing. There is no doubt, of course, that the recent Marconi royalty decision, as made by the Comptroller of Patents, has had a lot to do with putting a fresh impetus and fresh enthusiasm into British radio manufacturers. But even without that decision, it was evident for some time past that the British radio manufacturer had the American, as they say, "skinned."

British radio apparatus may not be so pretentious in appearance, and probably, in some aspects, not so cheap, but there is one thing that is definitely certain and that is that if you buy good class British products they are going to last you just about five times as long as most foreign products.

VALVES AT THE EXHIBITION.



One of the outstanding features of the recent radio show at Olympia was the number of new valves. On the Ediswan stand, for instance, as shown above, Pentodes and Screened-Grid receiving valves were exhibited together with huge transmitters.

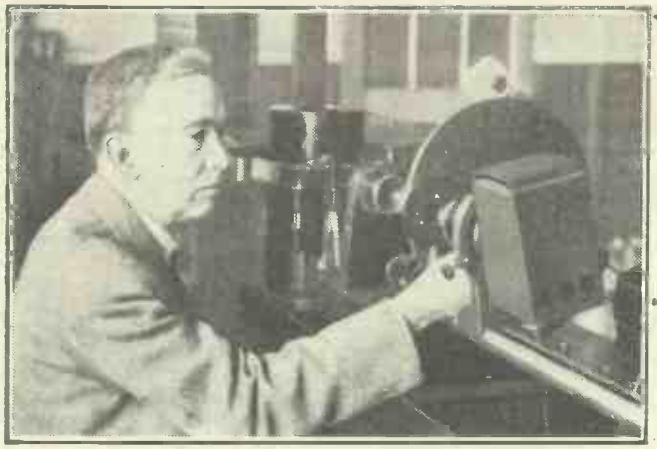
FOUR MORE 6d. BLUE PRINTS FREE!

With every copy of next week's "Popular Wireless" four more magnificent blue prints will be given away. Each blue print will be as complete and as clearly produced as all its famous predecessors.

OUR SECOND 2/- GIFT

includes blue prints of three entirely new sets, viz. the "ANY-MAINS" TWO, the "BANDMASTER" (a magnificent four-valver), and the "LONG RANGE" THREE—a fine wave-change set. The fourth print describes the "ANTIPODES ADAPTOR," one of the most successful of all "P.W." productions. It is a single unit which instantaneously transforms practically any ordinary set into a short-waver capable of receiving American and Australian broadcasters.

ORDER YOUR COPY OF NEXT WEEK'S "P.W." NOW.



BROADCASTING MOVING PICTURES.

The sending of moving pictures by radio is a complicated business, but in this article the main principles are clearly outlined. **A SPECIAL CORRESPONDENT.**

WHILE radio moving pictures must still be regarded as only in the laboratory stage, the recent demonstration carried out in America (when motion pictures were transmitted and picked up on a receiver at the Westinghouse Laboratory over a distance of four miles) is of some interest.

Although the sending of moving pictures by radio, as may well be imagined, required many complicated and delicate pieces of apparatus, the principle of the art as explained by the Westinghouse engineers is not beyond ordinary comprehension.

Foundations of Television.

Photography in its simplest form consists of the reproducing of spots of light and shadow in the same arrangement as they appear in the subject photographed. The screening of a motion picture, of course, requires that a roll of film be operated at a speed which sends sixteen pictures a second before a projecting beam of light. Because of the structure of the human eye, if a series of pictures follow each other at the rate of sixteen or more per second, the human eye sees it as a single moving picture.

All this the broadcasting of radio moving pictures requires, with the addition that the spots of light must be transformed into frequencies, some of which are in the audible range, transferred to a radio wave and broadcast as electrical energy. In receiving the pictures, the process is reversed, the electrical energy is picked up, and the frequencies returned to lights and shadows, which when viewed presents the radio movie.

In the first step of the process a pencil of light traverses each picture, or "frame," as it is called, at the rate of 60 times a sixteenth of a second. This process produces a 60-line picture, as clear as the usual newspaper half-tone illustration.

"Scanning" the Object.

The pencil of light is produced by a "scanner," which is a disc with a series of minute square holes near its rim. The disc is so arranged that all its light is excluded from the film except that which goes through the square holes. The disc turns very fast, and as it turns, passes the beam of light across each "frame," with the result that an individual beam of light touches every part of the "frame."

The beam of light passing through the film falls upon an electric eye or photo-electric cell, which is not unlike an over-sized incandescent lamp. Within the cell, however, is a material whose electrical resistance varies with the light falling on it.

Caesium, a rare metal, is used in the Westinghouse cell. The amount of light falling on this cell determines the amount of current passing through it. The result is that each individual beam of light sends an electrical impulse which varies directly according to the amount of light or shade in the film through which it passed.

The beams of light have now become electrical impulses, and are sent on to the broadcasting station. Here the beams assume definite and varied frequencies, some of which are audible. Dr. Conrad states that these frequencies range from somewhere near 500 to approximately 60,000. Since the human ear is limited to frequencies of approximately 15,000, much of the radio movie wave is inaudible.

At the broadcasting station these frequencies are transposed on a radio wave and transmitted exactly as the ordinary music or voice. The radio signals now can be sent across a room, or across the continent. Their distance range is limited only by the broadcasting station's equipment.

In the Westinghouse demonstration, the signals traversed a distance of about four miles; two miles from the laboratory to the broadcasting station by wire, and two miles back to the laboratory by radio.

To turn these radio waves back into light, an arrangement which permits the use of a mercury arc lamp is used. By this adaptation, the weak radio currents control the action of the many times more powerful current operating the arc lamp. This action may be compared to the action of a radio tube, where the weak radio current on the grid of the tube controls the action of the independent and more powerful plate current.

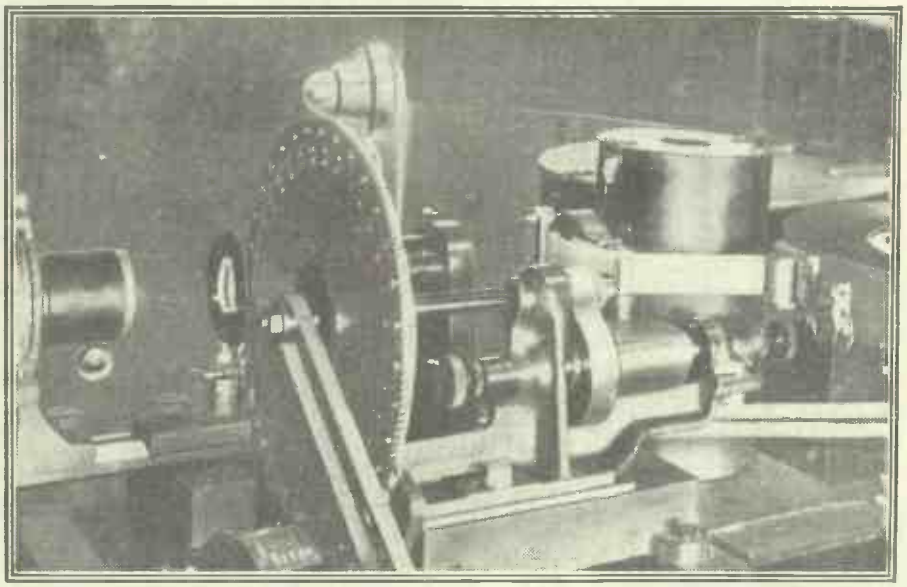
Building Up the Picture.

Thus the mercury arc lamp goes bright or dim as fast as the current changes, and its light at any instant is in proportion to the light that the electric eye sees in the same instant. To return the dots of light to their original pattern, another revolving disc or scanner is also used which is similar to the transmitting scanner.

Both these scanning discs turn at exactly the same speed; the hole in the receiving disc must be exactly in the same relative position as the corresponding hole in the transmitting disc. In other words, they must be synchronised.

The Westinghouse engineers were the first to develop a feasible method of synchronism, and their method was by means of radio. From transmitting equipment, which may be located in the broadcasting station, they transmit a constant-frequency-wave of 5,000 cycles. This wave is produced by a tuning-fork, and transmitted over a special carrier-wave from the broadcasting station.

The constant-frequency note is received on a special receiver, and by means of special apparatus controls the speed of synchronous motors; which drive the scanning discs of both transmitting and receiving radio-movie equipment.



A view of the television motion-picture transmitter. The dot of light thrown upon the moving film can be seen clearly.

LATEST BROADCASTING NEWS.

SIR JOHN REITH'S HEALTH.

MR. PERCY PITT—THE BROTHERS "ECK"—MRS. SNOWDEN ON THE AIR—P.M.'S SON TO BROADCAST—IDEALS OF THE THEATRE—A SCOTTISH FEATURE.

Sir John Reith's Health.

JUST as POPULAR WIRELESS was the only journal to give an account of Sir John Reith's recent illness, so now we have the exclusive privilege of recording the complete recovery of the Director-General of the B.B.C. It is typical of the exceptional character of everything that Sir John does that he got back his health by deliberately disobeying the advice of his friends, who implored him to go away for a long rest. He did the opposite, that is, he stayed at work, and had no holiday at all, with the result that he is now well in body and mind.

It is believed that Sir John will make some important public declarations during the coming season. After his Children's Hour "indiscretion" last spring, he evaded the platform for some time, but his reappearance at the Annual Adult Education Conference at Cambridge was as refreshing as it was effective. He gave the assembled Vice-Chancellors and professional educationists something to think about in their own business.

It would be a fine thing for British prestige and for British broadcasting if Sir John would tour the United States next summer. He has many friends there, and the Americans would take to his mannerisms.

Mr. Percy Pitt.

Mr. Percy Pitt, the distinguished and genial Director of Music of the B.B.C., surprised a gathering of artistic friends recently with the news that he contemplates taking advantage of the privilege of retirement which will be his by virtue of seniority in 1930. It is unlikely that the B.B.C. has as yet considered the possibility of replacing Mr. Pitt, and no doubt Savoy Hill will do everything possible to persuade Mr. Pitt to change his mind.

If, however, he is adamant, then a real prize in the world of musical appointments will be "going" in two years' time. In well-informed circles, Sir Hamilton Harty has the advantage of the odds, with Sir Thomas Beecham closing up.

The Brothers "Eck."

Students of broadcasting are always "intrigued" by the various moves of the "Brothers Eck" at Savoy Hill. Captain P. P. Eckersley and his brother, Mr. R. H. Eckersley, have become keen rivals for power. The gallant chief engineer, "Peter," who has earned for himself the title of the "Warwick" of broadcasting, through the numerous changes made at his wish, has now created a force which threatens to break out of his control. "Roger," although not of the same temperament, still has the traditional Eckersley passion for power, and now that he is feeling his feet on the programme floor, he resists the suggestion of swaddling strings. So the brothers Eck are in earnest and keen rivalry, albeit friendly; because heaven help the outsider who would slang either to the other.

Mrs. Snowden on the Air.

Mrs. Philip Snowden, one of the Governors of the B.B.C., will on Monday afternoon, October 22nd, open the Manchester Radio Exhibition at the City Hall, when the speeches at the ceremony will be broadcast from northern stations. Later during the evening a ballad concert, arranged in connection with the Exhibition, will be relayed from the City Hall, the artistes being Frederick J. Firth (the boy soprano), whose singing as a surprise item from the London studio a few weeks ago attracted so much attention; Arthur Broadbent, who will give a selection of songs by Vaughan Williams;

If you suspect that your transformer has broken down, you can test each winding by joining a dry cell and 'phones in series, and "listening for the click." When the other tags of 'phones and battery are placed across a sound winding there is a loud double click, but a broken winding gives little, if any, response.

Cedric Sharpe, the well-known 'cellist, and the Middleton Apollo Glee Society.

Other concerts will also be relayed from the Exhibition on Wednesday evening, October 24th, when the programme will be sustained by the Northern Wireless Orchestra, Reginald Whitehead and John Chantler in duets, and on Monday, October 29th, and Saturday, November 3rd.

P.M.'s Son to Broadcast.

Mr. Oliver Baldwin, the Socialist son of the Prime Minister, has no more objection than his illustrious parent to appearing before the microphone. On Tuesday evening, October 23rd, he is to visit the Birmingham studio to read "The Family Gathering" from Dickens' "Martin Chuzzlewit," and listeners will be able to decide whether he has inherited his father's undoubted microphone personality by tuning in to 5 G B at 9.30 p.m.

Ideals of the Theatre.

We hear and read so many hard things about our theatrical plays and those who are responsible for their production that considerable importance attaches to a series of talks entitled "Aims and Ideals in the Theatre," the first of which is to be given in the London studio on Wednesday evening, October 17th.

The speakers will be well-known theatrical producers—Sir Barry Jackson heads the list—who will explain exactly what they are endeavouring to accomplish.

A Scottish Feature.

An "All Dunfermline" Concert, organised by the local Rotary Club in aid of the Dunfermline and West Fife Hospital Extension Fund, is an important feature in Scottish programmes on Tuesday evening, October 16th.

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

H.F. AMPLIFICATION

LOWER PLATE VOLTAGES—AMPLIFIERS FOR TELEVISION—Etc., etc.

H.F. Amplification.

In H.F. stages many experimenters use a high value of H.T. voltage without a biasing battery and whilst this may result in a considerable degree of amplification in some cases, it is wasteful of H.T. battery current, and does not usually produce the best tone quality. Reducing this H.T. voltage will obviously have the effect of saving H.T. battery current, and will frequently be found to improve the tone quality on stations not too far distant.

A still better method, of course, is to introduce a suitable value of grid-bias voltage, which has the effect of improving the quality very greatly and at the same time cutting down the H.T. current. In an actual test two H.F. amplifiers consumed 12 milliamperes in the plate circuit when the H.T. voltage was 90 volts; the H.T. current consumption dropped to 7 milliamperes for the two valves at an H.T. voltage of 66 volts and to 3·4 milliamps when the H.T. voltage was reduced to 45 volts.

Lower Plate Voltages.

The use of lower plate voltages will sometimes so much as double the useful life of an H.T. battery and will often result in obtaining a much more quiet performance from an H.T. eliminator with more freedom from A.C. hum; this is particularly the case where the H.T. eliminator is one of limited output.

Another important advantage which must always be borne in mind with regard to H.F. amplifying stages is that the use of a high value of H.T. voltage tends to make oscillation much more difficult to control. Lowering the value of the H.T. results in more stable operation of the receiver and in better quality.

Amplifiers for Television.

Whilst the bigger type of amplifier as now employed for broadcast reception may be utilised in experimental television, the pronounced peaks, together with the limited frequency-response of most trans-

(*Continued on page* 306.)

USE YOUR OWN INITIATIVE — GET BETTER RESULTS — AND SAVE MONEY —

A childlike ease of assembly alone is not sufficient inducement to offer the thinking constructor as a reason for rushing in to blindly build. Constructors today are capable of using their own hands and brains, and there are 10,000 Lissen dealers who will help them.

When they build, they are capable of using their own judgment in selecting the parts which offer them the certainty of better results and best value for the money they are asked to spend.

Lissen now offer the constructor a complete range of important parts. Take any circuit you like, and before you build, compare side by side the quality of the parts, compare prices, criticise, analyse. And when you come to hearing results, it will be an achievement you will be proud to remember, that you adopted a circuit, and of your own initiative substituted Lissen parts and in that way got such far better results and at less cost than your friends who merely followed easy instructions.

LISSEN L.F. TRANSFORMER

The popular transformer, 4 to 1 ratio, that became known last year as "the transformer that never breaks down" .. **8/6**

LISSEN *SUPER* TRANSFORMER

This is a transformer of advanced design, which you will use when particularly pure reproduction is desired. Ratios 3½ to 1 and 2¾ to 1 .. **19/-**

LISSEN VARIABLE CONDENSER

·0001 mfd.	capacity	**5/9**
·0002	,, ,,	**5/9**
·0003	,, ,,	**6/-**
·00035	,, ,,	**6/3**
·0005	,, ,,	**6/6**

LISSEN WIRE-WOUND RESISTANCES

The Resistances are made in the following values:

Ohms	Price	Ohms	Price
10,000	**3/6**	80,000	**4/-**
20,000	**3/6**	100,000	**4/6**
25,000	**3/6**	150,000	**5/6**
50,000	**3/6**	200,000	**6/-**
250,000 Ohms	**6/6**		

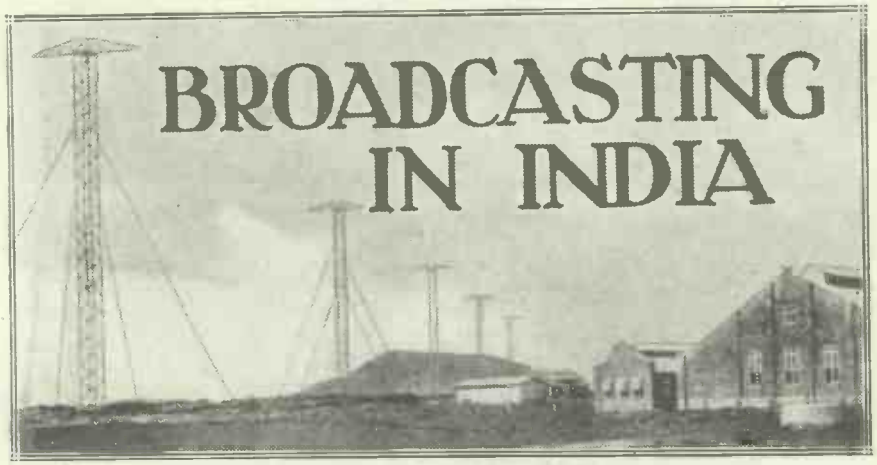
LISSEN FIXED CONDENSERS

Deliver all their stored-up energy. ·0001 to ·001, **1/-** each. ·002 to ·06, **1/6** each.

7 DAYS' APPROVAL

You can get the new Lissen components from practically every radio dealer.

LISSEN LIMITED, FRIARS LANE, RICHMOND, SURREY *(Managing Director: Thos. N. Cole.)*



BROADCASTING IN INDIA

From A CORRESPONDENT.

THE author has very often been asked what are the conditions pertaining to wireless in India. This is, however, a very difficult question to answer, depending a great deal upon the individual requirements of the questioner or listener in that country. To an enthusiastic experimenter there is plenty of scope, but on a comparison basis of service, radio as it is known in Britain is non-existent in India.

Calcutta (7 C A) and Bombay (7 B Y) working on wave-lengths of 370·4 metres and 357·1 metres respectively, are the real broadcasting stations of India, each serving a wide surrounding district. The bulk of the population of Bengal speak Bengali, while the European and Eurasian portion of this "hinterland" of the Calcutta station talk English. A programme under these conditions is doubly difficult; it presents the same problems as at home, but in two languages. Should an all English broadcast be given it appeals only to that section of the listeners conversing in English, to the remainder it is entirely foreign. With Bengali programmes the same applies to the English speaking populace.

When Calcutta carried out regular transmissions it was usual to allow three nights of an all-English version, while the remainder of the week was given in the language of the country, principally Bengali.

Programme Difficulties.

The providing of programmes in English is somewhat restricted, available artists are few and cannot be repeated too often. In consequence of this the gramophone plays a very important part in the construction of programmes. With a Bengali broadcast this difficulty does not arise since local artists are more or less national artists, and the gramophone is only used to fill in spaces.

It might be said, however, that from an English point of view Bengali music is not appealing, but it certainly pleases the native listener.

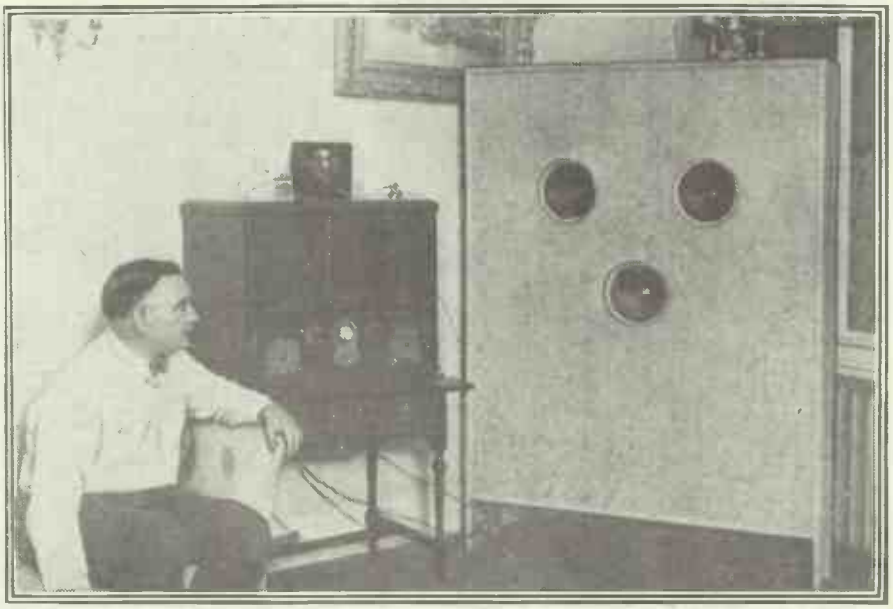
The licence issued in India is very similar to the British one, giving freedom to use a set for the purpose of broadcast receiving. Should our questioner be an amateur who wishes to build his set for the sake of the wireless, or from a scientific point of view, outside of programmes altogether, it is possible to log quite a few stations. The author has frequently logged Rangoon, Bombay, Ceylon, South Africa, Durban, and Calcutta. The set used was a super-het. stationed 50 miles out of Calcutta. This does not include any short-wave or amateur stations run by experimenters in the district.

Constructors Handicapped.

The greatest handicap to set-building is the procuring of material, since to bring wireless apparatus into India one requires a special import licence. This licence is sparingly granted, and without it any apparatus may be regarded as contraband and confiscated. It is, therefore, necessary to purchase parts, unobtainable locally, through a dealer with an import certificate.

Readers proposing to take sets to India with them should remember this.

THIS LISTENER LIKES LOUDNESS.



An elaborate loud speaker constructed by an American enthusiast. It consists of three moving-coil units mounted on one large baffle board. It is stated that he can shake the plaster off the wall without sacrificing tonal quality!

PRACTICAL POINTERS.

You can save a lot of trouble by keeping your accumulator terminals lightly covered with petroleum jelly, and screwed up tight.

* * *

Do not use an L.F. amplifier which has no grid-bias battery in it. It is out of date, and can easily be altered.

Even the best loud speaker cannot give good results on a poor set, and as a matter of fact the better the loud speaker the more it will show up the imperfections of the receiver to which it is attached.

* * *

When it is required to work a loud speaker at some distance from the receiver, a special output circuit should be used to disconnect its leads from the high-tension battery.

* * *

If your programmes are being spoilt by neighbouring sets, trams, electric motors, or machinery, etc., you should write to the Chief Engineer, B.B.C., 2, Savoy Hill, London, W.C.2, or to your local station.

* * *

If you have a valve set, and do not know how to handle the reaction properly, ask the B.B.C. for their free handbook on oscillation, which contains many valuable hints upon the correct handling of a receiver.

* * *

If you must have joints in either your aerial or your earth wire, be sure they are *soldered* ones.

* * *

There is a special *type* (not name) of valve for every valve socket in your receiver, so be sure you get the right one if you wish to get good results.

* * *

For really strong and pure loud-speaker reproduction it is absolutely essential to use a large power or a super-power valve in the last stage.

Do not forget to keep the acid in the accumulator at the proper level.

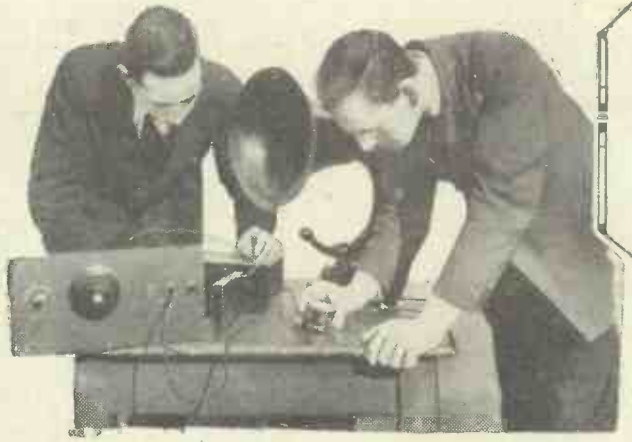
* * *

A 2-volt accumulator should never be allowed to run down below 1·8 volts per cell. A 4-volter below 3·6, and a 6-volter below 5·4 volts.

* * *

If you cannot afford a voltmeter for testing your accumulator ask your dealer about a hydrometer, which is much cheaper and very useful.

THE NEWCOMER TO RADIO



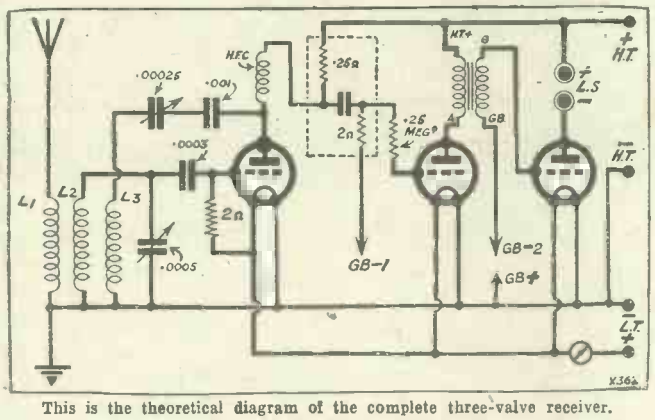
This week the series concludes with a description of the final details needed to finish the three-valve receiver. It is a first-class set and is capable of giving quality loud-speaker results from a number of broadcasting stations. Even if you have not read the preceding articles you may be able to build the set from the details provided.

Conclusion:—THE FINAL THREE-VALVE SET.

By G. V. DOWDING, Grad.I.E.E.

WE now come to the final stage of the construction of our set. This week it grows into its full three-valve form, and becomes capable of providing really robust loud-speaker results from a number of broadcasting stations.

In order to obtain this increased volume of sound, we will have still further to amplify the energy developed, and this further amplification is carried out by the third valve. This is coupled by means of an L.F. transformer, and not, as in the case of the first L.F. valve, by an R.C.C. unit. This mixture of two methods is very popular, and the set as a whole makes the best possible use of three valves.



This is the theoretical diagram of the complete three-valve receiver.

We are now in a position to return to the big theoretical diagram published in the second article, and reproduced herewith on an exactly similar scale. The plate of the second valve, instead of being connected to telephone receivers, is joined to the primary winding of an L.F. transformer.

How L.F. Transformers Work.

In close proximity to this primary winding is another winding, known as the secondary, and the energy is transferred from the one to the other in a somewhat similar manner to which the energy in the aerial coil of the receiver is transferred to the grid coil.

We again encounter a magnetic field. In the L.F. transformer, the magnetic field is intensified by providing what is known as an iron core. The iron core actually forms the basis of the component, the primary and secondary windings being wound around it. The energy developed in the secondary winding is taken direct to the grid of the third valve.

As with the first L.F. valve, this grid is initially adjusted by means of the grid-bias battery. The same grid-bias battery is used just as the same H.T. battery is used for both valves. The loud speaker (telephone receivers are not now needed) is joined in the anode circuit of this last valve.

You will see that only two additional components are necessary, an L.F. transformer and another valve holder, but the L.F. transformer is perhaps the most important component in a set of this kind. A poor example will completely ruin the performance of this set.

There are L.F. transformers for sale at a matter of a few shillings each, and these are mostly of Continental origin. I am not going to say that all such cheap L.F. transformers are complete "wash-outs," but do not be tempted to economise here, unless you are absolutely certain that you are getting good value for money.

Buy British!

One of the good English brands selling in the neighbourhood of £1 should be your aim. Rather than use a dud L.F. transformer, it would be better to forgo the addition of this third valve. If you cannot spare the money required for a guaranteed good make, you can leave this third valve addition for the time and make it later on and when you are in a position to do so. It is one of the advantages of the set we are dealing with that you do not have to make the outlay for the entire outfit in one lump.

Again, you have to alter only one lead to make the extension.

This is the same lead—the one which goes to the telephone terminal from the plate of the first L.F. amplifying valve.

If you have wired up the set in a similar way to the original, this lead crosses the portion of the baseboard on which the L.F. transformer will be fixed. Therefore, your first move this week will be to remove that lead. You need only disconnect it at the telephone terminal end, and bend it back out of the way while you fix the transformer, and new valve holder. This lead subsequently is connected to one of the terminals of the L.F. transformer.

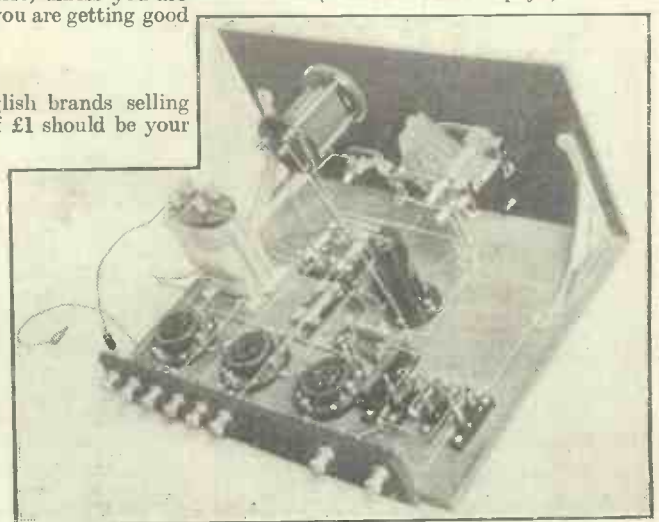
Another G.B. Lead.

The remaining wires are few in number, and are clearly shown in the wiring diagram in thick black lines. A further short flexible lead has to be connected to the G.B. terminal of the L.F. transformer. At its other end should be fixed another wander plug.

For the third valve holder, I would advise a valve of the power variety. An ordinary L.F. valve will hardly be able to deal with the energy, although this will not be great enough to warrant the use of a super-power variety. The grid-bias plug should be inserted in the grid-bias battery at the negative end.

You will no doubt find that you will need the whole voltage of this battery on the grid of the third valve, but it is worth while trying an adjustment when the set is operating in order to ascertain whether

(*Continued on next page.*)



By altering one existing lead and adding only two components and their simple connections, the set becomes a full three-valver.

THE NEWCOMER TO RADIO.

(Continued from previous page.)

this tapping gives you the clearest quality of reproduction.

You will now have to employ the full H.T. voltage at your disposal, and the 100 or so volts will be by no means too much. You have many makes and varieties of loud speakers to choose from. If you desire to economise, you may like to try your hand at the assembly of a loud speaker. You can buy a unit, such as the Lissenola, for about 13s. 6d., and but little ingenuity is required to fix this up with a cone. You will probably have noticed articles telling you how to do this in "P.W." This set deserves a good loud speaker, and if you purchase a ready-made instrument, make sure that you do get a good one. Endeavour to hear several demonstrated before you make your final choice.

Final Operating Notes.

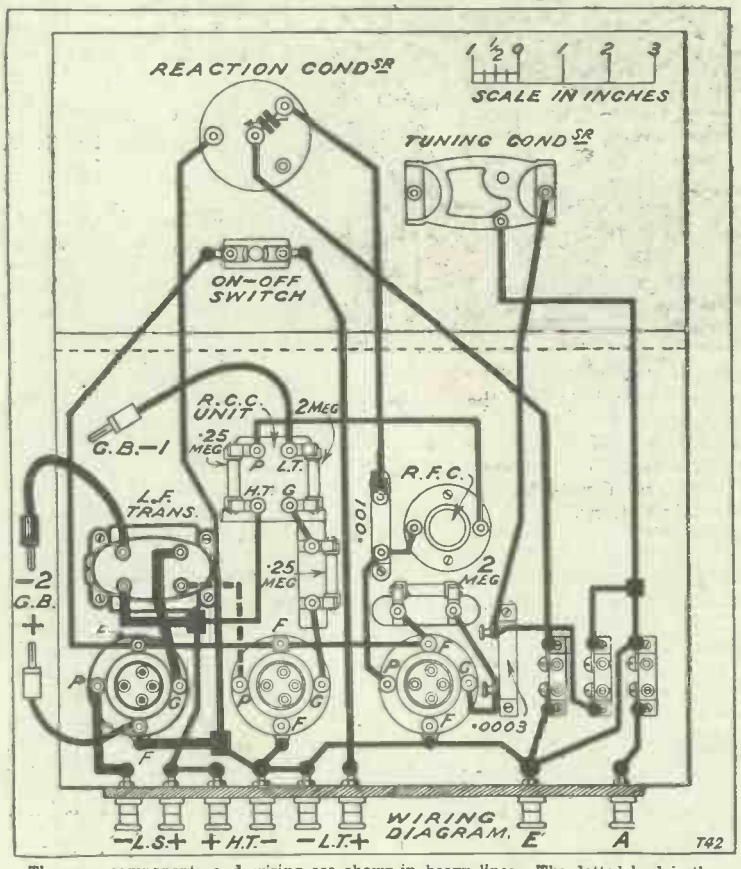
I do not expect that you will have any trouble with this set, because it is perfectly straightforward in design, and any little points concerning it, which crop up in subsequent correspondence, will be specially dealt with in the "Radiotorial" columns. By the way, I hope you have been watching these closely every week, for a special selection of queries has been made that closely follow the development of this series.

One final word in regard to the operation of the receiver. Providing you are careful with the reaction adjustment, upon which will depend to some extent the comfortable listening of others, you can experiment with the majority of the other adjustments as much as you like. But be careful with the H.T. battery. If this accessory becomes connected across the filaments of the valve, it will destroy them. Note that the plus terminal is connected only to the loud speaker, L.F. transformer and R.C.C. unit. Any other direct metallic connection with this point may be dangerous.

You can use a gramophone pick-up with this set and it is most suitable for such work. Adaptors can be obtained which render the plugging-in of such a device a very simple business. An adaptor of this kind has pins like a valve, the upper portion being itself a valve holder.

The adaptor is plugged into the first (detector) valve holder in the set, and the detector valve, which has, of course, been removed, is in its turn plugged into the adaptor. Two leads come away from the adaptor, and these are joined to the pick-up. No alterations of any kind have to be made to the set.

A pick-up adaptor costs only a few shillings, and can be purchased at practically any radio store.



The new components and wiring are shown in heavy lines. The dotted lead is the existing one which has to be altered this week.

Using Mains Units.

A few words with reference to the use of mains units with the "Progressive" Three may prove useful. The first thing to remember is that if an H.T. Unit for D.C. mains is to be employed it must be made certain that there is no direct metallic connection between the set and earth.

Some eliminators incorporate a fixed condenser for breaking this connection. The earth lead is joined to a terminal on the unit, another short earth lead running from another terminal on the unit to the earth terminal on the set.

Failing such a provision in the unit itself, it will be necessary to obtain a 2-mfd. fixed condenser. One terminal of this should be connected to the earth terminal of the set, the other accommodating the earth lead. Thus the condenser breaks the path to earth.

Some H.T. units supply limited currents, and it should be noted that the unit wanted for a set of this kind needs to be able to deliver currents up to at least 15 milliamperes.

In the case of an A.C. mains unit for supplying H.T., this can be of a robust character, employing either a valve or "dry" rectifier. There are units available which will give you grid bias as well, though for this set a large unit having high voltage and current-output characteristics really is not needed.

YOUR COMPLETE SHOPPING LIST.

This week, for the benefit of new readers, we are giving the complete list of parts needed for the three-valve set.

1 Panel, 14 in. × 7 in. × ¼ in. or ⅜ in. (Any good branded material, Radion, "Kay Ray," Ebonart, Becol, etc.).

1 Cabinet to fit, with baseboard 9 in. or 10 in. deep (Raymond, Arteraft, Camco, Pickett, Caxton, Bond, Makerimport, Gilbert, etc.).

1 ·0005-mfd. variable condenser, with slow-motion movement, or subsequently fitted with a special dial as previously indicated (Lissen in original. Any good make, J. B., Igranic, Cyldon, Raymond, Bowyer-Lowe, etc.).

3 Baseboard-mounting coil holders suitable for standard plug-in coils (Lotus, Raymond, Burne-Jones, etc.).

1 Terminal strip, 12 in. × 2 in. × ¼ in., with 8 terminals. (Indicating terminals such as Igranic, Belling-Lee, Eelex, etc., give a neat finish.)

2 Valve holders, baseboard type, anti-microphonic (Benjamin, Lotus, Igranic, W.B., Burndept, Redfern, Burne-Jones, B.T.H., Marconiphone, Bowyer-Lowe, etc.).

1 Grid leak and holder, 2 megohms (Lissen, Dubilier, Mullard, Igranic, etc.).

1 Fixed condenser, ·0003 mfd. (T.C.C., Igranic, Dubilier, Lissen, Mullard, Clarke, Burne-Jones, etc.).

1 On-off panel-mounting switch (Lotus, Lissen, Benjamin, etc.).

1 Variable condenser for reaction control, ·00025-mfd. capacity (·0002 or ·0003 will serve, also, either an ordinary variable condenser or one of the special small reaction type, such as Igranic, Cyldon, J.B., Bowyer-Lowe, Peto-Scott, etc.).

1 Fixed condenser, ·001-mfd. capacity (Dubilier, Lissen, T.C.C., Mullard, Clarke, Igranic, etc.).

1 High-frequency choke (Lissen, Cosmos, R.I.-Varley, Colvern, Igranic, Dubilier, Lewcos, Climax, Burne-Jones, Wearite, Bowyer-Lowe, etc.

1 R.C.C. unit (Lissen, Dubilier, R.I.-Varley, Marconiphone, etc.).

1 Grid leak and holder, 25 megs. (as above).

The additional parts needed to complete the three-valve set are :

1 L.F. transformer (Lissen, Mullard, R.I.-Varley, Ferranti, Marconiphone, Philips, Igranic, etc.). Note.—The component should have a ratio of 3, 3½, or 4 to 1.

1 Valve holder (as above).

Philips— the modern transformer for all modern circuits !

Choose Philips Transformers for your new circuit and give your receiver the best inter-valve coupling in keeping with the great developments in modern radio valves.

All the purity formerly associated with resistance capacity is now given by Philips Transformers at even *greater volume.*

Small, neat and highly efficient, this improved transformer offers you wonderful results and wonderful service. Its special construction eliminates all possibility of deterioration or break in the windings.

Ideal for Pentode Valves. Fit Philips in every modern circuit and secure the best from your radio.

Post the Coupon below for leaflets

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M.....

.....

P.W.

The remarkable 'Blue Spot' speakers
—and what they say about them

Blue Spot 44.—This cone speaker embodies the well-known and well-tried principle of the free edge cone. Only after a good deal of experimental and research work did we decide finally on the material and size of the cone, and buyers are therefore assured that it is to all intents and purposes impossible to improve on this practical demonstration of free edge cone theory. The cone is driven by the famous "Blue Spot" Balanced Armature Unit which we submit is generally recognised as the finest balanced armature movement available. All false resonances and natural frequencies have been carefully obliterated, and the performance of the speaker has so far received nothing but praise. Price £1 17s. 6d.

Blue Spot 49.—This attractive loud speaker is enclosed in a "Trolite" case of pleasing design, and faced with an attractive tapestry front-piece. The driving unit is the "Blue Spot" Adjustable Tongue System Driving Unit, which is capable of handling great volume without distortion and yet at the same time gives quite pleasing results with low H.T. values.
The cone is mounted on a baffle plate, and is based on the same principle as our more expensive models. The cabinet has been carefully designed to avoid distortion by natural resonances, and the complete speaker gives very faithful and pleasing reproduction. Price £2 2s. 0d.

Blue Spot 59.—Designed according to the results of our very latest research work, this cone speaker is a striking tribute to the "Blue Spot" principle of reproduction. The driving movement is No. 66K, our very latest model. The cone is of special paper mounted on a ring of Balza wood, which in turn is floated on a baffle plate by means of soft leather segments. This special method of mounting the cone is based on the theory of filtering out the dominance of the middle register, and thus giving equal response over the whole audio range. Price £4 4s. 0d.

The new one-o-one is Blue Spot at its best—a speaker whose interpretation is a revelation in realism. You can rely upon it for any programme—it is equally happy on speech, symphony or grand organ. Nothing escapes it—your dealer will demonstrate.

Price:

£3 13s. 6d.

"Ideal Blue Spot Cone Speakers are sold under full protection of the patents owned by Standard Telephones & Cables and the Hopkins & Lektophone Corporations."

The BLUE SPOT 101 CONE SPEAKER

Blue Spot Speakers have won outstanding praise from all quarters. These are extracts from a few of the press opinions about "Blue Spot" models.

It gives to each note its true value, whatever its pitch, and covers a very wide band of frequencies. Bass notes are reproduced with a faithfulness that has to be heard to be realised, while treble notes are clear and smooth, and unmarred by any harshness or "rattle."
This speaker gives to wireless reception an added enjoyment, as every note is reproduced exactly as transmitted, there being no distortion through excessive resonance, nor loss of notes through the frequency band covered being too restricted. It will take a very heavy load "without turning a hair," and its reproduction has a depth and roundness that are a revelation to all who hear it for the first time.—"The Daily Telegraph."

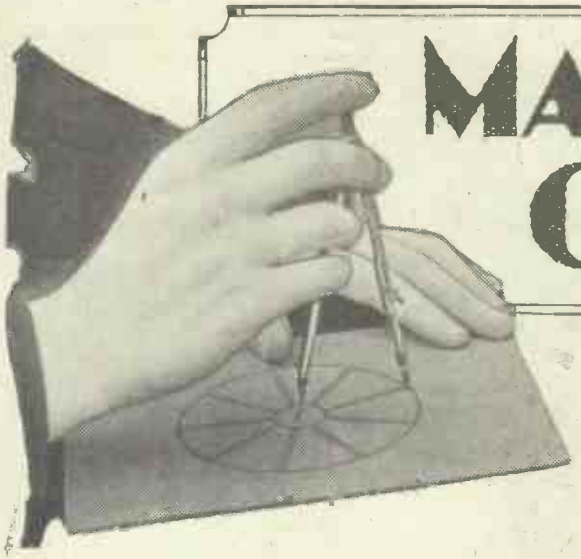
A loud speaker that gives clarity of tone, and is sold at a moderate price, is the ideal that we are all seeking . . . . Those who are seeking a cone loud speaker of this sort should ask their wireless dealer to give them a demonstration of its capabilities, and I should be much surprised if they came away without buying this excellent component . . . . There is an absence of the dissonances that so frequently mar the reception that one gets by means of a loud speaker.—"Morning Post."

This instrument . . . . incorporated the well-known Ideal four-pole balanced-armature unit; a "Blue Spot" device which will be familiar to most discriminating amateurs . . . . We have had exceptional results with one so used, and can endorse the makers' claims for it.—"Modern Wireless."

F. A. HUGHES & CO., LIMITED,
204-6, Great Portland Street, W.1

Distributors for Northern England, Scotland and North Wales:
H. C. Rawson (Sheffield & London) Ltd., 100, London Road, Sheffield; 185, Princess Street, Manchester.

and therefore labelled
BLUE SPOT



MAKING *your own* COMPONENTS

An Article which will Appeal to the Handyman.

By N. AYTON SCARLETT.

IF you want to assemble the biggest possible set for the least possible money, it will be advisable for you carefully to determine whether or not you can make any of the required components and accessories yourself. Some you will find that you could not possibly tackle; such items as L.F. transformers can only be constructed in very well-equipped workshops.

On the other hand, there will be items which are, it will be found upon examination, just as cheap, if not cheaper, to buy than to make oneself. Let me deal first of all with accessories.

Batteries are what I should call specialist productions. Considerable manufacturing skill and complicated processes go to the making of accumulators and dry batteries

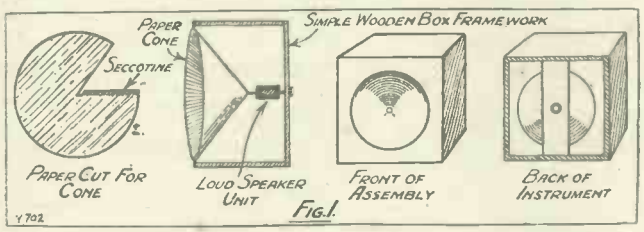


FIG. 1.

But complete sets of parts for the assembly of the wet Leclanché type of H.T. battery are obtainable, and these offer a definite and attractive alternative to the dry variety. Carefully maintained, wet H.T. batteries can be an economical source of supply for medium sizes of sets.

Assembling a Loud Speaker.

If you have supply mains laid on, an H.T. mains unit will be your best proposition, and one of the designs given from time to time by "P.W." will prove, in the long run, a most inexpensive article, especially if a large receiver is to be operated.

Valves are quite out of the ordinary amateur's province; they are even more of a "specialist" nature than batteries. But what of the loud speaker? A good cone model may cost £5 or more, but a very pleasing cone instrument can be made by the amateur with very few tools for something well under £1. All that is needed is a loud-speaker unit such as the Lissen "Lissenola," a sheet of stiff paper and a small amount of wood.

The assembly of such a device is simplicity itself. The more ambitious constructor can build the article into a cabinet of a more or less ornamental nature on the lines of Fig. 1. It is necessary to leave the back as open as possible, as shown, in order to avoid "box" effects in the reproduction. The front can be covered with colourful muslin or a carved wooden grill fashioned from three-ply.

By the way, the "Lissenola" functions very well indeed with a small, straight wooden horn, and this is a use of the device which may commend itself to the amateur who does not wish to tackle even the simple carpentry involved in the cone assembly.

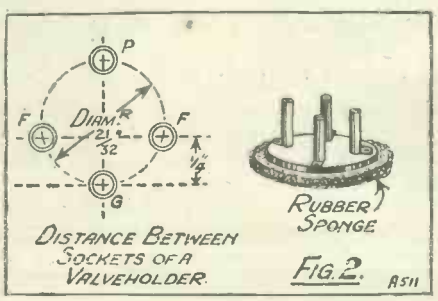
Construction of Coils.

The coils of most sets can very easily be made at home, and here again it is possible to save a fair amount of money. Usually coil-making details accompany the descriptions of the various sets, but when they do not it is probable that the amateur will discover that the same coils figure in a previously-dealt-with receiver. And it is with the account of this that coil-winding details are most likely given.

Coils are becoming standardised these days, and the same ones are liable to figure in a great number of sets. For instance, we have the "P.W." loading coil. This is embodied in practically every "wave-change" set introduced these days.

And an inquiry from a friend who has taken "P.W." regularly (if you have not done so yourself) will no doubt put you on the track of the details you require. A home-made coil may not be so neat in appearance or even as compact as a bought one, but there is no reason at all why it should not be as efficient.

The ordinary plug-in types are not so easily made as the more modern "6-pin" and other multi-pin varieties or as the permanent solenoid types. All these are very definitely within the constructor's scope. And if he does not want to fashion the former and base himself, these can be purchased quite cheaply.



DISTANCE BETWEEN SOCKETS OF A VALVEHOLDER. FIG. 2.

Anti-microphonic valve holders cost anything up to about 3s. each, but one of these devices can be improvised for the expenditure of only a few pence. Four valve sockets should be obtained, and these retail at 1d. or 1½d. each. These should be mounted in a small piece of ⅛-in. ebonite—the dealer from which you buy a few shillingsworth of other radio material will give you a little scrap ebonite for the asking, as he will always have heaps of this on hand. At the most he cannot ask you more than 1d. or so for a few square inches.

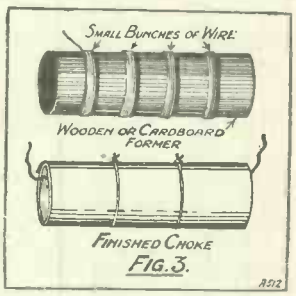


FIG. 3.

The sockets should be mounted in accordance with the spacings given in Fig. 2, and two holes drilled through which mounting screws could be passed. A soldering tag should be screwed under each socket, otherwise the leads could be screwed under direct or taken to the nuts beneath, but in either of these methods there are "snags" when the holder is baseboard mounted.

A piece of spongy rubber about ½ in. thick should be obtained by dispoiling a bathroom accessory. This rubber should be cut slightly larger than the portion of holder so far constructed. Two thick, soft rubber washers (¼ in. to ⅜ in. diameter and ⅛ in. thick) should be obtained or cut from an eraser.

Winding an H.F. Choke.

The mounting screws should first be passed through these washers and then through the holder with the spongy rubber underneath. The holes in the ebonite should be sufficiently large to give the screws an easy "play." The screws should be driven home so that the spongy rubber is not squashed down too hard, but so that the holder is free to rock quite easily.

The holder may not be quite as good as a 2s. 6d. one bought at a shop, but I will guarantee that it will answer your purpose.

An H.F. choke may cost anything up to half a guinea, and be worth the money. But the H.F. choke used in the detector circuit of an ordinary set used for normal broadcast reception (not short waves) is

(*Continued on page 279.*)

RADIO REMINDERS.

A SOFT rag with a trace of medicinal paraffin oil on is quite a good renovator for french-polished cabinets.

* * *

You must not run your aerial across other people's property without their permission.

* * *

Unless your aerial is less than forty feet long it is better to use one wire than two, in most circumstances.

* * *

A series of *regular* clicking or plopping noises in a set generally indicates that a grid leak of too high a value is being used.

* * *

A run-down H.T. battery is the commonest cause of sizzling noises accompanied by distortion.

* * *

Instead of having an open tin of flux upon the work bench it is a good plan to cut a hole through the lid into which a match stick or other convenient gadget may be inserted when using the flux.

* * *

Coil winding can very often be simplified by the use of a hand drill used in a vice.

* * *

A strong solution of ordinary washing soda will completely remove deposits upon accumulator terminals.

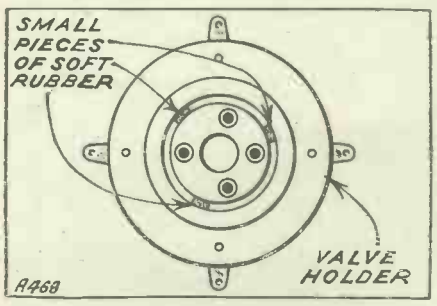
* * *

If a loud speaker is connected to the input of an L.F. amplifier the output of this will reproduce speech from the input end even though fairly long wires are used to connect the input and its "microphone."

A VALVE-HOLDER IMPROVEMENT.

FROM A READER.

MANY wireless enthusiasts endeavouring to cure the microphonic tendencies of their valves, have invested in the purchase of the so-called non or anti-microphonic valve holder with sometimes doubtful results. Quite often these valve holders are equipped with springs, which, as there is nothing to damp their action, vibrate



quite readily at a frequency of their own and may thus help to make matters worse.

Most of the anti-microphonic valve holders at present on the market are made somewhat after the style of that shown, referring to which we see that small pieces of soft rubber have been lightly inserted in the space between the sprung and the unsprung portions of the valve holder. These almost entirely stop the unwanted vibration by limiting the movement of the springs and damping them down to a reasonable extent.

Makes Great Difference.

Two or three small pieces of rubber, cut from an old cycle inner tube or from a rubber sponge or other convenient source of supply, and lightly inserted thus, will often make a great difference to the average valve holder of this type. The rubber used should be as soft as can be procured. The pieces should be lightly inserted, but this and the size should be experimented with until they absorb or damp out unwanted vibration without interfering with the proper movement of the springs.

INTERESTING ITEMS.

THE use of too much filament voltage may cause a valve to lose its emission, and is one of the commonest causes of poor reception.

* * *

Do not use an ordinary small H.T. battery if your set has a power valve, as so much H.T. current is required by a valve of this type that it is essential to use a large capacity H.T. battery, or else a mains unit.

* * *

In running a long length of wire from the set to the loud speaker, be careful to keep this a considerable distance from the aerial lead-in, as if the two are too close together a persistent and annoying howl may develop.

RADIO "HIDE AND SEEK."

The transmitting station operated by the 47th Divisional Signals, Territorial Force, and hidden at Elstree during the recent Field Day of the Golders Green and Hendon Radio Society. The members spent an exciting time tracing it.

MAKING YOUR OWN COMPONENTS.

(*Continued from page* 277.)

by no means a critical component. One that is even roughly home-made will generally give you just as good results as any other.

Special formers for H.F. choke winding are obtainable, with full instructions, from firms such as Messrs. Redfern, Raymond, etc., and the total cost is not going to be more than a shilling or two. There may be some hundreds of turns of wire to wind, but although this may be a little tedious it really is easy work, which need not be too "finnickly" carried out.

If you do not want to do so you need not even buy a special former. You can obtain a cardboard tube or wooden rod an inch or so in diameter, and three inches long, and wind the wire on this in the following way. One ounce of 36-gauge silk-covered wire will be ample.

Secure one end of the wire through a hole in one end of your former, and wind four or five bunches of about one hundred turns each. The bunches can be rapidly wound on, but should be kept fairly tight and separated by about ¾ in. each. Then the whole should be wrapped round with a piece of thick brown paper. Starting from the same end as before, another series of bunches should be wound on until about eight hundred turns have been completed. The exact number need not worry you.

Not Worth While!

The end of the wire should then be secured, and the device is ready for use. It can be covered with more paper or insulating tape if you so desire.

There are not many other components or accessories that you will find worth while making yourself. You could make fixed condensers with tinfoil and paper, and grid leaks and resistances with pencil lines or Indian ink and paper, but the difficulty is even roughly to approximate the required values. For the sake of a few shillings improvisations here are not really to be advised.

However, there are other means of saving money on sets worthy of serious consideration than that of making things, and in a further article I hope, in the near future, to be able to place my ideas in this respect before you.

THE VALUE OF VARIETY IN BROADCASTING.

Sir Oswald Stoll, in an interview, makes some frank and far-reaching proposals for improving broadcast entertainments.

By ARIEL.

THE Press has recently devoted some space to a controversy between the British Broadcasting Corporation and the Variety interests. The difference at some time appeared to be getting a little acute, but it is stated by Sir Oswald Stoll, with whom I had the privilege of an interview recently, that the position of Vaudeville managers has not altered.

"If, as is obviously the case, a great part of the public desire to be instructed or entertained by means of wireless," said Sir Oswald Stoll, "it is the duty of the purveyors of what has become almost a necessity, to provide the best commodity available."

It is agreed, according to Sir Oswald, that there must be some sort of control in allocating bands of wave-lengths and so forth, but, subject to such control, anybody who can give guarantees of the efficiency, continuity and quality of the services he wishes to provide, should be allowed to broadcast.

"Incompetent Authority."

"Some control is necessary in regard to the hours during which a specified broadcaster might work," said Sir Oswald Stoll to me.

"Apart from these considerations there should be no monopoly such as the Broadcasting Corporation at present possesses. In point of fact, in the United States there is no monopoly, and a large number of stations work on wave-lengths allotted by the Government and listeners have a very wide choice of material to which they may wish to listen.

"It is quite obvious that professional representatives of the interest with which I am primarily concerned, namely, variety, are those best qualified to broadcast variety," went on Sir Oswald Stoll. "Those interests are not claimed to be the best channel by means of which other matters should be placed on the ether.

"Time should be allotted to every subject in which the listening-in public is interested. For example, I would suggest that religious bodies should be allotted a time for broadcasting religious services and exercises. Sporting organisations should be allowed to use the air for their particular interests. Art and Science should be allocated their due space. Medicine, letters, music, and so forth, should be permitted to put forth their own particular subjects. But all this must be done without detailed control by an extraneous and incompetent authority.

"The present method of broadcasting may be, and in my opinion undoubtedly is, open to this criticism—that all types of instruction and entertainment are not permitted to broadcast the best of which those interests are capable, subject, and subject alone, to the control of the representative bodies of those interests, without the interference and censorship of a quasi-amateur body."

It was in April, 1927, that the controversy between the Vaudeville Managers and the British Broadcasting Corporation was at its height. Sir Oswald Stoll was the central figure in this controversy, and it is interesting to remember the statement that he issued at the time.

Complete Absence of Red Tape.

"Nothing but a considerable amount of money," he said then, "can indemnify managers against the loss their business would be likely to sustain by the broadcasting of variety performances by any authority other than themselves, since they alone have the means with which to do it properly. That amount, I estimate, should not be less than £60,000 per annum. With regard to my own companies, the price to be paid for a separate arrangement individual to them as a whole should not be less than £15,000 per annum."

In a concluding paragraph of the statement Sir Oswald Stoll added that he was ready to negotiate with the British Broadcasting Corporation on these terms, and although many months have passed nothing has happened. When I recently broached the subject to Sir Oswald Stoll he said to me:

"I am not in any way opposed to broadcasting, although I have many faults to find with the present system of wireless entertainments. I regret, as I have said before, most of all the fact that broadcasting in this country is under a monopoly. The best thing that could happen to broadcasting, in my opinion, is for it to become a free organisation without any ties at all, and newly launched with a complete absence of red tape."

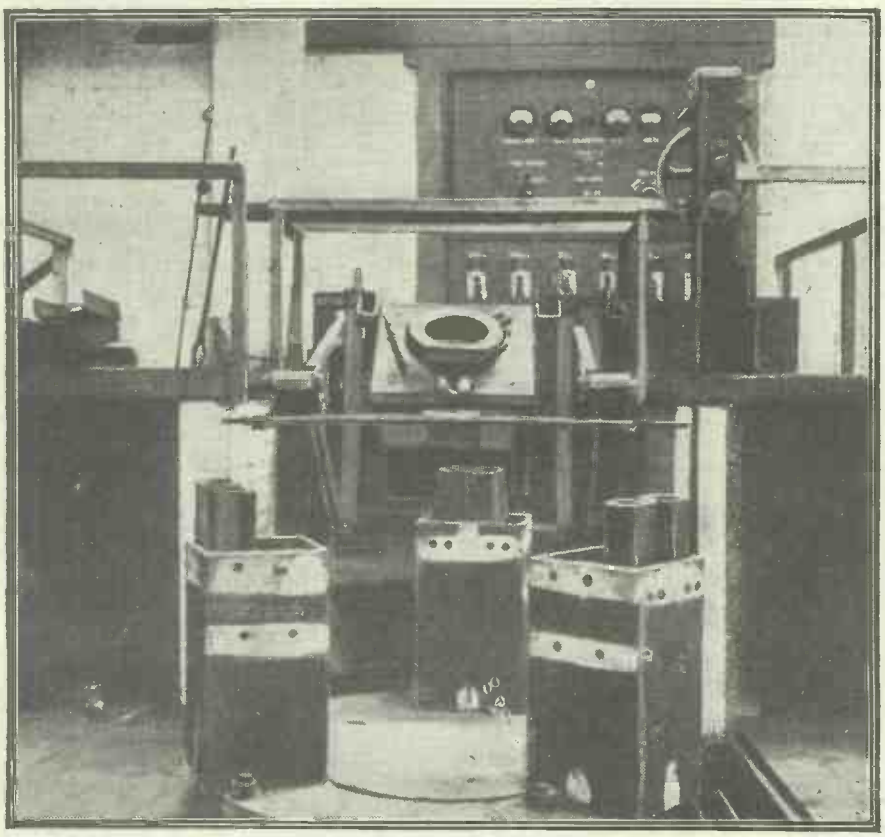
In conclusion Sir Oswald Stoll assured me that he would not lend a deaf ear to any proposition on the part of the London station to broadcast variety programmes which, he is of the opinion, is only possible if the foregoing suggestions are carried out.

"I am perfectly willing to listen to any proposition from the British Broadcasting Corporation to broadcast real variety entertainments," were his last words to me.

"I am not, however, agreeable to entertain the kind of proposition that is often submitted to me and which is to the effect that I should give a broadcast of the whole or part of one Coliseum or Alhambra variety performance.

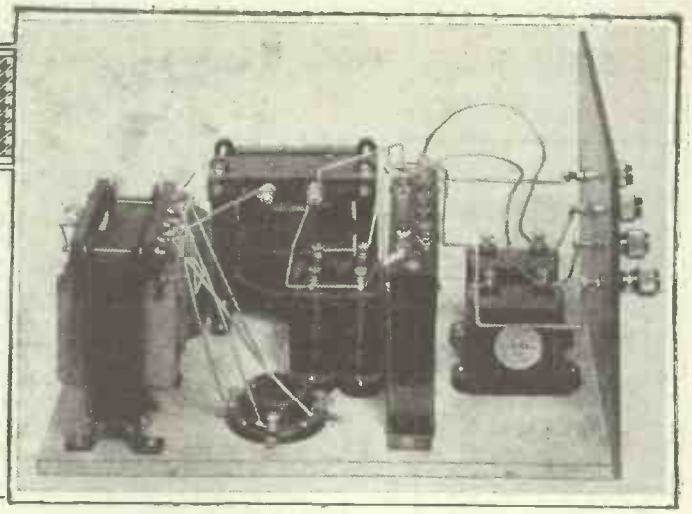
"If the B.B.C. care to approach me with a suggestion for a series of broadcasts of variety from any of my theatres, I shall not treat the offer with contempt. I am, above all, willing to give every help that is within my power to ensure that variety gets its merited place in the wireless programme of to-day."

MELTING STEEL BY RADIO-FREQUENCIES.



This is the first high-frequency electrical furnace, and it has been installed by a Sheffield firm. Steel is melted by H.F. currents, and much labour is eliminated. In the one operation a greater tonnage at a lower cost can be produced than by other methods. Above is shown the switchboard and casting turntable.

A SIMPLE A.C. UNIT



Why not get your H.T. from the mains? This H.T. unit, which can be used with any A.C. mains, is quite easy to construct, will provide you with an adequate H.T. supply—even for a large set—and it is absolutely silent in operation. The cost of running is negligible, so the expense of renewing H.T. Batteries is completely obviated once the unit is fitted. It gives variable H.T. voltages—1 fixed H.T.+ tapping, and two variable ones—so any normal voltage requirements are completely covered.

Designed and Described by the "P.W." TECHNICAL AND RESEARCH DEPARTMENT.

"GET my H.T. from the mains? Well, so I would, but my supply is alternating, and I suppose that means it would be an expensive business." Many people make some such reply as this to the suggestion that they should use the mains for their sets, and the impression seems to be quite a general one. General or not, the impression is not really quite correct, for the extra expense is not truly so very serious.

Extras for A.C.

Let us see just what the difference is between a unit for D.C. mains and one for use on an alternating supply. Well, both must contain "smoothing" circuits consisting of one or more chokes and large reservoir condensers, and devices for obtaining various voltages. When we have realised this we see that really the main parts of any eliminator unit are common to both types. All that is needed in addition in an A.C. unit is merely a means of rectifying the alternating current before it is passed into the smoothing circuits, and this is not truly a very expensive part of the unit.

Outputs Available.

The extra parts we need, in a unit of ordinary type, are these: a suitable power transformer with high and low-tension windings, a rectifying valve and a socket to carry it. The total extra cost need not amount to more than about 50s. if we do not require very high voltages, so that the transformer can be a small one.

In the unit you see in the photos, for example, the transformer is one costing 32s., the maximum output being about 180 to 200 volts at currents up to about 30 milliamps. Larger currents can be taken if required, of course, but the maximum voltage then comes down to about 150. Even so, you will see that the unit is suitable for quite large sets, with a super-power valve in the last stage.

If it is to be used only on small sets, say two- or three-valvers at most, an even smaller power transformer can be used, and the cost reduced a little further. For example, with such sets the maximum H.T. required for medium-sized valves may be perhaps 140 volts, and to get such an output as this we only need quite a small transformer.

One with a high-tension secondary winding rated to give 150 volts on either side of the centre tap (usually described as a "150—0—150" winding) will be quite adequate, provided that it also has the necessary low-tension secondary for lighting the filament of the rectifying valve.

The voltage required from the L.T. secondary will depend on the particular rectifying valve to be used, and will usually be either 4 or 5-6 volts. For example, for the following rectifiers you require a 4-volt supply: Mullard D.U.2, Cosmos U/42. For the Marconi or Osram U5 (seen in the photos) a 5-6 volt winding is correct. The original transformer was a "Goltone" giving 200—0—200 volts (H.T.) and 3—0—3 volts (L.T., really a nominal 6-volt winding with a centre tap), which is, of course, intended for use with the U5.

If one of the 4-volt filament rating rectifiers is to be used it is best to use a transformer with the correct filament winding, and a suitable one can easily be chosen from amongst those produced by Messrs. R. I.-Varley, Igranic, Heayberd, [etc.] Another method worth noting is to keep to a transformer with a 5-6-volt winding and use a couple of rheostats to cut down the voltage to 4.

Suiting Different Rectifiers.

The advantage of this scheme is that, if at any time you want to use a 5-6-volt valve you can do so by turning the rheostats full on, but if you do this you should look carefully and see whether, when they are full on, the slider really makes contact on the end turn. In some patterns you will find that it does *not* do so, leaving two or three turns always in circuit. Where this is the case it is best to short the rheostats out altogether with bits of wire across their terminals to make sure that the full voltage actually reaches the valve.

If, of course, you intend to use nothing but 5-6-volt rectifiers you can omit the two rheostats altogether and wire the filament terminals on the transformer straight to the terminals on the valve holder. (See wiring on blue print.)

Now, as to the 4-volt type. It has already been remarked that you can use one of these on a 6-volt transformer by including rheostats, and the reader may be wondering why two should be specified when it might be imagined that one would be enough.

Well, the reason is that to put just one in circuit would upset the location of the centre tap on the filament circuit. If one is put in each lead, both being set to the same value, the "symmetry" of the circuit is maintained and all is well.

Resistance Required.

When a 4-volt rectifier is used in this way you require a resistance of 1 ohm in each filament lead, giving a total of 2 ohms in all. Now, it might at first appear that this is a difficult business, for the voltage on the valve must obviously be adjusted fairly accurately lest the filament be damaged (too low a voltage is as bad as too high a one with some types of valves). There is quite an easy way out of the

(*Continued on next page.*)

SIMPLE A.C. UNIT.

(Continued from previous page.)

difficulty, however, and that is to use one of the roughly calibrated types of rheostats, such as the Igranic.

These have a scale which shows you just where to set the slider, and so it becomes quite a simple matter. You should be careful, by the way, to choose a rheostat which will carry a fair amount of current without showing signs of catching fire, since the filament current of these valves is of the order of 1 to 1½ amperes. (The Igranic type were used for tests in the original.)

Smoothing Circuits.

As to the choice of a rectifying valve, you will find that any of the well-known makes will work perfectly in this unit, but it is to be understood that one of the full-wave type must be used. A few suitable examples in the different makes have already been given.

This completes our consideration of the A.C. rectification part of the unit, and we can now go on to the smoothing and voltage adjusting parts of the circuit. Immediately following upon the rectifier comes a 2-mfd. reservoir condenser, and then a double-winding type smoothing choke, one winding being connected in series with the positive lead and the other in the negative.

This is a very convenient scheme for use wherever the output currents required are not very large, say up to 15 milliamps or a little more. (An example of such a double choke is the Igranic.)

Heavy Currents.

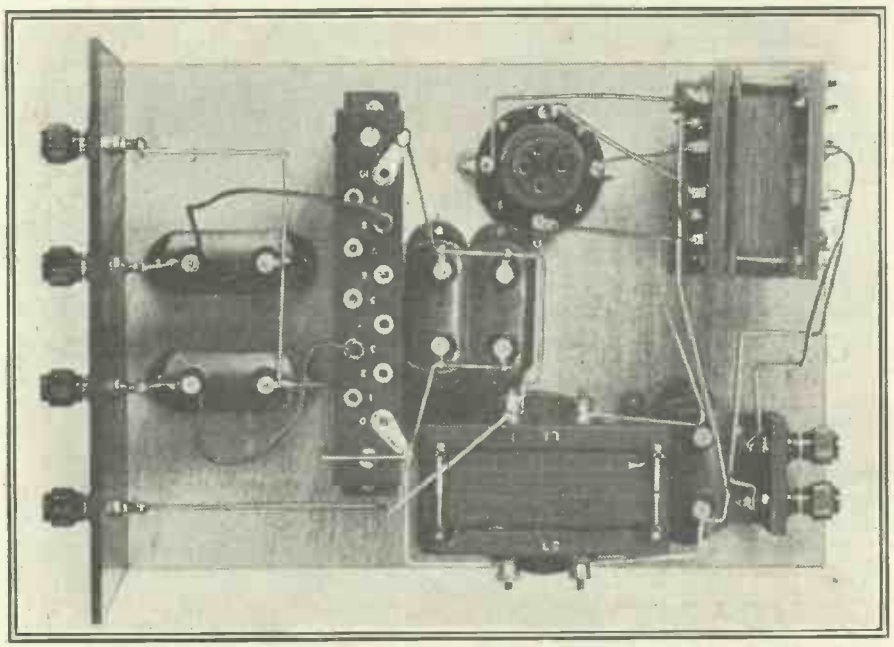
Where quite large currents are required a heavy duty choke should be used, such as the R.I.-Varley 28/14 henry model, and this will be found to have only one winding. This should be connected in the positive lead where the L_1 winding is connected on the blue print. The two wires shown going to the other winding (L_2) should, of course, then be joined together to form one lead.

After passing through the choke the currents arrive at another reservoir condenser (either a single one of 4 mfd. or two of 2 mfd. as in the original), which completes the smoothing. Next we arrive at the device provided for obtaining various voltage tappings, which in this unit takes the form of a "potential divider."

SPECIAL PRECAUTIONS FOR A.C. MAINS WORK.

1. **Always switch off at the mains first and leave the filaments turned on for a few moments to empty the reservoir condensers in the unit.**
2. **Always switch off at the mains before making any adjustments inside either the set or the H.T. unit.**
3. **Be careful to use adequate grid bias on your L.F. and power valves. The unit gives fairly high voltages and valves may suffer if proper bias is not used.**
4. **If you get crackling noises from the H.T. supply, remember that it may be due to a dirty switch contact, defective lamp holder, etc., somewhere about the house.**

This is simply a large tapped resistance connected right across between the positive and negative sides of the circuit, and in the original was an Igranic type. There is, of course, a fall of potential all the way along this, and hence all the tappings will be at different potentials, so that we can obtain the desired variations of voltage quite easily by inserting plugs in the various sockets.



Here is a "looking-down" view of the A.C. H.T. unit, which clearly indicates the positions for all the various components and the general layout. Compare the photograph with the Blue Print.

On the complete unit you will find that there is a negative terminal and three positives, one of these (H.T. + 3) being a fixed maximum tapping, giving about 180-200 volts, which is intended for running power and super-power valves of those types capable of standing up to such a voltage.

The other two terminals (H.T. + 1 and H.T. + 2) each carry on the inside of the panel a flex lead terminating in a wander plug (Clix, Eclex, or similar type) which can be inserted in any of the sockets on the potential divider (sometimes called a mains potentiometer).

These two adjustable voltage terminals are intended for the supply to the H.F. and detector valves in the receiver, and it is not possible to tell exactly where to place the plugs to get any given voltage, since this varies according to the current drawn.

Simple Adjustments.

However, it is quite easy to find a good adjustment for each by trial, and as a rough guide you can take it that if you put the plug for the H.F. tapping in a socket near the middle of the potential divider you will get somewhere about the correct 90-100 volts; while the detector plug should usually go in the second, third, or fourth socket, counting from the right when looking at the unit from the front.

These positions, of course, assume that the maximum voltage (on H.T. + 3) is about 180 to 200 volts, and if you have used a smaller transformer so that the maximum is only about 140 volts, you should move each plug a couple of sockets further to the left, again looking at the unit from the front.

If you required three separately adjustable positive tappings for any special purpose you can obtain them quite easily by making a very simple little modification in the unit. This does not prevent you from getting the full maximum on H.T. + 3 when desired, and the modification suggested can be regarded as a definite improvement on the original unit wherever much experimental work is to be done. We did not incorporate it in the design itself simply because we wanted to keep it as simple as possible.

Three Adjustable Tappings.

This is what to do if you find you DO want the third tapping to be adjustable and not fixed: Look at the wiring diagram and the photo on this page and you will see a wire running from the H.T. + 3 terminal to one terminal on the choke. Remove this, and attach to H.T. + 3 instead a flex lead carrying another plug on its end, which can then be inserted in a suitable socket on the potential divider. This modification will serve quite well for most purposes, but for the best results under all conditions you should also add another 2-mfd. condenser, wired between H.T. + 3 and H.T. —.

By the way, if you want to work a rather small set from this unit, say, a det. and L.F. two-valver, the best procedure is usually to run the detector from H.T. + 1 and the L.F. from H.T. + 2, which can be brought down to a suitable voltage for the medium-sized power valve likely to be in use. You can then retain the 200-0-200 type of power transformer, and have the higher voltage (H.T. + 3) always in reserve for *the bigger set you are likely to build some day.*

Just one constructional point: it is decidedly important to use covered wire for all the connections in wiring up. Bare wire is dangerous.

NEXT WEEK

FOUR MORE 6d. BLUE PRINTS FREE!

NEXT WEEK

A Valuable and Practical Two-Shilling Gift for Every Reader of "Popular Wireless."

The four fine blue prints which are given away with this week's "P.W." represent only half of our free gift to readers. Next week we shall be presenting four more blue prints, consisting of:

THE "ANTIPODES ADAPTOR"

A simple one-valve unit, easy and inexpensive to make, that *converts any ordinary valve set into a short-waver, capable of picking up Australia direct.*

THE "ANY-MAINS" TWO

This set can be used on either D.C. or A.C. mains, the only batteries required being the L.T. accumulator and the grid-bias battery. Easy to make and to instal, this receiver is a trouble-free triumph.

THE "BANDMASTER"

A four-valver (H.F., Det. and 2 L.F.) that incorporates a special scheme for getting full efficiency from your valves, and full selectivity under *all* conditions. A set to enjoy all the year round.

THE "LONG-RANGE" THREE

As the name denotes, this set is designed for real long-distance work, on both medium and long waves. No coil changing, and special high-efficiency switching make this an ideal "Home" receiver.

BEAR THIS IN MIND.

In next week's issue also will be found long illustrated articles dealing with the construction of The "Wave-Change" One and The "Regional" Three. The blue prints for these sets are now in the hands of all our readers, but these articles cover those many little practical points that may at first puzzle the newcomer to radio. Other blue print sets will be dealt with in subsequent issues.—THE EDITOR.

Order Next Week's "P.W." Now

and add to your collection

FOUR 6d. BLUE PRINTS FREE

LOTUS

THE MASTER VALVE HOLDER

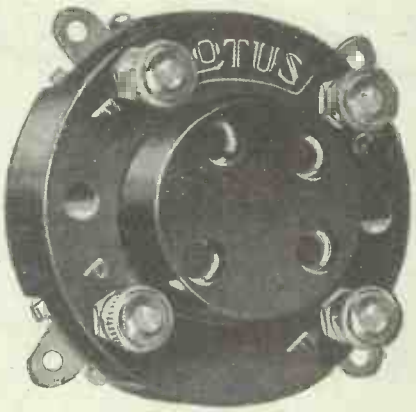
SPECIFIED FOR Mullard Master 3

Again Mullard have chosen Lotus Valve Holders for the Master 3. A good set demands a good valve holder, and Mullard have chosen the best their experts could find.

The new Lotus Miniature Valve Holder is anti-microphonic, almost indestructible, and only 1⅝ths" in diameter.

Phosphor bronze leg sockets and springs are all in one piece, all surplus metal has been removed between the valve legs, and the very finest bakelite mouldings have been used.

If you are building the Master 3 or any other good set, make sure you buy the new Lotus Miniature type Valve Holder. It will make all the difference to your set.



From all radio dealers, price 1/3.
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VALVE HOLDER
ANTI-MICROPHONIC

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Kingsway, W.C.2

Made by

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G. 672

FROM THE TECHNICAL EDITOR'S NOTE BOOK

NEW DUBILIER COMPONENTS.

The new "Dumetohm" holder is simply described by the makers as a "novel" component. It certainly is that, but its novelty is accompanied by usefulness—a combination which is not inevitable. The first advantage of the new Dumetohm holder is that it occupies extremely small baseboard space, but even more important is the fact that the contacts are unusually good.

Two Dubilier "Dumetohm" grid leaks, one held in the new "Dumetohm" holder.

In many grid-leak holders the contacts are of a simple pressure variety, but in the Dumetohm they are as complete and self-cleaning as could be. Readers will be able to see exactly how the component is constituted from the accompanying photograph, and they will be able to judge for themselves exactly what a refreshing departure the component is from the normal design. Another new Dubilier component is an H.F. choke which is small and compact and covers the whole broadcast range of wave-lengths. Then there is an R.C. unit with valve holder embodied in it. Messrs. Dubilier are certainly to be congratulated on the addition of some useful and brightly finished components to their already fine range of radio devices.

"GOLD WAVE" AERIAL.

Horace Soley & Co., Ltd., of Jewin Street, London, E.1, have sent me a 100-ft. length of their "Gold Wave" aerial wire. This is of American origin and consists of seven strands of gold-plated wire. I must say that it is very handsome looking material and looks most attractive in sunlight.

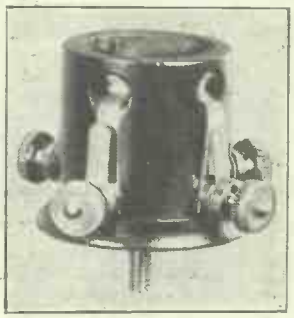
An acid test showed that its corrosion resisting properties are high, thus indicating that it should stand exposure. Also its ohmic resistance is low. It is pliable, does not tend to kink, and has considerable strength. Rather exaggerated claims are made for it, such as that it reduces static and fading, brings in "stations that your set has not previously received," "improves your set's tone"—how it can do this is somewhat of a mystery, although undoubtedly it has excellent properties. The retail price is 12s. 6d. per 100 ft., and I should say that it is well worth that.

AGAIN LISSEN'S!

There seems to be no sign of a slackening in the steady stream of new productions from that Richmond factory, and how Messrs. Lissen manage to keep it up is something of a mystery. They must certainly have gathered together a unique staff of extremely clever designers.

The latest Lissen product to hand is a new valve holder. It would be enough to say that it is as good as the other Lissen components I have recently reviewed, but it has points of its own which deserve special mention. For instance, it can be mounted on either a panel or baseboard, a nut and bolt being provided to facilitate the former procedure. Four terminals radiate from the sides of the device.

It is not fitted with the usual sockets, but is provided with four spring contacts, the plugs of the valve forcing these outwards, resulting in positive, self-cleaning contacts. No necessity for the clumsy business of opening the pins of the valve with a penknife with this holder! The whole of the centre of the holder being cut away, the ebonite moulding forming a sort of cup, the component has exceptionally low high-frequency losses.



The Lissen valve holder. The pins of this valve fix into grooves in the inside of the holder and force out the springs, two of which can clearly be seen.

Somebody may have produced a better valve holder, but I honestly cannot remember one. What I like about Messrs. Lissen's products is that they always seem to have the interests of the home constructor absolutely at heart and manage to anticipate his requirements and smooth away his difficulties. That Lissen components are cheap and, incidentally, excellent value for money, is an indirect indication of their success and popularity.

A MOVING-COIL SPEAKER.

With regard to the Lang and Squire moving-coil loud speaker, a specimen of which we recently tested and found somewhat deficient in certain respects, we have now had an opportunity of investigating the performance of two further instruments submitted, which we find to be quite satisfactory in behaviour.

The first point investigated was that of the current consumption of the field winding, the makers' rating being ·75 amp. at 6 volts. On measurement the current was found to be only ·6 amp. in both cases, to the nearest decimal point, indicating quite a reasonable degree of economy for an instrument of the "M.C." type.

Tests on signals were then carried out, a change-over switch being used to permit rapid comparison with a standard, the latter being a moving-coil speaker of very good general performance, including a degree of sensitivity above the average. Sensitivity was first compared, and it was found that the Lang and Squire speakers were both, so far as could be judged by ear, exactly equal to the standard.

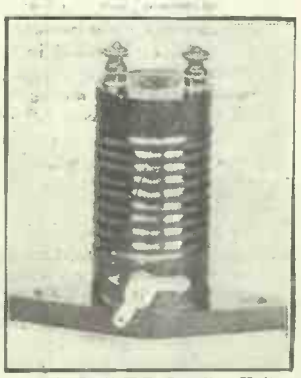
A careful test was then made on speech and a variety of musical items, and the general tone and balance of the instruments submitted was found to be decidedly good. Speech was slightly deeper-toned than on the standard, and a little "rounder," possessing the quality described by most listeners as "mellowness." It was found to be quite free from the objectionable "hissiness" and sibilance to be heard from some moving-coil speakers.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for tests. 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.

Altogether, it was found that these two instruments gave a very good performance indeed. It is, of course, quite possible that the previous specimen had been damaged in transit.

PETO-SCOTT H.F. UNIT.

The Peto-Scott H.F. Unit is a complete coupler of the size and appearance of an ordinary H.F. choke. Indeed, it embodies H.F. chokes, and gives one H.F choke-capacity coupling. There are two units, types "A" and "B." These are arranged so that when they are used together to couple two successive stages, no mutual resonance effects can occur, as they are designed with different electrical characteristics. The two units submitted for test were carefully tried out together, and singly, and found to function efficiently. They offer a simple alternative to normal methods of coupling, and make for compactness in set design.



A Peto-Scott H.F. Coupling Unit.

CORRESPONDENCE.

FILLING WET BATTERIES.

P C J J—AN ELIMINATOR DANGER —THE "CUBE-SCREEN" FOUR, Etc.

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.

FILLING WET BATTERIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have noted from time to time "tips" on the filling up of the "wet type" H.T. battery in the "Old Paper."

I myself spent half an hour on a gadget which has overcome the messy trouble some eighteen months ago, and I never regret it. All that is needed is a glass jar (2 lbs.), a cork to fit, a glass tube, and a length of rubber tubing.

It is arranged so that pressure of air from the mouth will make the gadget syphon while syphon suction will reverse the action. Six dozen batteries may be emptied and refilled with this method in ten minutes. Pressure on the filling tube with the finger will stop the dripping.

Wishing the Old Paper a great and prosperous future. I remain,

Yours faithfully,
CHARLES E. GILL.

Birmingham.

P C J J.

The Editor, POPULAR WIRELESS.

Dear Sir,—The recent discussion about the strength of P C J J has induced me to write this letter. On the 25th inst. I succeeded in bringing that station in at fair loud-speaker strength between 5.30 p.m. and 6.45 p.m., when I closed down. The announcer at one time called up the radio amateurs in Surabaya and gave the wave-length as 31·4 metres. My set is an 0-v-2 and I am using aerial 4 turns, grid 6 turns, and reaction 6 turns. Hoping this may be of interest to readers.

Faithfully yours,
A. MERRIE HARDIE.

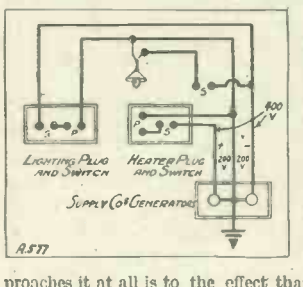
131, Hamilton Place, Aberdeen.

AN ELIMINATOR DANGER.

The Editor, POPULAR WIRELESS.

Dear Sir,—Being a reader of POPULAR WIRELESS, and noticing therein that H.T. eliminators are becoming popular, I thought I would send you enclosed sketch of a common system of wiring in a private house where eliminators are used.

You will see that it is quite possible with this system for a person looking for trouble with a defective handlamp to find more than he wants, especially if he is using the power lug for his H.T. supply. Quite unaware of the fact, he is playing with 400 volts.



As far as I know, there is no regulation to prevent this system of wiring. The only one that approaches it at all is to the effect that the plugs and main switches, etc., must be at least six feet apart, but as it is the usual practice to use standard lamps and electric radiators connected by flexible cords, you will see that the danger is present in far more places than the consumer thinks.

I hope this will prove of interest to somebody, but I cannot close without thanking you for your fine book and interesting subjects published in it, from the Unidyne onwards.

Yours faithfully,
J. BOORER.

Fulham, S.W.6.

THE "CUBE-SCREEN" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having built the "Cube-Screen" Four, described in "P.W." Oct. 29th, 1927. I would like to give my verdict with those of your readers who have already given theirs.

It is a first-class set and well worth the time and trouble taken to build. I can get twenty-one "low-power" and eight "high-power" stations, and the majority at loud-speaker strength.

I used an ancient aerial condenser, an old variable coil holder for the aerial coupling, and a plywood panel, the latter varnished and an ornamental moulding put round the edge. Results, both in operation and appearance, are very pleasing.

Good luck to "Ariel" and his "Radio Notes and News!" How refreshing to the jaded spirit of the radio enthusiast who, having built sets for others, is sometimes confronted with "I can't get a thing on it" when the L.T. accumulator is exhausted, or "This thing won't work" when the aerial lead-in is around the leg of the side-board! There are those who do not mind whether it comes through a turnip or a crystal, a wheelbarrow or a valve-set, as long as they "get the goods." It is the main thing after all, but there must be a Paradise for radio men, where accumulators do not run down, where there are no X's, and where "P.W." comes twice a week!

In the meantime, patience!

Yours, etc.,
"Windyridge," KEVIN HUGGARD.
Enniscorthy, Co. Wexford.

MAINS UNITS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I notice in a recent issue of the above journal, an article by Dr. J. H. T. Roberts entitled "Mains Unit Reception," in which the writer refers to the deficiencies of socket power. I have been using an H.T. A.C. Mains unit for about seven months now and have not come up against any of the difficulties to which Dr. Roberts refers. My unit is of the electrolyte type. The output is 160 volts. at approximately 120 m/a. As an ideal source of H.T., I consider that this is the goods. The output is steady, silent and absolutely without hum. Even on the very short waves (I can reach down to about 14 or 15 metres) there is no trace whatever of the hum that is usually associated with these units. Reception is wonderfully clear. On the medium waves I have compared reception when using unit and when using H.T. batteries, and cannot notice any difference. I, for one, shall never go back to H.T. batteries.

Yours faithfully,
N.W.6. H. FRENCH.

SHORT-WAVE BROADCASTING.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to a letter appearing in the "Radiotorial" of your issue of August 18th, 1928, under "Short-Wave Broadcasting" answering a question from A.M.B. (Vienna), I should like to inform you that the Nairobi broadcasting station, 7 L O, has been working on 150 metres for some time and never on 100 metres. Perhaps you have been advised incorrectly.

Perhaps it would be of interest to anyone listening for 7 L O, Nairobi, that on October 1st transmissions started on 35 metres and 400 metres; programmes on the former wave-length should be audible throughout the world. Times of transmissions are now and for the future, until further notice, 4 p.m. G.M.T. until 7 p.m. G.M.T. every evening, Sundays included.

Although wireless is new to this colony, I have been experimenting for over four years, and have found your paper, POPULAR WIRELESS, most interesting and helpful, having taken it in for a number of years.

I might add, that 5 S W comes in fine nearly every night on the loud speaker employing three-valves.

Wishing POPULAR WIRELESS all the best.

Yours faithfully,
W. E. LANE.

P.O. Box 572, Nairobi,
Kenya Colony, East Africa.

The Editor, POPULAR WIRELESS.

Dear Sir,—I want to convey my sincere appreciation to "P.W.," and also to the fine broadcasting of 5 S W which I get about five nights in the week.

I am an amateur radio enthusiast with a three-valve short-wave receiver, and my aerial is only 17 ft. in length fixed indoors without earth wire.

In spite of the rumour that conditions in Malaya are unfavourable towards wireless work, I have never theless worked with a fair amount of success, though sometimes atmospherics are really bad.

I have, so far, picked up more than twenty short-wave stations (mostly from Java) including the P C J J and P C L L, the latter comes in sometimes with tremendous volume with the loud speaker. The best station I have so far listened to is 5 S W, for she is always clear and loud, and the fact that I have sat up at 1 a.m. will testify that it is really worth while to wait for.

Yours faithfully,
LEE WUNG TSEONG.

154, High Street,
Kuala Lumpur (F.M.S.)

SHORT-WAVE NOTES.

By W. L. S.

TWO or three enthusiasts have written to me in connection with minor troubles that they have experienced with mains units used in conjunction with a short-wave set. Most of their queries have already been answered in the article by Mr. G. P. Kendall in the issue of September 29th. One point I have noticed, however, that one correspondent brings up is this: That if you receive a hum when the set is just on the oscillation point, that set is very near the state of threshold howl.

Inaudible "Howl."

Whether it is possible for a set to produce an inaudible threshold howl, as it is possible for a note-mag. to oscillate at an inaudible frequency, I do not know, but I have found repeatedly, since my correspondent was so good as to awaken me to the point, that a set exhibiting this annoying habit of "humming" loudly at the mains frequency when it is just on the oscillation point is almost invariably a set which has "only just" been cured of threshold howl.

Apparently the one common-sense rule to bear in mind when setting out to check threshold howl is this: keep all the H.F. out of the note-mags. at any cost. Sometimes a single by-pass condenser will cure the trouble, sometimes a single choke. Yet there are cases so troublesome that a complicated H.F. filter system of chokes and condensers is necessary before a cure is effected.

At the time of writing these notes 8 X K, 2 X A D, and all the American amateurs that work round about 20 metres are coming through much earlier than has been their wont for the past four months. On a Sunday recently I heard about forty amateur stations in the States in the course of one afternoon, whereas one has had to wait up till nearly eleven before they were sufficiently strong to be readable for some considerable time.

Apparently winter conditions are with us once more. What is rather more extraordinary is this, that a member of the "P.W." Queries Department noticed at the same time that conditions had changed. After all I have said about local conditions and reports which contradict each other, although from stations less than a mile apart, two of us found the same thing on the same day—that the Americans were stronger in the afternoon and faded out earlier at night.

A Good Set.

I have at home a commercial short-wave receiver employing a perfectly standard circuit with which I can find no fault whatever. There is no tendency to howl, reaction control is perfect, there are no capacity effects when one handles the headphones or cords, and you can touch all the dials and the panel brackets without affecting the beat-note of the signal by ten cycles. Why is it that some people can design a receiver like this while others will copy it in the smallest detail and produce an abortion which combines every fault one can possibly imagine?

One of the Ediswan S.-G. Range.

TRYING THE NEW VALVES.

Some notes on their operation that will prove of interest to all constructors.

By KEITH D. ROGERS.

IT is impossible in the short space at my disposal to discuss fully even a few of the new valves which have made their appearance during the recent show, but I have been carrying out a number of tests with some of these valves, and it may be of interest to my readers to have a brief chat upon them. In the first place, of course, we must mention the screened-grid valve, which, at last, has come out in full force, and is now available in the four-pin form. These are excellent valves and in none of the makes I have tested can the slightest exception be taken to the manner of working.

So far only the Ediswan people have submitted a 6-volter of that type to be tested, and this really lives up to the standard of the 2- and 4-volters, both of that and of other makes. It must be remembered, of course, that the Marconi and Osram people are not yet placing on the market a 6-volter of the four-pin type, the famous S.625 being retained.

Of the pentodes, of course, plenty were seen at the show in portable sets and other apparatus, and of these I need say no more than it yet remains to be seen how popular they will be, and what plans will be made for the overcoming of the disadvantage caused by their high H.T. consumption, especially where they are to be used in portables. Properly used the pentode should have a great future, but it is not a valve which the average man can just shove in his set and get perfect results right away. A certain amount of care has to be taken with regard to its operation, and one must look out for that great bugbear of L.F. amplification—overloading.

New B.T.-H. Range.

The B.T.-H. Mazda nickel-filament valves, which have come to the fore in great strength lately, are all excellent. The new 2-volt power valves are very efficient little fellows, and so are the 4- and 6-volters, though, of course, one expects the 6-volter to be able to do its job without any fuss. All are capable of handing quite good inputs without distortion, and can be fully recommended.

Whilst talking about power and super-power valves, one must not forget to mention the P.625 and the P.625 A., the Marconi and Osram valves, having impedances of 2,500 and 1,700 ohms respectively, with magnification factors of about 6 and 3. These two are certainly remarkable valves, the former being a very useful super-power output valve, and able to carry quite a substantial input; while the latter is a "larger" valve, getting on for the L.S.5 A. type, and capable of carrying a considerable input without overloading, though it will not take as much H.T. as the 625.

The P.625 has its fellow in the form of the P.425, a 4-volt valve having a very similar impedance and a high magnification factor.

A recent test using two of these valves alternatively (625 and 625 A.) gave a very good indication of the value of a super-power valve in the last stage of a set. The set, an ordinary det. and 2 L.F., was being employed on a speaker which was not particularly sensitive on the bass notes. In fact, with an ordinary super-power valve it gave no real bass.

An Interesting Test.

The test was first carried out with the P.625 and with this in the last stage considerable amplification was obtained and a faint bass was heard on the loud speaker. This must not be taken as any adverse reflection upon the operation of the valve, because it should be understood that it was the loud speaker that was to blame, it being very insensitive to the bass notes. After the 625 the P.625 A. was plugged in, and immediately bass notes of a much deeper character began to "appear" on the speaker.

In other words, a valve having the power capacity of the 625 A., coupled with its very low impedance, was able to amplify these bass frequencies so that they became apparent even on a speaker which was insensitive to the lower frequencies. So it is interesting from that point of view to those of you who have loud speakers either emphasising the bass notes or lacking at that end of the scale, and who are desirous of super-power results, you have a choice between the 625 and the 625A.

The P.625—an excellent super-power valve.

Those of you who want more bass should use the 625 A., and those who want less or certainly do not want their bass emphasised to too great an extent, should use the 625, it being remembered, of course, that the input the 625 will carry is not quite so great as that which the 625 A. will deal with. It will, however, take more H.T. voltage, while the total output volume, that is, signal strength, is perhaps even greater than in the case of the P 625 A.

With both these valves, however, filter output is almost essential. As a matter of fact, it is essential if anything like good amplification is to be obtained.

The Osram screened-grid 4-pin type of valve.

Then, we must not forget the new mains valves of the ·8 variety. These have not yet been fully tested out, and so I cannot give any particular details as to their operation, except to remind you that they are to be used direct on raw A.C., which is snpplied to their filaments via a special transformer, so that this type of valve is not recommended for detector work, where the use of the independently heated cathode valve would be more suitable.

The Ediswan Co. have brought out two new indirectly heated cathode valves, the M.I. 41R.C. and the M.I. 41L.F., and these, are under test at the moment, so that more will have to be said at a later date.

A newly re-designed valve, and a new addition in the 6-volt series of the Marconi and Osram types, need a little reference here, and they are the D.E.L.610 and the H.L.610. The former, of course, is a well-known valve and was exceedingly popular during the last year, when it had a magnification factor of about 13 and an impedance of 13,000. Since then, however, it has been re-designed, and now has an amplification factor of 15 against an impedance of only 7,500.

Efficient H.F. Valve.

This means that you have to use a little more care in its use than formerly, because it is liable to saturate the core of some L.F. transformers should it be used in the primary circuit, but against this the magnification is so much higher, and its efficiency greater, that it is a valve that can be well recommended. When properly biased, and an H.T. voltage of 110 is placed on the anode, it takes a current of 4·5 milliamps. The H.L.610 is a new valve somewhat like the D.E.5 B. in characteristics, and replacing that valve. It is much smaller in build, and has an impedance of 30,000 ohms. Against the D.E.5 B.'s magnification factor of 20, the H.L.610 has a magnification factor of 30.

As an anode-bend detector, the H.L.610 is excellent, and it can also be recommended as a first-stage L.F. valve for resistance-capacity coupling where tremendous amplification is not required, and in this position it acts admirably. Especially is it suitable for a first-stage amplifier where a gramophone pick-up is being employed, as many pick-ups will overload proper resistance-capacity valves with their high impedances, whereas this valve will carry quite a reasonable grid swing without overloading.

RADIOTORIAL

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 and 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. Lite, 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.

SURBITON READERS PLEASE NOTE !

If Mr. Bowles, of Surbiton, who wrote recently in "P.W." regarding wet H.T. batteries, would not mind giving further particulars to another reader, will he please furnish us with his address again in order that we may give it to our enquirer ?

AM I OSCILLATING ?

E. G. B. (Gravesend Kent).—"Although it is only a one-valve set it seems very powerful. In fact, I sometimes frighten the whole household with its yell. I understand that if I use too much reaction I make it oscillate, but I am never sure when I am doing this.

"What is the sign of oscillation ? I have asked several people and nobody seems to know exactly, and I should very much like to know this, as I am keen on getting long-distance results with my set (if possible). They tell me you want plenty of reaction for that, but although I can get plenty of reaction, I do not seem to get long distance. Sometimes London is very loud indeed, and sometimes it is very pure. Am I getting reaction when it is very loud ?

"And why is it sometimes purer than others ? It has two dials on it, one tuning and one reaction, and I think if I once get the hang of the thing I could get much better results."

You certainly must learn the trick of reaction properly if you are going to do any good reception with the set, and there are several other important things to watch.

The first is, that if you oscillate by giving the set too much reaction you will be disturbing your neighbours for miles round. Obviously this is not fair, and we are sure you would not like to do it, so please be sure that you do not make the set oscillate in this way whilst broadcasting is going on.

Another important point is this. The B.B.C. have prepared a booklet about oscillation which is a very helpful one and gives a lot of detail. If you send a stamped addressed envelope they will send it by return to you (no questions asked, or anything of that), and you will find it contains really invaluable information about handling a set. So certainly we advise you to send for that.

Finally, we would describe a method which will tell you whether the set is oscillating or not, which is this. Choose some time when there is no broadcasting on (so that you are certain not to upset your neighbours), connect up batteries, aerial, etc., as usual and switch on. When you switch on, if everything is O.K., you will, by listening carefully in the 'phones, hear a very faint noise, even when the reaction condenser is set at zero, and you are not touching the tuning condenser.

The noise is a sort of very faint background, and is due to certain tiny inequalities in the current supply, etc., but not to any station transmitting at the time. Switch on and off two or three times, listening carefully all the time, and you will soon get the knack of learning whether the valve is "alive" or not. Having made sure that you can recognise the very slight sound which a valve set causes when it is "alive" (even when no signals are being received) set the tuning condenser about half-way round the dial, and then leave it alone.

Turn your attention now to the reaction condenser, and first listening carefully to the "valve noise," slowly advance the reaction condenser about five or six degrees. Having done so, listen to the "valve noise" again, and you will probably find that it does not sound any different. If so, advance the reaction condenser about another five or six degrees and then listen once more to the noise.

Possibly it will still be just about the same, so advance another five degrees. Continue this, listening carefully all the time, until you find that the valve noise is becoming much louder. This means that the valve is getting much more sensitive and, consequently, it is much better suited for long-distance work than before.

Continue advancing the reaction condenser two or three degrees at a time. You will find that

(*Continued on page* 294.)

28 STATIONS in 7 minutes

This is the excited report of a delighted Brighton constructor who has just built the Ediswan R.C. Threesome Circuit No. R/3T—3-Valve incorporating Transformer Coupling in the last stage.

How is that for a 3-valve set which can be made in an hour or so at a lower cost than any other 3-valve receiver of its kind?

There is a thrill in making your own wireless set, and, of course, you cut out the labour costs.

No soldering, no coil changing, no failure. The paper models make child's play of building the Ediswan R.C. Threesome.

The secret of this remarkable performance lies in the

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P.W. 13/10/28

C.S/T3

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 292.*)

as you advance the noise gets louder and louder, until it is, comparatively, a quite noticeable hissing noise. Continue advancing the reaction condenser a degree or two at a time, still listening carefully all the while. Presently you will find, in all probability, that there is a soft "plop," followed by a loud breathing noise. *This indicates that the set is oscillating.*

If you want to make doubly sure, turn the reaction coudenser back again and listen in again as before, whilst slowly advancing the condenser, but this time wet the finger and tap the aerial terminal. Every time you tap the terminal there will be a very faint click in the 'phones corresponding to this, and as you increase reaction, and the set gets more sensitive, this click will become louder.

It will be both loud and clear just before the set starts to oscillate, but as soon as the set is actually oscillating, the clicks will become very loud indeed, and it will be a pronounced *double* click, that is to say, it will click when you put the finger on the terminal and when you take it off again. The difference between the ordinary clicks and the oscillation clicks is very marked indeed, and you should be able by this method to tell, absolutely for certain, whether the set is oscillating or not.

You should never allow the set to oscillate. Apart from the fact that when doing so it is spoiling your neighbours' programmes, there is another reason. It is no earthly good to you either when it is oscillating.

Although, perhaps, you can hear broadcasting when it is like this, it is so distorted and nasty that it is not worth listening to. Reaction—even properly used—always causes a certain amount of distortion, so the ideal is to use as little reaction as possible.

Listening in to the local station should require little or no reaction. If, however, the local station is closed down, and you wish to reach out for long-distance stations it is permissible to use some reaction, but not so much as to make the set oscillate. The most sensitive condition for the receiver is when the set is nearly *but not quite* oscillating.

Unfortunately, you will find that not only the reaction condenser affects reaction, but every time you alter the *tuning* condenser you alter the degree of reaction required. If the tuning condenser is set at 40 and you tune it down to 20, you may find that you have automatically made the set oscillate, and you will have to slacken off the reaction in order to prevent this.

As a matter of fact the two controls must be used together, and used very carefully, for long-distance work, so as not to interfere with other listeners. You should not attempt to try for distant stations until you have grown thoroughly accustomed to the set, and have had practice in handling the reaction outside broadcast hours.

When you can alter the tuning and bring up the reaction until the set is quite sensitive and yet not in danger of going into oscillation, you will have learned the art of controlling reaction. But it takes time to do this, and we should advise you to go very carefully at first and especially not to try it during the broadcasting hours so as to interfere with other people's entertainment.

"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 a revised 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.

No one-valve set can carry out good long-distance work whilst the local broadcasting station is working, so we are afraid that with a set of this type you will always be tied down to doing your long-distance work outside broadcasting hours. When you get the knack of the thing you will be surprised at how sensitive you can make the set without causing it to oscillate, and how useless it is to you or to anybody else when it is actually oscillating. You will realize that reaction is a good servant but a bad master.

CHANGING ACCUMULATOR ACID.

E. M. G. (Southampton).—"I have been told that in an accumulator employing a celluloid container the acid should be poured off and renewed occasionally. How often should this be done, and do you think I could have a go at it although I know nothing about wireless, or is it better to let them do it at the shop?"

Where celluloid containers are used it is not a bad plan to renew the acid about every twelve months. This is decidedly not a job for the novice, and we should recommend you to allow the dealer to do it, asking him to make sure that the new acid is of the correct specific gravity.

ADDING A LOADING COIL TO A CRYSTAL SET.

JONAH (Hertfordshire).—"If I did not think I could get 5 X X I would never have done it. Everybody told me that if I got a loading coil and connected it in the aerial I could get 5 X X. Well, I must say I did not believe it at first, but they all seemed so sure that in the end I got a loading coil.

"It was marked 5 X X so it must be the right one. I got a coil holder with it, and I screwed the coil holder on to the cabinet near the aerial terminal. This coil holder has two terminals, and I was told to put one of them to the aerial terminal and the other one from the wire of the outside aerial itself.

"Well, I connected up like that and it was one of the greatest disappointments of my

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RADIOTORIAL QUESTIONS AND ANSWERS

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life. I could hear 5 X X just a little in the background when I pressed the telephones against my ears, but how can I listen like that? It hurts my ears and it hurts my pocket. Although I have got the coil now and the coil holder I cannot use them.

"What I have had to do is take the aerial off coil holder again, put it back on the aerial terminal and listen in like I used to do. The coil is no good to me and I wish I had not got it. I cannot sell it to anybody, because they know I cannot get 5 X X with it. So what can I do? Why is it marked 5 X X if it will not get 5 X X? I am very hurt about it (especially my ears, when I have to hold the 'phones on to try and hear 5 X X)."

There is no need for you to get down in the mouth, Jonah. (Remember the other Jonah, he came out all right!). From the sketch you have enclosed, we see that you have not connected the coil up properly. If you turn your panel over again and look at the wiring, you will see that the present connections are as follow:

Your aerial terminal was originally connected to one side of your small tuning coil, to the variable condenser, and to the crystal. The other side of the crystal went to the telephones; and the other telephone terminal went to the earth terminal, and to the remaining sides of the coil and condenser.

You altered this by adding the loading coil, but you added it in the wrong place. What you have to do now is to disconnect the leads to the loading coil, and break that lead from the small tuning coil which goes to the aerial terminal, to the crystal detector, and to the variable condenser. Take the wire from the short-wave coil to one of the loading-coil terminals. Then take the other terminal of the loading holder to the aerial terminal which will still be connected to the crystal and to the variable condenser.

Now plug in your 200-loading coil, readjust the variable condenser, and you should be able to receive 5 X X at good strength, when the aerial is on the "aerial" terminal. Just to make sure that you have the connections O.K., we will repeat them (after they have been altered).

The aerial will be connected to the aerial terminal, which is joined to one side of the loading-coil holder, to one side of the variable condenser and to the crystal. The other side of the loading-coil holder is joined to one end of the old or short-wave coil.

The other end of that coil goes to the earth terminal, to the remaining side of the variable condenser, and to the telephones. The other side of the telephones and the other side of the crystal are connected together, and this completes the wiring.

As stated, you ought to be able to get good results from 5 X X with this arrangement, but when you pull out the 5 X X coil and try to listen on the short waves again, you will find that nothing comes through, because the circuit is "open." This can easily be overcome either by purchasing one of the little shorting plugs to put into the loading-coil holder, or else by taking a piece of bare wire and joining its two terminals together. When this has been done, the circuit will in effect be exactly the same as it was before you added the loading coil.

THE "P.W." "SHORT-WAVE" TWO.

"In the description of the 'P.W.' 'Short-Wave' Two, it was stated last week that the set was quite suitable for the reception of ordinary broadcasting as well as for short-wave working. Apart from changing the coils there is practically nothing to do except retuning, and the following description of the procedure should make the matter perfectly clear to constructors.

"Supposing that it is desired first of all to tune-in to the local station upon the ordinary (or medium) broadcast wave-length (the band between 250 and 550 metres). The first thing to do is to remove the H.F. choke from the receiver and plug in a large tuning coil which will act as an H.F. choke. Almost any large coil will act as this choke, though it should be of a good manufacture so that it has a reasonably low self-capacity, or otherwise, instead of choking, it will allow a good deal of the energy to pass it. Almost any of the better makes of coil having 200 turns or more will do for this purpose, but if it is necessary to buy this coil the No. 250 size is recommended, as this has proved extremely satisfactory in practically all circumstances.

"Having fixed up the H.F. choke it will be necessary to provide the tuning coils for the medium or ordinary wave-band in their appropriate holders. For L_1 we shall require a

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RADIOTORIAL QUESTIONS AND ANSWERS

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25 or a 35 coil. For L_2 the number of turns should be 60, and for L_3 it should be 50. Generally it is best for L_1 and L_2 to be coupled tightly. When changing over from the short waves after the tuning coils have been inserted in their sockets, remember that the aerial should be removed from the A terminal and taken to A_2. Finally, the fixed condenser C_3, ·0005 mfd., should be shorted so as to enable the tuning condenser to cover a really wide band of wave-lengths without a change of coil.

"Probably the best and most effective way of shorting this condenser is the very convenient method of a flexible clip. All that is necessary is a short lead of flexible wire, at each end of which should be soldered one of the small crocodile clips that can be obtained for a penny or so at any dealers. (Soldering is recommended for this, as high resistance here, such as a twisted joint would give, may have a detrimental effect upon the working of the set.) A 3-in. length of flex should be plenty and this leaves a nice loop so that it is not easily mislaid as a shorter length may be. To short the condenser all that is necessary is to clip one of the crocodile clips on to one of its terminals and the other one upon the other terminal, which will automatically restore the tuning condenser's capacity to ·0005 mfd. instead of ·00025 mfd. as normally. When arranged as described the set is ready for the ordinary broadcast reception. But it is also quite capable of receiving on the 5 X X and Hilversum range. For this purpose the H.F. choke will remain as previously described, and so will the connection to the aerial terminal, but larger coils will have to be fitted. The coils for the various holders for the 5 X X range are as follows: L_1, 100 turns; L_2, 250 turns; L_3, 150 turns. On these longest wave-lengths it is generally better for L_1 and L_2 to be coupled tightly together. In other respects the working of the set is unaffected, so that the operation which was given last week still applies to the broadcasting and the longer wave-length bands."

this junk, make a decent wave-trap which I can add to the set without altering the wiring of it? If so, how do I connect up?"

The easiest form of wave-trap (and a very efficient one) is added in series with the aerial lead, and as this does not involve any alteration to the wiring of the set whatever, we recommend you to try it. Your 60 centre-tapped coil will be just the thing, and across this you should connect the ·00025 mfd.

CONNECTING UP A WAVE-TRAP.

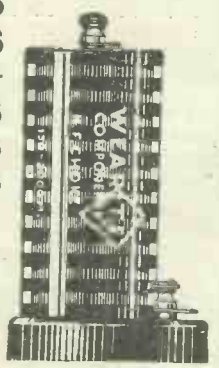
B. A. F. (Liverpool). "Having heard that a wave-trap is simply a coil and condenser as used for tuning, I have been trying to make one up out of my old coils and condensers, but so far I have not had much luck. The trouble seems to be that either I do not use the right sized coil, or else I do not connect up properly.

"I am enclosing a list of my coils on hand, and I have two variable condensers, one ·0005 mfd. and one ·00025 mfd. Can I, out of all

variable condenser. This arrangement constitutes a wavetrap, and it can be mounted as a separate unit and placed close to the set, if you desire to make a neat job of it.

When it is placed conveniently, all that you have to do is to take off the aerial wire from the aerial terminal on the receiver and place it on the centre tapping of the wave-trap coil. Now take another wire and join the aerial terminal of the receiver to either the plug or the socket of the wave-trap coil. This completes the alterations, so that the whole job should not take more than a few minutes of your time.

You will find it is well worth it, for such a wave-trap can be uncommonly efficient in cutting out the local station's signals. (Careful adjustment is, of course, necessary.)



ZERO HOUR AT THE SHOW.

The adventures of our short-wave expert at the recent Radio Exhibition at Olympia.

By W. L. S.

IT is rather a bitter thought for the public (if the public *does* think !) that it is not admitted to see what is, to an outsider, probably the most amusing and interesting part of the Radio Exhibition. I refer to "zero hour," and the frantic minutes spent behind the scenes by the demonstrators and showmen just before the stroke of eleven, when the great flood of past, present, and future "radio-bugs" is admitted to see the results of their labours on the stands. I was fortunate enough to get into Olympia on the opening day at an hour well in advance of eleven, having first observed with much joy the fast-lengthening queue outside the shuttered and bolted main entrance.

An "Unholy Mess."

The first unkind thought was "what a perfectly unholy mess!" At ten o'clock several of the stands looked like carpenters' shops, and I must admit that I watched the worst offenders with great interest at eleven o'clock to see what they were really like at that hour. To the credit of those in charge, most of them were indistinguishable in point of tidiness from those that had been spick and span for hours.

The show looked quite crowded at this hour (I mean ten o'clock !) and the crowd was actually caused by all the staff parading round to look at other peoples' stands, either out of genuine interest or with a hope of cribbing some useful ideas from them. There were also hordes of press photographers, all in the usual press-photographer hurry, and others like myself, merely walking round and displaying vulgar curiosity. The whole atmosphere was, however, one of real hard work and real enthusiasm.

Meanwhile, outside the queue was still growing, and the arrival of the Cossor "newsboy" with the morning edition of the Melody Maker, and of several gentlemen selling humorous papers, had lent an air of liveliness to them. I could not help reflecting that they looked like wireless enthusiasts one and all, whether mere crystal-gazers or users of Solodynes and other lordly outfits. The antics of a mounted policeman deflecting would-be criminals who slowed their cars down and looked for an opening at the side of the road also helped to speed the time.

Inside, however, was the place for me, so I began to examine things in more detail. The "carpenters'-shop" stands were improving visibly, sprouting blue and gold at a tremendous rate, and apparatus was arriving at unbelievable speed from nowhere in particular and covering up the bare patches. One stand, as I passed down the avenue, was quite bare. On my return journey, not more than ten minutes later, it was covered with loud speakers and transformers, and had been deserted by the staff as if it had been finished for some days. And very smart indeed was the general effect.

Last Moment Preparations.

The POPULAR WIRELESS stand was being sadly mauled by members of the Technical Staff, armed with brushes and feather dusters, removing small specks of dust from the sets that were on show. Strange, by the way, how long it takes for dust to arrive in a place like Olympia. I believe if one man were to walk slowly round the stand, dusting each in turn, he would be kept occupied all day!

Another stand was in much confusion owing to the fact that one of the firm's products was found ticketed at the price of £880 instead of £8/8/0! Two strokes of the brush put things right, but suppose the public had seen!

The Radio Society's stand sported a 10-metre crystal-controlled transmitter, and the loving care with which the crystal was handled (although it *was* only a piece of ground glass!) was pathetic to behold.

Further round a sudden cascade of valve-boxes livened up the proceedings for a few moments, and I believe I did also hear a distinct "pop" such as might be caused by the dropping of a valve.

And then came eleven o'clock, with the thrilling sound of two or three hundred

(*Continued on page* 302.)

VALVES OF CHARACTER
FOR OPERATION OFF THE ELECTRIC LIGHT MAINS
Don't engage a Valve without a good character

Met-Vick Cosmos A.C. Valves are each supplied with a written character, the details of which are in close accord with the actual inherent character of the valve.

The new reduced prices are comparable with those of ordinary battery valves and will greatly assist all who are converting their sets from battery working to operation from the electric light mains.

The A.C./G (Green Spot) Valve can be used for any stage except the last. It has a very high amplification factor of 35 with an impedance of only 17,500 ohms. It is suitable as a Detector and for all forms of coupling.
Used by Mr. N. P. Vincer-Minter in his A.C.2 and A.C.3 (*Wireless World, August 22nd and September 5th*).

The A.C./R (Red Spot) valve has been designed specially for the Loud Speaker Stage. It has a very high mutual conductance, having an amplification factor of 10 with an impedance as low as 2,500 ohms at 180 volts H.T.

It will give twice the output for the same input of any battery operated valve on the market.

EVERY USER IS ENTHUSIASTIC ABOUT

"COSMOS" A.C. VALVES

PRICES NOW REDUCED TO

15/- (GREEN SPOT) **17/6** (RED SPOT)

METRO-VICK SUPPLIES LIMITED
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Ask your Dealer for Booklet 4117/3

ZERO HOUR AT THE SHOW.

(*Continued from page 300.*)

"staff" sighing simultaneously as the first visitor to the Exhibition stumbled over the mat. And I could not but reflect that the speed at which the visitors spread themselves evenly over the whole show was somewhat marvellous. Never did those stands near the entrance receive more than their fair share of attention. Probably most of the "paying guests" had made their plans, and went for some particular stand as soon as they were inside. Sufficient to say that the "P.W." Queries people were soon looking hot and bothered as only technical queries people *can* look when they are trying their hardest to answer four questions at once! Thus, the show really being open, I became an ordinary member of the public and made a thorough nuisance of myself at as many stands as possible.

POWER BY RADIO.

IN an age of unbelievable developments we have arrived at one of the most unexpected of them all. First radio transmission of voice and later television have startled our credulity at their introduction, but now comes the announcement of a phenomenon surpassing either of them—power by radio. In the transmission of a picture from point to point the picture as such does not move through space, but in the transmission of power the electrical energy will be actually transmitted through space, independent of the strength of the radio transmitter.

Apparently Simple.

Mr. Phillips Thomas, Ph.D., research engineer of the Westinghouse Electric and Manufacturing Company of America, in a recent lecture predicted the transmission of power by use of very short-wave radio transmitters. Very short radio waves, of the order of 10 centimetres, may be reflected and focused in a parallel beam in the same manner as light and with comparatively simple apparatus.

This type of reflector has been employed on a large scale by Signor Marconi in his well-known beam transmission systems. A few thousand watts concentrated in a short-wave beam could be expected to ionise the air in the path, changing it from an insulator to a fair electrical conductor. Two such beams, along parallel paths, would constitute a pair of weightless conductors, literally "hanging in thin air," which could be aimed at any desired point. If the two reflectors were connected to the high voltage terminals of a transformer and the beams focused on two metal targets connected to a similar transformer for reducing the voltage, power could be received without the aid of any further radio apparatus. The power received would not necessarily have any relation to the power of the radio transmitter.

Another "Death Ray"?

Rumours of a "death ray," capable of creating havoc in time of war, recently created much consternation in the minds of the people. Perhaps their fears may now be realised, for it would be as fatal to life to come into the path of rays energised by the high voltage as it would be to pick up a high-tension wire. Its onslaught on an army would be noiseless and—at least in daytime—invisible.

Apparatus for producing the 10-centimetre radio transmission is not available, but it is now in the process of design and construction and will soon be tested experimentally.

One cannot conceive of any location so remote or inaccessible that it could not be furnished with power by radio. If the development becomes practical for commercial use we may look for the universal dissemination of electrical energy.

ABC OF THE B.B.C.

"The B.B.C. Handbook, 1929," is now available at all bookstalls, price 2s., and "Popular Wireless" has no hesitation in recommending it to readers.

THERE are only two minor points in connection with the B.B.C. Handbook, 1929, upon which I can offer serious criticism. The first is its title—B.B.C. Handbook—which does not do justice to the full scope of such a useful publication, containing, as it does, quite as much information on wireless matters in general as on the Corporation itself. Surely The "B.B.C. *Wireless* Handbook" would have been more in keeping with its contents and have given a better indication of what the prospective reader might expect to find in it.

The Farce of Anonymity.

Secondly, it is disappointing to find that this year the B.B.C. has carried the farce of anonymity to the extent of not having a single authentic article signed by one of the staff. Last year we did at least see the signatures of the Earl of Clarendon and Sir John Reith, but the only signed articles in the 1929 Handbook are those by popular broadcasting artistes, lecturers, etc.

One would have thought, for instance, that the part dealing with Oscillation would carry more weight if the signature of Captain Eckersley—the B.B.C.'s Chief Engineer—were appended. Has "Please don't do it!" so soon been forgotten?

The 1929 Handbook is produced on lines similar to last year's edition, but contains considerably more information. The annual is divided into four sections. In the first, the B.B.C. accounts for its behaviour in the past twelve months and outlines its intentions.

The second—a "general section"—contains a record of the year's work, together with a mass of information of broadcast interest, and many pleasing articles on the various aspects of broadcasting technique. In the third and fourth sections the technical problems of wireless transmission and reception are ably dealt with in a manner which is attractive even to those of us who are not technical "experts."

What Happens to Licence Fees.

All listeners should be interested to read what happens to their ten shillings. The B.B.C. gives a lengthy account of its finances and produces some surprising figures. A total of £1,135,000 was collected in licence fees during the past year.

Of this sum £800,959 was paid to the B.B.C.; £141,875 to the Post Office, the remainder accruing to the Treasury. We learn, too, that 63·07 per cent of the B.B.C.'s expenditure is on programmes, while the second largest item is Maintenance of Plant, Power, etc., for which 16·95 per cent is expended.

Empire Broadcasting is the subject of a specially noteworthy article, for in it the B.B.C. explains in so many words what many have considered to be its "backward attitude" in connection with 5 S W.

CHOOSING AN H.T. ELIMINATOR.

By A. S. CLARK.

HAVING just moved to a new house where electric mains are installed, and not having previously had access to an electric-lighting supply, it occurred to the writer that there must be quite a number of home constructors in a similar position. Probably these enthusiasts have not previously taken much interest in eliminators, chiefly because they could not employ one. A few notes on choosing a suitable unit will therefore prove useful, and even if you have not only just acquired mains they will be helpful if you intend taking advantage of your electric supply.

Advantages of Mains H.T.

The following hints are just as applicable whether you intend making your own H.T. unit or purchasing a commercial one. First of all it is necessary to decide on the type of set to be employed and the number of valves. Since the supply of H.T. will not now be limited due to reasons of economy, as many valves as is desired may conveniently be employed.

Having decided on the circuit, you should choose suitable valves for same, and taking into account the maximum voltage at which each is likely to be used, decide on the total current required in milliamperes. Reference to the valve curves published by the manufacturers will help you to make this estimate.

We now know the current and maximum voltage which the unit must be capable of giving, and it is an easy matter to find from the circuit the number of H.T. + taps which are required, but take into consideration the fact that on some sets two of the H.T. + taps can be joined.

Low Voltage Mains.

Before proceeding further, you must ascertain the voltage of your supply, whether it is A.C. or D.C. and if the former, the frequency of same. Should it be D.C. and of a low voltage, say below 150 (and this is quite likely with private installations) there is one particular point to watch. That is, if you are going to work a moving-coil loud speaker or require very large volume, you should choose a circuit using a push-pull output stage. In most cases of private installations a very simple eliminator can be used, no smoothing being required.

You will now have collected together sufficient information to enable you to choose a suitable eliminator from catalogues or descriptions published for home construction. If you tabulate your information as set out below you will find it in a very convenient form for reference purposes.

DETAILS OF INPUT SIDE
A.C. or D.C.
Voltage.
Frequency if A.C.

DETAILS OF OUTPUT.
Maximum current required.
Number of H.T. taps.
Likely maximum voltage for each tap.

TECHNICAL NOTES.

(Continued from page 268.)

transformer-coupled amplifiers, will produce distorted television images.

"We all recall the early amplifiers which operated our first loud speakers," states Mr. Ehle, President of the International Resistance Co., U.S.A. "Because of the novelty of radio in those days, more or less distortion made little difference. It must be much the same with television. In the first thrilling days of experimental television, even the mere outline of a man or hand or other object will suffice, despite splotches and breaks and disfiguration of all kinds, due to faulty amplification at the receiving end.

R.C. Amplification Better.

"However, while the ear may pardon much in the way of distorted music and even get to like it, for that matter, the eye is far more critical. With the eye, a thing must be *right*. Therefore, better amplifiers will be required, and resistance-coupling is certain to find extensive use for a nearer approach to uniform amplification over a wider range of frequencies than is necessary in sound-reproduction. I understand that even the present admittedly crude television experiments call for frequencies varying from 18 to 25,000. This is far in excess of the 200 to 5,000 cycle range which is average for radio rendition."

Quality-Meter.

In estimating the quality of the reproduction from a loud speaker and an amplifier it is usual to rely upon the impression received simply by ear. But in making definite experiments with a view to the gradual improvement of the apparatus this is not sufficiently definite, and it is very desirable to have some really scientific method of showing exactly how the reproduction compares with the original sound. An instrument for this purpose has now been invented by a well-known radio scientist, Dr. D. E. Miller.

The Phonodeik.

The apparatus, which is known as the Phonodeik, makes a photographic record of the sound-wave as it is received by the ear. Dr. Miller's method is to connect the loud speaker undergoing test to a microphone, then to record the output on the phonodeik. A similar record can be made of the original sound, and by comparing the two the characteristics of the speaker can be determined. When a vacuum-tube voltmeter is substituted for the speaker, the

(Continued on next page.)

TECHNICAL NOTES.

(*Continued from previous page.*)

experimenter can determine how much distortion is introduced by the electrical system, and can make allowances for it.

Photo-Telegraphy.

I have a letter from a reader in Wallasey, Cheshire, upon a point of passing interest. He remarks that the sending of pictures by radio or wire is often referred to as "telephotography," whereas the correct designation is "photo-telegraphy."

This is perfectly correct, although I do nor myself recollect ever having seen any examples of the confusion of these terms to which my correspondent refers.

Telephotography is the taking of photographs at a distance by means of a special type of photographic lens known as a telephoto-lens.

"Telephotography" is thus the taking of photographs at a considerable distance by means of a camera equipped with a special lens, whereas "photo-telegraphy" is the sending of photographs over a distance by means of radio or landline. The broadcasting of pictures by radio, such as is proposed by the B.B.C., therefore comes within the scope of "photo-telegraphy."

Multiple Valves.

Recent litigation has brought into prominence the multiple valves, of which probably many readers have previously heard little or nothing. These valves, which are now, of course, on the market and which will probably be much talked about by the time these notes are in print, are designed mainly to simplify the construction of a multi-valve set—or, to be more exact, the *equivalent* of a multi-valve set.

Stability.

In one form the multiple valve is equal to a detector and two low-frequency amplifiers, the second of the low-frequency stages being a power stage. In addition, the glass bulb contains the necessary condensers, resistances, etc., for the inter-valve coupling, and as all these components are necessarily in very close proximity, very short connections may be used. This has many advantages, not the least important being increased stability.

Compact.

By using a triple valve of this type you have the major part of your three-valve receiver contained in a single small glass bulb and by connecting a conventional coil and condenser before the valve, with the loud speaker after the valve, together with the necessary batteries, you have a three-valve local station receiver—detector and 2 L.F.

This arrangement clearly is without any high-frequency amplification and, moreover, it is impossible to introduce reaction; therefore, as I have already mentioned, the set which you have made in this way will necessarily be a local station, or at any rate a short range, receiver.

(*Continued on next page.*)

BELLING-LEE TERMINALS.

On page 148 of our September 29th issue we illustrated a box of Belling-Lee terminals. But it has been pointed out that, unfortunately, it was an old box bearing the price of 9d. each. The price has, of course, recently been reduced to 6d. each.

TECHNICAL NOTES.

(Continued from previous page.)

H.F. as Well.

A high-frequency multi-valve is made, however, comprising two stages of H.F. amplification, and when this is suitably employed before the above-mentioned triple valve, you have the equivalent of a five-valve receiver and in an extremely simple form.

A Curious "Fault."

A trouble which often puzzles the non-technical listener very much is when the set, after working perfectly, suddenly "goes off," speech becoming very indistinct and "far away," whilst music practically vanishes. After a short time, perhaps no more than a few minutes, the set will go back to normal, for no apparent reason. The trouble then may not occur again that evening or perhaps for several evenings, when, without any warning, the same thing happens.

If this happens to *your* set, try switching in to another station on a different wave-length. If the trouble is the one we are discussing, you will find that the alternative station comes in perfectly, and probably by the time you switch back to the original station *that also* will be coming in in the normal way.

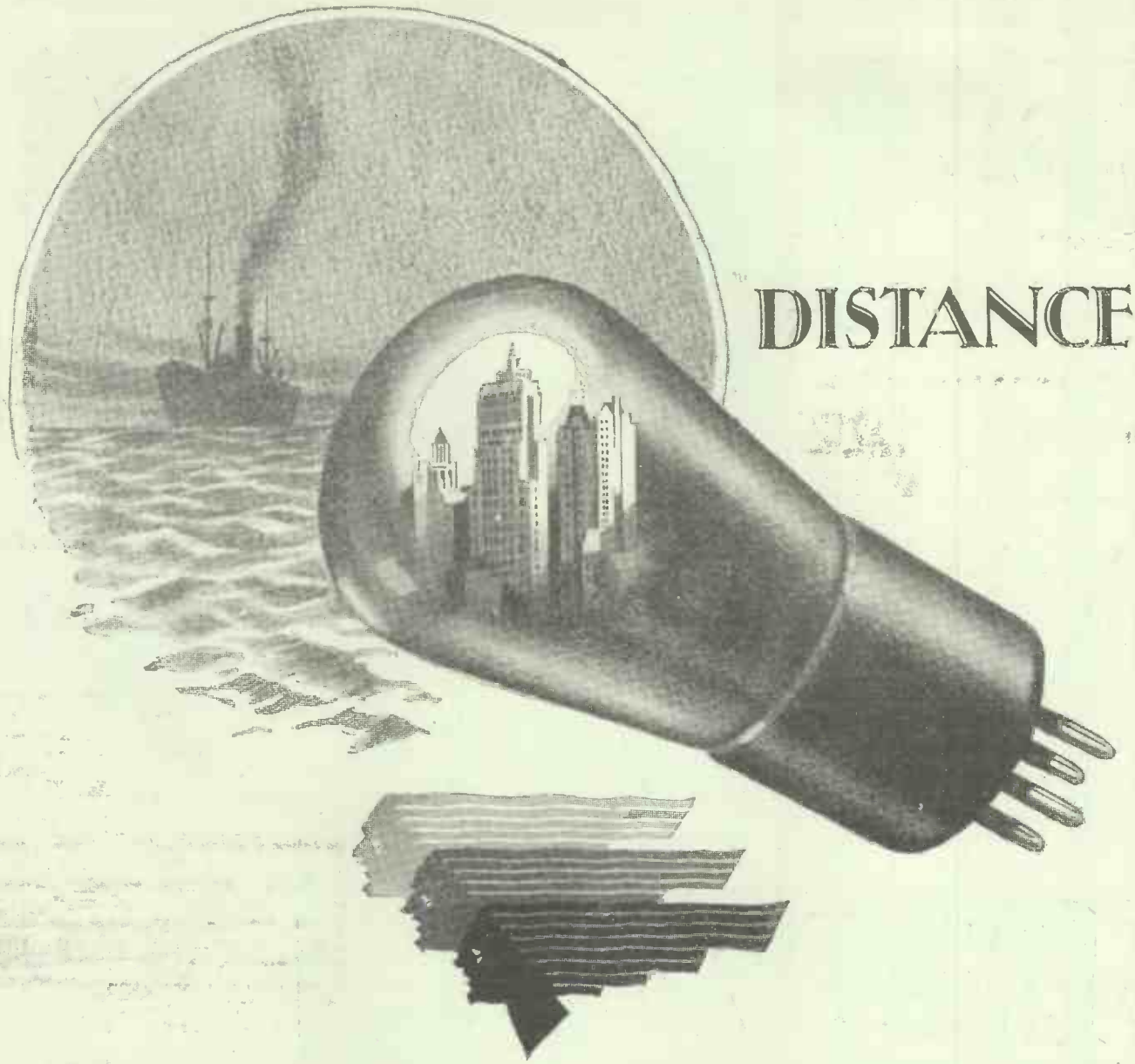
If you have, in the meantime, in searching for the trouble in the set itself, made any alterations or adjustments, it is as well to put things back as they were and see whether the set then behaves as I have indicated above.

Interference.

If so, it is practically certain that the trouble is not due to the set at all, but to interference by a set somewhere in the immediate neighbourhood.

The type of oscillator who causes howls and wailings is comparatively easy to discover, but there is a kind of oscillation which is not evident by any noises of that kind, and, when the oscillator switches on, his set may be oscillating steadily and causing interference all round without the fact being known even to himself.

If, therefore, you find your set afflicted with these sudden and mysterious fits of "going off," you may be pretty certain that the cause of the trouble is to be looked for a little further afield.



DISTANCE

When your "local" programme is uninteresting, when you long to search for distant stations—then it is that you will appreciate Mullard P.M. Valves.
The huge emission from the wonderful Mullard P.M. Filament means stronger and clearer signals—reception such as you can obtain only with Mullard Valves. You notice the difference as soon as you put them in your receiver. You appreciate the better tone, richer volume and greater ease of tuning-in distant stations.
Get Mullard Valves to-day. Every radio dealer sells them.

Mullard
THE · MASTER · VALVE

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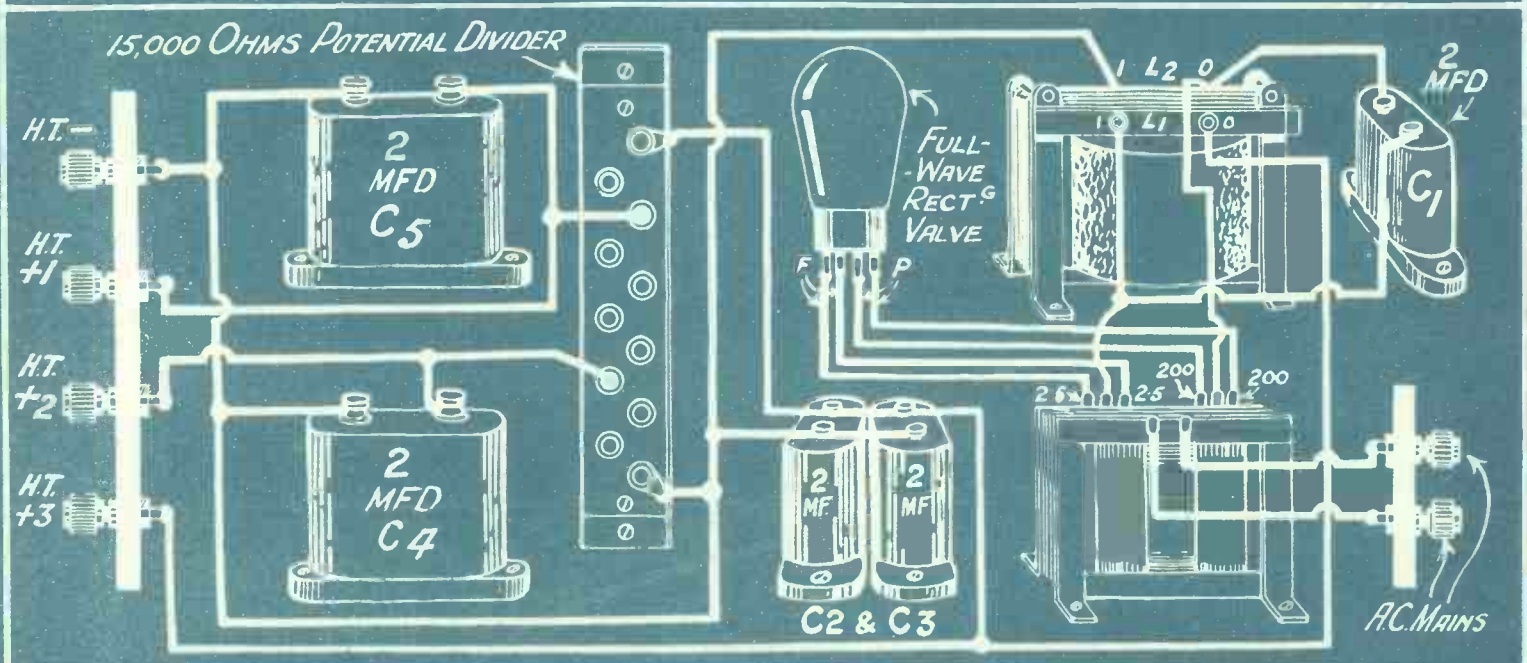
BLUEPRINTS

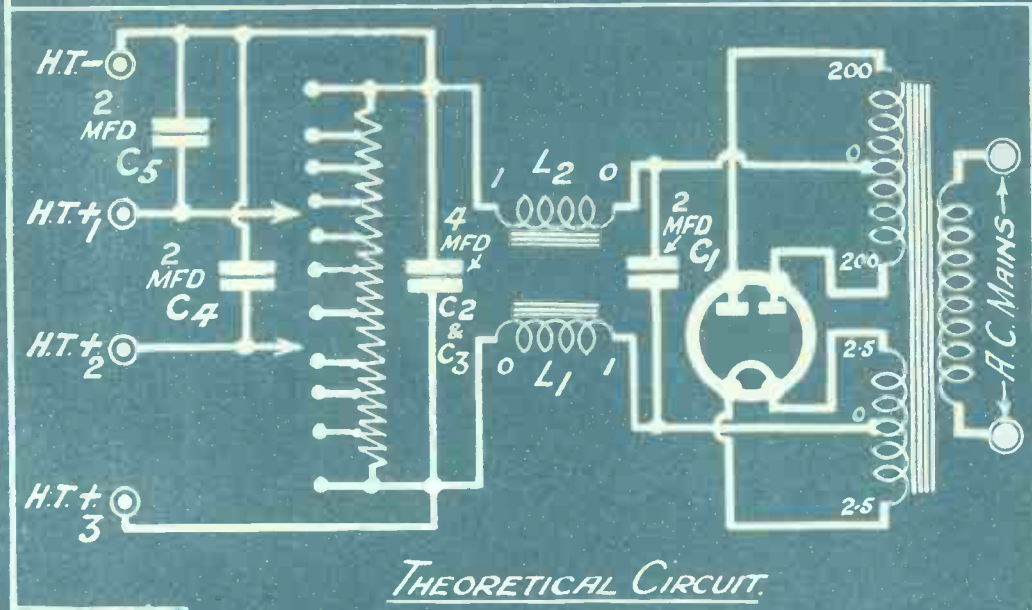
Presented free with "Popular Wireless," week ending Oct. 13th, 1928

THE P.W. BLUE PRINT CIRCUIT No. 45.

A Simple A.C. H.T. Unit.

6d.



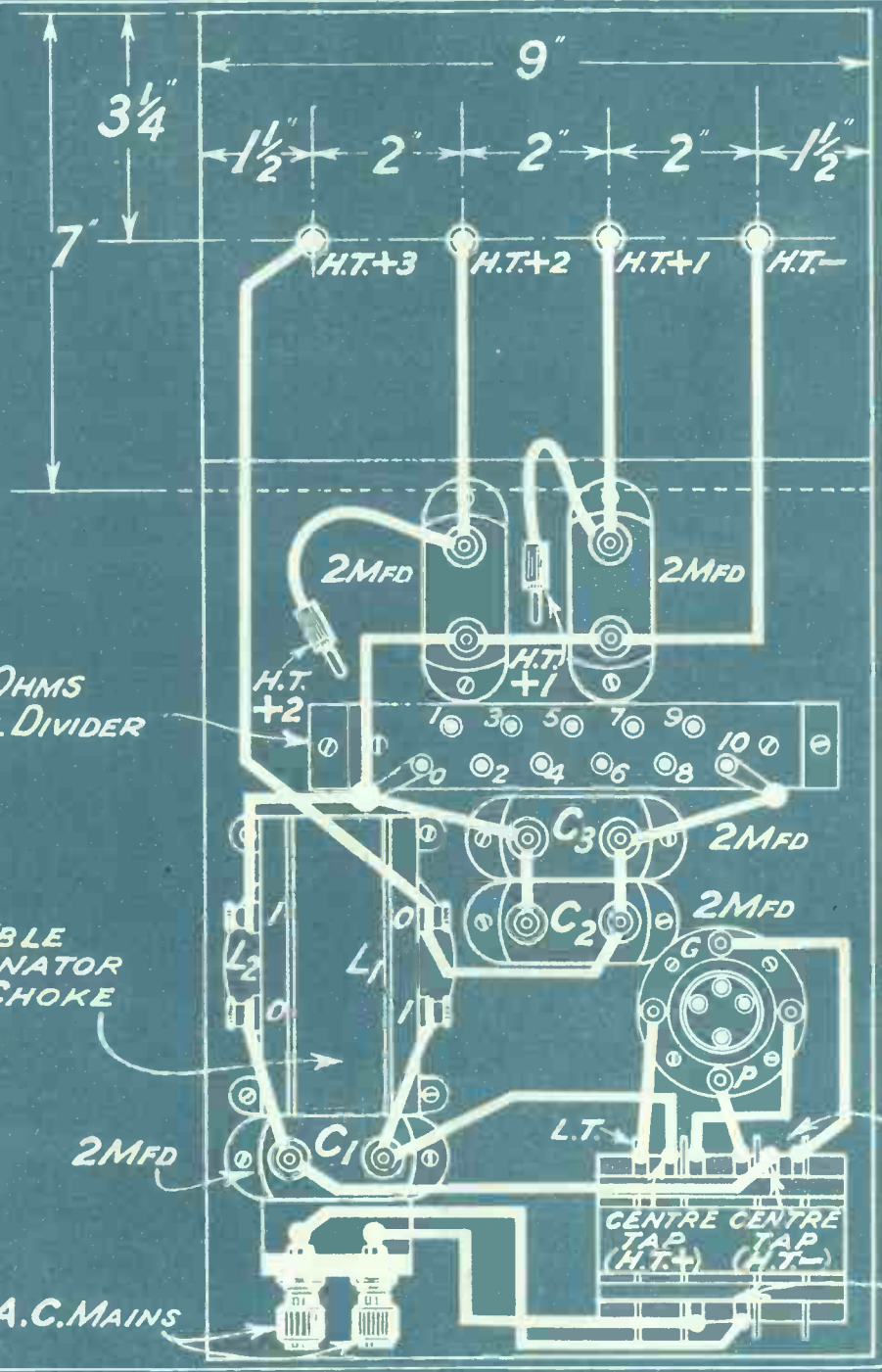


THEORETICAL CIRCUIT.

CHKD: BY KKe
SER. Nº 47

COMPONENTS AND MATERIALS.

- 1 Panel, 9 in. × 7 in. × ¼ in. or ⅜ in.
- 1 Cabinet to fit, with baseboard 12 in. deep.
- 6 Insulated terminals.
- 5 2-mfd. condensers, working voltage not less than 250.
- 1 Sprung valve holder.
- 1 Power transformer to suit your mains, with L.T. secondary giving 4 or 5 to 6 volts, according to the rectifying valve to be used, with centre tap, and H.T. secondary (also centre tapped) giving about 150—0—150 volts for small sets, or about 200—0—200 where large power valves will be used.
- 1 Potential divider.
- 1 Double eliminator-type choke.
- 1 Small terminal strip.
- 2 Plugs (battery type), flex, wire, sleeving, screws, etc.
- 1 Full-wave rectifying valve.



A Simple A.C. H.T. Unit.

Specially designed to reduce risks of motor-boating and to give a clean supply with a minimum of hum. Gives three different voltages, one fixed at maximum (H.T. + 3) and two variable in steps (H.T. + 1 and H.T. + 2) by moving plugs in sockets of potential divider. These serve for H.F. and detector tappings, the L.F. and power valves being fed from H.T. + 3. With a 200 – 0 – 200 transformer maximum output will be about 220 volts on light loads, falling to about 180 volts on loads of 30 to 40 milliamps. For small sets use smaller transformer or run detector from H.T. + 1 and L.F. valve from H.T. + 2.

Note that C_2 and C_3 are in parallel, so you can use a single condenser of 4 mfd. instead of two separate ones of 2 mfd. each if you like.

The potential divider used was one of 15,000 ohms resistance with tapping sockets along the top, but other types can be used, provided they are of about the right resistance and suitable arrangements are made for tappings.

The double choke is suitable for all cases where only medium outputs are required, up to perhaps 20 milliamps. For large outputs (20 to 60 milliamps) a single heavy-duty choke should be used, connected in place of L_1. L_2 will then be omitted and the wires which went to its terminals will be joined together.

SER. No. 47A
CHKD: BH KKC

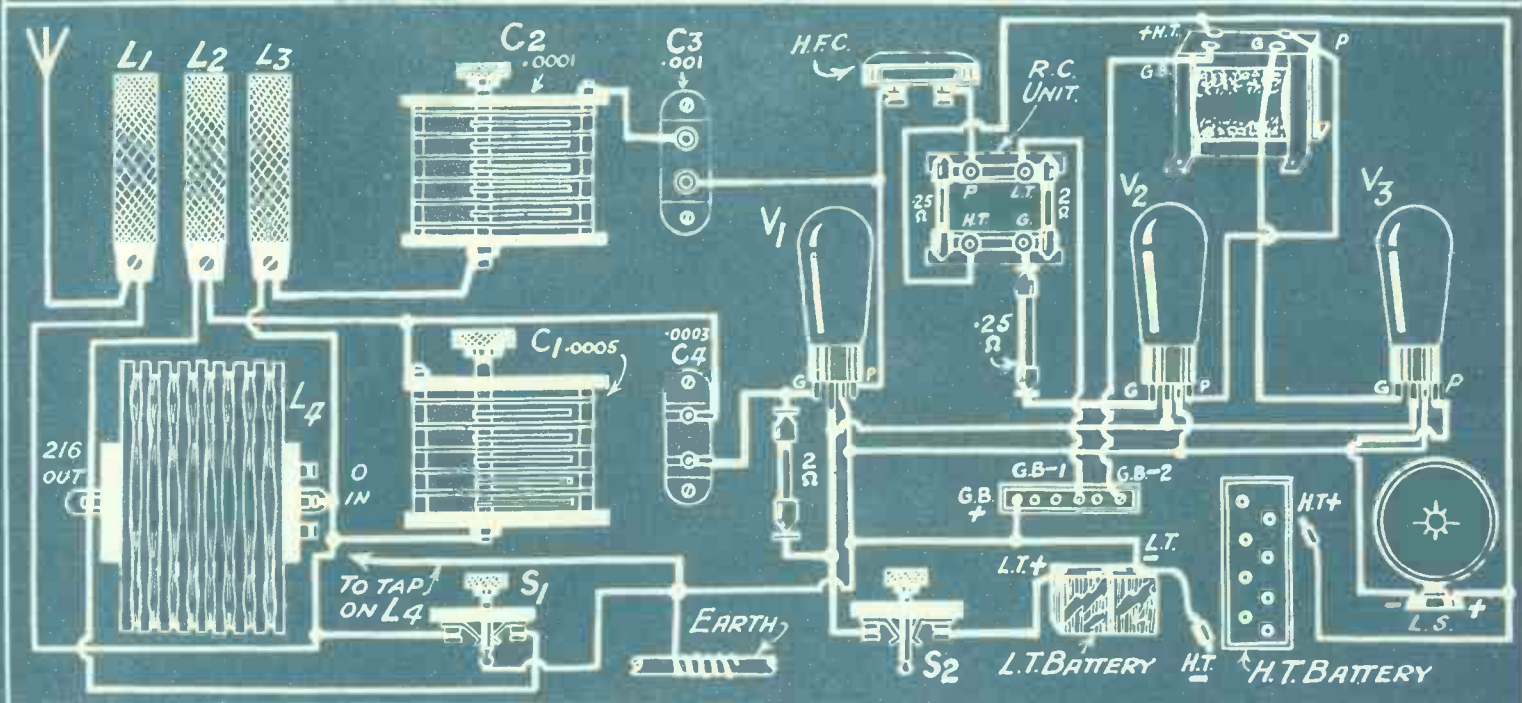
Special Points For Constructors.

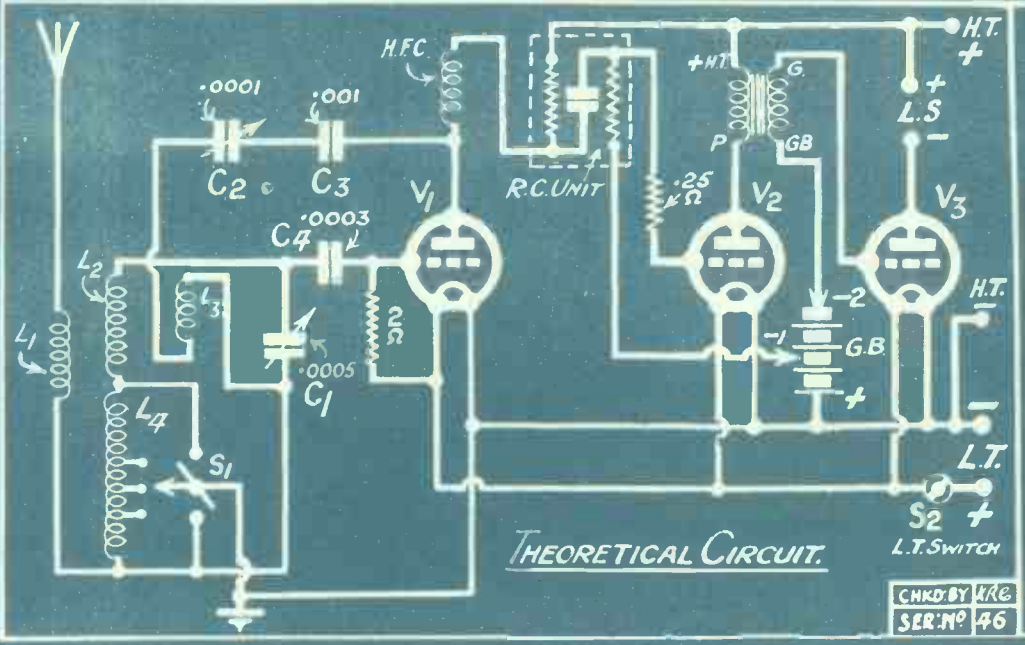
Always remember that there are quite high voltages between various points inside the unit and *never* put your hand in while it is working.
For the same reason it is wise to use well insulated wire for the internal connections. Stiff tinned wire and Systoflex sleeving is good for this purpose.
If you use ordinary flex for the connection to the mains be careful to leave no "whiskers" at the ends which might touch and so produce a short.

THE P.W. BLUE PRINT CIRCUIT No. 46.

The "Regional" Three.

6d.



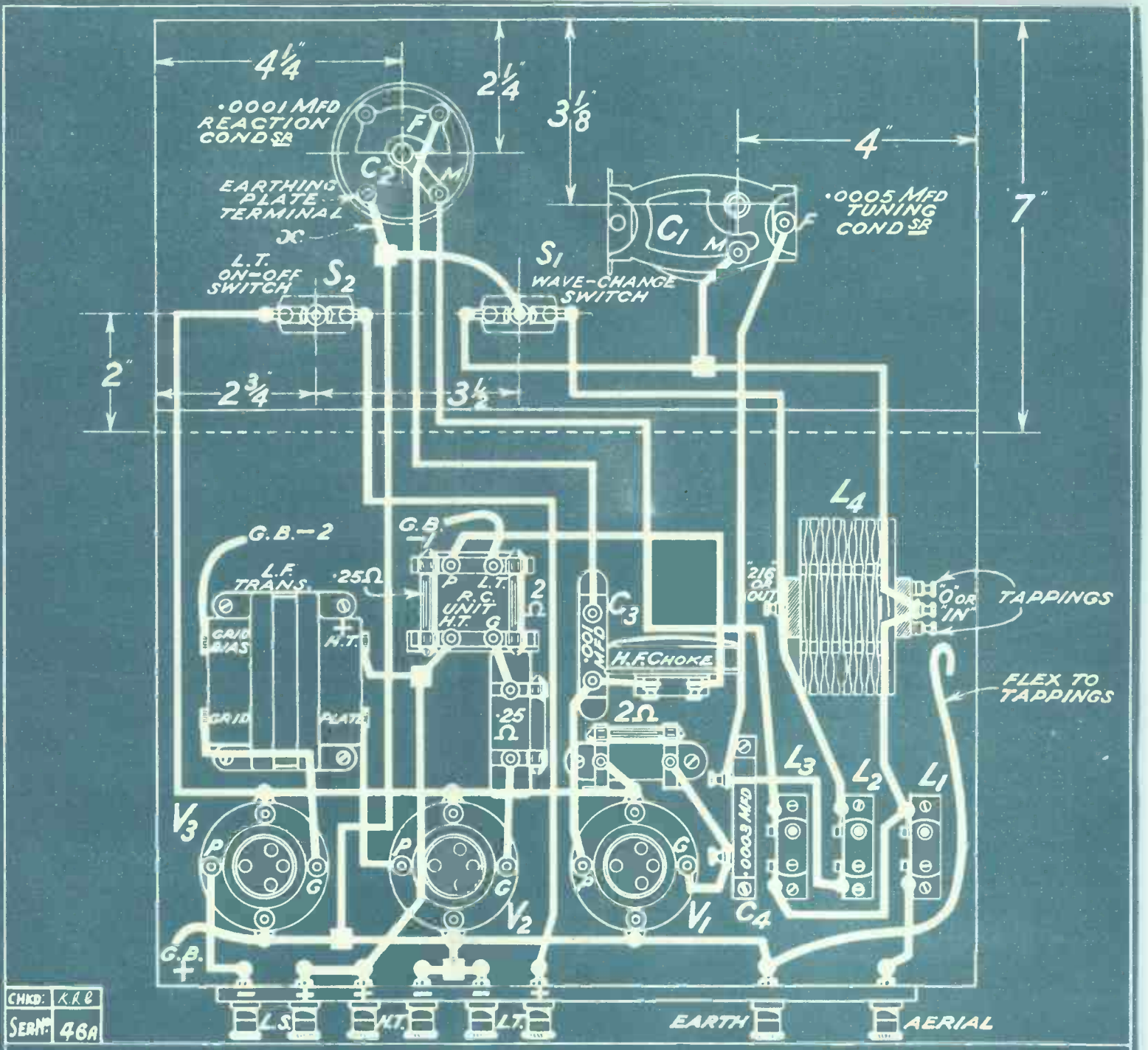


COMPONENTS AND MATERIALS.

1 Panel, 14 in. × 7 in. × ¼ in. or 3/16 in.
1 Cabinet to fit, with baseboard about 10 in. deep.
1 ·0005-mfd. variable condenser, preferably slow-motion type or with vernier dial.
1 ·0001 or ·00015-mfd miniature-type reaction condenser. (If not provided with earthing terminal omit lead thereto, marked *x* on diagram.)
2 On-off switches (one must be of the push-pull type commonly used for wave-change switching. Note flex lead soldered to tip of plunger).
1 Standard loading coil.
3 Single-coil sockets.
3 Sprung valve holders.
1 R.C. coupling unit, anode resistance about 250,000 ohms, grid leak 1 or 2 meg.
1 L.F. transformer of fairly low ratio.
1 Fixed condenser of ·0003 mfd. and one ·001 mfd.
1 Grid leak of 2 meg. and one of ½ meg., each with holder.
1 H.F. choke.
1 Terminal strip, 12 in. × 2 in., and 8 terminals.
Battery plugs, flex, wire, screws, etc.

ACCESSORIES.

1 Power and 2 H.F. type valves.
Plug-in coils, Nos. 25, 35, 50 and 60.
H.T., L.T. and G.B. batteries.
'Phones or loud speaker.



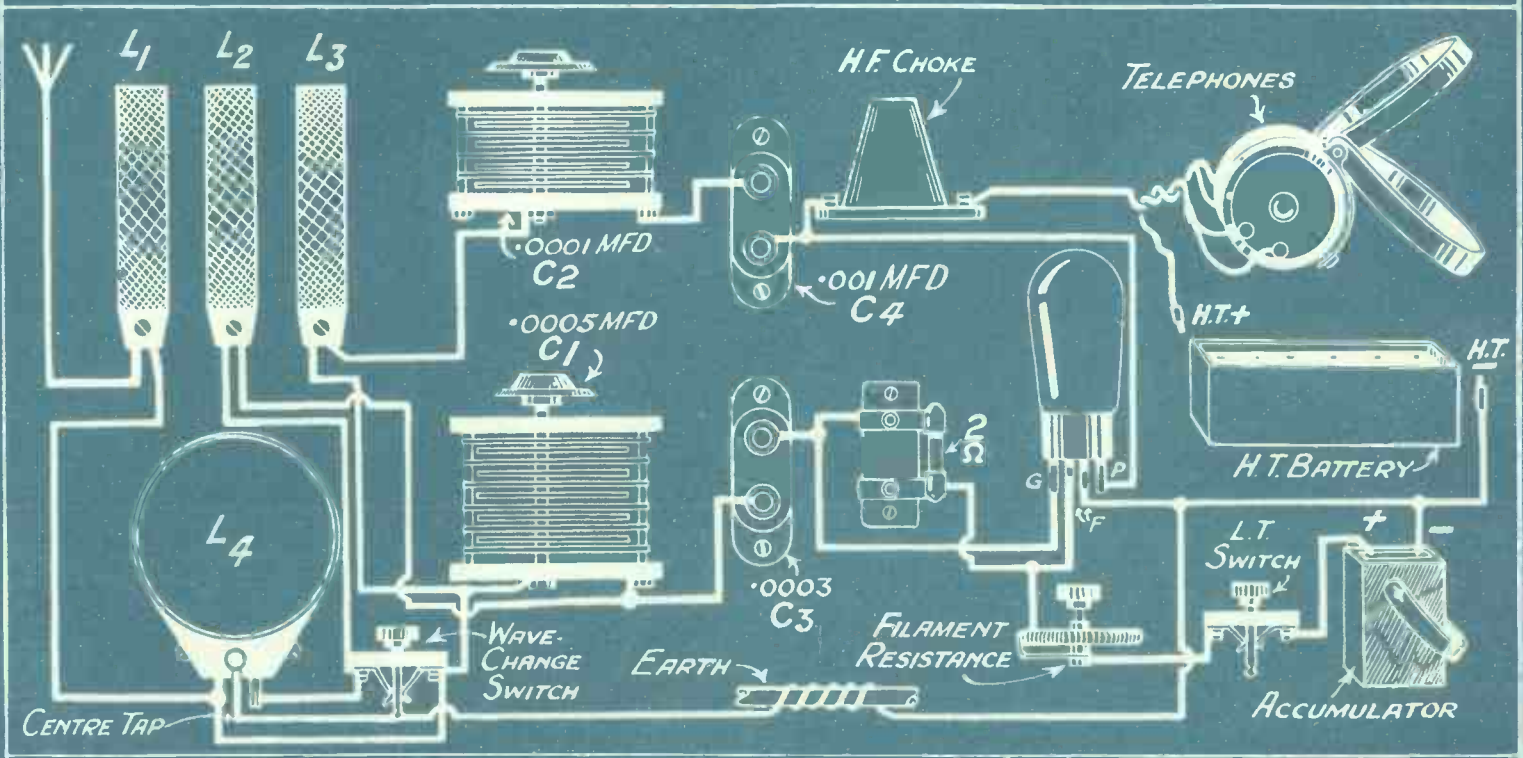
The "Regional" Three.

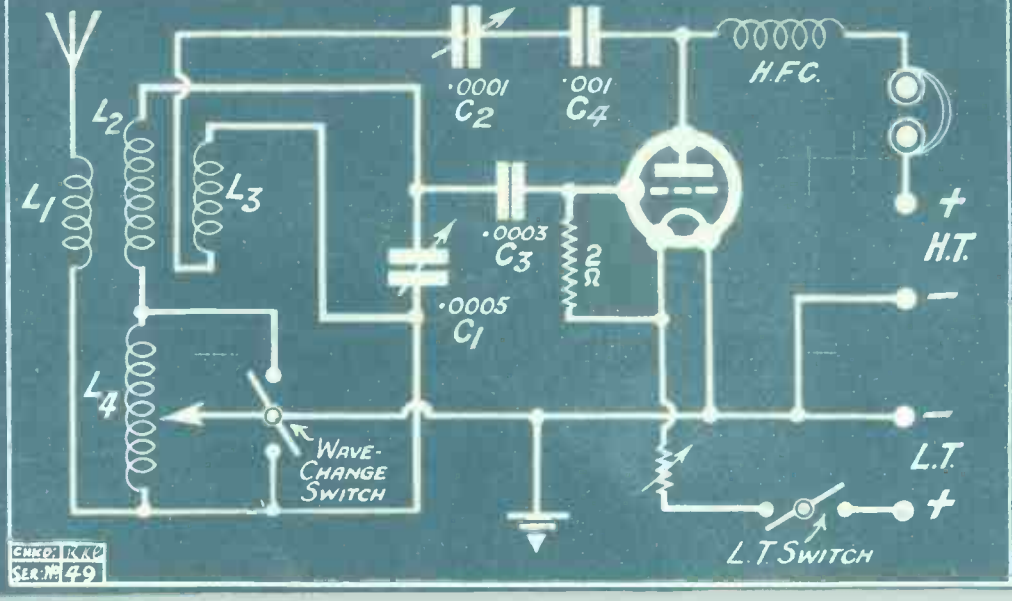
A simple but efficient set for both short and long broadcast wave-lengths, with a switch for changing over (no need to change coils). Will work a loud speaker from the local station, 5 G B and 5 X X, also usually several foreign stations, many more coming in on 'phones. Use No. 25 or 35 as L_1, No. 60 as L_2 and No. 50 as L_3. Attach flex lead to 60 or 80 terminal on loading coil. Push switch in for long waves.

THE P.W. BLUE PRINT CIRCUIT No. 47.

The "Wave-Change" One.

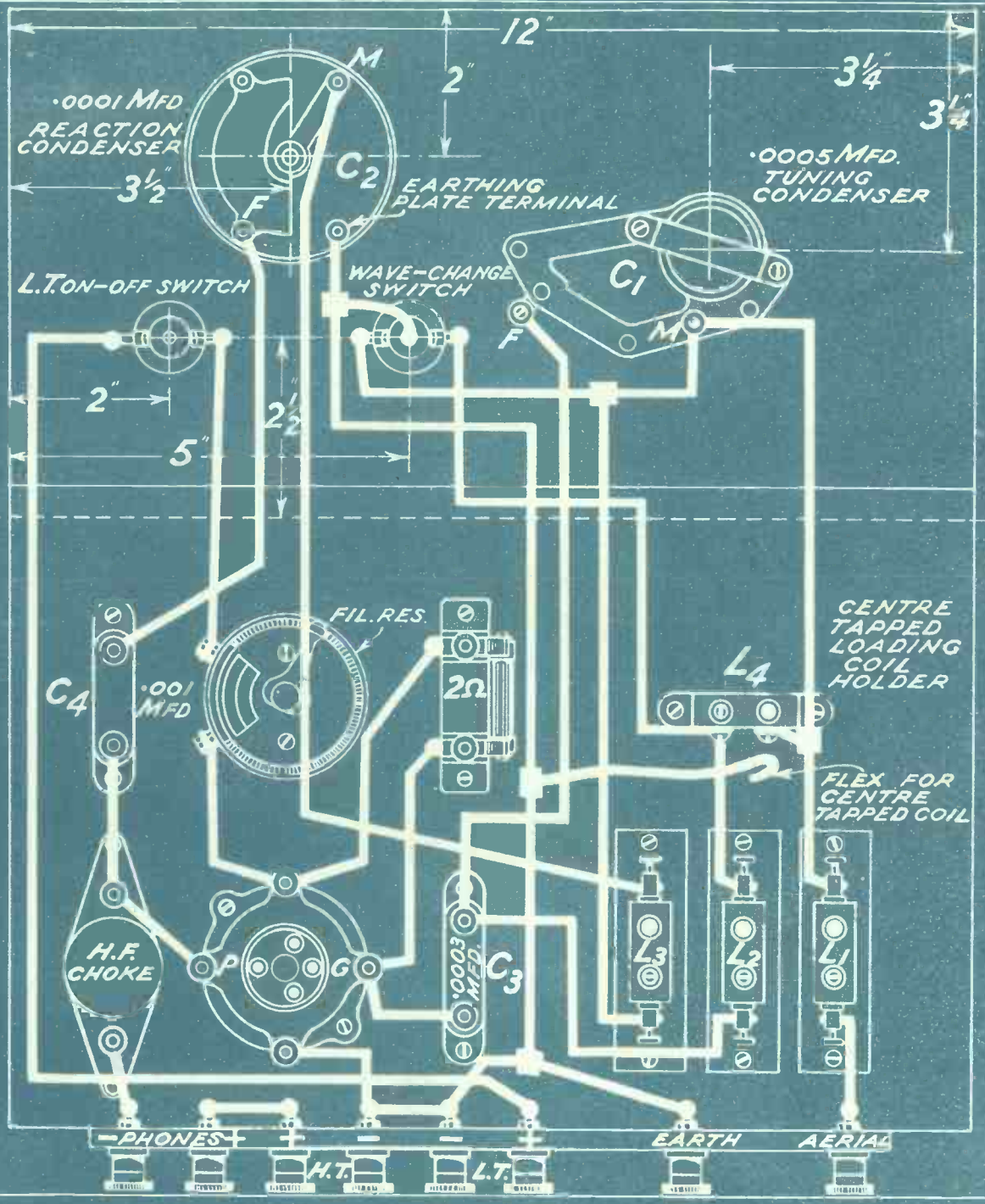
6d.





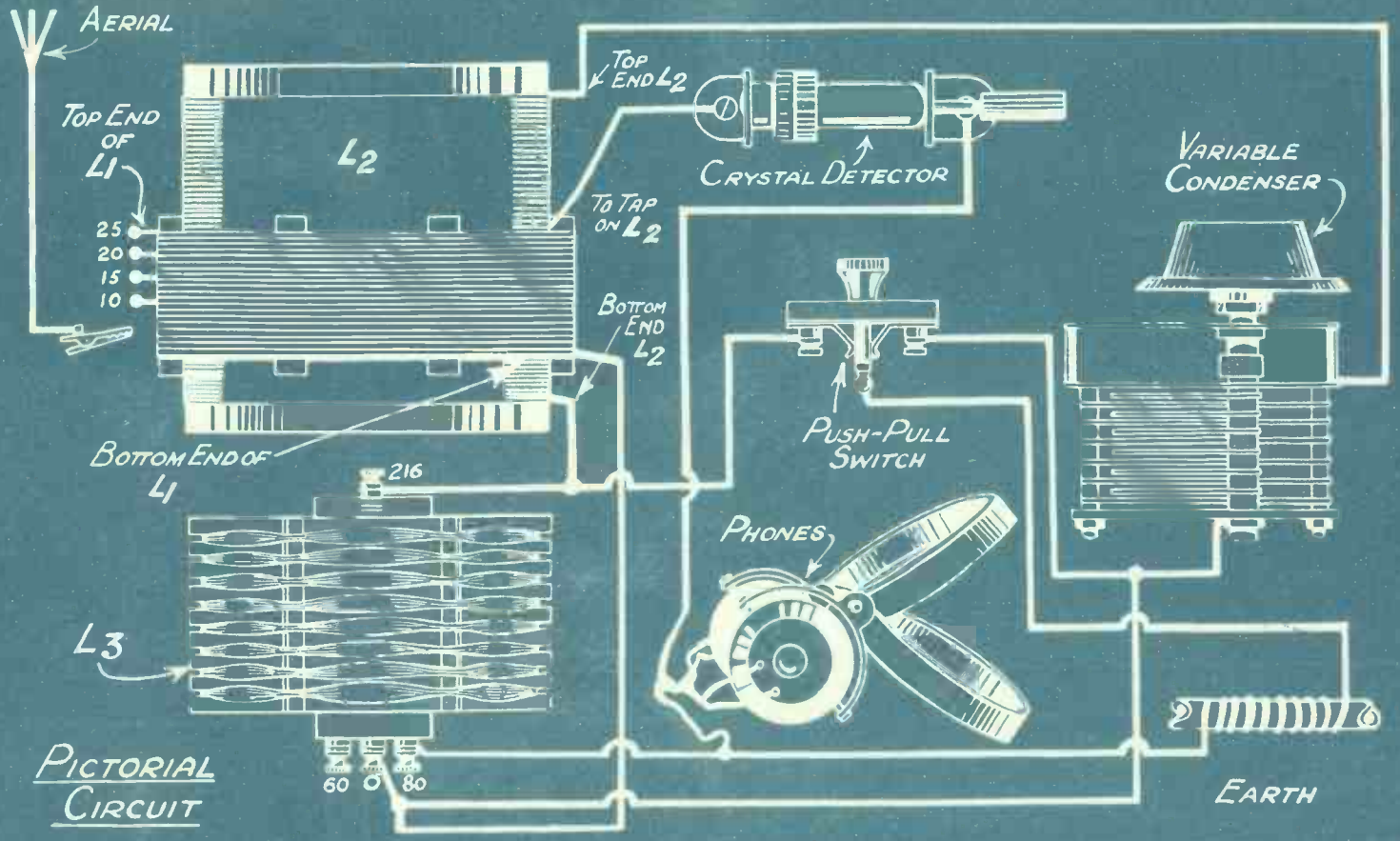
COMPONENTS AND MATERIALS.

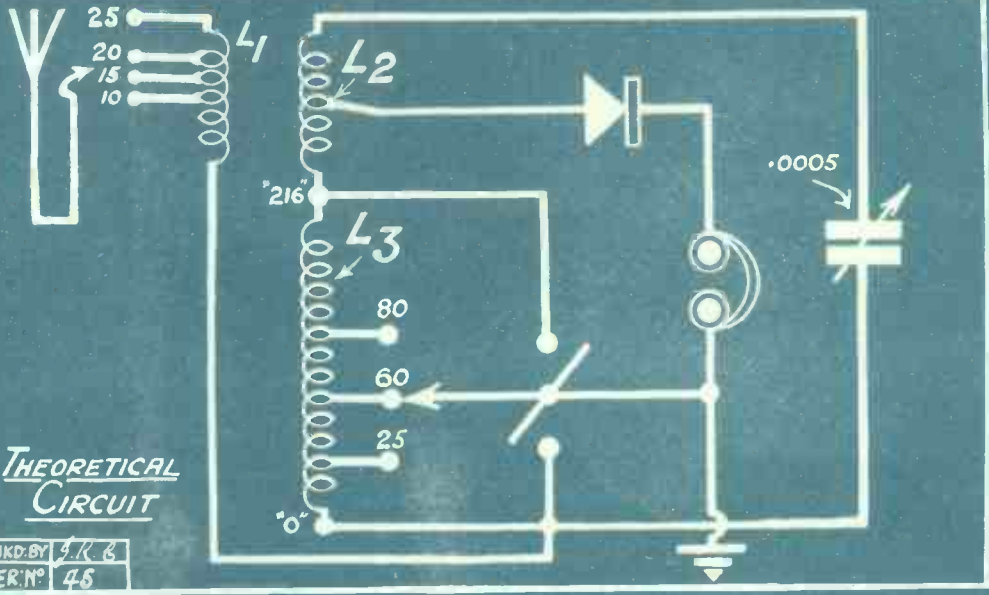
1 Panel, 12 in. × 7 in. × ¼ in. or ⅜ in.
1 Cabinet to fit, with baseboard 9 in deep.
1 ·0005-mfd. variable condenser, slow-motion or with vernier dial.
1 ·0001 or ·00015-mfd. miniature type reaction condenser.
2 Push-pull on-off switches. (One must be of the type used for wave-change switching. Note the flex lead attached to centre plunger.)
4 Single-coil sockets.
1 ·0003 and one ·001-mfd. fixed condenser.
1 2-meg. grid leak and holder.
1 H.F. choke.
1 Sprung valve holder.
1 Baseboard rheostat or resistor.
1 Terminal strip, 10 in. × 2 in. × ¼ in., and 8 terminals. Flex, wire, screws, etc.
1 H.F. type valve.
Plug-in coils Nos. 25, 35, 50, 60, and 150 or 200 (last to be centre-tapped).
H.T. and L.T. batteries, pair of 'phones.



The "Wave-Change" One.

A neat little one-valver for headphone work, with good long-range capabilities. Covers both upper and lower broadcast wave-bands without changing coils. Simply push switch in for long waves, pull it out for shorter waves. Use coil No. 25 or 35 as L_1, 60 as L_2, 50 as L_3, and 150 or 200 as L_4. [Note:—If reaction condenser used has no "earthing" terminal simply omit the wire shown thereto.]





THE P.W. BLUE PRINT CIRCUIT No. 48.

The "Regional" Crystal Set.

COMPONENTS AND MATERIALS.

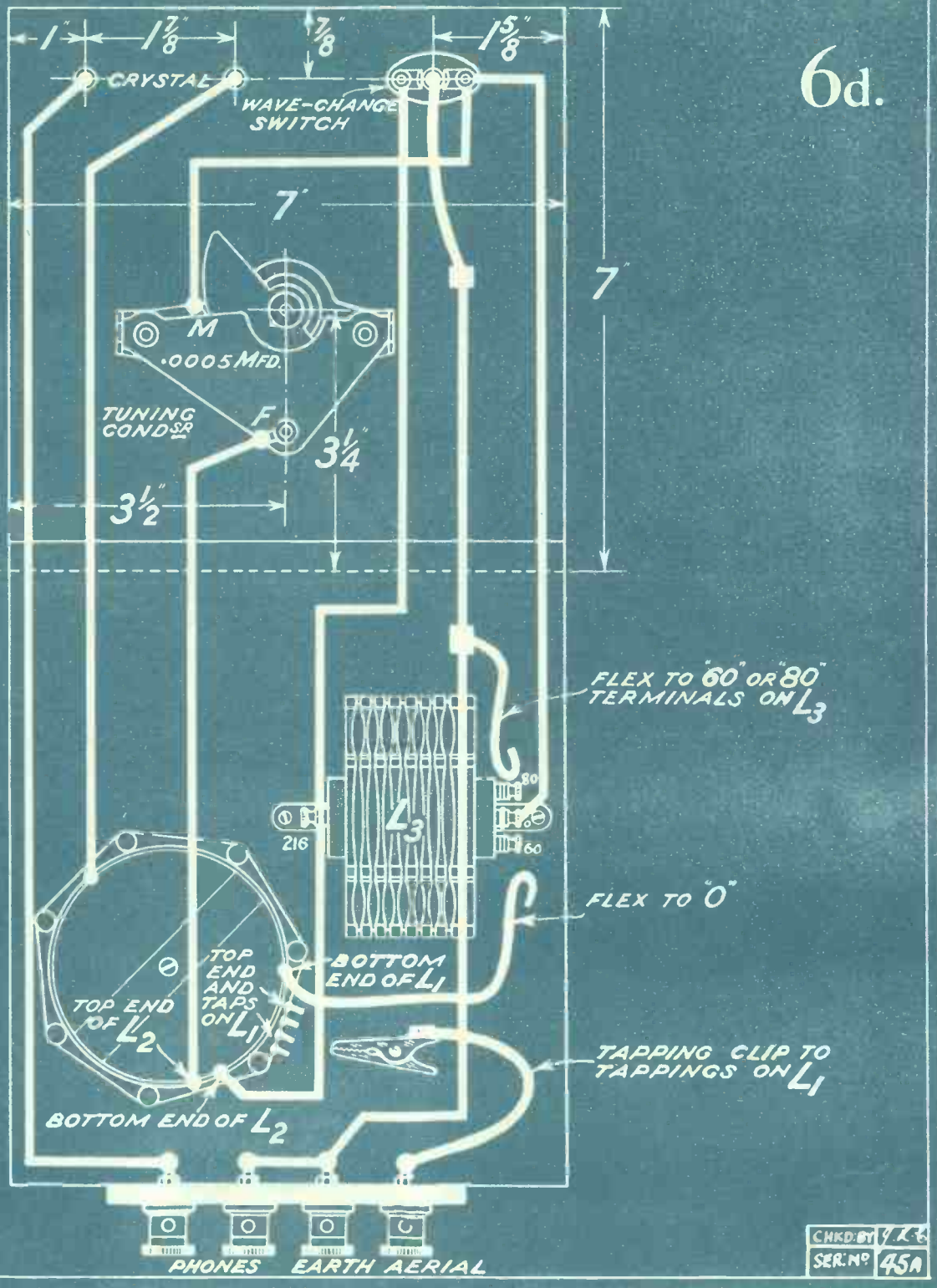
1 Panel, 7 in. × 7 in. × $\frac{3}{16}$ in. or $\frac{1}{4}$ in.
1 Cabinet to fit, with baseboard 8 in. deep.
1 ·0005-mfd. variable condenser, with plain dial.
1 Push-pull on-off switch of type commonly used for wave-change purposes. (Note flex lead soldered to central plunger.)
1 Crystal detector, panel mounting.
1 Standard loading coil.
1 "Derby Three" type aerial coil. (Note that a tapping must be made roughly at the centre of the secondary winding.)
1 Terminal strip, 5 in. × 2 in. × $\frac{1}{4}$ in., and 4 terminals.
Flex, wire, screws, tapping clip, etc., pair of 'phones.

6d.

The "Regional" Crystal Set.

A high efficiency crystal receiver for both the upper and lower broadcast wave-bands, with switching for the change-over. (No coils to change.) Adjust position of clip on the tappings on L_1 for the best signals and selectivity. (The higher the clip the louder the signals, as a rule, but better selectivity is obtained on a lower tap.) Similar adjustment is obtainable on long waves; note the flex lead to "60" or "80" on the loading coil.

To wind the "Derby Three" type coil for yourself, obtain a piece of insulating tubing 3 in. diameter and 3½ in. long. On this wind 60 turns of No. 24 D.C.C. wire with a tapping at the centre. (This is L_2.) Over the lower end of this wind on the primary, L_1, which consists of 25 turns with tappings at 10, 15, and 20, of the same gauge of wire and in the same direction. This winding is to be spaced from L_2 by means of about seven pieces of wood or ebonite rod, about ¼ in. in diameter, as shown.



POPULAR WIRELESS, October 20th, 1928. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

ANOTHER 2/- GIFT FOR READERS

Popular Wireless

Every Thursday PRICE 3d.

No. 333. Vol. XIV. INCORPORATING "WIRELESS" October 20th, 1928.

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Long, Illustrated Articles dealing with
THE "WAVE-CHANGE" ONE and THE "REGIONAL" THREE
appear in this issue, together with many other special features.

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B.T.H GRAMOPHONE PICK-UP

THE introduction of the B.T.H. Gramophone Pick-up marks a very definite step towards fidelity in sound reproduction. It is a thoroughly reliable instrument of extreme sensitivity and is capable of translating the impressions on the gramophone record into electrical impulses over an exceptionally wide range of frequencies. A wonderfully designed balanced tone arm ensures correct needle weight, thus minimising wear on the record. Used in conjunction with the new B.T.H. Pick-up amplifier, and a moving coil loud-speaker, a most remarkable degree of tonal purity is obtained.

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This instrument will appeal to those who have their own power amplifiers, but require a further stage. In addition to the one stage of amplification, this instrument embodies a scratch eliminator and volume control.

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B T-H
GRAMOPHONE PICK-UP

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RADIO NOTES AND NEWS.

Wesleyan Wireless—Ariel's Fairy Story—Bottled Crystal Sets—Television in Germany—The Strength of PCJJ—The Eavesdropper—B.B.C. to Flit West

Wesleyan Wireless.

IF you lived in Newfoundland you might have some excuse for not turning out to church! But probably you'd have to "go" just the same, because the Wesleyans would be after you via S W M C, a fine half-kilowatt broadcasting station that works on 400 metres.

Every Sunday they put out a morning service at 11.00 a.m. and evening service at 6.30 p.m., for the benefit of the sick and shut-ins. Congratulations to the Rev. J. G. Joyce, to whose enterprise this St. John's station is due.

"Ariel's" Fairy Story.

ONCE upon a time there was a naughty, naughty Marconi Company, which, standing high upon its own dignity, would not let a little listener listen without paying a pretty penny for it. So the poor listener was in despair, and things looked very black indeed. But one day along comes a good little Brownie (Company), and this little Brownie, dashing past when the Marconi Company was not looking, opened a *patent* gateway and let the listener listen for a teeny weeny fee instead of paying a 'uge, big, 'normous royalty. Wasn't that a good little Brownie? Night-night, children!

I Want to be Happy.

MY old friend, "Novice," is sure to be asking soon, "What station was it that played 'I Want to be Happy' last night, on about 300 metres?"

Well, *I* want to be happy, too! But this is a warning that I never shall be if I start trying to identify stations without exact wave-length, time, etc. As a matter of fact, now there are so many of them, the only way of being sure of a station is to hear it announced itself, clearly. (And *then* you aren't sure, because it may be a relay!)

The Perfect Loud Speaker.

A VALUED Kentish reader (may his size increase) writes to me a down-right-no-beating-about-the-bush letter in which he says, I'm-right-and-don't-contradict-me fashion, that ". . . in spite of all this wireless literature displayed for the unwary upon bookstalls and booksellers' counters, there is only one radio journal in the whole wide world—viz., namely, i.e., that is to say, 'P.W.'"

He has tried others, patiently and without malice, but the one that got him down at last was the one that said that the perfect loud speaker should give omnitonal reproduction and must be capable of equitonal response. It was going on to say that another quality that was essential was sonority, but at this stage my correspondent could bear it no longer. He tells me that he just had to put on record that, in his opinion, if you want common sense about radio, told in plain language, you have got to have "P.W."

Bottled Crystal Sets.

SINCE I suggested that some of the old sailors who constructed three-masted and fully-rigged barques inside small beer bottles should try their hand at bottled crystal sets, I have had an eye-opener upon the subject of human ingenuity. The stunts that some people think of! 'Smarvellous!

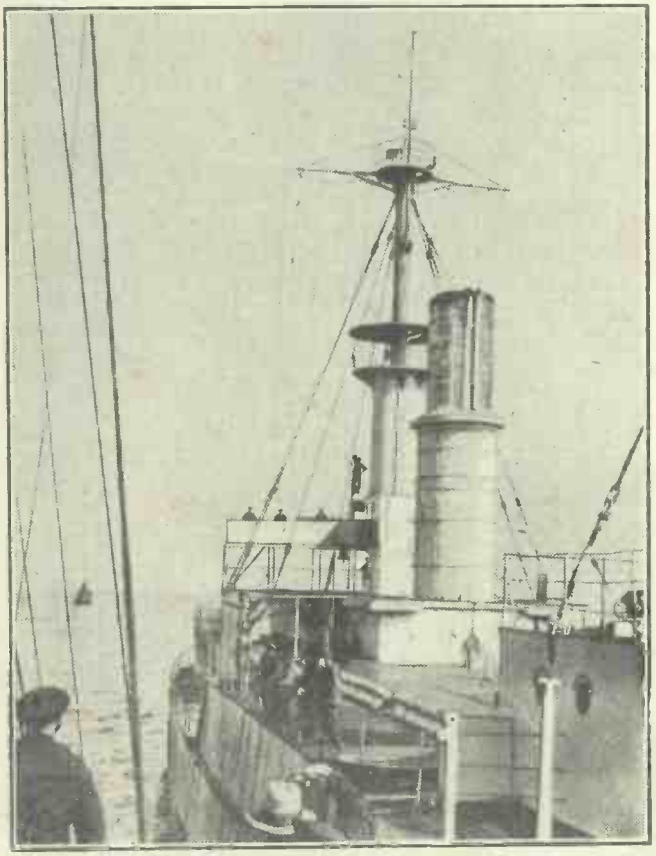
One Cheltenham reader made a set upon a spirit-bottle (I don't know what kind of spirit!) and tuned it in by pouring water into the bottle. I've certainly never tried that, and, honestly, I shouldn't have expected much alteration in tuning, but perhaps it was those famous Cheltenham Waters that did it! Anyhow, he takes the biscuit until someone can go one better.

Television in Germany.

ACCORDING to one of the German papers the television apparatus as displayed by Mihaly at the Berlin Radio Exhibition so impressed the German Post Office that they purchased the entire German rights, with the intention of giving a picture service in conjunction

(*Continued on next page*)

REMARKABLE RADIO ROBOT.



Here is the old German battleship "Zahringen," which has recently been reconditioned for radio control. By means of wireless she can be steered and controlled at a distance without a soul on board her, and even if the control aerial is shot away another automatically rises in its place.

NOTES AND NEWS.

(*Continued from previous page.*)

with the radio stations. If this is true, it will be the first time that a European Government has adopted a system of wireless pictures as an adjunct to the broadcasting service.

"Not Guilty."

"I MADE up the Simmonds 10-metre receiver," writes an Australian "P.W." pal, "and constructed it so that I could change from short to broadcast waves. Since then I haven't been guilty of listening to broadcasting on the ordinary waves for longer than one week at the most since November, 19[illegible], when I made up the short-waver."

That shows you what fun there is in this short-wave stuff!

Giving 5 S W a hearty pat on the back in passing, and mentioning the usual list of long-distance captures, this reader goes on to ask if any British listeners picked up the "Southern Cross" 'plane (K H A B) on its way across the Pacific to Aussie? If so, he suggests a letter to "P.W.," giving details, would prove most interesting to our Antipodean pals.

Radio Society's Ruse.

IN sending me a cheery letter about the programme of the Leeds Radio Society, the hon. secretary—he hangs out at 33, Milan Road, Harehills, Leeds, and is a glutton for new members—tells me they have a fine list of "fixtures" for this season.

I notice that "nights have been set apart for mutual interchange of spare components." Oh, Boy! What Joy! There's no thrill like swapping the parts you can't use for the very identical transformer or speaker that you've been dying for!

The Strength of P C J J.

SINCE that first letter about "The Strength of P C J J" appeared in "P.W.," I have had dozens upon the same subject. The funny part of it is that, although no two readers seem to get quite the same results from him, everybody has a good word for P C J J. And this kindly feeling extends also to P C L L, who plays a sort of "Charles's-His Friend" part, and keeps the audience entertained whilst P C J J is resting and getting ready for the the next act. Fine entertainers these two.

New P C J J Programmes.

TALKING about the Dutch short-wavers reminds me that P C J J is now giving a special transmission every Thursday ("P.W." night). Until further notice he will be "on the air" from 11 p.m., Thursday, to 3.0 a.m., Friday (Greenwich Time)

British Best.

YOU know Zeesen, the German super-power station? Well, the German State Telegraph people have been worrying about the H.T. supply for Zeesen, and, having looked all round, and carefully investigated and painstakingly calculated in true Teutonic style, they decided they'd have to get a real snorter while they were about it.

And where *do* you think they've bought it? From Newton Bros. (Derby), Ltd. (the people who arranged the H.T. for 5 G B)! Quite a reversal of the usual state of affairs—what!

Mr. Percy Scholes.

IN a characteristically cheery letter, Mr. Percy Scholes gently chides "P.W." for the recent reference to his "retirement."

As a matter of fact, he is now residing in quietude in order that he may work as hard as ever upon the production of an Encyclopædia of Music. He thinks, therefore, that the word "eventide" was misleading, as a reference to "Who's Who" will soon prove that he is no Methuselah!

(He certainly never sounded like one, did he, "Listeners all"?)

"Purple Patches."

J. G. (Sweden) considers that one of the most impressive things he has heard was the broadcast of the Watch Night service from York Minster last New Year's Eve.

And here's a warning! All afire to hear Sir O. Lodge explain the great telepathy experiment he settled down to enjoy himself and the L.T. battery "conked out!" So don't forget old man voltmeter, you fellows. A charge in time saves—'orrid words.

SHORT WAVES.

"The Real Joys of Wireless. Listeners who have never yet discovered them," runs a headline in the Sunday News.
We know one or two.

* * *

FINANCIAL CLARIFIER NEEDED.
Mabel: The interference is, just awful on our radio. Is yours clear?
Lilian: Oh, no. Not yet. We've got three more payments on ours.—"Radio News."

* * *

I am asked to deny the rumour that a game of "whisky-poker" is projected as one of the forthcoming surprise items at 2 L O.—"London Calling."

* * *

"It is likely that a running commentary on the greyhound racing at Manchester and the White City will be broadcast," we read in the "People."
But surely the broadcaster would be too much out of breath to broadcast?

* * *

"Choke" coils should not be allowed in houses where there are children, writes a correspondent. Our neighbour's little son nearly choked himself the other day trying to fix the radio set.

* * *

IN THE NEAR FUTURE?
'Phone Ham: Say, I just heard a ham in Australia drop a pin! Can you beat that?
Television Ham: Huh that's nothing. I had that fellow tuned-in, too, and saw the pin drop.—"Radio News."

* * *

An Aberdeen reader has written to ask us if there is any use for used H.T. batteries.
They are, of course, always handy when your neighbour wants to borrow one.

The Eavesdropper.

ON May 12th, under the heading "Keyholing Extraordinary," I described the feat of a New Zealand listener who overheard a conversation between 5 S W and 2 X A D, working on different wavelengths.

A letter from F. W. S. (Wellington, N.Z.) reveals that he was the listener in question. F. W. S. points out that though he wrote to both stations his letters were not acknowledged. He adds that he repeated his ear-span of the globe two mornings a week for several weeks—surely one of the most remarkable experiences that ever came to a lucky amateur.

B.B.C. to Flit West.

SO the B.B.C. propose to migrate to the West End and build themselves "a lordly pleasure house." Well, it is right that they should have proper premises of their own, for they represent a big thing—the British mind and soul expressed in sound. I hope that they will build with a large, free conception of the future and that the new venture will succeed in putting British broadcasting indisputably at the head of all broadcasting services. But they must produce that super-orchestra first. I have heard a Spanish *cinema* orchestra which was as good as the B.B.C. Wireless Orchestra, though that is very good. Let them take their time! An orchestra is not *chucked* together.

"Kid's Corner."

A 13-YEAR old writes from Southampton to say that he gets "both" Toulouse, Nurnberg, Cologne, Stuttgart, Prague and heaven knows what not, "besides five stations unknown." Good for you, buster (initials C.A.S.). I hope you will enjoy "both" health, strength, wealth, happiness, 3 L O, talks, income tax, chamber music, "musical" evenings, sacking the cook and caviare.

But all in due time.

A Treat for the Trams.

IF reports are not lying jades then the University of Birmingham is experimenting in the transmission of power to moving tram-cars by radio means, the short space between the line and the car being bridged by high-frequency waves produced at 20,000 cycles by a Poulsen arc. The received power is then converted by a mercury arc rectifier. Very ingenious! But why this pother about those obsolete omni-chariots called trams? Why not experiment in their abolition and clear the roads a bit?

Veteran Wireless Society.

FOUNDED in 1913, and believed to be the third oldest society of its kind in the Kingdom, the Croydon Wireless and Physical Society is still alive and bobbish, though it would not decline a little fresh blood in the form of new members. This is a serious Society, with a sound backing of V.P.'s. The hon. sec. is Mr. H. T. P. Gee, A.M.I.R.E., Staple House, 51–52, Chancery Lane, W.C.2, who will be pleased to take your fees and give you membership.

Pernicious Radio.

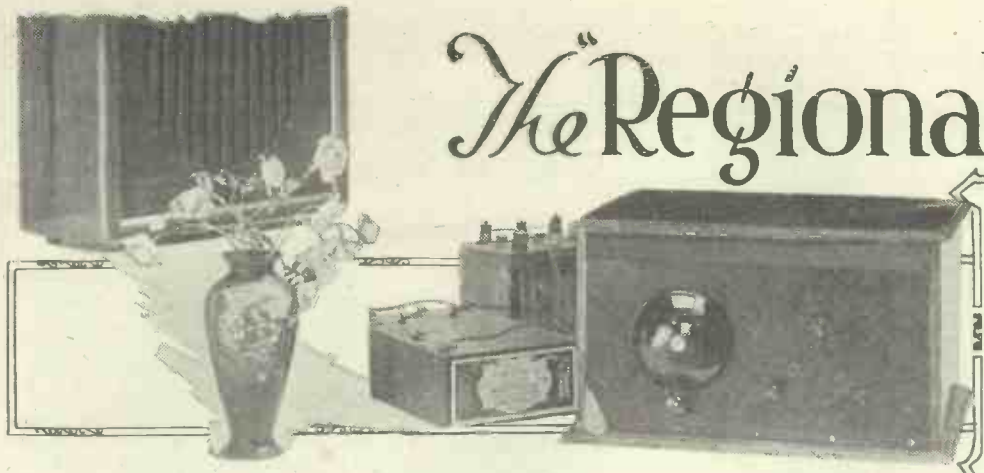
THE worst has happened. Mr. Stobart, of the B.B.C. ("Education") has heard a railway shunter singing a bit of Rimsky-Korsakov! Mr. Stobart says that this is a proof of the value of broadcasting classical music. But what special value attaches to an audition by Mr. Stobart of a shunter? The day I hear a pickle-blender's mate singing a bit of Honegger I shall smash my set—as a gesture to show that I spurn radio—and buy a saxophone.

Aftermath of the Show.

SIX-YEAR OLD boy to boy next door: "I say, Ginger, you ought to see our new baby. Latest model portable, with loud speaker built in, one dial and no control. Very sensitive. Gets Chile *easy*." And my young nevvy, Bill, says the lack of souvenirs in the shape of crystals and cat's-whiskers shows what things are coming to. All he got was a dummy hydrometer and a cardboard valve!

ARIEL.

The "Regional" Three



This one-dial, wave-change three has been specially designed to fulfil the needs of those who require an easily-handled receiver which will bring in a large number of stations on both medium and long waves without changing coils. The set is perfectly stable and is capable of giving very high quality reproduction.

By THE "P.W." RESEARCH AND CONSTRUCTION DEPT.

THE "Regional" Three is just what a glance at the heading photograph would lead one to expect. It is a real simplicity three-valve receiver, designed for the listener who requires something which really is easy to handle and to build.

The first point which strikes one is that it is a three with only one tuning control.

A further inspection shows that it is a wave-change receiver which does not require to have a different set of coils inserted when it is desired to listen to 5 X X or the other stations working on this wave-band.

A 6d. BLUEPRINT OF THIS SET WAS, WITH THREE OTHERS, GIVEN FREE WITH LAST WEEK'S "P.W."

A push-pull switch "does the necessary," and it is possible to go straight over from the local station to Daventry (5 X X) in a second.

There are other very desirable features in this excellent little set. For instance, one H.T.+ tapping supplies all three valves, and in consequence one has only to tap the H.T. supply at its maximum value to obtain the best results from the receiver. No experimenting with different voltages is necessary.

Quality is another point which has been given every consideration in the design. The low-frequency side consists of a stage of resistance-capacity coupling for which well-tried values have been chosen, followed by an efficient transformer of a type capable of delivering the bass notes.

About the Circuit.

The circuit briefly is as follows. The aerial is coupled to the secondary coil on what is termed the "semi-aperiodic" principle, that is to say, no separate tuning condenser is employed for the aerial circuit. Selectivity and signal strength are adjusted by varying the size of the aerial coil which, it will be noted, is of the plug-in type. The secondary coil does not need alteration; a No. 60 will cover the 250-500-metre band easily. Reaction on this wave-band is arranged for by placing another plug-in coil alongside the secondary coil in the usual manner for obtaining "Reinartz" reaction.

For the long waves a standardised loading coil is brought into action by means of a switch, and the aerial circuit becomes auto-coupled; that is to say, a certain proportion of the loading coil is connected in the aerial-earth circuit. This portion of the winding also serves for reaction purposes. So you see, although the detector circuit is very up-to-date, it is nevertheless quite simple.

The reaction control has a value of ·0001 mfd., but there is a safety condenser placed in series with it. The object of this fixed condenser (its capacity is not critical, and ·001 is about right) is to prevent the H.T. battery from shorting, should the moving vanes of the reaction control touch the fixed vanes.

Otherwise there would be a danger of the H.T. battery being ruined and, moreover, of the valves being burnt out.

Next we come to the L.F. side. The first stage consists of a 250,000-ohm anode resistance and a 2-meg. grid resistance. These values are ideal for all-round work, the anode resistance being just right for obtaining the maximum output from a modern "H.F." type valve when used in the detector socket. If a higher value than this were used it might be difficult to obtain sufficient reaction.

It will be noticed that an extra ·25 meg. resistance is inserted in series with the grid of the first L.F. valve. The object of this is to stop any stray H.F. currents getting through into the L.F. stages, thus producing distortion, and possibly howling in some cases.

Constructional Details.

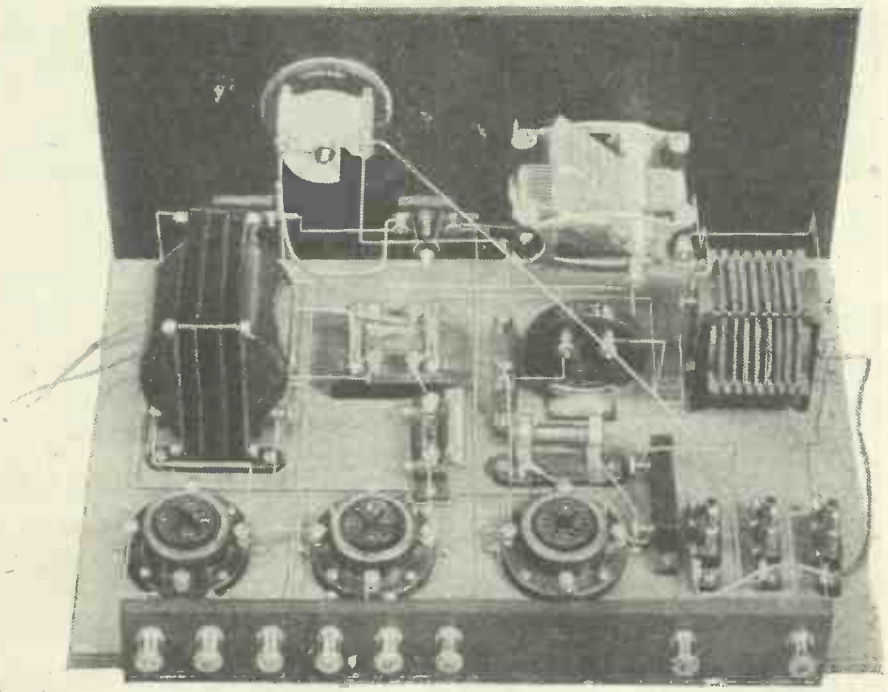
Next we have a stage of transformer coupling. The only point to remember is that the transformer should be of good make and should preferably have a low ratio of about 3-1, or less.

Now for the construction of the receiver.

The first procedure is to mark out the panel ready for drilling.

The dimensions will be found marked on the blueprint, and the components required are the ·0005-mfd. tuning condenser, the reaction control, the filament "on-off" switch, and the wave-change switch.

(*Continued on next page.*)



The three coil sockets seen on the right are for the ordinary broadcast wave-band coils. Suitable sizes would be, right-hand socket, a No. 35; middle socket, a No. 60, and left-hand socket a No. 35 or 50.

THE "REGIONAL" THREE.

(*Continued from previous page.*)

Take a sharp nail or a scriber and mark out the back of the panel to the dimensions given. Then centre-punch the drilling points. It is probable that the four components which are to be mounted on the panel will be of the single-hole fixing type.

If so, a ⅜-in. twist drill will serve throughout, but it is advisable to run a ⅛ in. pilot drill through first, otherwise there is a tendency for the larger drill to run out of centre.

The ⅜-in. drills, and those of similar type, are best used in a carpenter's brace for work of this nature.

The Baseboard Lay-out.

If you attempt to employ an American brace you will probably be unable to cut the hole cleanly, since it is difficult to obtain adequate torque to turn the large drill.

Having drilled the holes for the components, drill four more along the bottom edge of the panel to take the four wood screws by which the panel is secured to the baseboard.

Now secure the panel to the baseboard and mount on it the two condensers and the switches.

Then commence the baseboard lay-out. Follow the blueprint as closely as possible. Note carefully how the three coil sockets are placed.

They must be close together, so that the coils when in position practically touch. Remember that your coils may be thicker than those shown in the photographs, it depends upon the particular type you choose; but if the sockets are arranged as in the blueprint, there will be plenty of clearance. See that the terminal strip passes right along the back of the baseboard, except for a space at each end. This space at each end is the clearance employed with cabinets of standard type and the terminal strip should measure 12 by 2 inches.

There is little more to be said concerning the lay-out, except for the fact that space should be left for a grid-bias battery of the strip type. This should be done at the left-hand end of the baseboard (looking at the back of the set). An alternative is to fix the grid battery to the inside of the cabinet itself, and this is a procedure which is frequently carried out with commercial designs. It allows more space for the baseboard components.

The wiring is not difficult, although perhaps the neat appearance of the leads seen in the photographs might lead one to think that it is a job for the more expert constructor. In practice, neat wiring is very simple, and it is only a question of "taking one's time" and not hurrying.

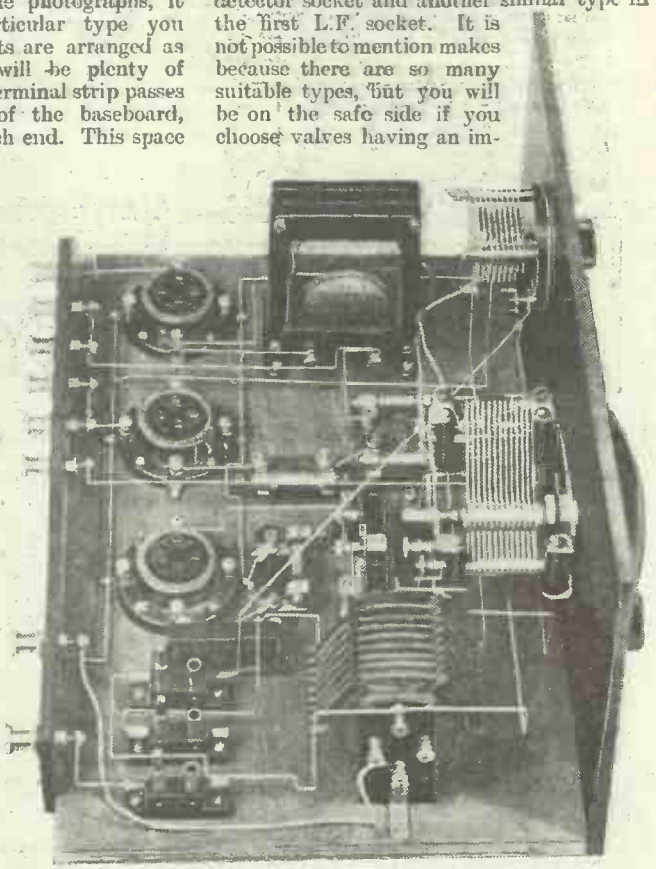
It is best to commence with the various leads near the baseboard and gradually to work upwards, because it will be very difficult to carry out some of the wiring if a haphazard procedure is adopted.

Solder all your joints, if possible, but there is no objection to using the terminals where they are provided. One type of joint is as good as the other in practice. Systoflex covered bare tinned wire can be employed, or, alternatively, one of the insulated wires such as Glazite.

Now for a few hints on the operation of the set.

First, connect up the aerial and earth to their respective terminals and insert a No. 35 coil in the aerial socket (L_1), a No. 60 in the secondary socket (L_2), and a No. 50 in the reaction coil socket (L_3).

Place an "H.F." type valve in the detector socket and another similar type in the first L.F. socket. It is not possible to mention makes because there are so many suitable types, but you will be on the safe side if you choose valves having an impedance of, very roughly, 20,000 ohms and an amplification factor of about 20.



This view shows the flexible lead to the tappings on the loading coil. The two terminals marked 60 and 80 should both be tried. Just above the loading coil is the tuning condenser, and above this again there is another small condenser for reaction control.

In the last socket insert a power valve, or, if you are near to a powerful station and you wish to obtain distortionless volume on loud signals, you can use a super-power valve.

Apply 100-120 volts H.T. to the H.T.+ terminal and adjust the grid bias in accordance with the maker's recommendations.

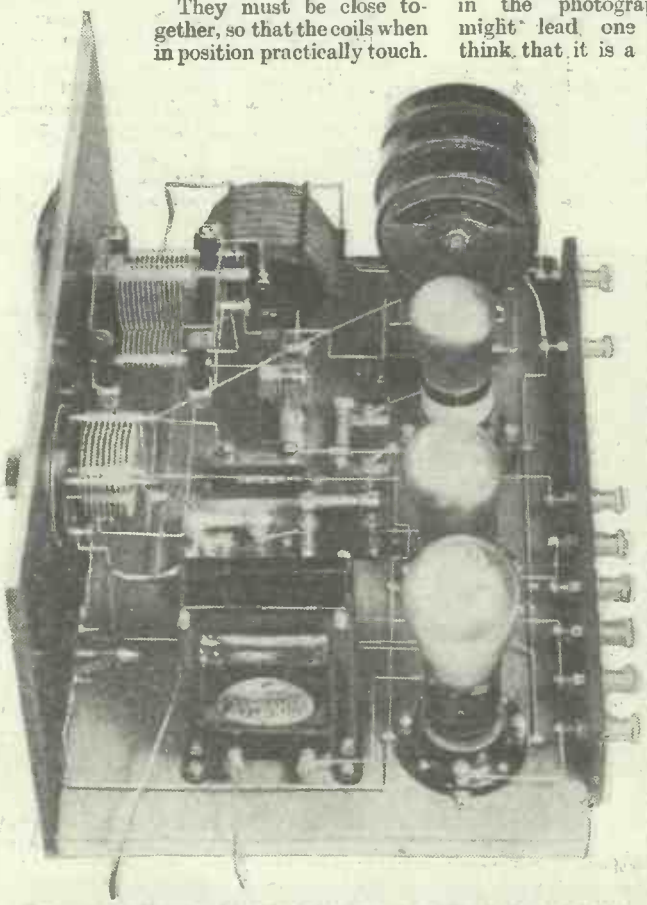
Operating the Set.

Switch on the set by means of the filament "on-off" switch, and short-circuit the loading coil by placing the wave-change switch in the short-wave position. With many switches this will mean pulling the knob out.

Now rotate the tuning condenser, with the reaction control set at its minimum—i.e with the plates out.

Rotate the ·0005 condenser until you hear your nearest station and then adjust the reaction control until the signals reach their maximum volume.

Next test out the set on 5 X X. Place the wave-change switch in the "long-wave" position and rotate the tuning condenser. Try the flexible lead from the centre of the switch to the loading coil on the 60 and 80 tappings in order to see which gives the best results. That is all there is in operating this receiver. First, you tune in the station with the ·0005 condenser, and then you bring up the strength with the reaction control. With a little practice you will soon be able to use both condensers together, working the reaction control so that the set never oscillates but yet is in a sensitive condition.



Here we see the plug-in coils and valves in position in the set. The question of housing the grid bias battery may possibly worry the constructor at first. As you will observe, there is just room for a grid-bias strip between the last valve and L.F. transformer and the side of the cabinet.

WHY THE COIL MOVES.

An interesting description of the operation of a moving-coil loud speaker. The action is quite a simple one and every radio enthusiast should make himself acquainted with it.

By C. E. FIELD, B.Sc.

IN a moving-coil loud speaker there is no iron diaphragm or armature to be attracted by the magnetism produced by speech currents, as is the case with other types of speaker, and consequently amateurs are apt to be puzzled as to how the speaker operates, and why the moving-coil should move.

In view of the immense growth in popularity of this type of loud speaker, and of the important principles involved in its method of operation, it is proposed to explain fairly fully just how the speaker works.

How Cones Cause Sound.

Fig. 1 shows a simplified diagram of a moving-coil speaker. When signal currents from the output of a receiving set are sent through the moving coil, M, it moves to and fro in the direction of its axis, i.e. between the two positions shown in dotted lines. The cone, C, to which it is attached moves with it, and produces sound waves, the intensity of the sound depending upon the extent of the movement of the cone.

In order to understand how it is that signal currents cause the coil to move, let us consider first just what happens when an electric current flows along a wire.

Firstly, of course, the wire becomes heated (as in the case of a valve filament).

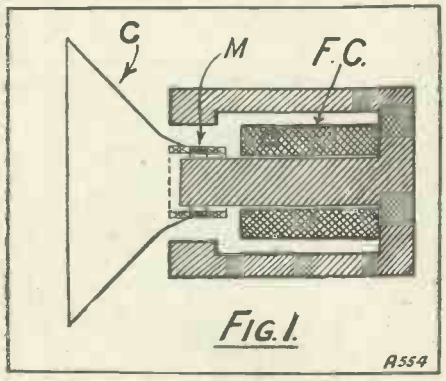


FIG. 1.

Secondly (and it is this effect with which we are here concerned), the wire becomes surrounded by what is known as a *magnetic field*, which means to say that the space round the wire is affected just as if it were the space between the poles of an ordinary horse-shoe magnet, and the effect on a piece of metal or a compass needle in the vicinity would be the same.

A compass needle would be found to take up a position at right angles to the wire, as if it were trying to point *round* the wire, as shown in Fig. 2, and if the current were suddenly reversed the needle would swing round and point in the opposite direction.

We can therefore say that the presence of current in the wire causes some sort of magnetic force to act round the wire, in a direction dependent upon the direction of the flow of current.

Suppose, now, that the wire is curled into the form of a spiral, as shown in Fig. 3 (a). In the sectional view of the lower half of the illustration, it is evident that current will be flowing through all the wires on the right-hand side in one direction,

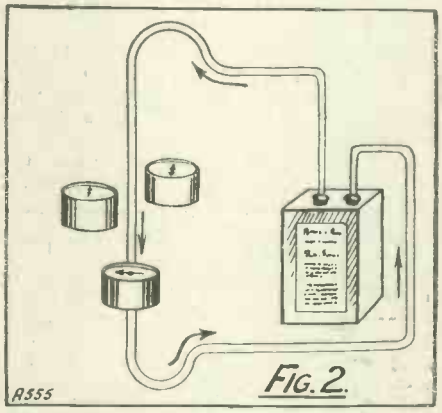


FIG. 2.

and in the opposite direction through all those on the left. Hence, we can imagine the magnetic force round the wires to be acting in the directions shown by the arrows, from which it will be seen that all the individual forces add together to produce one large force acting up the centre of the spiral and down the outside, while between any two adjacent turns of wire are two forces, which, acting in opposite directions, neutralise one another.

Magnetic Flux Explained.

The effect of a current flowing through a spiral of wire is therefore to produce a magnetic force along the axis of the spiral, as represented in Fig. 3 (b). Now, a magnetic force, or, more correctly speaking, a *magnetic flux*, which is the name given to the "magnetic current" which is driven by a magnetic force (just as an electric current is driven by an electro-motive force) is much more easily conveyed by iron than by air, so that if an iron core were inserted in the spiral this would serve as a conductor for the flux, and the latter would be very much increased.

This is shown carried out in Fig. 4 (a).

In Fig. 4 (b) the iron core is shown extended round the outside of the coil, so that the magnetic flux is led up to a small air gap, g. The amount of flux passing round the coil through the air, as indicated by thin arrows, will be negligibly small on account of the very much better conducting properties of the iron.

Fig. 4 (e), which is a section of the magnet of a moving-coil loud speaker, will be seen to be simply a modification of this latter arrangement, the only difference being that the iron core is extended so as to form a conducting path for the flux all round the outside of the coil.

The air gap is, of course, ring-shaped, as shown in the plan view, and the flux passes across it radially.

The "Field Coil."

Thus, the field-coil of a moving-coil speaker (F.C. in Fig. 1), which is supplied with a steady current from a battery or electric mains, simple serves to send a strong magnetic flux across an air gap, just as is brought about by a horse-shoe magnet.

In fact, many moving-coil speakers are made in which permanent magnets are employed for the purpose, and no field coil is required.

We have seen how a wire carrying current produces a magnetic flux. Let us now consider how this flux would affect another wire.

In Fig. 5 (a) is shown the end view of a wire lying in the path of the magnetic flux between the poles of a magnet. The flux is represented by a series of thin lines, and is assumed to be flowing in the direction of the arrow-heads.

As long as it is not carrying an electric current, the wire will have no effect on the magnetic flux, for this will pass through the copper as easily as it does through the air, but if a current were to flow through the wire, we might expect the flux to be upset in some way, for we have seen that it would itself give rise to a magnetic force acting round it.

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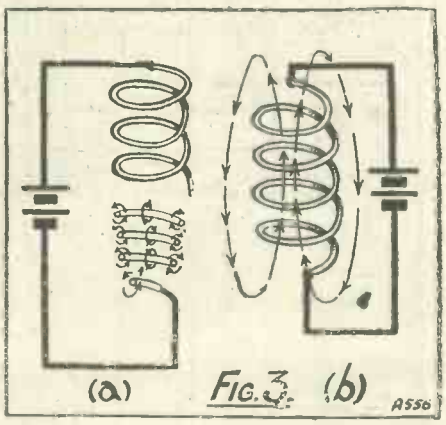


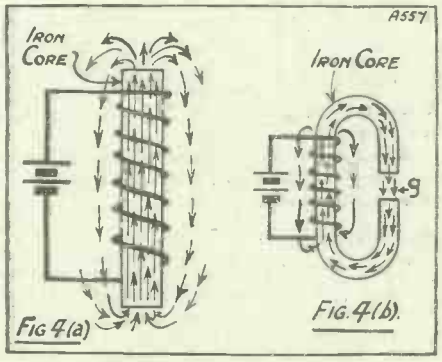
FIG. 3.

WHY THE COIL MOVES.

(Continued from previous page.)

Let us suppose, then, that a current is suddenly caused to flow in the wire, such that a magnetic force acts round it in a clock-wise direction, the result being that a magnetic flux will try to flow round in the same direction.

The results will be more easily understood by reference to Fig. 5 (b), than from a full explanation. It will be clear from the illustration that the flux on the top side of the wire is flowing in the same direction as that produced by the magnet, while below

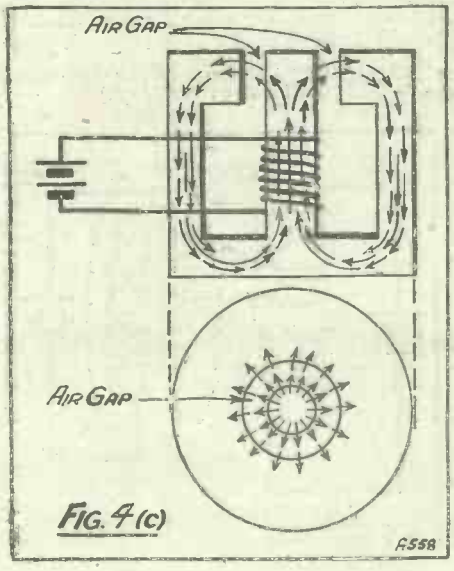


the wire the magnetic forces due to the wire and the magnet oppose one another, and to a large extent cancel one another's effects.

The Flow of Flux.

Hence the flow of flux is diverted and takes the path shown in the sketch, there being a piling-up of the flux on the top side of the wire. In order to bring this about, the flux has been turned from its straight path, and made to take a devious route which is unnatural to it, and it therefore tries to straighten itself out.

The only way in which this can be brought about is for the wire to move downwards, and that is actually what happens, and since, so long as current flows, the magnetic flux is pushed from its straight course, the wire continues to move.



If the current in the wire were reversed, or if the direction of the flux due to the magnet were reversed, the wire would move in the opposite direction, i.e. upwards in Fig. 5.

A very rough analogy may be drawn with a semi-circular body held in a current of water, as shown in Fig. 6, which is a view looking down into the water.

The fact that the body creates a deflection of the stream-lines of water causes a force to act on it, and moves it (downwards in the illustration) in order that the stream-lines can straighten themselves out.

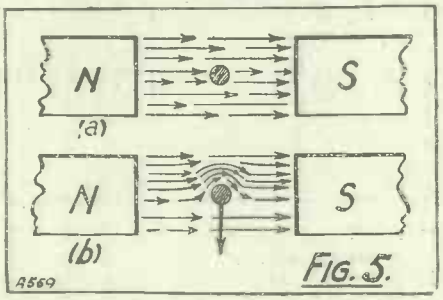
In the case of the moving-coil loud speaker, instead of a straight wire we have a coil of wire, the moving coil to which is attached the cone, shown in Fig. 1.

Current Changes.

An enlarged and simplified view of the moving coil and the end of the magnet is shown in Fig. 7, where a sectional view of the coil is shown, and the magnetic flux produced by the field magnet is indicated by arrows. If it is assumed that a current is flowing round the coil from B to A, it will be seen that all the wires on the left-hand side will be carrying current in one direction (i.e. towards the reader), whilst those on the right carry current in the opposite direction.

The stream-lines of magnetic flux will thus be distorted in the same direction (e.g. upwards) in all parts of the air gap, and so the whole of the coil will be pushed downwards.

If a reversal of current takes place, the coil will move in the opposite direction—a



fact which the reader is recommended to verify for himself with pencil and paper.

As alternating signal currents are passed through the coil, therefore, the latter follows the alternations, the core moving with it and producing corresponding sound waves in the air.

Nearly all forms of electrically produced movement are brought about in the manner outlined above, the moving-coil speaker being, in fact, simply a tiny electric motor.

SIMPLIFYING SWITCHING.

From a Correspondent.

IN the usual way one does not find it difficult to remember to switch an ordinary L.T. switch off, for even when there is no broadcasting, noises are emitted from a loud speaker owing to atmospherics; but when one adds an H.T. unit to the set one's memory has to begin to do harder work. With the addition of a moving-coil loud speaker having a mains supply field, yet another switch may be needed.

It is an advantage to connect the loud-speaker feed to the same mains plug as that supplying the H.T. unit. The removal of this plug then disconnects both circuits. Unless efficient smoothing is introduced there will always be a slight hum in the moving-coil loud speaker if its field is actuated by a D.C. supply, but this might not be sufficiently noticeable to supply a reminder.

Flash Lamp Fuse.

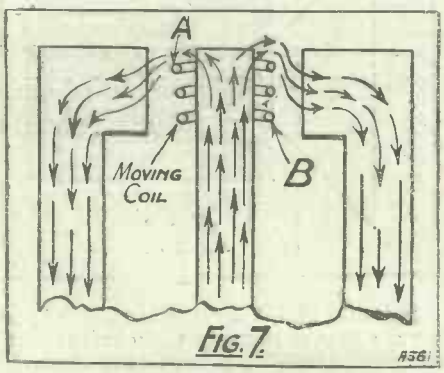
A good idea is to connect in series with one of the leads supplying the field a small

pea lamp. Pea lamps are available which will light up with currents as low as 65 milli-amps, and some moving-coil speakers demand much more current even than that. A flash lamp so connected can also operate as a fuse. It should, of course, be fixed in a position where it might be seen quite plainly. The resistance of the flash lamp will be so small as to be, in the circumstances, negligible.

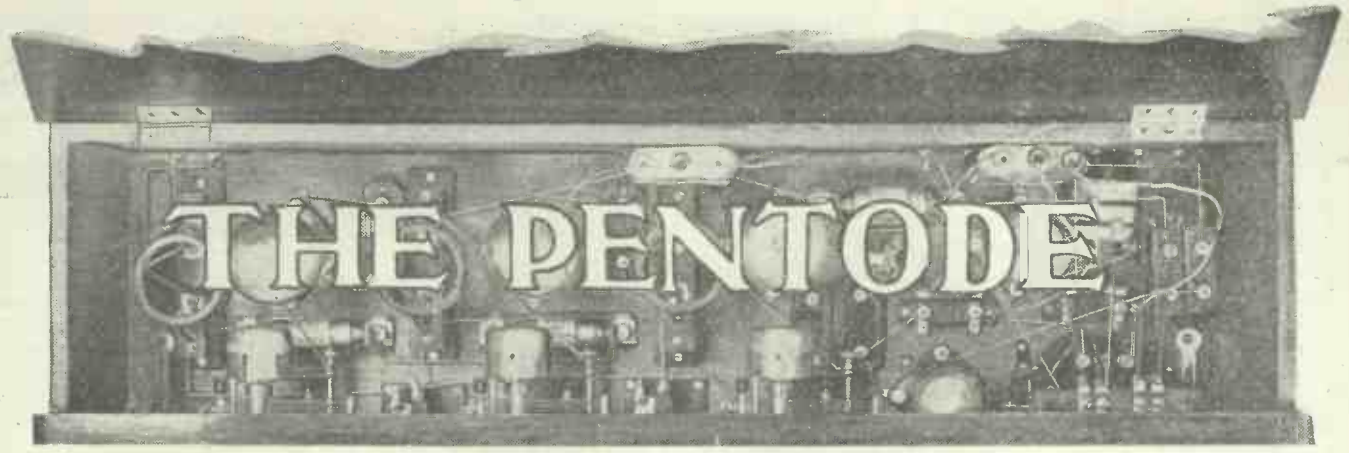
A Further Precaution.

The more things you have connected to your electric-supply mains the more essential it is that the wiring should be carefuly arranged, and ample security in the form of fuses provided. Always arrange such fuses, such as the small flash lamp above mentioned, as close as possible to the supply socket. Do not join the leads to terminals merely by screwing the ends underneath the nuts. Small loops should be twisted in the ends of the wires so that, should the terminals become loose, they cannot slip off.

As a further precaution a short length of string can be tied around the cable at the one end, the other being tied around the base of the terminal. This string should pull the lead forward so that some slackness exists between the two nuts, and accidental



tugs on the leads will not then result in a direct pull on the terminal connections. Needless to say, wire of a strong, flexible character, and well covered with rubber and fabric, should be used for mains connections. On no account use single-stranded wire covered only with silk or cotton, and always keep all the wires directly connected with the power point well away from the L.T. battery, aerial, and earth connections.



THE PENTODE

In this article Mr. G. P. KENDALL, B.Sc., Chief of the "P.W." Research Department, answers those many correspondents who have asked for set designs incorporating Pentode valves.

THERE is a certain type of new invention whose arrival always places the conscientious set designer in something of a quandary. The type is one which enables something rather revolutionary and highly attractive to be done, apparently in a simple manner, yet involving special technical difficulties which are evident to the aforesaid designer, but not to the public for whom it is his duty to cater.

The designer can see, perhaps, that some particular little difficulty will require the expenditure of a considerable amount of time in patient experimental work before it can be overcome and the new device embodied in a completely satisfactory design. The interested public, on the other hand, see merely that a promising new scheme is available, and are naturally impatient to be in a position to reap such benefits as it may offer with as little delay as possible.

The Cossor five-electrode valve.

In such a case as this there is an obvious temptation for those responsible for providing the public with its needs to rush out the necessary receiver designs at the earliest possible moment without taking time to remove such small "snags" as there may be in a new scheme. The settled policy of "P.W.", however, is rigidly against any such proceeding.

In every case it is laid down that if there appear to be any difficulties or weaknesses which can be removed by carrying out sufficient experimental work, the necessary time shall be set aside for the purpose, and no design on the new lines published until the work has been done. Our readers are sometimes kept waiting by the effects of this policy, but its advantages from their point of view are too obvious to require emphasising here.

A Recent Example.

A case in point is the moving-coil loud speaker, which the reader may remember was only described constructionally in "P.W." some considerable time after designs began to appear in other quarters. The reason, of course, was that we found that many early forms (home construction ones, that is) were decidedly imperfect, the main weaknesses being difficulty in centring the moving coil in the gap, obtaining and maintaining a suitable degree of tension in the suspension material, and getting the necessary degree of sensitivity. A great deal of practical work was done on these problems and effective solutions obtained, so that the final published result was remarkably free from the drawbacks met with in many systems of construction.

A somewhat similar position arose in connection with the advent of that interesting new valve, the Pentode. This valve was nominally available to the public on and after the first of September last, yet after a lapse of six weeks no set design including it has appeared in "P.W.", and it is surmised that some of our readers may be wondering why.

Reason for the Delay.

Well, the reason is simply that the Pentode is most definitely an innovation of the type requiring experimental work to determine its best uses, and to decide whether certain apparent "snags" can be eliminated, or must be endured.

The necessary work has been proceeding actively for some time in the "P.W." research department, and it will be found that in the very near future we shall be publishing designs for sets especially arranged to make use of this valve in the best manner.

It will be discovered when these designs do appear that they represent a very marked advance in two important respects over any sets hastily rushed out.

Upon the two features in question much time has been spent, although the final solution in each case is a very simple one. The first and most obvious problem was this: The Pentode is a valve of decidedly delicate and complicated internal structure, and there are large differences of voltage between the closely-spaced electrodes.

It is quite feasible, obviously, for rough treatment to jar some of these into contact, and since the only symptom which the user would observe at first would be an absence of signals, the resulting short-circuit of the H.T. battery might go on for some time, with disastrous consequences.

The other problem, even more important, was that of the quality of reproduction obtainable, and here it must be explained that the Pentode is *not* quite such a simple proposition as might appear at first glance.

Output Difficulties.

Where the difficulty arises is in the arrangements to be made for connecting the loud speaker to the anode circuit of the Pentode. Now, it is obviously very bad practice to connect the speaker direct in the plate circuit of a valve carrying so large a current as the Pentode, which usually takes from 12 to 16 milliamps in its 2-volt form under average conditions. Evidently, then, something in the nature of an output filter or transformer will be needed, after making which decision we come up against a very awkward point, namely, the selection of an output device to suit the valve.

The point is that the impedance of the Pentode is several times higher than that of the average super-power valve, such as ordinary output transformers and filter devices are designed to suit. The effect with most loud speakers is to render the reproduction decidedly high-pitched and "edgy," which the majority of listeners are likely to find a little displeasing.

The Mullard "Pentone."

Upon this question much work is being done, and useful results have already been obtained with a type of output transformer originally intended for a somewhat different purpose. Further, it is now learned that at least two leading manufacturers (Marconiphone and Igranic) are bringing out special output transformers to suit the Pentode, and with the aid of these and the information now in our hands, we are in a position to produce a design, in which the new valve and also the latest screened-grid type, will be used in a really efficient manner.

LATEST BROADCASTING NEWS.

"BROADCASTING HOUSE" SILENCE

ROOM FOR PICTURES — THE POST OFFICE AND WAVE-LENGTHS —THE ARCHBISHOP'S BROADCAST FAREWELL — HOW NOTTINGHAM FADES INTO 5 G B— Etc., etc.

"Broadcasting House" Silence.

THE B.B.C. seems terrified of the subject of its new headquarters. The unhappy reporter who breathes the subject at Savoy Hill is lucky to escape uninjured. Why this attitude? It is part of the growing reticence of the B.B.C. on all the things that people are really interested in about broadcasting. So, in the absence of any information, we must draw our own conclusion, which is that the B.B.C. has not yet made up its mind about the kind of headquarters it wants. Into the breach therefore. A dozen studios, for broadcasting, three picture studios, a fully organised news-room, and a super-studio-concert-hall: provide these, and let the rest look after itself.

Room for Pictures.

The addition of still pictures to the broadcasting service will not mess up the wave-length allotment contemplated for the regional scheme. But if television comes along, this will smash the regional scheme to bits. The sidebanks for television transmission would take a terrific "chunk" of ether, and this alone may be ample cause for blocking television.

The Post Office and Wave-lengths.

There is a strong rumour in I.E.E. circles that the Post Office is threatening to sell the pass for broadcasting. Some Continental countries are anxious for more generous slices of the broadcasting waveband. It would serve the Foreign Office well in other directions to placate these countries. The alleged plan is to hand over three of the B.B.C. wave-lengths.

Moves of this kind are not new. If it had not been that Captain Eckersley had been in personal though unofficial attendance at the Washington Wireless Conference last year, Britain would probably have lost the long wave on which 5 X X is working. Such a catastrophe was averted because the gallant Chief Engineer took charge of the proceedings at Washington.

One can only hope that he will have similar chances now. No one else seems capable of handling the situation.

The Archbishop's Broadcast Farewell.

The Archbishop of Canterbury is preaching his farewell sermon before his retirement as Primate, during the evening service which all stations are relaying from Canterbury Cathedral on Sunday, November 4th. Dr. Davidson will also be heard by 2 L O and 5 X X listeners when he receives the freedom of the City of London, on October 22nd.

How Nottingham Fades into 5 G B.

On Thursday, November 1st, the Nottingham station will have ceased to exist. Its transmitter, working for the last time on the previous night, will be dismantled. Its staff, having finished their local duties, will be transferred to other centres of the Corporation's activities. But the citizens of Nottingham being, as they have for long past, more adequately served from the technical aspect of broadcasting by 5 X X and 5 G B, are not to lose their proud position in providing a definite share of the local programmes.

The Birmingham station is arranging for the frequent appearances of Nottingham artists in the 5 G B studios, and is also giving a number of public concerts in Nottingham, portions of which will be broadcast, and the profits devoted to local charities. It is a gracious act and a fitting tribute to what Nottingham has done for broadcasting during the conspicuous "life" of the local station, that 5 G B should give an "East Midland Hour" on the first evening of the new regime.

The programme will be provided entirely by Nottingham artistes and will include Ida Sargent, who at one time took a prominent part in the Nottingham Children's Hour, Beatrice Leonard (contralto), Hilda Warren (soprano), Mark Sellers (baritone), a pupil of Robert Radford, the famous operatic star, and himself a native of Nottingham, and F. W. Hodgkinson ('cello).

"GONNA GETTA GOAL?"

Rival captains of the English and Australian Rugby teams sending greetings by radio before an important Rugby League fixture in Australia.

Sir Henry Wood in Belfast.

Sir Henry Wood is to pay his annual visit to Ireland on Friday, November 2nd, when he is conducting the Belfast Symphony Orchestra in a concert at the Ulster Hall. This is an event which is eagerly anticipated by music lovers all over Northern Ireland, and for those who cannot be present the concert will, as usual, be available by wireless.

The programme includes Beethoven's Rondino in E Flat for Wind Instruments, the Gavotte in E for strings by Bach, Liszt's Second Hungarian Rhapsody, and Handel's Organ Concerto No. 10 in D Minor.

The soloists will be Jelly d'Aranyi (violinist) and Marjorie Sinclair (soprano).

By the way, the stories about Sir Henry Wood's illness made him so furious that he has extracted public apologies from most of the newspapers that published them. A fine old row is brewing between Sir Henry and the B.B.C., whom he blames for a lot of unpleasantness lately.

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

FILAMENT IMPROVEMENTS

ADEQUATE ELECTRONS—TREATING THE FILAMENT—Etc., etc.

Filament Improvements.

AMONGST the most remarkable developments during the comparatively short time broadcasting has been in existence are the improvements which have been made from time to time in radio receiving valves. It is only a very few years back, if you remember, that a stir was created when certain improvements were made in the old "R" type of valve. Since then the efficiency of receiving valves has been periodically increased and you may well wonder what further developments are to be expected in the near future. In this connection I have before me some information from the General Electric Company with regard to their new valves, in which they are incorporating a special filament with a highly-emitting coating tenaciously attached by a special process.

Adequate Electrons.

The efficiency of a valve is very largely dependent upon an adequate supply of electrons. This may be obtained from a pure metal, such as tungsten, by heating the metal to the point of incandescence. If, however, the tungsten is coated with a film of specially prepared substance which emits electrons more readily, the necessary electron stream may be obtained without raising the filament to so high a temperature.

In the new G.E.C. valve the filament is coated with an extremely thin layer of barium which in this form is a rare element, although in some of its compounds it is extremely abundant.

Treating the Filament.

The process is carried out after the bulb has been exhausted; then in a very high vacuum the metal is deposited upon the filament to form a tenacious coating which, it is claimed, is practically embodied in the filament itself, not merely pasted or painted upon it. This coating is highly emissive and therefore copious electron emission is obtained at a very low temperature.

Battery Economy.

You will see that with a filament of this type (of course, other valve manufacturers

(*Continued on page* 358.)

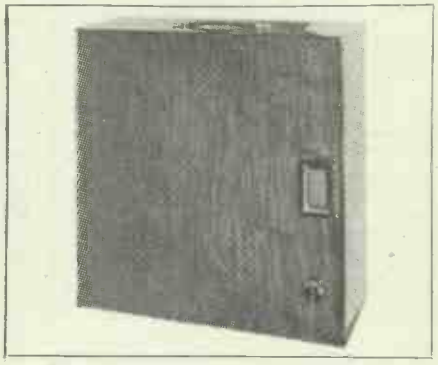
THE BAIRD TELEVISORS.

A review of the various models offered to the public, together with interesting details of prices, etc.

By G. P. KENDALL, B.Sc.

NOW that actual television-receiving apparatus in various forms is being offered for sale, it may be of interest to our readers to describe briefly the general nature and requirements of the machines just placed on the market.

The Baird Television Company showed three principal types of machine at Olympia, and gave demonstrations at an address nearby, at one of which two members of the



The cheapest model, above, costs £20 and is simply the televisor alone.

"P.W." staff were present. The results seen at this demonstration were sufficiently good to be of distinct interest, but it must be borne in mind that on this occasion the transmitting and receiving instruments were united by a direct-wire connection.

The simplest machine in the Baird range is priced at £20, and is not to be regarded as a complete receiving outfit in itself, since it is really the television equivalent of, shall we say, a moving-coil loud-speaker equipment.

Large Additional Outlay.

Before it can receive a television transmission it must be connected to the output terminals of a fairly powerful wireless receiver capable of tuning to the wave-length of the station putting out the transmission. Even if the required set is assumed to be a home constructed one, it is difficult to see how a complete installation could be assembled for an *additional* outlay of less than £30, remembering the considerable power-handling capacity required in the set.

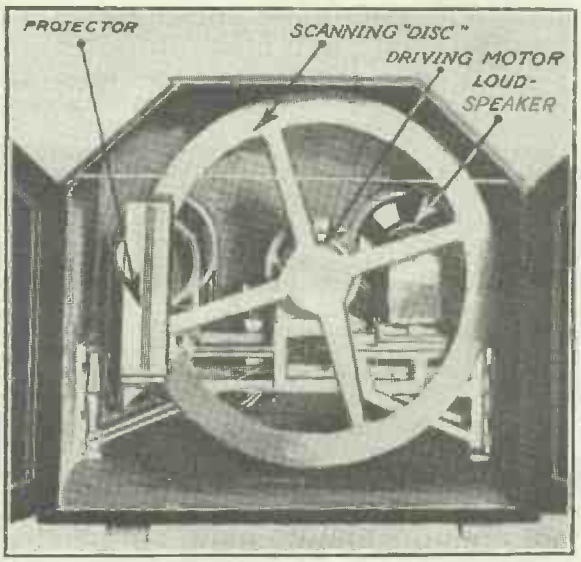
The Voltage Requirements.

This machine, it is stated, must be provided with a supply of H.T. at a minimum pressure of 350 volts, the actual milliamperes required not being given.

THE TELEVISION TEST.

From inquiries we have made this week in connection with the recent test of the Baird system by B.B.C. engineers, we understand that no regular television service from B.B.C. stations will be given. It is possible, however, that a limited number of experimental television broadcasts may be made. The general opinion of the B.B.C. experts who attended the Baird official demonstration is, we understand, unchanged as regards the present suitability of known television systems for a public utility service from the B.B.C. stations.

There is no indication in the descriptive literature as to the means suggested for obtaining this high voltage, and in the absence of a suitable mains unit with proper safety devices to accompany the machine, it can only be assumed that the purchaser must improvise such an apparatus for himself. To do so with any degree of safety in future operation is most emphatically a task for either the very advanced wireless experimenter or a qualified electrical engineer.



The interior of the largest model, showing the scanning disc and the back of the moving-coil speaker.

The second type of machine is to sell at £40, and is similar to the first except that it actually incorporates a moving-coil type loud-speaker, with provision for running either this instrument or the television reproducer from the associated wireless receiver.

Both these machines, of course, include a driving motor for the television disc, calling for a further current supply. An interesting feature is that the effect of a comparatively large image is obtained by the simple device of a large bullseye lens in front of the receiving screen.

The third instrument takes the form of a complete receiving equipment assembled to form a very handsome piece of furniture with the television screen and moving-coil loud speaker suitably placed in the front.

The receiver proper is actually in duplicate to a considerable extent, one "channel" being provided for broadcast reception, and another for the television station, which is apparently expected to operate on a wave-length off the normal broadcast band. Each receiver is a multi-H.F. affair, and a good deal of screening is used.

On the L.F. side the necessary provision is made for handling considerable power, and all the current supply arrangements are built into the outfit itself.

The £40 televisor, which includes a moving-coil speaker and televisor, but no set.

Provision of Power.

We have not heard the apparatus working as an ordinary radio receiver, but the quality of reproduction available should be decidedly good. The receiver, by the way, works from a frame aerial for both telephony and television.

The price of the complete installation is £150, in which connection it should perhaps be emphasised that the power supply to an apparatus of this kind is necessarily a fairly costly business.

The complete outfit, costing £150 and including the set and a moving-coil loud-speaker as well as the televisor.

THE "CUBE-SCREEN" THREE.

The Editor POPULAR WIRELESS.

Dear Sir,—It has several times occurred to me that you would probably be interested to have an account of the performance of an amateur-built "Cube-Screen" Three; I say amateur-built, because prior to December, 1927, when I built a straight one-valver with reaction (swinging coil) (which, by the way, gave good volume on 5 X X at a distance of approximately 240 miles), I had not had any experience of valve work.

I, therefore, enclose a list of stations received on my set.

Only such stations as were actually received at good strength on the speaker are marked L.S. and since most of my listening was done on 'phones, it does not follow that it is a full list as regards loud-speaker reception.

It may seem strange to mark a station like Lille as being received on a speaker, but I have had quite good volume from it, quite loud enough for a small room. The selectivity of the set was fairly good, Langenberg and 5 G B being easily separable, and one could approach to about 50 metres from 2 L O without serious interference, and it was possible to bring Hamburg through 2 L O, though not very satisfactorily.

One peculiarity that I found was that while stations over, say, 350 metres came in best on a long outside aerial, stations under that wave-length came in best on a 50-ft. length of wire lying round the floor of an upstairs room.

Also, with the outside aerial stations under 350 metres caused a hopeless tangle of interference, while with the indoor aerial stations over 350 metres were very sharp in tuning and much reduced in volume.

On the indoor aerial Nurnberg and Cologne were practically equal in volume to 5 G B (or sometimes even 2 L O—2 L O without reaction, that is).

However, I have now dismantled the "Cube-Screen" Three and built the "Economy" Five, and have logged about 40 stations (on the loud speaker) so far, including 9 on the long waves (8 of which could be received any time of day at full strength at my home, which is over 300 miles due north of here).

I also received 6 medium-wave stations in broad daylight on the speaker, one of which was 2 L O.

My great trouble, however, as with the "Cube-Screen" Three, is to get it to be equally selective over the whole 250–550 band with the same aerial even having neutralised it on 2 L O (which setting seems to be the same whatever station I neutralise it on, either by the reaction demand method or by turning out the filaments of the H.F. valves.)

A wave-trap doesn't seem to be much good. I don't know whether you can suggest the cause of the above peculiarity, but if anyone can, and send me any necessary information, I should be much obliged.

As with the "Cube-Screen" Three the set is very selective above 350 metres approximately, but very flat below.

Two other "P.W." sets I have built are the 1928 "Chitos" one-valver and the "Antipodes Adaptor."

As regards the "Chitos" I was very successful with it at my home in Dumfriesshire, receiving 15 stations during a short week-end, amongst which were Radio Toulouse, Hamburg, Langenberg, Leipzig, Stuttgart, 5 G B and Madrid. The reception of the last-mentioned rather surprised me even although it was weak, as was to be expected. Since then (last Easter) I have not used the "Chitos" more than once or twice owing to interference from the electric-lighting system causing a bad hum. I have seen ways of eliminating this mentioned, but have not bothered to put them into operation as I intend to convert it to the "Chitos" Two for use where the lighting is not electric. As a matter of fact, I found that this hum could be eliminated entirely, at least on London, by simply placing one finger on the earth and the other on the aerial terminal of the set; a large plug-in coil connected across these terminals had a similar effect.

Turning to my latest set, the "Antipodes Adaptor" it has not so far justified its name, chiefly, I suppose, through the fault of the operator! I am glad, however, (so far, at least) that we do not have to rely on short-wave broadcasting for our regular programmes!

The set, however, seems to be working O.K., for it brings in dozens of Morse stations which I am, unfortunately, unable to read, besides about half a dozen telephony stations, which I can never identify!

However, I have at least managed to get 2 X A F on it, on a 25 ft. length of wire stretched round the room, from about 1 a.m. to 3 a.m. one Sunday morning, at strong telephone strength, but with very quick, jerky fading. I found it at 13 degrees on the grid condenser instead of 22, as suggested by Mr. Kelsey. I don't exactly see why the reading should be so low, as my set is made up exactly as per specifications, except that I have used ·0005 fixed condensers in series with ·0005 variables for tuning and reaction. Possibly this may affect tuning, and probably I need smaller coils to get down to 2 X A D. I must add that in spite of the rapid alterations in volume of 2 X A F on Sunday I could catch practically every word.

I used the "Adaptor" plugged into the L.F. end of the "Economy" Five.

I have also fitted a telephone jack to the "Economy" Five so that I can use it as a 2 H.F. and detector set, and I find it very efficient as such. Using 'phones after the detector, I also find it will work as a single-valver (on London, at least).

Well, I am afraid if I go on much longer this letter will find its way to the waste-paper basket (if it has not already done so).

I hope that some of the details, at least, have interested you, or the designers of the sets.

Yours sincerely,
J. WILLIAMSON.

P.S.—On two occasions I heard what I took to be direct reception of America on the medium broadcast band, on the "Cube-Screen" Three: First, on March 3rd and 4th of this year, when I listened to W G Y from 12.45 a.m. to 2.45 a.m. when I switched off. A sceptical friend did not believe it was direct (and does not yet), so I tried for W E A F on March 5th and 6th and listened to it from 1.45 a.m. to 2.10 a.m. I had previously been listening to W G Y from 1.45 a.m.; both were marvellously clear and audible several feet from the 'phones, and for the last quarter of an hour or so W E A F was so clear and entirely free from atmospherics that I might have been listening to 2 L O on a crystal set.

Both stations were dead on their published wave-length, W E A F being the same almost as 5 G B, 491·8.

Now I have heard several German stations relaying W G Y (the reception of the Bremen aviators), and I know what the volume of Stuttgart and others is, and besides it seems inconceivable that a Continental station would relay until 2.10 and 2.45 a.m. respectively, a programme which had no peculiar interest for its listeners.

"CUBE-SCREEN" THREE.
Stations received from London:

Radio Paris, 5 X X (L.S.), Motala, Zeesen (L.S.), Kalundborg, Hilversum (L.S.), Zurich, Budapest (before and after increase in power), Milan, Munich, Brussels, Aberdeen, 5 G B (L.S.), Berlin, Lyons (La Doual), Langenberg (L.S.), Unidentified (French) Seville (W.L. and Language), Frankfurt (L.S.), Kattowitz (L.S.), Berne, Glasgow, Madrid (Radio Espana), Cork, Hamburg (L.S.) Radio Toulouse (L.S.), Manchester, Stuttgart (L.S.), Madrid (Union Radio) Leipzig (L.S.), 2 L O (L.S.), Cardiff, Prague, Radio Barcelona, Posen, Bournemouth, Unidentified (Spanish), Glewitz, Breslau, Dublin, Konigsberg (L.S), Hanover, Rennes (L.S.), Radio Lyons, Cologne (L.S.), Grenoble (L.S.), Lille (L.S.), ? Malmo (W.L. and programme), Kiel, Cassel, Munster, Nurnberg (L.S.), Bordeaux (W.L. and Language) Stettin, Kaiserslauten (55).

N.B.—As this set was dismantled in early July the order of stations varies from the present in some cases.

Golder's Green, N.W.

BAD GRAMOPHONE BROADCASTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—After the success of the "Daily Mail" gramophone "Street Noises" broadcast, which showed that the B.B.C. *can* transmit records quite well, surely they should look into the matter of their usual gramophone items, especially the morning service hymn broadcasts. They are usually nothing short of insulting to the average intelligence, and can surely not be imagined by the powers that be as serious substitutes for the genuine article.

Yours truly,
Hampstead, N.W.3. E. G. W.

CORRESPONDENCE.

THE "CUBE-SCREEN" THREE

THE RESULTS ACHIEVED WITH THIS AND OTHER P.W. SETS BY A GOLDER'S GREEN READER.

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.

SHORT-WAVE NOTES.

By W. L. S.

AS I "go to press" with these notes I have heard the most interesting news item that has come my way for a long time, although it is as yet unconfirmed officially. It is that O Z-3 A R, of Ashburton, New Zealand, has been in touch with a 6th district American amateur in California on 10 metres. If this is all in order it is easily the record for 10-metre communication at present, and is a very creditable feat indeed for both stations.

Ready for 1929?

With 1929 in mind, I listened for two or three hours a few nights ago, covering the band from 10–100 metres and taking mental notes of the sending, types of notes, and general efficiency of all the stations heard. The most conspicuous fact of all is the enormous improvement in the average amateur transmission. Notes are steadier and certainly purer, on the average, than they have ever been before.

Amateurs have seen that it is inevitable that they should take care of their transmissions, if anyone wants to achieve anything at all within the narrow bands allotted for their use next year. The "creeping" note, the common or garden "wobbler," not to mention interrupted C.W. and raw A.C., must be scrapped entirely, and they seem to be fast disappearing already.

Bad Transmissions

As a contrast to this state of affairs, the short-wave commercial stations seem, on the whole, to be concentrating on turning out the nastiest possible noise for a given power input. Scrapes, rasps, screeches, and general turn-outs sounding like a 1914 spark station are to be met with all over the place, and one trembles to think of the fate of an amateur who dared to turn out such a noise. German stations are particularly good—they are nearly all crystal-controlled, as are the Americans. Of the Dutch stations and our own, the less said the better.

How many of my readers have tried the Ultraudioncircuit for short-wave reception? A friend of mine uses it both for reception and transmission, and obtains excellent results in both departments! As a receiver circuit it has the merit of simplicity and very easy change from one wave-length to another. I am trying out a set using this circuit myself, and will pass on my experiences when I have had a little more to do with it.

The latest occupation I have heard of (and it does not come from America this time!) is "stamp-collecting by radio." The originator simply possesses a short-wave transmitter and receiver, both of them quite efficient, and no particular desire to experiment, and passes his time quite contentedly "hooking up" with different countries, making friends with stations situated therein, and "cadging" stamps from them!

Waste of Ether.

It strikes me as being quite an amusing hobby, although it is hardly open to amateurs in this country, who have to do some genuine experimental work to earn their licences. The radio chess match is, of course, an old favourite. But please don't use up our valuable short-waves for these stunts!

YOU are the best judge of which TRANSFORMER to use

and Lissen believe you want to be free to choose your own parts and to replace them in a free market, and not be forced to pay any more than the price you choose when you come to renewals or alterations.

Lissen Offer You Two Transformers.

There is the famous 8/6 Lissen Transformer which has sold by the hundred thousand and has been used, it is safe to assert, in almost every known radio circuit during the two years since it was introduced. When Lissen produced this transformer, it was as good for every purpose as any transformer, however high in price. That is why it enjoyed such a huge popularity. Even now you cannot do better than try

for general use the famous model 8/6

RATIO 4 to 1.

In a different field altogether is the new Lissen Super Transformer. If you want music on a background of utter silence, if you particularly require constant amplification over the whole band of audible frequencies, if you have a fancy to get the best value in transformers in this price field—in fact, wherever in your opinion a SUPER TRANSFORMER is called for, there it will pay you to use a

LISSEN super transformer 19/-

RATIOS 3½ to 1 and 2⅛ to 1.

OBTAINABLE AT ALL RADIO DEALERS.

LISSEN LIMITED,
Friars Lane, Richmond, Surrey.
(Managing Director: THOS. N. COLE.)

NEW AMATEUR TRANSMITTING REGULATIONS.

By THE EDITOR.

READERS of POPULAR WIRELESS who own amateur wireless transmitting stations should bear in mind that the new regulations of the International Radio Telegraph Convention come into force on January 1st next year.

The wave-lengths reserved for amateur working will be:

150	to	157	metres
75	„	85	„
41	„	42·8	„
20·8	„	21·4	„
10	„	10·7	„
5	„	5·35	„

Commencing on January 1st the call "C Q" (all stations) will not be allowed to be used by amateurs. Instead, the call "Test" may be used. For adjusting apparatus when transmitting the test signal will consist of a series of V's in which the call sign of the transmitting station must be included frequently. Strict adherence to the right wave-length is enjoined in the new regulations.

The Q Code also has been revised. The new list for amateurs is considerably different from the old one, and amateur transmitters should make themselves thoroughly familiar with it, as also with the new nationality prefixes.

Stricter Discipline.

Great Britain and Northern Ireland continue to use G and G I, and Great Britain only has the sole use of the letter "M."

We refer to these new regulations at this early date because amateurs should take every opportunity of familiarising themselves with the full details, which can be obtained from the General Post Office on application. When the new regulations come into force, we understand that a strict watch will be kept on the amateur transmissions by the Post Office listening-in authorities, and discipline in this direction is likely to be much more strict than it has been hitherto.

Red-tape restrictions concerning the broadcasting of international events of importance seems to be slackening a little, which is all to the good. It will be generally accepted as good news that there is every likelihood that the Armistice Day Cenatoph Service, which will be included also in the ordinary Sunday morning service in most of the churches throughout the land, will probably be broadcast. November 11th this year falls on a Sunday, and there seems to be a general desire on the part of the churches to advance the time of their services and to install loud speakers so that as many people as possible may participate in this national service.

There seems to be a wide desire, according to the "Daily Telegraph," to co-operate with the B.B.C. in an endeavour to make the Cenotaph Broadcast Service as universal as possible. The B.B.C. intend broadcasting the Cenotaph Service from all stations, and it is quite likely that 5 S W at Chelmsford will also transmit the service for the benefit of British listeners in distant parts of the world.

The B.B.C.'s technical arrangements for the broadcasting of the service are well in hand, and an official said the other day that two microphones will be used, both inconspicuously placed, one being suspended from a tree on the pavement very nearly opposite the Home Office, while the other will be concealed in a lectern which will be erected near the Cenotaph itself.

Armistice Day Arrangements.

The microphones will be connected by telephone lines under Whitehall with the B.B.C. van in Whitehall Mews, which will itself be connected direct with Savoy Hill.

Between 10.30 and about 10.50 on the morning of November 11th music of the Brigade of Guards Bands will be heard by listeners, after which the King will lay his wreath on the Cenotaph. The band will then continue to play until about 11 o'clock, when there will be the Last Post, the two minutes' silence, and the Reveille.

* * *

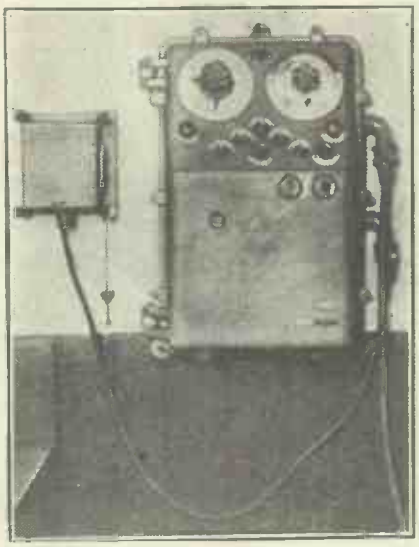
It is now definite that the Post Office engineers, having tested the Baird Television System, have reported to the Postmaster General, who received some weeks ago an application by the Baird Television Company for a licence for general television broadcasting, together with an application suggesting that B.B.C. stations might be used for experimental services.

The Postmaster-General, having considered the whole question, has informed the B.B.C. of these applications and has suggested that the B.B.C. should handle the matter. Consequently the B.B.C. recently issued the following statement:

"The B.B.C., with the approval of the Postmaster-General, have required a specific demonstration of the Baird Television apparatus before considering experimental transmissions form the B.B.C. stations."

By the time these words are read, it is quite likely that the B.B.C. engineers will have investigated the Baird Television system, and before very long a definite statement of the B.B.C.'s future policy with regard to television should be announced.

Battleship's "Broadcast" Brains.



The radio transmitter fitted to a destroyer and used to control the movements of the German radio battleship illustrated on our first page.

LEARN TO SOLDER

By G. T. KELSEY.

AFTER five—or is it six—years of broadcasting (time passes so quickly I really forget!), it seems rather late in the day to start a discourse on soldering.

But the fact remains that there are still a large number of enthusiasts who have not yet mastered the art, or shall I say the knack of soldering, and in the production of a neatly-wired set I am firmly of the opinion that soldering is essential.

Three Faults.

Be warned, you husbands, before you read the following, that when you can solder you will probably be dragged into kettle-mending in exchange for the use of the gas-stove, but that is a minor point, and in any case it is probably worth it!

It would, perhaps, be as well to start by giving the usual faults associated with soldering, and they are:

Dirty surfaces; Too much flux; A "cold" iron.

When making a connection say, for the sake of example, between a terminal shank and a piece of wire, both the wire and the shank must be well cleaned. For this purpose, either a file or a piece of emery cloth will serve quite well.

A thin film of Fluxite should then be applied to the surfaces you have just cleaned.

It is in the correct heating of the iron, I venture to suggest, that most people unable to solder go wrong. It is a common impression that the iron has reached the correct temperature when the green flame appears, but as a matter of fact this is not so.

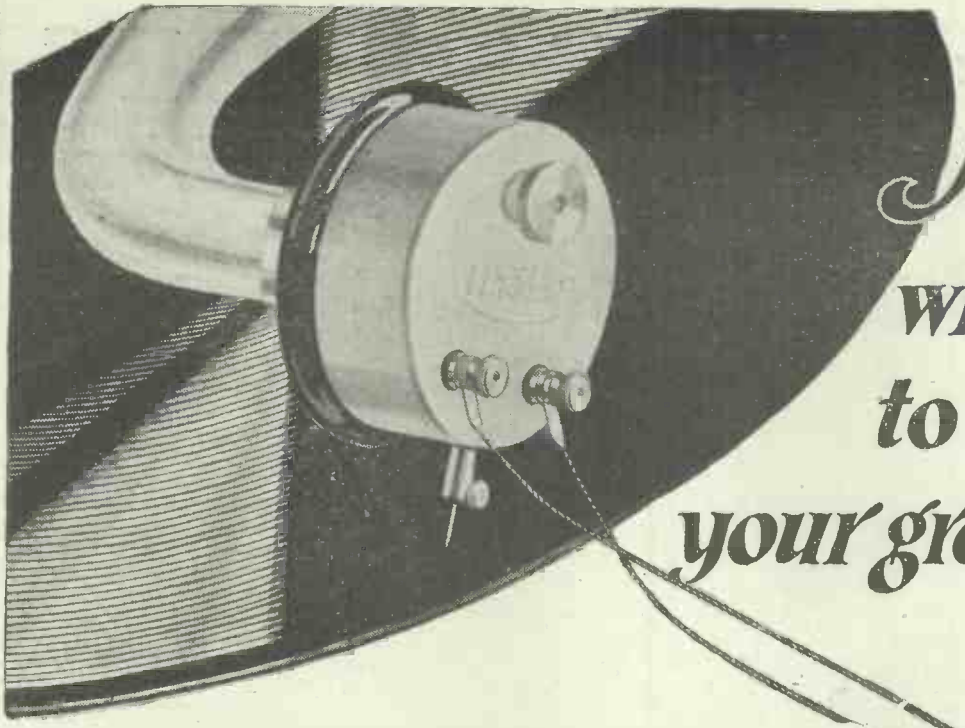
The best indication that the iron is correctly heated is obtained by holding it against a piece of paper whereupon, if the iron is hot enough, the paper will singe.

To tin it, give the end of the bit a rub over with a file, and place each surface in turn into a tin lid containing solder until a bright nickel appearance results.

Don't Use Cool Iron.

Reverting to the wire and the terminal shank which it is desired to join, each of these two should be tinned by the application of a little blob of solder from the tip of the iron, and the two should then be welded together.

As soon as the solder becomes "tacky," the iron requires re-heating, and it is not a bit of use to continue with it in this state.



How to use your wireless set to amplify your gramophone

AN ordinary gramophone with an ordinary horn and an ordinary sound box will not reproduce notes below middle C of the musical scale. Now with the new LISSEN Electrical Pick-up your gramophone will not only reproduce the low notes on your records as you never heard them on your gramophone before, but will amplify your gramophone music to any degree of loudness to fill a large room or a large hall for dancing—you can make one gramophone supply every room in the house with music—you can use your old records, long discarded, because needle-scratch is now largely eliminated. Your new records, too, will play better because needle noise is largely subdued.

TO ELECTRIFY YOUR GRAMOPHONE

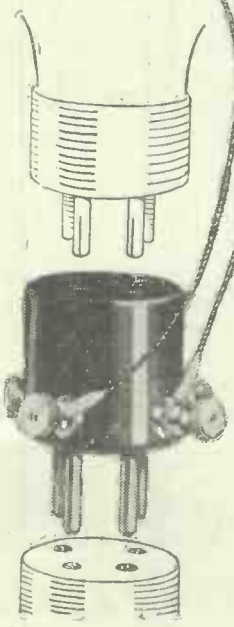
the Lissen Pick-up not only largely eliminates needle scratch, but brings out the low notes on a record which no ordinary sound box is capable of reproducing.

INSTRUCTIONS.

Slip on the new Lissen Electrical Pick-up in place of the sound box on the tone-arm of your gramophone—take one connection from the Pick-up to the grid terminal of the Lissen Pick-up Adaptor (sold separately and having plugs and sockets corresponding to those of an ordinary valve-holder) and take another connection from the Pick-up to the negative filament terminal on the Adaptor (a trial on each of the filament terminals in turn will clearly show which is negative). When the Adaptor is used in the way just explained, care should be taken that NO connection is made to the plate terminal on the Adaptor, otherwise the H.T. battery will be short-circuited.

Alternatively, a connection from the Lissen Pick-up, instead of going direct to the negative filament terminal on the Adaptor, can be made to the negative terminal of a grid-bias battery. A connection should then be made from the positive terminal of the grid-bias battery to the negative filament terminal on the Adaptor.

The connected Adaptor, with a valve fitted into it, should be plugged into the detector valve socket of a two- or three-valve set. Volume can be controlled by the round milled nut on the Lissen Pick-up.



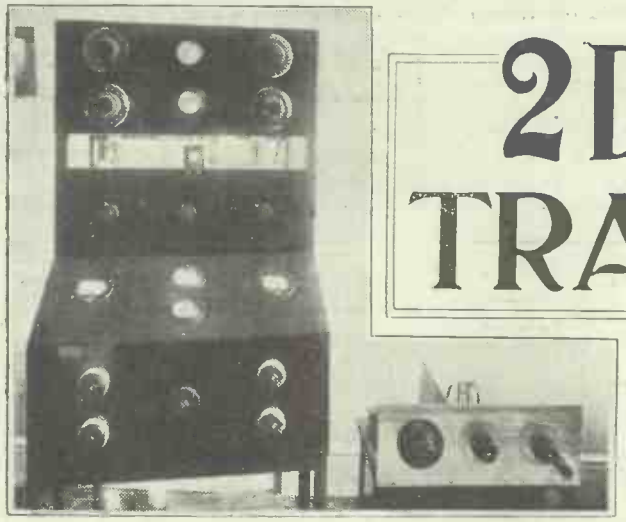
Lissen Electrical Pick-up 15/-
Adaptor for same 1/6

7 DAYS' APPROVAL

Obtainable at most dealers, but if any difficulty send direct to factory, no postage charged. Or can be sent C.O.D.

LISSEN LIMITED, FRIARS LANE, RICHMOND, SURREY.

(*Managing Director: THOS. N. COLE.*)



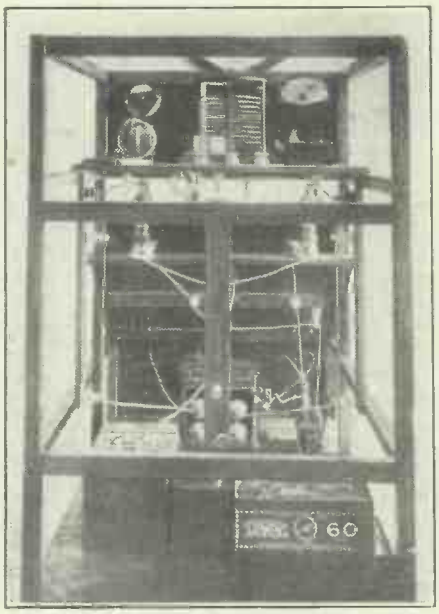
2DA's NEW TRANSMITTER

By THE ENGINEER-IN-CHARGE.

Some interesting details are given here concerning the design and operation of a new crystal-controlled short-wave transmitter at the "P.W." Experimental Station.

THE middle of this winter will see the introduction of the new amateur wave-lengths consequent upon the Washington Conference of 1927. Amateur transmitters the world over will be confined to the same wave-bands, and increasing difficulties will be experienced in long-distance work on account of the interference which is bound to take place.

Theoretically, it is likely that the British amateur will find that he has been allowed more room in the ether than before, and may use fresh wave-lengths. But in practice he will soon discover "the fly in the ointment," for foreign amateurs will have just as much right to work on these new wave-lengths as Britishers, and the jamming will undoubtedly be severe.



2 D A's new transmitter as seen from the back before the wiring was finished.

Clearly, it is up to every amateur to take as little room in the ether as possible, and maintain accurate and constant tuning of his transmitter. Moreover, it will be to his own advantage to do so; for it is well known that even in these days of comparative freedom from jamming, it is the steady, clear note that "gets there."

The "P.W." Experimental Station, 2 D A, which, during the summer has confined most of its activities to reception, has now a new transmitter and receiver specially designed to carry out their work even through heavy interference.

The receiver will be dealt with in a separate article, but briefly, it consists of a three-valve short-waver with one stage screened-grid H.F., detector, and one L.F., with an additional separate power amplifier for special use. The transmitter employs a crystal-controlled oscillator, followed by an amplifier. The present normal wave-length is 45 metres, but provision is made for an easy change to other waves.

The Happy Mediums.

From the accompanying photos a very good idea may be obtained of the general lay-out and design of the complete transmitter. It will be seen that the whole of the apparatus is built into a framework which stands about five feet high. No attempt has been made at "ultra-low-loss" as, in the writer's opinion, "ultra-low-loss" combined with reliability and neat appearance is not compatible.

If the set is to work consistently, and be kept tidy, a certain amount of efficiency must be sacrificed. However, reasonable precautions have been taken against unnecessary losses, as will be seen from the use of glass for H.F. choke formers, ample spacing of H.F. wiring, and avoidance of wood and metal near H. F. circuits, etc.

The use of ebonite panels may be criticised by some, but in this connection rather interesting observations have been made at 2 D A. To begin with, very little of the H.F. circuit comes into contact with the panels, so what losses there are have been considerably reduced in that respect.

The question of moisture being absorbed by the surface of the ebonite has more or less been ruled out, since it is found that only a very short transmission is necessary before the ebonite becomes practically free from all moisture!

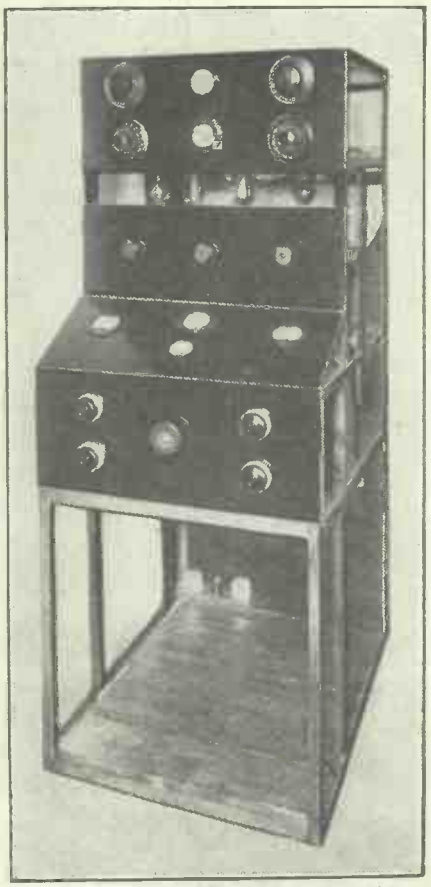
A Radio Rainbow.

Apparently the high-frequency currents straying across the damp surface quickly heat up and evaporate all the minute drops of water. Often this driving off of the water can actually be made visible in the form of vapour scintillating in the air "rainbow fashion" if light from an arc lamp is shone across the surface of the panel while transmission is taking place! (Incidentally, it should be noted that the ultra-violet rays given out by an arc lamp may be detrimental to the surface of most ebonite.)

Fig. 1 shows a simplified diagram of the transmitting circuit used. The H.T. supply is not included, as this has been described before. It will be seen that the circuit is fairly straightforward. V_1 functions as the oscillator on 90 metres and is controlled by the quartz crystal C.

One of the enormous number of harmonics produced by this oscillator is picked out on approximately 45 metres to be amplified

(*Continued on next page.*)



The completed transmitter stands five feet high, and is two feet wide.

2 D A's NEW TRANSMITTER.

(Continued from previous page.)

by V_2. Keying is effected by breaking the grid negative lead, thereby isolating the grid of the amplifier. (So far as D.C. is concerned.)

The variable resistance, R_1, is a Universal Range Power Clarostat of 200–100,000 ohms which will carry up to 40 milliamps without excessive heating. It is used to drop the voltage applied to the oscillator anode, since the value here has to be kept round about 250 volts, while V_2 requires considerably more. This circuit will be dealt with more fully at a later date, when an explanation of its working will be given.

Arrangement of Controls.

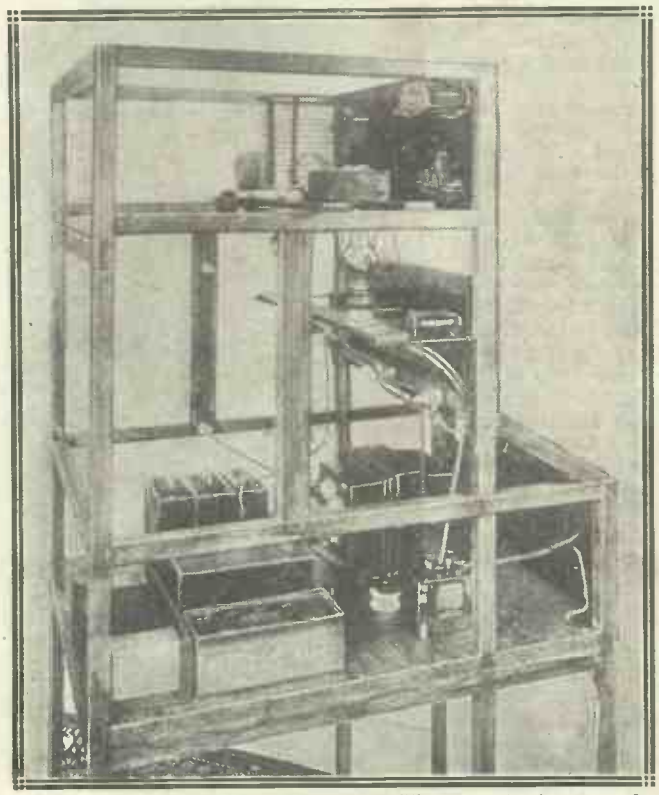
The arrangement of controls on the various panels has been planned in groups as far as possible so as to facilitate adjustment. The top panel (see photo) deals exclusively with the high-frequency circuits. The various dials of the tuning circuits, and the H.F. ammeters can be clearly seen. The two meters indicate the H.F. currents in the oscillator and aerial circuits respectively.

On the panel below are three rheostats in the filament circuits of the valves. The sloping panel holds the various meters, namely: Two 0 50 milliammeters, an H.T. voltmeter, and an A.C. ammeter in the filament circuit of the Mullard U30 rectifiers.

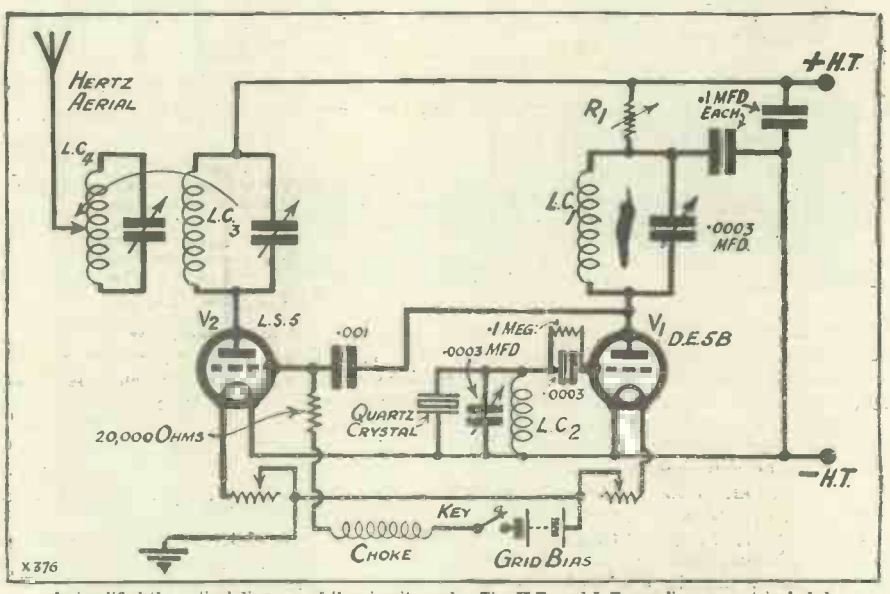
These meters must, of course, be perfectly reliable, since, apart from anything else, they indicate the power, which has to be kept within Post Office limits. Weston and Ferranti meters seen in the photo have been found perfectly reliable in this respect. The lowest panel of all has the switches for the A.C. circuits, meters, etc., while the centre knob is attached to a Zenith type "B" adjustable resistance of 276 ohms connected in the Zenith transformer for regulating the power.

It is surprising that more use is not made of the porcelain "stand-off" type insulators for wireless purposes. A number of these have proved themselves remarkably useful at 2 D A in numerous ways. To avoid losses it was found best to take off the base of the LS5 valve, which is the amplifier, but not the DE5B oscillator, since this was not necessary.

At present 2 D A works exclusively on continuous wave, but very shortly some telephony will be used, and details will probably be published of the times of transmission so that "P.W." readers may co-operate in sending in reports, etc. Meanwhile, reports by readers who know the Morse code are always welcome.



A side view of the crystal-controlled transmitting apparatus in course of construction.



A simplified theoretical diagram of the circuit used. The H.T. and L.T. supplies are not included.

CQ de G 2 D A.

WANTED! DURING WINTER MONTHS.

An American or Canadian East Coast amateur to maintain schedules two or three nights a week with the "Popular Wireless" Experimental Station G 2 D A, on the 40-metre band.

Any transmitting amateur whose station is situated in the above-named area, and who is willing to co-operate with G 2 D A, is invited to write to the Engineer-in-Charge, G 2 D A, c/o The Editor, "Popular Wireless," Tallis House, Tallis St., London, E.C.4.

TIPS AND TECHNICALITIES.

IT has been estimated that only 1/100,000th part of the surface of the ordinary crystal detector is used when it is in action for rectifying purposes.

Do not pull on the *windings* of a coil when removing it from a plug-in coil holder; it should be held by its base.

* * *

Now that high grid bias up to twenty volts or more is being used, it is necessary to remind valve set owners that even when the H.T. plug is removed from the set there is still potential danger to the filaments from the grid-bias battery, if wires are carelessly crossed.

* * *

In America high-frequency is always called "radio frequency" and this explains why H.F. chokes are sometimes called R. F. Chokes.

* * *

Although it is often claimed that a small piece of coal can be made to act as a crystal, it will generally be found that when such a piece is examined it is coal on which a yellow scale has formed, and actually this scale (iron pyrites) is the rectifying agent, and not the coal.

* * *

In some low-frequency transformers, up to two miles of wire are used in winding.

* * *

One advantage of charging an accumulator at home is that the owner can watch that the maker's instructions regarding the charging rate, etc., are carried out properly.

* * *

Always give the last valve as much H.T. as its makers allow, and the correct grid bias, as this is a great aid to pure reception.

* * *

New H.T. batteries should not be joined up in series with old ones as the latter are definitely unsuitable for use in such circumstances.

A selection of short articles of an eminently practical nature, which covers all phases of radio receiver construction, operation, and maintenance.

Adjusting a Crystal.

CRYSTAL-SET enthusiasts who do not want to go to the trouble of fixing up a buzzer to help to find a sensitive spot on their crystals will find an ordinary electric house-bell quite effective, providing it is not too far away from the set.

The bell is set ringing and, when the contact arm moves, a click will be heard as the crystal is adjusted. The radiation is too weak to produce a buzz. The switching on and off of an electric light also causes a click in some cases.

Connecting Dry Cells.

It is poor economy to connect new and old dry cells in parallel. The effect is to ruin the good cells. Little harm will be done if two such cells are connected in series. In a parallel arrangement the positive terminals are connected together, and also the negative terminals are joined. In connecting in series, positive terminals are connected to negative, and the end positive and negative terminals are connected to the device that is being supplied with current.

Planing Ebonite.

Amateurs who want to smooth the edges of ebonite panels may not be aware that they can be planed quite effectively. This gives a better finish than the usual method of filing the edges down, but care must be taken to see that only the finest shavings are taken off.

FOUR USEFUL TIPS.

A HOLLOW tube is just as good as solid wire for carrying high-frequency currents, because they flow only on the outside surface of the conductor.

* * *

The voltage of a battery is not a better indication of its condition than the specific gravity, which can be easily tested by means of a hydrometer.

* * *

If acid from an accumulator is spilt on a carpet, apply ordinary washing soda, baking powder, ammonia or even soap flakes immediately, until the gassing ceases and the acid is neutralised, and then wash the carpet thoroughly.

* * *

As an emergency receiver, the ordinary wave-trap can be used as a crystal set by merely adding a pair of telephones in series with a crystal across the ends of its coil.

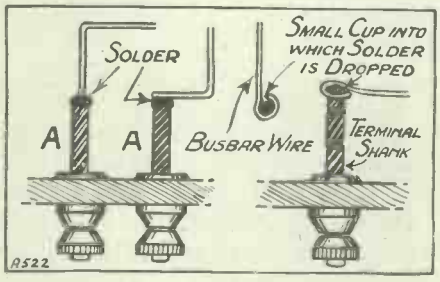
Jerky Filament Control.

This is invariably caused by the wire resistance of a rheostat becoming rusty, dirty, or otherwise coated with corrosion. Treatment with very fine emery is advised. Carbon resistances may "pack," and need treatment by an expert.

A Soldering Tip.

The usual method of soldering an end of a lead to the shank of a terminal is as shown in the diagram at A.

An advantage may be gained by twisting the wire round the shank as tightly as



possible, making a small cup into which a drop of solder is very readily introduced.

A very neat and strong joint is thus obtained, aided by the fact that the actual lead need not be held during the operation.

Testing Condensers.

Fixed condensers should be tested from time to time to see that all is well with them. Here is a simple method of doing so. Connect the terminals of the condenser to a flash-lamp battery for a few moments; then remove the battery and touch the condenser terminal with the 'phone leads. There should be a click caused by the discharge of the stored energy. A good condenser should produce this click, even if the 'phone test is not made for some time after the battery has been disconnected.

Accumulator Hints.

Do not starve your accumulator. When it has become discharged, get it charged up again—not next month, but at the earliest possible moment. Should it be in a semi-discharged condition, and you are not going to require it again for several weeks, get it charged up before you put it away. If it is going to be laid aside for a longer period—say, four to six months—give it a "freshing" charge before using it.

Add distilled water to compensate for evaporation before charging, not afterwards. Do not be afraid of over-charging. Provided it is not charged at too high a rate, over-charging will do no harm. In fact, to over-charge periodically may be beneficial.

Drilling Hints.

The amateur should see that his drills are ground with both cutting edges of equal length and with equal clearance. Failure in this usually results in numerous breakages, especially with the small sizes.

It sometimes happens that a number of holes have to be all drilled to a certain depth. To do this quickly and with no risk of the drill breaking the surface on the other side, measure the drill from its point up to the desired depth and bind a length of copper wire tightly round it. This will indicate to the operator how far to feed the drill.

Before attempting to tap a hole or thread a rod with a die, always examine the cutting edges and threads in order to make sure they are sharp and free from chips.

Telephones Wires.

There is always the chance that the telephone wires will absorb some of the energy which might otherwise come on to your aerial, but if you erect your aerial at right-angles to the wires, and as high as possible above them, you will notice very little, if any, reduction in your signal strength.

THREE MORE TIPS.

DO not shake an accumulator, especially if there is a certain amount of sediment at the bottom, as this latter is liable to cause local action and may result in considerable damage to the plates.

* * *

When the minimum capacity of a neutralising condenser does not seem to be low enough, a little extra capacity may be added externally to the grid and plate of the valve by means of short insulated wires joined to the respective terminals and twisted together.

* * *

If you cannot use distilled water to fill a battery which has lost some of its liquid due to evaporation, rain water carefully filtered may serve, but tap water should never be used. (As a matter of fact any water other than distilled is apt to give rise to serious trouble.)

YOUR AERIAL AND EARTH

If you want to get the best out of your set, give an hour or two to an overhaul. This article tells you how to commence right at the aerial, and step by step advance, eliminating the little losses that prevent the programmes from rolling in.

By J. ENGLISH.

ABOUT this time of the year reception of distant stations gradually improves, and before very long we shall notice a marked increase in the strength of foreign stations as the evenings lengthen, conditions being most favourable for DX reception when winter comes.

Now, if your aerial has been up for a year or two there is certainly need for overhaul at some part or other. Moisture and smoke cause corrosion of the aerial wire, supporting wires, and lead-in contacts, while dust and grime account for faulty insulation.

Commencing first with the aerial wire, this should be hauled down and examined for corrosion and weak spots, where it is liable to snap under the strain of winter gales. The old type of stranded 7/22 bronze or copper wire is particularly liable to surface corrosion, while the gauge of this wire is much too heavy for my liking. If your aerial wire is of this type and has been up some time it will pay you to scrap it and substitute a length of No. 16 or 18 enamelled copper wire. In my opinion enamelled wire is the most satisfactory for aerials, as it is quite strong, has a very low H.F. resistance which cannot change as the enamel prevents corrosion, and is very easily soldered.

Improvements Worth Making.

If you are renewing the aerial wire it is a good idea to take it in one unbroken length straight through the lead-in insulator to the set, thus cutting out all losses due to faulty soldered joints and bad contacts at the lead-in insulator. While you are about it it is worth while trying to improve the aerial as much as you can, every foot increase in height being worth several extra feet in length. In fact, some aerials are too long for selective broadcast reception near to the local station, say up to ten miles. Here a satisfactory length of wire is about 75 ft. from receiver to free end.

The next step is to examine insulators.

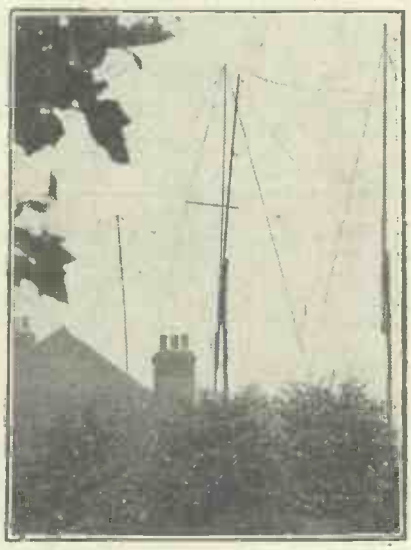
The best way to get rid of the oily, sooty deposit is to wash the insulators in a hot solution of washing soda, rinsing well with clear water when clean, and then polishing until dry and smooth once more. If the deposit is not very thick a wet rag and a little energy will remove it all.

You should now examine the halyards and wires supporting the aerial wires for corrosion and weak places. If these wires are very old it will repay you to renew them, using that widely sold insulated stranded steel wire for halyards and thick copper or galvanised iron wire for supporting wires.

Lead-in Insulators.

Copper wire, about 12 or 14 gauge, is the best, as it corrodes much less rapidly than galvanised iron wire and is strong enough for the biggest of aerials.

The last part of the aerial calling for special attention is the lead-in insulator. It is here that a large proportion of the total loss occurs in aerials which have not been overhauled for a long time. This insulator



The higher the aerial, the less it is screened by trees, neighbouring houses, etc.

usually consists of an ebonite tube with a brass spindle down the centre and fly nuts at each end. The aerial lead-in and the aerial lead to the set are merely screwed down under these nuts, and before very long atmospheric corrosion increases the resistance of these mechanical contacts.

To avoid serious loss here it is necessary to be continually cleaning up the wires and contacts with emery paper. I have always considered this type of insulator to be thoroughly unsound. A far more efficient method is to use a simple ebonite, glass or porcelain tube and take the aerial lead straight through the insulator in one unbroken length to the aerial terminal of the set, as mentioned previously. In this way you avoid all the losses which may occur at the lead-in point, and it is then only necessary to keep the lead-in tube free from dust and dirt.

If the lead to a water-pipe earth is sound, all you need to do is to clean the contact device and pipe with emery paper and screw up tightly again. There is little that can be done to a faulty buried earth except dig it up and make a new one, which I would strongly advise you to do. While you are doing this it is a good idea to rearrange its position to give the shortest lead to the set. If the distance from earth to set is over six feet it is really necessary to use a heavy gauge of wire, well insulated, the more insulation the better, whether the earth is a buried or a water-pipe one.

Suppose now that you decide to renew your outside earth. First of all dig up the old one, and if you cannot find a better position for it, commence to dig the hole deeper. This hole should not be less than three feet deep.

"Buried" Earths.

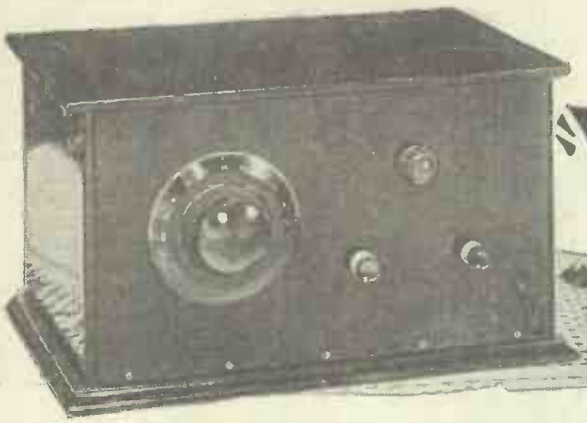
Having made a good deep hole you should look for the largest piece of metal you can find. The ideal is a sheet of stout copper or galvanised iron not less than three feet square. As a last resort a coil of several yards of thick galvanised wire can be used, shaking the coils loose to make the wire cover a greater area. All joints of the earth lead to the earth plate should be well soldered and then liberally coated with tar or paint. This is vital, as a bare joint will quickly corrode, thus severing the connection to the earth plate.

If you use a counterpoise, overhaul it as described for the aerial wire, paying particular care to insulation and good contact.

Indoor aerials are not so subject to corrosion and insulation faults as outdoor systems, but it is worth while going over the aerial wire and earth, cleaning the insulators and examining the wire and leads for weak places. Any doubtful joints should be broken and well soldered up again.

If a buried earth is used the lead from it can come up a gas-pipe, down which water could be poured in dry weather.

A good "tube" earth is very efficient, provided there is a good joint with the earth lead.



The "WAVE-CHANGE" ONE

Here is a design for a very neat and efficient little set which brings the convenience of wave-change switching within the reach of the single-valve enthusiast. Simple, sensitive and easy to build, it has been specially arranged to use standard parts throughout.

Designed and Described by the "P.W." RESEARCH DEPT.

"ARE these wave-change sets really efficient? What about all those losses in switches we used to hear so much about not very long ago?"

Some such questions as these were put to the writer several times in the course of his period of duty as "technical expert in attendance" at the "P.W." stand at Olympia last month, which seems to indicate a fairly general feeling of misgiving on the subject.

Let it be very definitely stated, then, that the wave-change switching schemes used in our sets nowadays are fully efficient, and compare on perfectly equal terms with a set using the same coils and circuit, but with one of the older interchangeable schemes for changing from medium to high waves.

A 6d. BLUEPRINT OF THIS SET WAS GIVEN FREE WITH LAST WEEK'S "P.W."

True, schemes are in use in some quarters which are far from efficient; but you are safe in assuming that anything which is adopted for use in our designs has been chosen after it has proved capable of meeting a certain very rigorous test—namely, of giving results exactly equal to those obtainable from the particular circuit when the coils are made interchangeable instead of being switch-controlled.

A Reassuring Note.

What this really means, of course, is simply that the "P.W." Research Department has put in a very great amount of careful experimental work on the problem, and has accumulated a mass of valuable data which enables us to produce practical designs which we know definitely will do the work required of them, without measurable losses in the switching. The special schemes which have been adopted have been found to lead to no perceptible loss of efficiency whatever, for reasons which the more advanced reader will be able to see for himself (all switching done where switch capacity is harmless, dead-end losses practically impossible, and so on).

So far as each individual circuit is concerned, you may be certain that the introduction or omission of our particular methods of wave-change switching will make no discoverable difference whatever to the results on either the upper or lower wave-band. The only limitation involved is that certain definite types of circuits must be used to suit the switching schemes, but since these are all good standard ones, no misgivings need be felt on that score.

Here is a frank statement of the real drawbacks of the series of wave-change sets published in "P.W." The constructional work involved is somewhat greater than in a set with interchangeable coils, since there are certain extra parts to be mounted, and there is, as a rule, something like 25 per cent more wiring than in a plain set. Further, the wiring is a little more difficult to follow, and requires slightly more care to avoid mistakes.

There, now you know the worst, and can proceed to balance against these drawbacks the very solid advantages of such sets. In the case of very many of us there can be little doubt that one of the main advantages of a wave-change set is that when we possess one we derive any amount of pleasure from listening to the very excellent transmissions of the various high-power long-wave stations, whereas with a set with a series of coils to be changed we just can't be bothered, and so never listen on the long waves.

Real Advantages.

That, at any rate, is what happens in the case of the writer of this article, and he believes that he is by no means alone in his lazy refusal to change a series of coils in the dark interior of a set, often with the addition of a bitter struggle with a badly-fitting one.

Next, what about the domestic aspect of the case? So far as the non-technical members of the family are concerned, if there are a lot of coils to be changed, it is practically impossible for them to go over to the long-wave station when the only qualified operator is absent. When, on the other hand, it is merely a matter of pressing a switch and re-tuning, they can do it with the greatest of ease, and you may be sure that if you put the matter to a family vote there will be an overwhelming majority in favour of a wave-change set.

You are now in a position to form a correct opinion as to whether the advantages of wave-change sets are sufficiently great to outweigh the drawbacks which we have enumerated, and there can be little doubt as to your decision.

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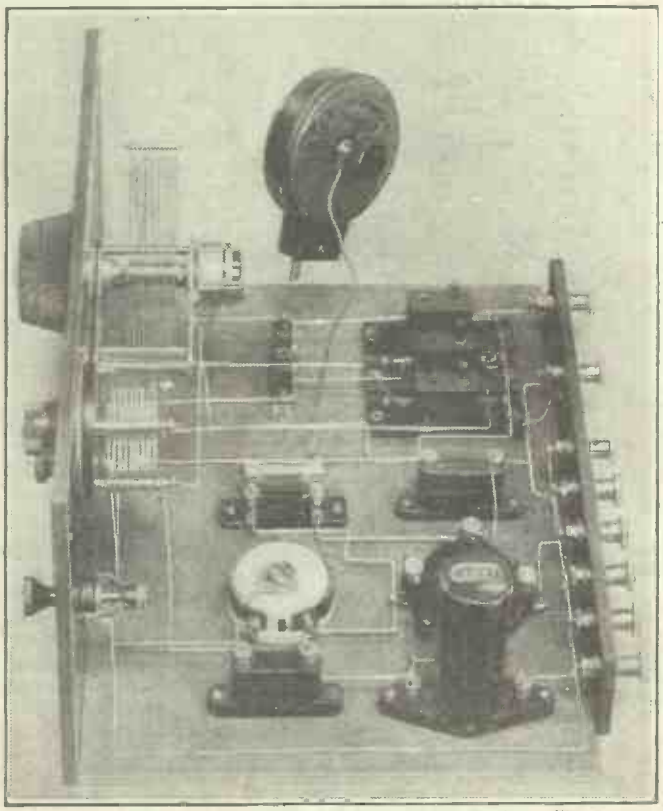


Note the arrangement of the parts in neat rows. A very workman-like appearance and easy wiring is the result.

THE "WAVE-CHANGE" ONE.

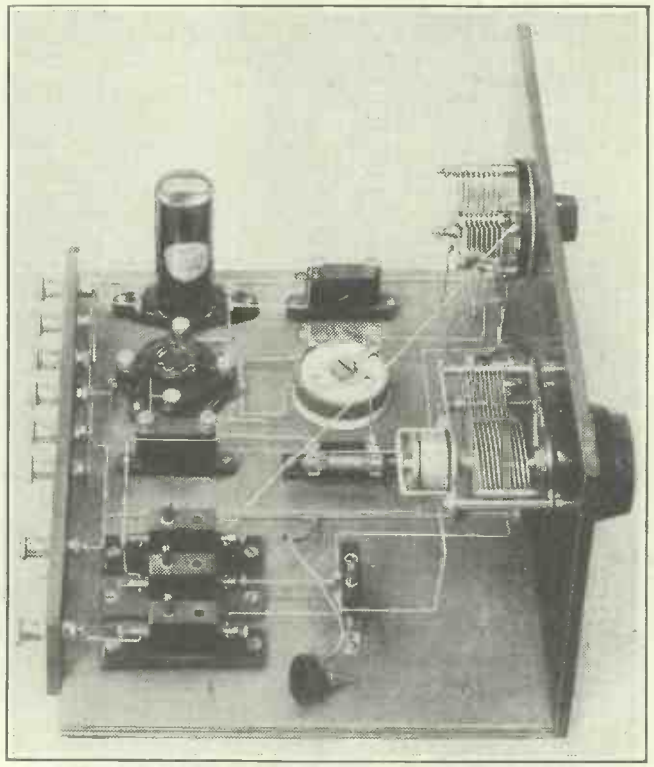
(Continued from previous page.)

So far, the designs published for wave-change receivers have mostly been for sets of the multi-valve type; but there is no reason why the single-valve enthusiast should be debarred from the convenience of switching instead of coil changing. After all, the single detector valve with reaction circuit is one of the best possible simple arrangements where reception on 'phones only is required, for it is simple, cheap to install and run, easy to operate, and capable of bringing in quite a respectable string of foreign stations in reasonably favourable conditions.

Standard Parts Throughout.

Our latest wave-change design, therefore, is for a straightforward single-valver using a good and sensitive circuit, with nothing freakish about it, giving all the convenience of high or medium-wave reception at the touch of a switch. It has given excellent results on test, and has been specially designed to be as easy as possible to construct, and also to be capable of assembly very largely from materials which many constructors will already have on hand.

Every part used in this set is a perfectly standard one, and you can assume with perfect safety that absolutely any good make can be used at any point in the circuit. There is nothing critical anywhere, hence you can use up any standard parts you may have in stock, or any which your dealer happens to have. There is no need whatever to try to use the same makes as were employed in the original, so you cannot possibly have any trouble or delay in trying to get hold of any particular items at a small local dealer's. His assurance that something else will be "just as good" is, in this case at least, perfectly correct!



Bare wire was used for the connections of the original set, which looks neat and helps to make one careful in spacing everything out.

For the tuning and reaction arrangements, for example, we have used plug-in coils, and most constructors will be very likely to have the necessary sizes already in their possession, which means that in their case the set will be a particularly cheap one to make.

A Flexible Design.

A further advantage, of course, is that the set is rendered particularly flexible, since it is easy to suit different aerials by varying the size of the coupling coil L_1, and also to obtain just the desired amount of selectivity in the same way, to suit different valves by varying the size of the reaction coil L_3, and so on. It is even possible to work the set on short waves by taking out the standard coils and inserting in their places suitable short-wave ones, such as the Igranic, Atlas, DX, etc.

A Useful Tip.

The circuit, it may be explained for the benefit of the more advanced reader, is of the Reinartz type in its better form, in which separate coils are used for tuning, aerial coupling, and reaction, these being L_1, L_2 and L_3 on the diagrams. On the long waves another plug-in coil is brought into the circuit by means of a very simple type of switch, which completely short-circuits it on the lower waves.

On the long waves the circuit is altered slightly, and becomes more akin to the Hartley, this being achieved by using a standard centre-tapped coil for the loading coil (L_4). This scheme was adopted on account of its extreme simplicity, since it solves the whole problem of providing extra aerial coupling and reaction coupling on the long waves. By the way, this is the only coil which you are not very likely to possess, and it is worth noting that if you get the set finished before you have time to buy the necessary coil you can still use it on the ordinary wave-band by leaving the L_4 socket empty and keeping the switch in the low-wave position (knob pulled out).

Reaction is controlled in the usual way with a small variable condenser, preferably of ·0001 or ·00015 mfd. capacity. In the original this was one of the miniature type now produced specially for the purpose by a number of condenser makers (Cyldon, J.B., Bowyer-Lowe, Dubilier, Igranic, Peto-Scott, etc.), but if you happen to possess a spare variable of the ordinary type and any capacity up to about ·0003 mfd. you can quite well use it, so long as it is not a very large and clumsy specimen. If you use one of a capacity of the order of ·0002 or ·0003 mfd. it will be better to reduce the capacity of the fixed condenser C_4 to ·0005 mfd.

Now as to the wave-change switch: this must be of a certain definite type, and you must be careful to get the right kind. What you require is an L.T. on-off switch of the push-pull type, the particular feature which is essential when it is to be used for wave-change purposes being that it shall have two side spring contacts and a central metal plunger to which a third lead can be attached.

Suitable Switches.

Examples of suitable switches are the Lissen, Lotus, and Burne-Jones, and you should note that the third connection must be taken direct to the metal tip of the plunger. A flex lead is evidently desirable, and this can either be soldered to the plunger or secured by unscrewing the metal tip a little, placing the bared tip of the wire behind it and tightening up again.

Now as to constructional matters. You will already have the blue print of the set, which you will find gives you a very clear idea of the general lay-out and wiring, and a dimensional drilling diagram which makes the whole business very simple.

The photos reproduced on these pages will probably give all the additional information you need, and there is little which we can add which would be of any real help. It is just a straightforward job of drilling the panel with holes of sizes to suit your components, screwing the other parts down on the baseboard in the positions indicated, and wiring up in accordance with the diagram on the blue print.

You should not experience the slightest difficulty in completing the set, and we can now go on to deal with the operating side, which again is very simple. Coil sizes are given in a summarised form on the blue print, but some additional notes may be helpful. First, as to the aerial coupling coil L_1 (this affects the lower wave-band only). This can be any size between 25 and 40, the actual size for best results depending on the size of your aerial and the degree of selectivity required. The smaller the coil the greater the selectivity, but too small a coil will also weaken signals unduly.

For Large Aerials.

On large aerials this coil will require to be a size smaller for any given degree of selectivity, and it is also worth noting that when you are receiving a station near the upper end of the ordinary wave-band it sometimes improves results to use a slightly larger coil as L_1. For example, if a No. 25 seems the best size for stations up to about 400 metres a No. 35 may give you stronger signals on those between 400 and 500 metres.

The reaction coil will normally be a No. 50, but if you happen to be using a very freely oscillating valve a No. 35 or 40 will sometimes give a smoother adjustment. This is not very often necessary, but it is just worth bearing in mind.

The best type of valve for use in a set like this is usually the H.F. variety, either 2-or 6-volt, with an impedance of from 15,000 to 30,000 ohms, suitable types being

(Continued on page 341.)

KEEPING LEADS SHORT

From A CORRESPONDENT.

IT is not perhaps generally realised how exceedingly important it is in a sensitive receiving set to keep certain leads as short as they can possibly be. The most important of all are the grid leads upon the high-frequency side, for if these are unduly long various undesirable effects may occur. Amongst other things, long grid leads make for lack of selectivity, for instability, and for fierceness in the reaction control.

Next in importance come the plate leads, too great length in which is apt to result in the presence of unwanted couplings with all their unpleasant consequences.

L.F. Troubles.

On the low-frequency side it is almost as important to keep these particular leads short, at any rate, in cases where more than one efficient stage of note-magnification is installed. There used to be an idea that amongst the low-frequency circuits the lay-out and the wiring did not matter very much. With the highly efficient valves and transformers that we have to-day this has long since been exploded, and many constructors know to their cost what troubles can be caused on the low-frequency side of the set by lack of attention to these points.

Let us consider, first of all, how long leads may be avoided on the high-frequency side. Remember that every half-inch by which you can reduce the length of grid and plate leads is a distinct and very real advantage. And we must add one more here, the lead from the aerial terminal to the aerial tuning inductance, for this is also a very important point of high potential.

In the first place, the holder for aerial and grid coils should not be fixed in position upon the baseboard until the best place for it has been found by trial. Often one sees sets with long aerial and grid leads in the first tuned circuit, which could be avoided by quite a small rotation of the coil holder in one direction or the other. As is so often the case in wireless, we have to compromise, for the aerial terminal will in most instances be at the back of the baseboard, whilst the condenser tuning the grid coil will be mounted upon the panel.

Inter-valve Coupling.

It is of no use making the lead from the grid to the coil very short if this means an enormously long wire between the high potential end of the coil and the fixed plates of the tuning condenser. A little care taken over the lay-out will probably enable a position to be found for the coil which allows both leads to be reasonably short.

Don't imagine that there is only one possible position for the aerial terminal—at the extreme right of the baseboard, as viewed from the back. Often a shortening of the lead from terminal to coil can be effected by moving the former a little to the left.

Next, consider the coupling between the first valve, which, we will take it, is a high-frequency amplifier. In modern sets this will usually be a transformer of some kind. By placing the base in the proper position we can obtain much shorter leads than if the lay-out is carelessly done. Don't bother about the high-tension and low-tension battery connection to the transformer—or, at any rate, don't allow a desire to fit them in neatly to result in your having grid and plate leads even a quarter of an inch longer than they need be.

Sometimes one can dispense altogether with a wire between the transformer secondary and the grid of the rectifying valve. Certain patterns of fixed condensers have 4 B.A. or 6 B.A. clearance holes at their contacts and it may be possible to make the grid condenser itself form the connection between the appropriate secondary terminal and the grid terminal of the rectifying valve holder.

This, of course, applies only to leaky grid rectifiers. Whilst we are on the subject, another method of reducing length may be mentioned. Some patterns of grid leaks have stiff wires fixed to the little metal cap at either end of them. These can be shaped with round-nosed pliers into loops to fit over the grid terminal and the low-tension positive terminal of the valve holder.

With anode-bend rectifiers keep the grid lead short and don't, whatever you do, place the biasing battery between the high potential end of the transformer secondary and the grid.

Switch Points.

Switches are not to be recommended on the high-frequency side of a set, but if you must use them, place them so that long leads become unnecessary. This cannot be done if you mount them directly on the panel, but it becomes easy if you fix switches of the push-pull kind quite far back on the baseboard, and replace their knobs by extension rods protruding through the panel. Instead of bringing the wires to the switch, take the switch to the wires!

When mounting variable condensers don't think it essential to place them so that the straight edges of the fixed plates are vertical. One may often obtain a considerable reduction in the length of connecting wires by turning the condensers to a different position.

Whatever form of coupling you use arrange your components with this end in view. As soon as the first rough lay-out has been made, go over it carefully and see whether a rearrangement of the components will not enable leads to be shortened. Often you will find that a small alteration in the position of a valve holder or of a transformer will make a great deal of difference.

Sub-baseboard Wiring.

One method which enables leads to be kept short on both high- and low-frequency sides of the set is what is known as the sub-baseboard type of construction. Instead of being flush with the lower edge of the panel the baseboard is raised by perhaps a couple of inches.

This enables certain components such as fixed condensers, resistances, and so on, to be mounted on the underside in positions which make it possible to take high potential leads straight through to them instead of their having to pursue devious courses on the upper side of the baseboard.

Even if you don't go in for the sub-baseboard method wholeheartedly, you may find it an advantage to raise your baseboard by an inch, which will allow you to fit a number of essential fixed condensers on its underside.

R. W. H.

THE "WAVE-CHANGE" ONE.

(*Continued from page* 336.)

available in all the well-known makes (Mullard, Cossor, Ediswan, Six-Sixty, Marconi and Osram, B.T.H., Cosmos, etc.). It is sometimes found, however, that makers describe their L.F. valve as "L.F. or detector," and these usually work well in this circuit, their impedances being somewhat lower (12,000 to 20,000 ohms). The receiver is not critical, however, and almost any type of valve, except the power type, can be used at a pinch.

Reaction Adjustments.

The only really important adjustment to be made before putting the set into service is that to obtain smooth reaction, and a little care here is well repaid. First, give the valve about 45 volts H.T. and try varying the filament current gradually, noting whether you can get a reasonably smooth passage into oscillation when you adjust the reaction condenser. If the control remains ploppy, alter the H.T. a little (either way) and try again. You should soon find a combination which gives you a smooth and pleasant control, and you are then ready to begin searching for distant stations.

Searching with this little set is a very simple business. All that you have to do is to turn the tuning condenser dial very slowly and at the same time keep adjusting the reaction to keep the set just (and only just) below the oscillation-point. In this way you will find, after you have had a little practice, that you can cover the whole wave-band and bring in station after station without ever actually letting the set oscillate.

Just a little persevering practice will enable you to master this method of searching, and then you will have the satisfaction of knowing that you are using the same procedure as the expert, who can cover the whole dial of a set like this quite quickly, missing no stations, yet never radiating a single squeak from the aerial.

The alternative method, of course, is to search with the set oscillating and only slack back the reaction when a carrier wave is found; but whenever you see anyone using this system you are safe in deciding at once that he lacks either experience in the art or consideration for neighbouring listeners.

On the Short Waves.

Short-wave reception is becoming so popular nowadays, and there are so many interesting short-wave stations to listen to, that it may perhaps be desirable to give some hints on the use of the "Wave-Change" One on the lower waves.

Well, first and foremost, you want some short-wave plug-in coils, such as the Igranic or Atlas. These coils are wound with stiff bare wire, the turns being spaced apart a little, and they give quite good results in a suitable circuit.

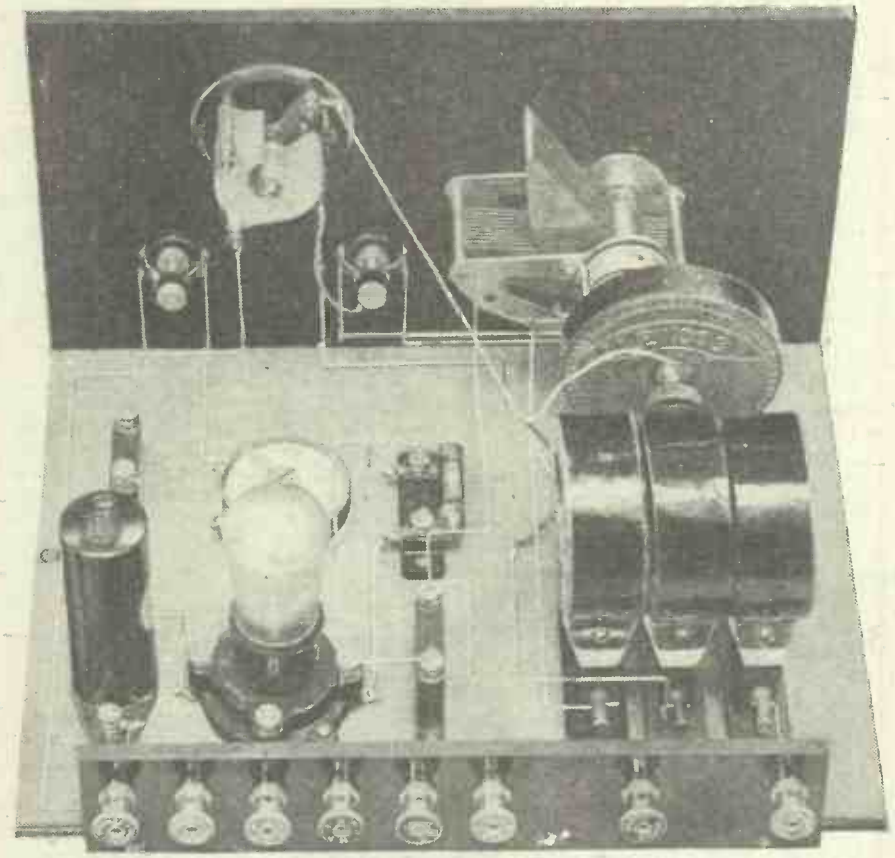
For the most interesting wave-band (20 to about 50 metres) you do not need a full set of these coils, and it will be sufficient to obtain coils of 2, 4 and 6 turns, at any rate for a start. For working on the 20 to 35 metre band you should put the smallest coil in the aerial socket (L_1), the 4-turn one in the secondary socket (L_2) and the 6-turn one in L_3 (reaction). The desired wave-band will now be covered by roughly the lower half of the condenser scale, and it is to be noted that if you intend to do much short-wave work it is well worth while to obtain a really good, smooth, slow-motion type of condenser or vernier dial.

Now devote careful attention to the question of reaction control, and adjust H.T. and L.T. very painstakingly until you have got the smoothest possible control.

Do not imagine that because your high-tension positive plug is in place at "60 volts" on the H.T. battery you are giving the valve itself 60 volts on the plate, because there is a big drop in the effective voltage due to the fact that part of the pressure is lost in passing through the circuit resistances.

* * *

When putting in a D.C. H.T. mains unit, do not forget that there must be a large fixed condenser in series with the earth lead. (Otherwise there is a danger that you may short your supply mains to earth).



The low and high-wave coils were specially arranged to prevent objectionable inter-action effects, and the constructor should copy this part of the lay-out carefully.

After this, you are ready to begin searching, and you are strongly advised in this connection to read the various hints and tips which are constantly appearing in "P.W."

INTERESTING RADIO ODDS AND ENDS.

CRYSTAL detectors have quite a high resistance, generally of the order of from 10,000 to 40,000 ohms.

* * *

In an ordinary pair of telephones there is over half a mile of wire.

* * *

An ordinary Meccano coupling, drilled out to the right size, is very handy for fitting an extension handle on to a coil holder, or similar control.

An ordinary paper clip of the spring type screwed underneath a grid-bias plug makes a very handy little emergency clip for wires when testing, etc.

* * *

The real difference between a crystal set and a valve set is that the former is limited to energy supplied by the broadcasting station whilst the latter uses this as a trigger to release energy of its own, supplied in the form of batteries, etc.

* * *

If your set employs an H.T. battery eliminator working from A.C. mains it is advisable to switch on the filaments before switching on the H.T.

* * *

Do not let dust accumulate on your H.T. battery, as this may give rise to a leak.

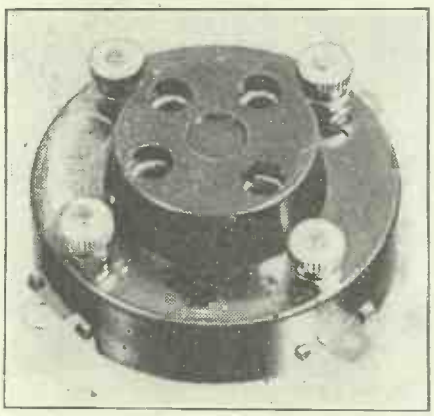
* * *

Be very careful of outdoor switches when H.T. is taken from the mains, as if the voltage is high a leak can be caused by fog or rain settling on the insulation.

FROM THE TECHNICAL EDITOR'S NOTE BOOK

NEW "LOTUS" VALVE HOLDER.

AFTER reading Mr. Percy Harris' article on valve holders which appeared in "P.W." some few weeks ago, readers will realise that these components are not such straightforward articles as they might at first sight appear. Even a valve holder into which valves will fit snugly, and which is bright and pretty and has nicely nickelled terminals, can be, from an electrical point of view, a "dud." For instance, its H.F. resistance might be so low that many distant broadcasters merely disappear in it, and a relatively low ohmic resistance might provide an additional grid leak from the grid to filament, together with another connecting the plate and grid and severely disarrange normal conditions.



This is the miniature type "Lotus" valve-holder.

But nothing like this will happen in a "Lotus" holder, for its electrical properties will be as good as its mechanical qualities.

I have used dozens of "Lotus" valve holders in the past, and I cannot recollect that I have had the slightest trouble with any one. Therefore, I was pleased to see that Messrs. Garnett, Whiteley & Co., Ltd., had produced a miniature type "Lotus" valve holder which, fitted with terminals, sells at 1s. 3d. It is of anti-microphonic design, and the makers claim that it is the strongest valve holder on the market at the present time, "it being impossible to fracture or damage this valve holder, regardless of the roughest treatment that it may be subjected to." And I must say that it is indeed a most robust little affair.

The springing is most ingenious, and the same metal with which this is carried out is extended to form the actual socket itself and thus provide a completely continuous connection.

It is extended at the other end as a terminal tag, which is provided in addition to the screw terminals. The other two varieties of "Lotus" valve holders will still continue to be manufactured and marketed at the same price as formerly, i.e. 1s. 9d. for the model having terminals, and 1s. 6d. for the non-terminal variety.

CHEAPER A.C. VALVES.

It is good news for mains users that the Metro-Vick people have reduced the prices of their Cosmos A.C. green and red spot valves. The A.C.G. valve sells now for 15s., and the A.C.R. for 17s. 6d. In the one case the reduction is as much as 7s. 6d.

HUNT "POLYMET" COMPONENTS.

Some idea of the immensity of the radio industry in America is afforded by the fact that over 60,000 Polymet condensers are stated to be made and despatched daily. They are popular products, and are used by many of the leading set makers. It is interesting to note that the sole selling agency of Polymet products for Great Britain has been given to Messrs. A. H. Hunt, Ltd., of Croydon. They recently sent me a range of these devices.

They are certainly of a high-grade character, and the prices at which they are listed gives one seriously to think. For instance, the "postage stamp" type fixed mica condenser retails at 1s. each, in five capacities up to ·0005 mfd. At this price you get terminals and a robustness of construction almost approaching indestructability. And electrically their capacities are close (they are guaranteed to be within 5 per cent of their rated values), and it is stated that every condenser has to pass a 1,000-volt breakdown test.

At 6d. more condensers of moulded bakelite type are available.

But of all the Polymet components the one which appeals to me most is the R.C.C. unit. Not only are the resistances interchangeable, but also the fixed condenser can be removed. This is a very good point, and one that must commend itself to the discriminating constructor. The grid leak, which ingeniously locks into position between clips, is of the metallised type. The complete outfit costs 6s. 6d. Another interesting Polymet production is a wire-wound resistance for mains units.

A BATTERY DISCOVERY.

The Eton Glass Battery Co., Ltd., of Leyton, E.10, are the makers of those natty little wet H.T. batteries which are fitted with porous pots similar to the large Leclanché cells. Realising that the ordinary porous pots tend to give the battery a high internal resistance, these enterprising people carried out researches with a view to overcoming this drawback.

The result is, they tell me, that they have discovered a substance, which they make by secret process, having all the advantages of the usual type of clay, but a porosity that cuts down internal resistance very considerably.

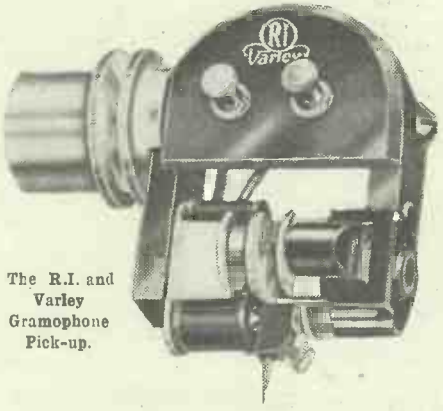
These new pots they are selling at 4s. per dozen. They sent me a complete battery made up with them. I have placed it in commission and find it very effective. The case in which the battery is contained is also new in design and similar to those in which all their batteries are now supplied. Each case is standardised to fit any other case with a like number of cells.

THE R.I. AND VARLEY PICK-UP.

One of the general criticisms that has been levelled against the gramophone pick-up is that it causes considerable wear on records. It is true that there are one or two makes which are rather "heavy on the wax," but it is one of the remarkable features of the new R.I. and Varley pick-up that it is extremely light on records.

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 what to to buy and what to avoid.

Curiously enough, I had not noticed that the makers have brought this point prominently forward, although undoubtedly it is a most important one. Some records seem to be softer in composition than others, and with one of the earlier pick-ups these were threaded up terribly. Fine coils of wax could be seen collecting round the needle as it travelled.



The R.I. and Varley Gramophone Pick-up.

In similar conditions the R.I. and Varley does not show the slightest signs of causing wear. It is, indeed, superior in this respect to many of the best ordinary sound boxes. It forms a complete answer to record-wear criticism. It is a well-made device and a novel scheme makes it easily adaptable to any ordinary tone-arm.

The results it gives are of the highest standard. It is sensitive and the reproduction is clean and bright and has adequate bass. Undoubtedly the form of suspension adopted is an entire success. Messrs. R.I. and Varley are to be congratulated upon the addition of yet a further outstanding item to their already brilliant range of radio devices and equipment.

RADIOTORIAL

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 and 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.

CAUSE OF POOR RESULTS.

"ANODE" (London, S.W.11).—"I have been a constant reader of 'P. W.' and, starting from one of your crystal sets, I have, like many other amateurs, built up to a three-valve set. Thinking I would tackle higher game, I then constructed the 'P.W.' Four, exactly to your specification. But I do not appear to neutralise the set properly, because so much reaction has to be applied before the set will oscillate when the circuits are in tune, and when the plates of the N.C. condenser are fully open. Even then it only oscillates properly over the lower half of the scale.

"Although I am working 120-volts H.T. and not the mains, I get a continual hum, which diminishes when the copper screen is touched. I have never had this trouble of hum before with a valve set, and I am nowhere near any power plant.

"The tuning also appears to be wrong, and although I have a good outside aerial, I can only get 2 L O and 5 G B. I am sure the 'P.W.' Research Department obtained far superior results to this, and I am hoping to emulate their feat if you can point out the trouble to me."

You certainly have a very serious fault somewhere, for most readers who have built this set report that the stations are fairly rolling in on it. Regarding the coils and valves (which were referred to separately), we have not tried the plug-in coils and split-primary transformer of the makes you name in this set, but if they are of the ordinary standard type they should be O.K.

The valves mentioned by you are all of the correct types, and we should have supposed that the trouble might lie here, except for the fact that you say that the hum diminishes when the copper screen is touched. This is a rather curious symptom, which seems to indicate that you may have an improper connection somewhere.

It looks as though one of the grid circuits is "in the air," so to speak, and the input to one of the valves is not being correctly applied across grid and filament. We have known the same thing occur where it escaped notice that the grid-leak holder was one of those in which an insulated clip is used instead of a metal connecting clip.

We have experienced the same trouble, when a grid-bias connecting lead has been broken underneath the insulation, and we have also traced the symptom to a faulty coil holder, in which the grid coil did not make connection with the grid pin on the coil holder. Consequently, although the latter was earthed and applied to the filament, the coil itself was in the air.

Such a fault can be very difficult indeed to find, but we think that if you suspect every grid-filament connection in your set and go very carefully over it, or if you test all the contacts through with 'phones and dry cell (as recommended in "Radiotorial" recently), you will be sure to discover that somewhere there is a "joint" which is not a joint, and that this is the whole cause of your trouble.

THOSE ABBREVIATIONS!

"Q. R. S. O. S." (Trowbridge, Wilts).—"With reference to the list of Q's which you published for me recently in 'Radiotorial,' would you please inform 'Morse of Letchworth' of one you somehow missed. It might interest him as he is keen on them. The one in question is Q S S, which means 'Are my signals fading?' This is an important one which is often heard."

"73's OM."

"SHORT-WAVER" (Northampton.)—"Having learnt telegraphy in the Post Office, I am able to listen-in to a great deal of short-wave working and to understand a great many

(*Continued on page* 346.)

4 WONDROUS OFFERS

DUNHAM LONG RANGE RECEIVER

in ordinary and transportable (non-aerial) model. Our long-range three-valve set is now recognised as THE set for distant reception. Hundreds of actual testimonials have been received and this set is UNIVERSALLY REGARDED AS BEING THE EQUAL OF ANY FIVE-VALVE RECEIVER. This was before the screened-grid valve, but now that the design works in conjunction with this wonderful "distance getter" the results are really remarkable. We have received a note actually of direct reception of broadcast on ordinary wavelengths from South America, and details together with full name and address will be given in a later advertisement. Meantime write for latest catalogue with **legally proved testimonial book**, with actual reproductions of about twenty letters received from all parts of the British Isles, these being selected at random from many hundreds we have on our files and which are open to inspection at any time.

Set in beautifully finished cabinet, as illustrated, with compartments for all BATTERIES and with absolutely all accessories (Screened-grid and other valves, batteries, etc.), Cone or ordinary loud-speaker as desired, £20: or supplied for first payment of 35/- and balance 25/- monthly.

Catalogue free. Your own set taken in part exchange if desired

ACCUMULATOR CHARGER

Our accumulator charger MUST interest you, for if you have electric light laid on in your house you can charge your own accumulator for a mere fraction of the cost of having this done at your local charging station, and without all the trouble and inconvenience of having to take and collect it again. BETTER STILL, if you desire we make a special model that enables you to charge the accumulator without even disconnecting it from your wireless set. In any case, however, you can leave the accumulator on charge one night a week, and then in the morning it is fresh, fully charged, and ready for use again. FIREPROOF, AUTOMATIC, this charger incorporates the Westinghouse metal rectifier, the device that needs absolutely no attention whatever, and in addition has many additional advantages our own special design gives. 50/-; or sent for 10/- first payment and 4/6 monthly.

In addition to the three remarkable offers made above, our catalogue, which is free for the asking, gives a whole host of useful information for the experimenter and home constructor, and in addition something like **twenty different sets are listed and described** for those who prefer to buy complete including the Dunham ONE-DIAL Simplicity set, that receives on *EVERY* WAVELENGTH FROM 150 to 2,000 metres, without any coils whatsoever, and which costs only £8 2s. 6d., absolutely complete with all accessories, loud speaker, etc. Those who desire to make their set are invited to send 6d. with their request for catalogue, and a full-size 1/- BLUE PRINT WITH ALL CONSTRUCTIONAL DETAILS OF THIS SET WILL BE POSTED FREE.

Use our All-Wave Tuner in your set and eliminate all those troublesome interchangeable coils 150 to 2,000 metres, 9/6.

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Late Radio Engineer to Marconi Sc. Inst. Co's Member of the B.B.C. since its inauguration

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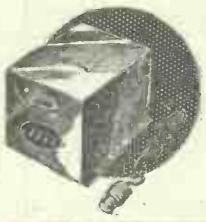
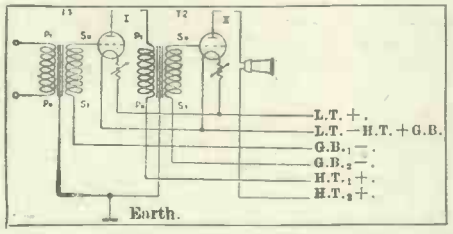
Our high-tension eliminators are universally recognised as THE ELIMINATORS, on account of extraordinary high efficiency and unique design. The remarkable interest taken in them at recent Wireless Exhibition and orders that have followed since is a sure sign that the public recognises their remarkable capabilities. To mention but a few (space does not permit a long description), but you should write not only for free full description, but also for details of combined eliminators that automatically supply H.T. and keep accumulator charged without even disconnecting it from the set or troubling about it in any way, these eliminators are made under I.E.E. rules, have isolating transformers that prevent possibility of shock through contact with mains, incorporate their own glass-protected fuses that safeguard your house wiring cables, and the iron screening container not only is a safeguard against fire, but effectively prevents any possibility of hum being set up through induction. GUARANTEED ABSOLUTELY QUIET IN USE.

Two models available for A.C. or D.C. Senior model: £5 18s. 6d. or supplied for 10/- and 10/- monthly. Output: 150 volts, 20 milliamps. De-Luxe model £7 7s. or supplied for first payment of 12/6 and 12/6 monthly. Output 180 volts, 40 milliamps. All models have four tappings to obtain different voltages, and variable tappings can also be supplied to obtain ANY voltage from zero almost to highest voltage.



JUST OUT!

WEILO CIRCUIT No. 1



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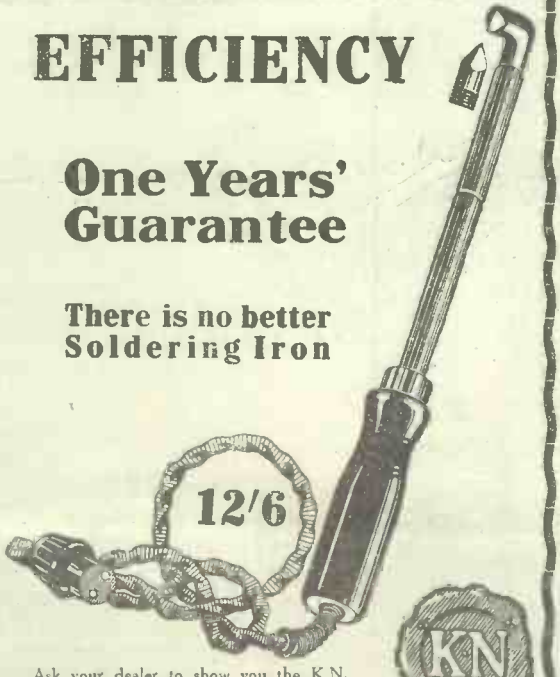

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Phone Regent 4632. **87, Wardour St., London, W.1.**

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 344.)

of the abbreviations, but there is one thing I do not understand and that is '73s. What does this mean ?

"As I do not try to follow out all the other abbreviations, I have never compiled a complete list, but at some time or another I have satisfied myself of the meaning of nearly all of them in common use, except this dreadful 73. What does a man mean when he has finished and he says 73s. O.M. 73."

The signal "73" used in this way is a long-established abbreviation used by American telegraph operators. Actually, the two figures are used to express "kindest regards" or "good wishes" or "cheerio," or anything friendly like that.

Just why *these* two figures should have been chosen, and no other, for the purpose, is a bit of a mystery now, but the fact remains that somehow the two figures 7 and 3 did come to stand for good wishes of this kind, in some way. The same telegraphic abbreviations naturally tended to creep into wireless, many of them being very applicable, such as "O.M." for "old man," "H.W." for "how?" and others less easy to understand, but universally used for the same meaning. Amongst the others in this class we have MIM, which means "laughter" and "73" which means "best wishes."

TRANSFORMER TERMINALS.

A. J. W. (Chorlton-cum-Hardy, Manchester).—"I should like to know your opinion of the practice now common with many makers of transformers of putting the terminals of the instrument at the base instead of at, or near, the top? This seems to me rather a risky proceeding, since the H.T. wiring to the primary will, in many cases, run close to and parallel with the filament wires, whereas with the terminals at or near the top of the transformer, such wires were well spaced and away from the filaments.

"Moreover, if any alteration of transformer leads were required at any time after the set was built, this could be much more conveniently effected with the terminals well above the baseboard. Anyhow, what is the advantage supposed to be with this new arrangement? You can certainly make a shorter lead to the grid so far as the secondary terminals are concerned, but I am not certain that this is so necessary in L.F. coupling as in the case of grid condenser and leak.

"Your opinion would be of value, as, to me, the disadvantages appear to outweigh any other consideration."

Probably this practice arose because it is an advantage in the opinion of many to keep all wiring well down on the baseboard. With care filament leads can still be well separated, but, as you say, there is the disadvantage that a change-over is comparatively inconvenient. There is, however, a growing tendency to run all leads underneath the baseboard, and this method—which has much to recommend it—is greatly facilitated by "low-down" terminals on the transformer.

"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 a revised 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.

THE "TRAVELLER'S THREE."

D. G. W. (York).—"In what number of 'P. W.' was the 'Traveller's Three' described, and where can I get a back number?"

The "Traveller's Three" was described in "P.W." No. 322 (August 4th, 1928, issue). Back numbers of "P.W." are obtainable from The Almagamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4, price 4d. per copy, post free.

CURRENT CONSUMPTION OF SCREENED-GRID VALVE.

"INTERESTED" (Henley-on-Thames).—"I have become very interested in the 6-volt screened-grid valve, and I notice that the extra screening of the valve is connected to the H.T. positive terminal. In the valve I have in mind it is connected to about 80 volts H.T. positive, and what I am wondering is whether this represents a drain on the H.T. battery in the same way as, for instance, the anode connection of an ordinary valve?

"In other words, does the screened-grid valve have two plate currents—one to the real plate and one to the screening plate?"

Yes, the fact that the screen is connected to a point on the high-tension battery means that it will be correspondingly positive to the filament, and consequently there will be a tendency for the filament electrons to be attracted to it. A certain proportion of the total electron feed of the filament will be

(*Continued on page* 348.)

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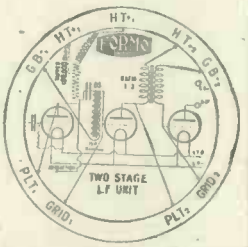

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Reproduction of label on top of moulding.

Terminals conveniently arranged, making components extremely simple to wire.

FREE Booklet "L.F. AMPLIFICATION" contains BLUE PRINT of THREE VALVE SET incorporating the "TWO STAGE" UNIT, from your dealer or post free on receipt of post card.

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ANTI-MICROPHONIC SHOCK ABSORBING

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BAKELITE throughout, including BASE PLATE. Practically DUSTPROOF.

The springing is such that even rough usage will not affect its liveliness.

The "float" is recessed on top, thus making easier the manipulation of valve when plugging into holder.

As illustration shows, Terminals are provided as well as soldering tags.

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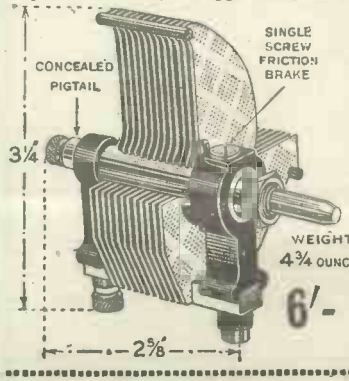
This Condenser has an ingenious NOISELESS "PIGTAIL" incorporated in a manner unobtainable in any other Condenser.

Capacities : ·0005 ·00035 ·00025 ·00015



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SIEMENS

POWER BATTERIES

WRITE FOR CATALOGUE 641.

SIEMENS BROTHERS & CO., LTD., WOOLWICH, S.E.18

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 346.)

absorbed by the screen, and this does represent an additional current taken from the H.T. battery.

This does not, however, mean that the valve is in any way inefficient or wasteful to use, because it is only a very small proportion of the total anode current which is absorbed in this way. Considering its distance-getting properties, the valve's H.T. current consumption, including both the plate and the screen, cannot be called excessive.

Switching for Pictures.

D. R. P. (Bromsgrove, Worcestershire).—"Will you tell me if it is possible to switch a set like the 'Sceptic's Three' so that in one position the set will work a loud speaker, and in the other position of the switch taken out to leads to enable the output to work a broadcast picture machine? Apparently these latter are not on sale yet, but as you have already in 'P.W.' given a 'radio-picture' receiver it looks as though the time is coming when we shall be able to make ourselves simple 'looking-in' sets.

"I understand that the B.B.C. is starting picture transmission from Daventry this month, and I expect we shall soon be purchasing or making a machine to pick them up. I do not want to have to make a special receiver for the job, and I wondered if it was possible to get the switching part ready so that my present set will work either the loud speaker as usual, or the picture transmitter when this arrives. What sort of switch would be required?"

It will be a very simple matter to alter a good loud-speaker set so that it is ready for a picture receiver to be attached to it. All that is necessary is a little modification of the output terminals to bring it into line with the "Radio Picture Four," which has already been described in this journal, and which incorporates an easily-switched output that can be used to work either a loud speaker or a picture machine.

Practically any loud-speaker set should be capable of working a picture machine, and any type of double-pole double-throw switch connected to its output will enable this to be switched over to "Loud Speaker" or "Pictures" as required. The connections are as follows:

First of all the terminals of the double-pole double-throw switch must be labelled, and we will start with its *centre* terminals, one of which we will call "A," and the opposite one "1."

When the switch is thrown over into one of its positions, each of these terminals will connect with another, and the one which is now joined to A we will call "B," and the one which is now joined to 1 we will call "2."

If the switch is now thrown over into the *other* position A and 1 will make contact with two different contacts, and these we will call "C" and "3" respectively.

To wire up the switch to the output of the loud-speaker set all that is necessary is to place it near the output terminals and to join one of the output wires to A and the other output terminal to lead 1. Then connect the leads from the loud speaker to B and to 2.

When making a picture machine it will be necessary to connect the leads from this to the terminals marked C and 3.

This completes the wiring, and the output of the receiver can now be diverted either to the loud speaker or to the picture machine, according to the position of the switch.

A READER'S REMARKS ON SPACING.

Although the importance of the correct spacing of components, etc., has often been emphasised in these columns, the Technical Query Department is often confronted with cases where all sorts of mysterious spacing troubles have arisen. Generally these are on account of the fact that the reader has departed from the design of the set by enclosing it in a smaller cabinet, or by using a different baseboard. Apparently it is not generally realised that inside the wireless set it is not only the wires that are working, but all the space around the coils, etc., is filled with wireless activity.

In this connection we have pleasure in giving publicity to the following letter from a reader who built the "Sydney Two de Luxe" (and added a third stage so as to make it a Det. 2 L.F.). The set was very unsatisfactory, so that eventually he placed the trouble in the hands of the Query Department. After some correspondence this department recently received the following letter from him.

London, N.W.10.

"Dear Sir,—You will be pleased to know that I have been able to correct the fault that has caused my 'Sydney' to work unsatisfactorily. The H.F. choke was quite O.K., but the fault lay in the fact that I had placed the tuning condenser, the H.F. choke and aerial reaction coils *too close together*. Moving the H.F. choke away from both condenser and coils has absolutely cured my set of its trouble, and now I am quite satisfied that the set is all you said it would be when describing its construction.

"Perhaps you could give a word of warning to other readers of POPULAR WIRELESS about placing the different parts too close together if there is a chance of them being better spaced.

"What is the technical reason? It is that the field of each acts on the other and causes interaction?

"Thanking you for your help and advice.

"Yours truly,

"F. A. B."

The Knife-Edge Crystal Set.

E. W. (Gloucester).—"You have put out a set called the 'Knife-Edge Crystal Set,' and it was a winner. I tried it here and up at Hartlepool, and it was so good in the latter place that I was persuaded into leaving it behind for a friend. Having tried several others, I am going to build that one again, and

(*Continued on page* 350.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 348.)

I should like to know where I can get the particulars?"

Details of the "Knife-Edge Crystal Set" will be found on the "P.W." Blue Print No. 33. This is obtainable from the "P.W." Queries Department, The Fleetway House, Farringdon Street, London, E.C.4, to whom application should be addressed. (Note that a sixpenny postal order should be enclosed to pay for the print, and it is important to note also that a large stamped addressed envelope should be enclosed with your application.)

COILS AND CRACKLES.

F. L. N. (Belfast).—"A friend of mine who knows a bit about wireless has helped me with it, and all we can find out is as follows: Whenever it is in use at my house it crackles and makes awful noises. Taken round to my friend's house, where he has his set, it gives the same sort of results, but when I use his H.T. battery on my set the crackles cease and all is O.K. again, so that the fault must be in the H.T. unit. Where shall I look for it?"

The fault is no doubt due to a faulty connection somewhere, as this would account for the type of noise produced; but do not forget that the faulty connection may not be inside the H.T. eliminator itself. Some time ago we traced a similar trouble to a break in one of the high-tension leads. This was one of four leads in a cable and it looked perfectly sound, but the flex at one end of the lead was broken and was making intermittent connection. It is quite likely that one of your leads on the unit is playing the same trick and only needs replacing to remove the fault.

H.F. IMPROVEMENTS.

L. T. H. (Rugby).—"How can I neutralise a tuned-anode set? (I might say that I might have saved myself a lot of trouble if I had asked you that question a week ago. I was not very clear about the connections, and in trying to do it myself, I burnt out a valve!) If possible, I want to use an ordinary neutralising condenser and a plug-in coil."

The holder for the plug-in neutralising coil should be mounted close up to the holder for the tuned-anode coil so that when the coils are plugged in they are coupled close together. The neutralising condenser should be mounted near to the neutralising coil, and then these two should be joined together by a short wire.

The only remaining connections are (a) a lead from the free side of the neutralising condenser to the earth-filament lead, and (b) a lead from the remaining neutralising coil-holder terminal to the grid of the tuned-anode H.F. valve.

Neutralising is carried out in the ordinary way, but it may be necessary to reverse the leads to the neutralising coil (or, if more convenient, to the anode coil, as these two must be in correct relation to each other).

NEXT WEEK

In NEXT WEEK'S issue of

Popular Wireless

will be given

Full Constructional Descriptions

of

The "Long-Range" Three

and

The "Bandmaster"

BLUEPRINTS of these splendid sets are GIVEN AWAY with this week's issue of "P.W.," but be sure to get the DESCRIPTIONS too, in NEXT WEEK'S

Popular Wireless

THOSE CONTACT RESISTANCES.

By G. P. KENTALL, B.Sc.

WHEN you hear people talking learnedly of "contact resistances" it is rather a temptation to assume that they are referring to something of purely scientific interest, with no practical bearing for the man who merely makes and uses a wireless set. Well, that may be, but all the same there *is* a side of the question which concerns all of us.

If you will consider a moment you will realise that there are quite a lot of points in the wiring of every receiver at which we depend upon a mere contact between two pieces of metal to complete a circuit. Even if you solder every possible point, there must still remain a number of places where wires are gripped under terminals (what about the aerial and earth leads, for example?), and as a rule there are also several points where something interchangeable fits into the socket.

Important Practical Applications.

Now, every one of these contacts is a possible source of trouble. You cannot assume that because two metallic surfaces are touching therefore there is a perfect connection between them. On the contrary, such contacts have a definite resistance, and it is quite possible for this to be high enough completely to spoil the performance of a good set under certain conditions. More than once I have come across a set which was "a thorough failure" according to its owner simply and solely because there were numbers of high-resistance contacts in the tuned circuits, and which worked perfectly as soon as these were attended to.

Evidently then, the apparently abstruse subject of contact resistance has some decidedly important practical applications

(*Continued on page* 354).

THOSE CONTACT RESISTANCES.

(Continued from page 352.)

and it may save trouble in the future to get an idea of what it is all about. The first point to grasp is that a contact between two metallic surfaces, even quite clean ones, has a certain definite resistance, which depends on a number of factors, such as the pressure forcing them into contact, the areas touching, and so on.

The Two Essentials.

So long as there is a fair amount of pressure and the metals are clean it can be assumed that the contact resistance is so low as to be negligible so long as we are dealing with the small currents to be found in a wireless set. These two conditions (pressure and cleanliness) may seem easy ones to meet, but actually there are a number of places in the set where one or the other may easily be absent.

For example, where a wire is gripped under a terminal there is pretty sure to be plenty of pressure, but the surfaces may well be dirty in the electrical sense (most metals corrode and tarnish when exposed to town air). Again, the plug and socket contacts of a coil may be both loose (lack of pressure) and dirty, and the statement applies to all the other interchangeable items in the set, such as valves, grid leaks, etc.

Manufacturers are doing a good deal to reduce these troubles by using non-tarnishing metals and providing heavy pressures wherever there are interchangeable fittings, but it is still up to the user to take great care to see that the two essentials of a good contact are always present. Heavy pressure is a fairly simple affair, but keeping surfaces really bright and clean is not so easy. Probably the best expedient is the use of glass or emery paper and then a very slight smear of vaseline. (This last is important. It both stops corrosion and improves contact.)

FIXED RESISTORS.

By A. JOHNSON RANDALL.

IT is common practice these days to adjust the filament current of a valve by the simple expedient of inserting a length of coiled up resistance wire in one of the filament leads. These lengths of coiled wire are commonly termed fixed resistors, this being simply another name for a non-variable resistance.

In the old days it was the usual thing to place a variable resistance in either the positive or negative filament lead and to vary the setting until the best results were obtained with the smallest current flowing. The object was to ensure the maximum valve life.

Valves are cheaper now, and in addition are not critical. Most of them are intended

(Continued on page 356.)

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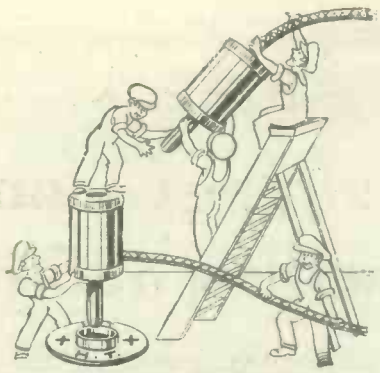


FIXED RESISTORS

(Continued from page 354.)

to be worked at 2, 4, or 6 volts, according to type.

Now, provided a 2-volt accumulator is employed with 2-volt valves, a 6-volt accumulator with 6-volt valves, and so on, it is not necessary to use fixed resistors at all. There are, however, cases where the makers' filament rating may be a little below the L.T. battery voltage.

For instance, we may have a so-called 6-volt valve which is designed to work at 5·5 volts, or a 2-volter intended to operate on a filament voltage of 1·8.

There would be no harm in connecting the L.T. battery direct across the filaments of these valves, but on the other hand nothing would be gained in slightly overrunning the filaments. It would tend to shorten the life of the valve.

The listener's trouble is usually to choose the correct value resistor.

He doesn't know how to work this out for himself, and he frequently purchases the wrong value for the job.

Yet the choice of the correct resistance is the easiest thing in the world.

There is a law called Ohm's Law, and briefly it is a statement that the current (in amperes) flowing in a circuit is equal to the voltage divided by the resistance in ohms.

We can make use of this law in working out the value of our resistor. By transposition the value of the resistor required is

equal to the voltage to be dropped in the resistor divided by the current in amperes.

Think how simple this is. Suppose we take an example. The valve we will imagine is rated at 5·5 volts, ·1 amp. Our L.T. battery is a 6-volt one. Then we shall require to drop ·5 volt across the resistor in order to run the filament at 5·5 volts. Our equation is:

$$\text{Resistance} = \frac{\text{Volts to be dropped}}{\text{Current in amps.}}$$

In figures for the case in point this becomes

$$\text{Resistance} = \frac{\cdot 5}{\cdot 1}$$

The answer is 5 ohms, since ·1 goes into ·5 five times.

Let us take a second case. Suppose the valve is rated at 1·8 volts, ·1 amp., and that we are using a 2-volt L.T. battery.

We have Resistance $= \frac{\cdot 2}{\cdot 1} = 2$ ohms.

The figure for "volts to be dropped in the resistor" is found by subtracting the makers' filament voltage rating from the L.T. battery voltage.

This little calculation—if one can call it by this name—is very simple, and yet so many readers are puzzled when it comes to choosing the correct value.

Perhaps this explanation will clear up their difficulty.

DESIGNING SETS FROM CIRCUITS.

By A. S. CLARK.

HAVE you ever paused to think how much work there is between a circuit diagram and a complete receiver in its cabinet, ready for work? If not, you will find it very interesting, and also instructive, to take a theoretical circuit and, without any other information, construct a receiver from same.

Choose a simple valve circuit, as otherwise you may find yourself tackling a job that is really beyond your skill.

With the circuit in front of you, you will probably be at a loss to know how to start. First of all you must decide on the types of components to use. For instance, you must decide whether ordinary two-pin plug-in coils are to be employed or whether six-pin coils should be used.

Component Considerations.

A list of the components required should be made (with notes on the types at the side), after which they should all be collected together.

The next point is to decide which components have to go on the panel; and then, bearing in mind which are to go on the baseboard, decide on the panel and cabinet sizes. If there are any H.F. valves, allowance must be made for the associated components to be wider spread than those on the L.F. side.

There is more behind laying out a panel than at first is apparent. After deciding which terminals, if any, are to be placed on the panel, the disposition of the controls must be decided. There are three things which have to be borne in mind while doing this.

First of all the controls must progress from left to right, as the circuit is drawn. The wiring must also be visualised roughly so that long, straggly leads and crossing leads are avoided. Lastly, the controls must be arranged to give a pleasing appearance, and be more or less symmetrical if possible.

The lay-out of the components on the baseboard is not so straightforward as those on the panel. In order to get an idea of the amount of room available, all the components should be set out on the baseboard, roughly in the order they appear in the circuit. Now, since it is desirable to have plenty of room at the H.F. or tuning end of the set, it is as well to arrange the L.F. components first.

(*Continued on next page.*)

DESIGNING SETS FROM CIRCUITS

(*Continued from previous page.*)

These may be placed almost as close together as possible, providing such components as L.F. transformers are kept apart and with their cores at right angles. Of course, room must be left to insert valves, etc., and the points to be connected together when wiring must be arranged as near to one another as possible.

More care must be taken over the H.F. side of the set. Here it is very necessary to keep coils properly spaced out and, where necessary, with their fields at right angles. All components in the plate circuit of an H.F. valve must be kept away from those in the grid circuit in order to avoid coupling. It is also necessary when arranging the components to place them so that the wiring will be short and properly spaced, so that little feed-back, which would cause oscillation, can take place.

The foregoing is merely a brief outline of the designing of a set, but serves to show the process of evolution of a receiver from the circuit to the cabinet. It also indicates that every little detail must be thought out scientifically, and with due regard to its relationship to the set as a whole.

NEXT WEEK

Full descriptions for the construction of

The "Bandmaster"

and

The "Long-Range" Three

will be given in

Popular Wireless

The Blueprints for the two sets are included in these Free Gift contained in this issue.

TECHNICAL NOTES.

(*Continued from page* 322.)

have their own methods of obtaining corresponding results) less electrical energy is required to operate the valve, thus effecting economy in accumulators. At the same time a long filament may be used for a given voltage, giving a large electron-emitting surface. The filament is also claimed to be exceptionally robust and so to withstand vibration and rough treatment without danger of destruction.

Screening Precautions.

My recent references to screen-grid valves and the screening of the H.F. stages have brought me several enquiries with regard to the screening and use of these valves generally.

I should say that there are a number of points which must be carefully borne in mind when designing a set intended to be

(*Continued on next page.*)

TECHNICAL NOTES.

(Continued from previous page.)

used with screen-grid valves and one of the most important of these refers to the running of the wires carrying the high-frequency current. If two H.F. leads belonging to different H.F. circuits happen to be parallel and fairly close together, it is practically certain that interaction will take place and the set will oscillate. It is, therefore, advisable to see that the screening is carefully and effectively carried out as between the various circuits. A screen which is not properly effective may cause a considerable amount of trouble and it may also be difficult at first to locate the cause of this trouble.

Finally, you should take care that the lead-in wire from the aerial does not run in close proximity to the H.F. circuits or tuning coils.

Distance from Station.

If two receiving sets, identical in all respects, are placed, one at a distance of, say, 20 miles from a broadcast station and the other at twice that distance, how will the loud-speaker strength in the first compare with that in the second?

This is a rather theoretical way of stating what, in an equivalent form, is really an everyday problem. The more practical way of stating the problem is, perhaps, this: If a receiver is operated at a distance of 20 miles from a broadcast station and the same receiver is moved, without any alteration otherwise, to twice that distance, what will be the effect upon the loud-speaker strength?

Signal Strength.

Every experimenter knows that the signal strength will fall very considerably

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

and will be much less than half the value at twice the distance. Of course, in actual practice you adopt various means to boost up the signal strength to a suitable value, but the problem as to what would happen if all conditions except distance were kept constant is very interesting.

How It Falls Off.

It is impossible to answer this question in any very definite way, as so much depends upon transmission conditions and upon all manner of factors in the receiving circuit itself. But some idea of the great falling-off of signal strength with the distance may be gathered from the following considerations :

The power in the anode circuit of the power valve (and, therefore, the power supply to the loud-speaker) varies as the square of the signal voltage on the grid of the power valve.

The voltage output of the detector varies as the square of the voltage on its grid.

Consequently the power passed into the loud speaker varies as the fourth power of the voltage impressed upon the grid of the detector valve. The voltage impressed upon the detector valve is proportional to the voltage in the aerial, and consequently the power into the loud speaker varies as the fourth power of the voltage impressed upon the aerial.

The Field Strength.

Now, the voltage in the aerial varies as the field strength, and the field strength surrounding the aerial varies inversely as the square of the distance between transmitter and receiver.

Reverting now to our problem as to the effect upon signal strength when the distance between transmitter and receiver is doubled, we see that the signal strength at twice the distance is 1/256th of the original value, since the distance is multiplied by two (and two to the power of 8 is equal to 256).

As I remarked before, this cannot be taken in any way as a hard and fast rule, as there are so very many considerations entering into the calculation which cannot be allowed for in such a simple manner as that which has been followed above.

The calculation serves to show, however, the very rapid way in which the signal strength (other things being equal) falls off as the distance from the transmitter increases.

LOTUS

THE MASTER VALVE HOLDER

SPECIFIED for Mullard Master 3

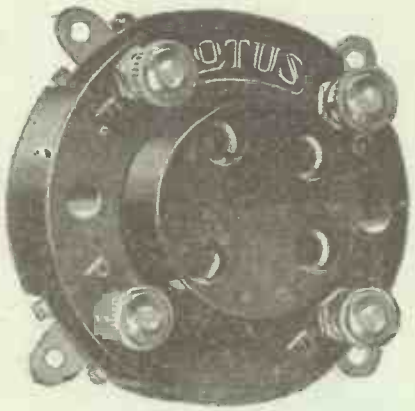
Again Mullard have chosen Lotus Valve Holders for the Master 3. A good set demands a good valve holder, and Mullard have chosen the best their experts could find.

The new Lotus Miniature Valve Holder is anti-microphonic, almost indestructible, and only 1⅝ths" in diameter.

Phosphor bronze leg sockets and springs are all in one piece, all surplus metal has been removed between the valve legs, and the very finest bakelite mouldings have been used.

If you are building the Master 3 or any other good set, make sure you buy the new Lotus Miniature type Valve Holder. It will make all the difference to your set.

From all radio dealers, price 1/3.
Other types 1/6 and 1/9.



London Representative:
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LOTUS
BUOYANCY
VALVE HOLDER
ANTI-MICROPHONIC

Made by

Garnett, Whiteley & Co., Ltd., Broadgreen Road, Liverpool

Caustan.

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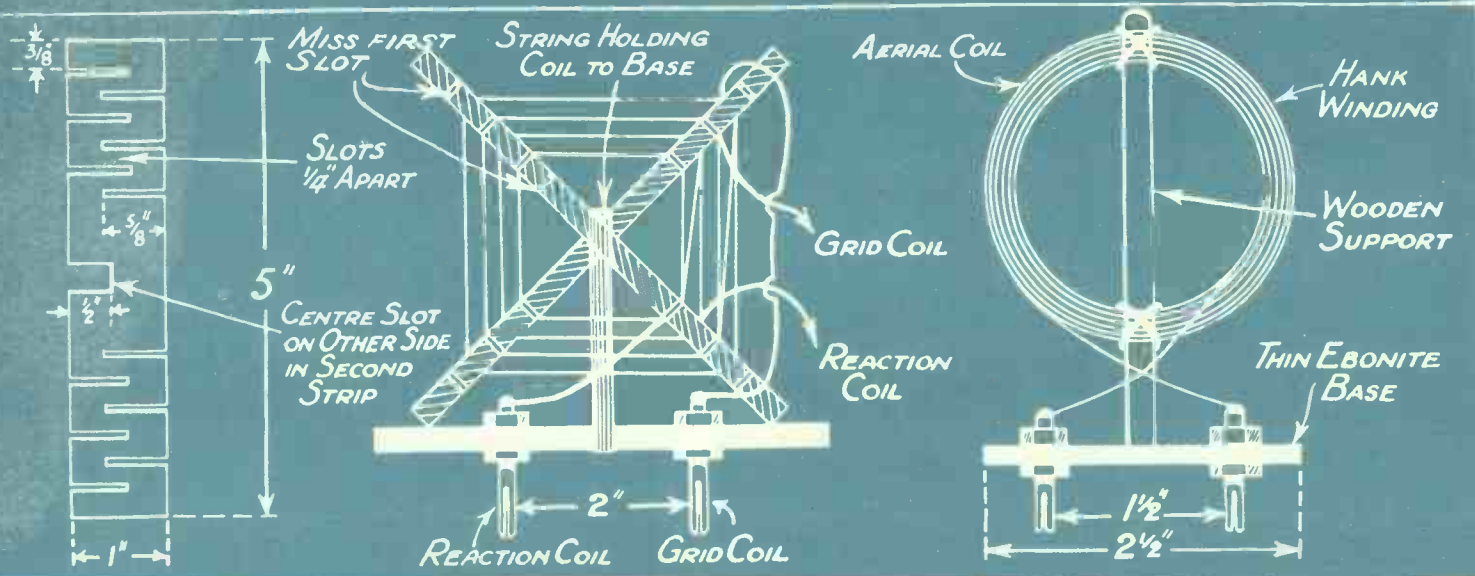
BLUEPRINTS

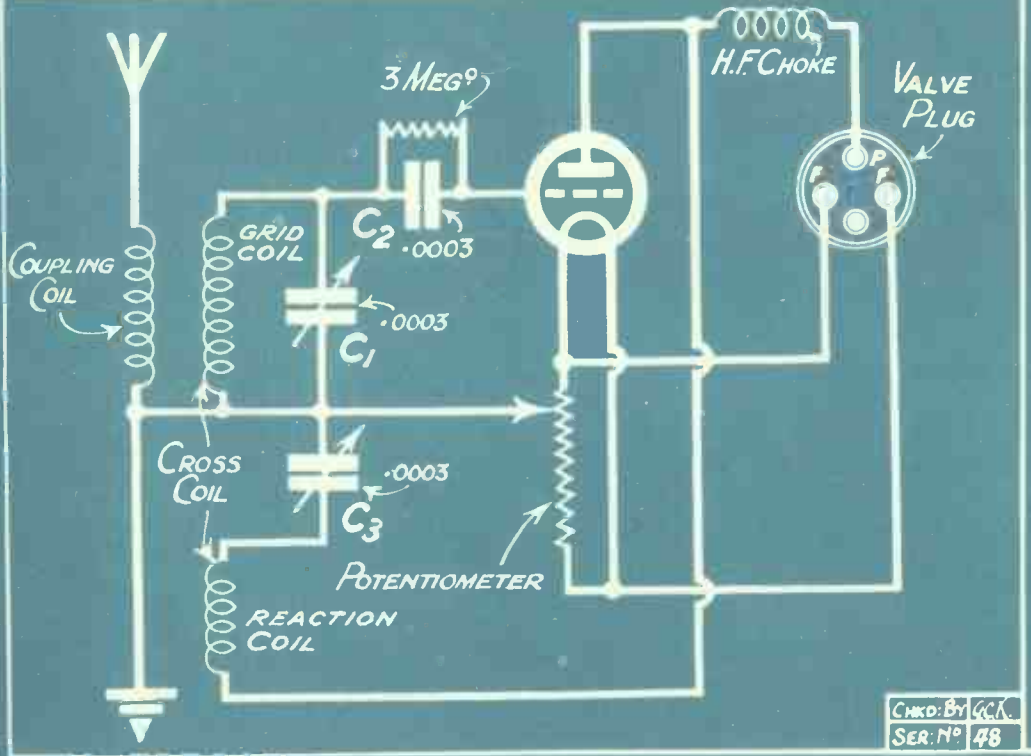
Presented free with "Popular Wireless," week ending October 20th, 1928.

THE P.W. BLUE PRINT CIRCUIT No. 49

The "Antipodes Adaptor."

PRICE 6d.





COMPONENTS AND MATERIALS.

1 Panel, 12 in. × 7 in. × $\frac{3}{16}$ in. or $\frac{1}{4}$ in.

1 Sheet of thin copper, 12 in. × 7 in., for back of panel.

1 Cabinet to fit, and baseboard, 9 in. deep.

1 Piece of ebonite, 5 in. × 3 in., for coil base.

2 ·0003 mfd. ('00025 will do) variable condensers, with slow-motion or good vernier dials.

1 Grid condenser and leak, ·0003 mfd. and 3 meg.

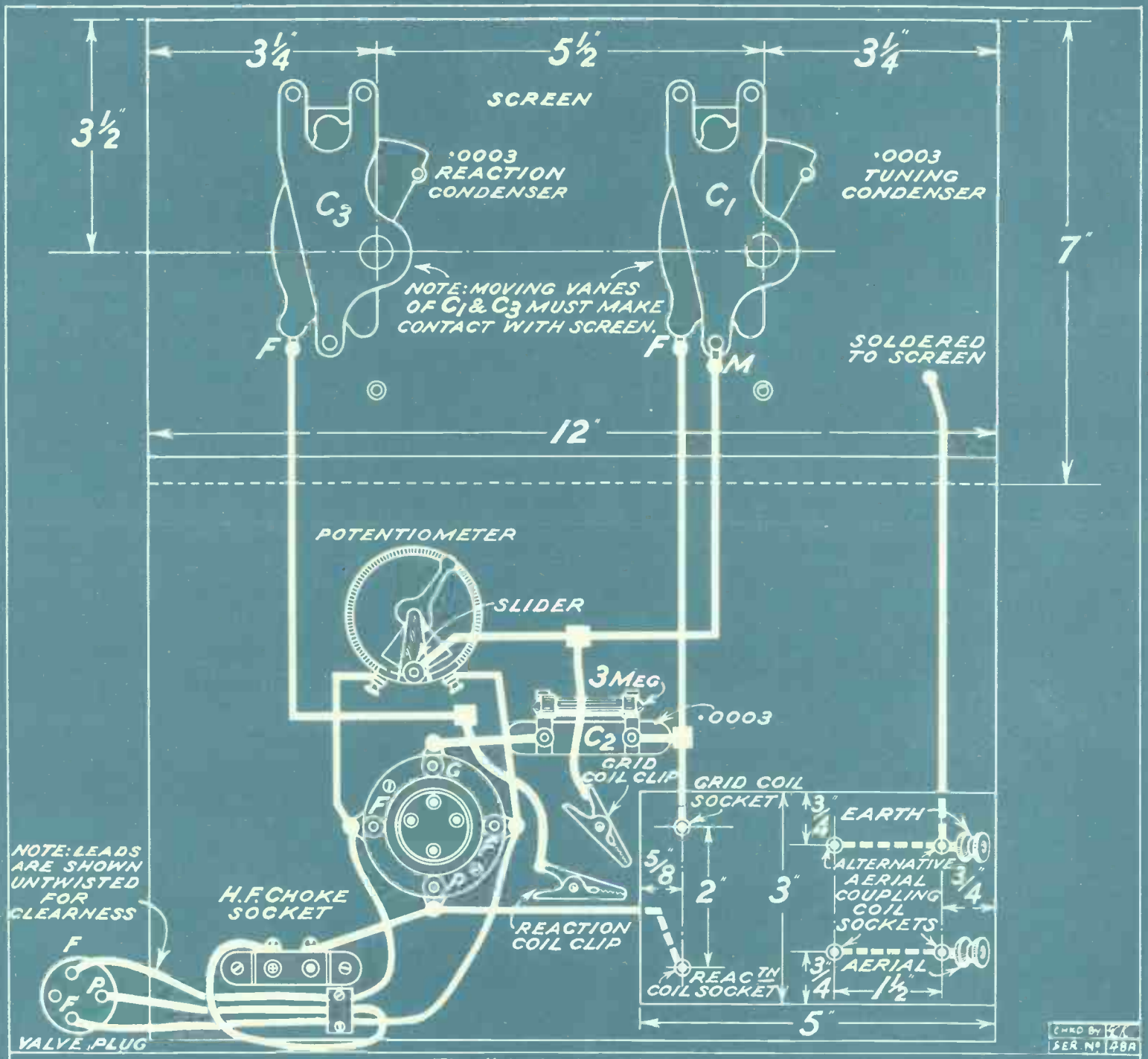
1 Sprung valve holder.

1 Single-coil socket for ordinary plug-in coil.

1 Baseboard-mounting potentiometer, 300 or 400 ohms.

1 Valve plug (an old valve base can be used, or a gramophone pick-up adaptor).

$\frac{1}{4}$ lb. No. 22 D.C.C. wire, ebonite strips for cross coil former, flex, clips, valve legs and pins, 2 terminals, wire, etc.



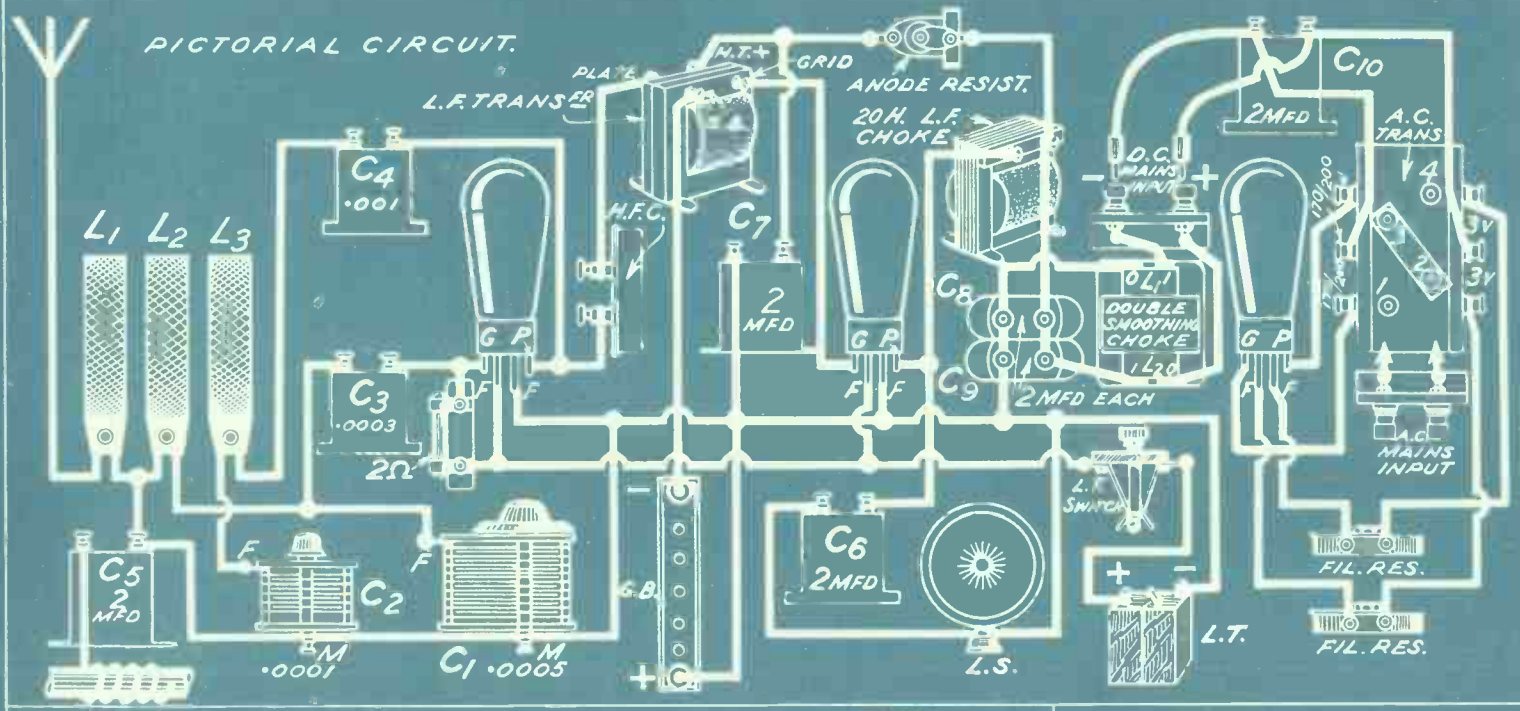
The "Antipodes Adaptor."

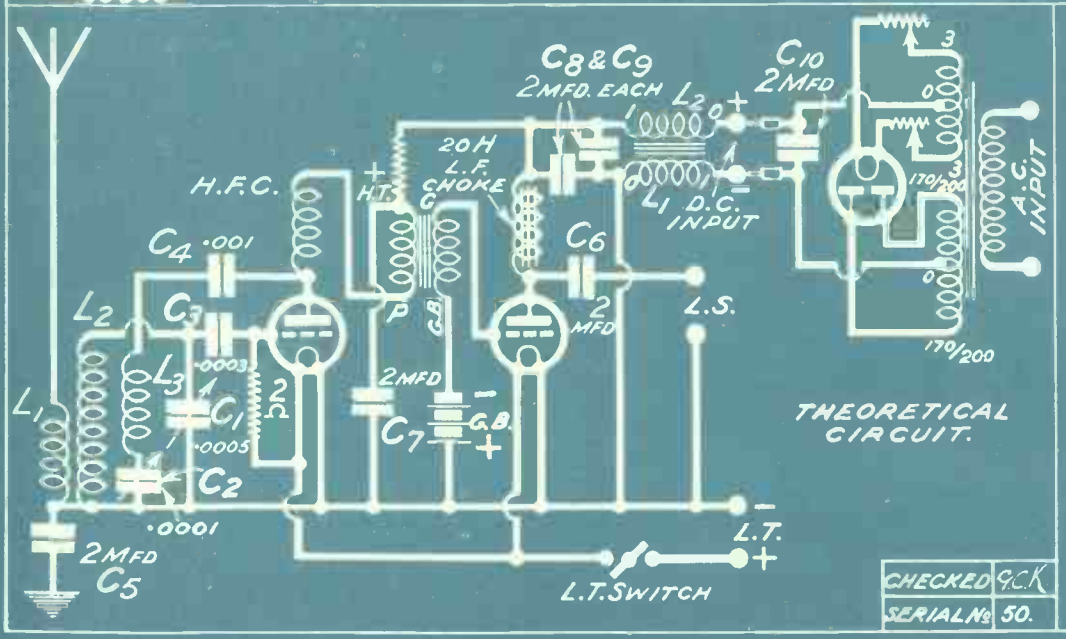
A simple little unit which can be connected in front of any straight valve set with one or more L.F. stages for the reception of short waves. Take detector valve out of set, replace with adaptor plug from unit, insert detector valve in unit. Aerial coil is a plain hank of five turns. Try various couplings. Main coil has 6 turns reaction and 6 grid, in same direction, 3 turns each slot, turns spaced ⅛-in. apart. Inner and outer slots not used. Use plug in No. 60 or 75 for H.F. choke.

THE P.W. BLUE PRINT CIRCUIT No. 50

The "Any Mains" Two.

PRICE 6d





CHECKED	G.C.K.
SERIAL No.	50.

COMPONENTS AND MATERIALS.

1 Panel, 14 in. × 7 in. × ¼ in. or ⅜ in.
1 Cabinet to fit, with baseboard 18 in. deep.
1 ·0005 mfd. variable condenser with slow-motion drive or vernier dial.
1 ·0001 or ·00015 mfd. reaction condenser.
1 L.T. on-off switch.
10 Insulated terminals.
6 2 mfd. condensers (see note on wiring diagram re voltage rating. Instead of two separate condensers for C_8 and C_9 you can equally well use one of 4-mfd. if desired).
3 Sprung valve holders.
3 Baseboard-mounting single-coil sockets.
1 H.F. choke.
1 L.F. transformer.
1 L.F. choke suitable for output filter circuit. (About 20 henries capable of carrying a fair current.)
1 Anode resistance and holder. (See elsewhere for resistance value.)
1 Fixed condenser of ·001 mfd. and one of ·0003 mfd.
1 2 meg. grid leak and holder.
1 Piece of iron, copper or aluminium for screen, 6 in. × 4½ in.
1 Double L.F. smoothing choke.
2 Baseboard filament rheostats capable of carrying fairly large current.
1 Mains transformer to suit voltage of your mains, with H.T. secondary (centre tapped), giving about 180—0—180 volts and L.T. secondary giving 3—0—3 or 2—0—2 volts, according to the rectifying valve to be used.
2 Terminal strips, each about 2½ in. × 2 in.
Wire, screws, flex, battery type plugs, etc.

ACCESSORIES.

1 H.F. type valve, 1 power or super-power, 1 full wave rectifier.
Coils Nos. 25, 35, 50, 60, 100, 150 and 250.
L.T. and G.B. batteries to suit valves.
Loud speaker and 'phones.

The "Any Mains" Two.

A compact detector and L.F. set for loud-speaker reception of the local station (and 5 G.B. in the south if the aerial is good), and 'phone work over greater distances. A complete H.T. battery eliminator unit is built into the set and the only external battery needed is the L.T. accumulator. Ordinary valves are used and are furnished with a constant supply of H.T. which never runs down and costs extremely little once installed.

The set can be used on either A.C. or D.C. mains. For A.C., connect mains to terminals marked "A.C. mains imput," and take flex leads marked + and − to the appropriate terminals marked "D.C mains input." Note: The original terminals were of the type with hollow shanks, hence the leads in question were furnished with plugs to fit therein.

On D.C. mains disconnect these flex leads and connect the mains direct to the appropriate terminals. If the set then gives no sign of life, reverse the mains leads.

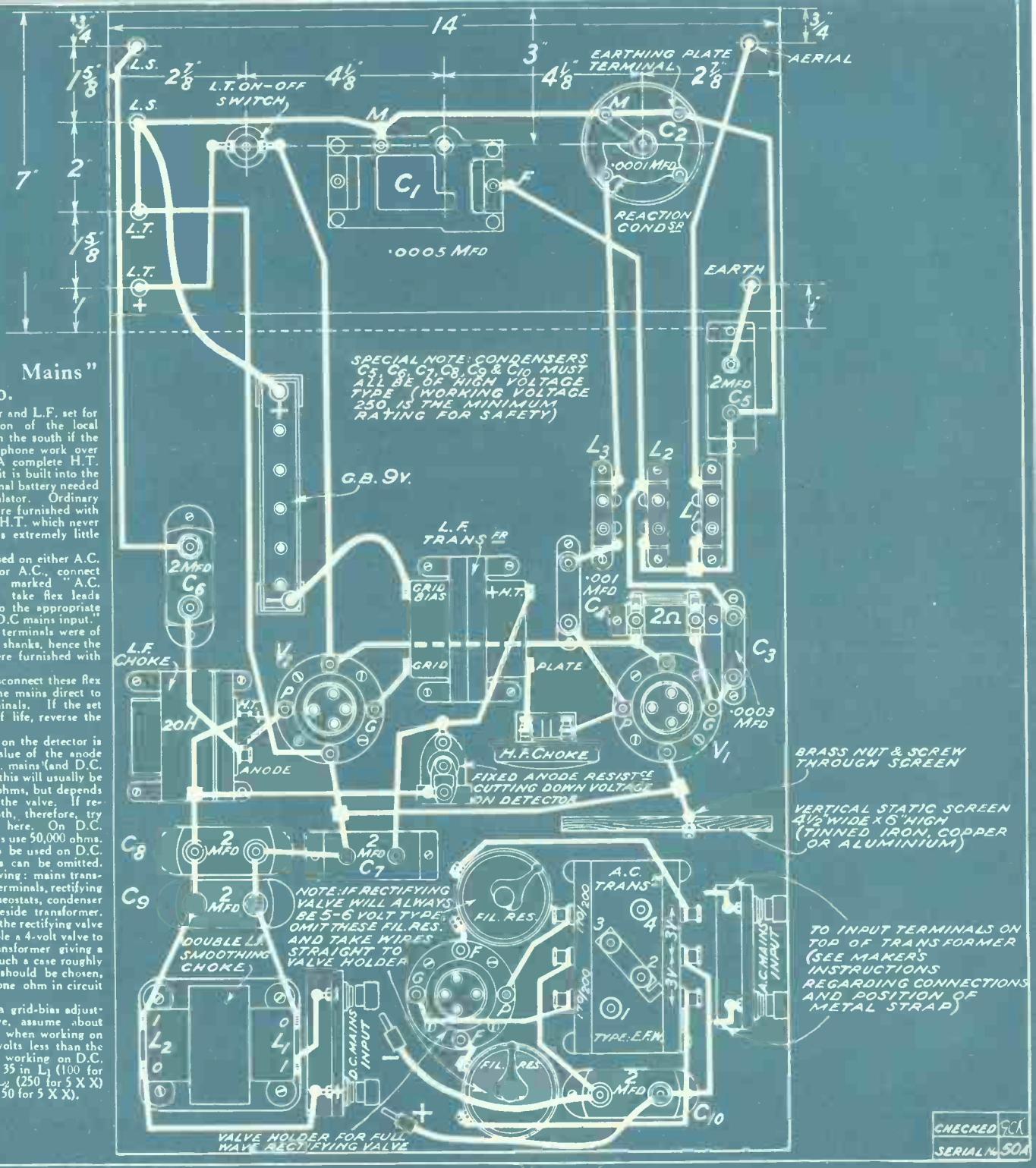
The H.T. voltage on the detector is controlled by the value of the anode resistance. On A.C. mains (and D.C. of 200 volts or over) this will usually be 150,000 or 200,000 ohms, but depends to some extent on the valve. If reaction is not smooth, therefore, try different resistances here. On D.C. mains below 200 volts use 50,000 ohms.

Note.—If set is to be used on D.C. only, all A.C. parts can be omitted. These are the following: mains transformer, A.C. mains terminals, rectifying valve socket and rheostats, condenser C_{10}, metal screen beside transformer.

The rheostats for the rectifying valve are intended to enable a 4-volt valve to be used with a transformer giving a 6-volt supply. In such a case roughly calibrated rheostats should be chosen, and set to include one ohm in circuit on each resistance.

For purposes of a grid-bias adjustment on last valve, assume about 180–200 volts H.T. when working on A.C. and about 5 volts less than the mains voltage when working on D.C.

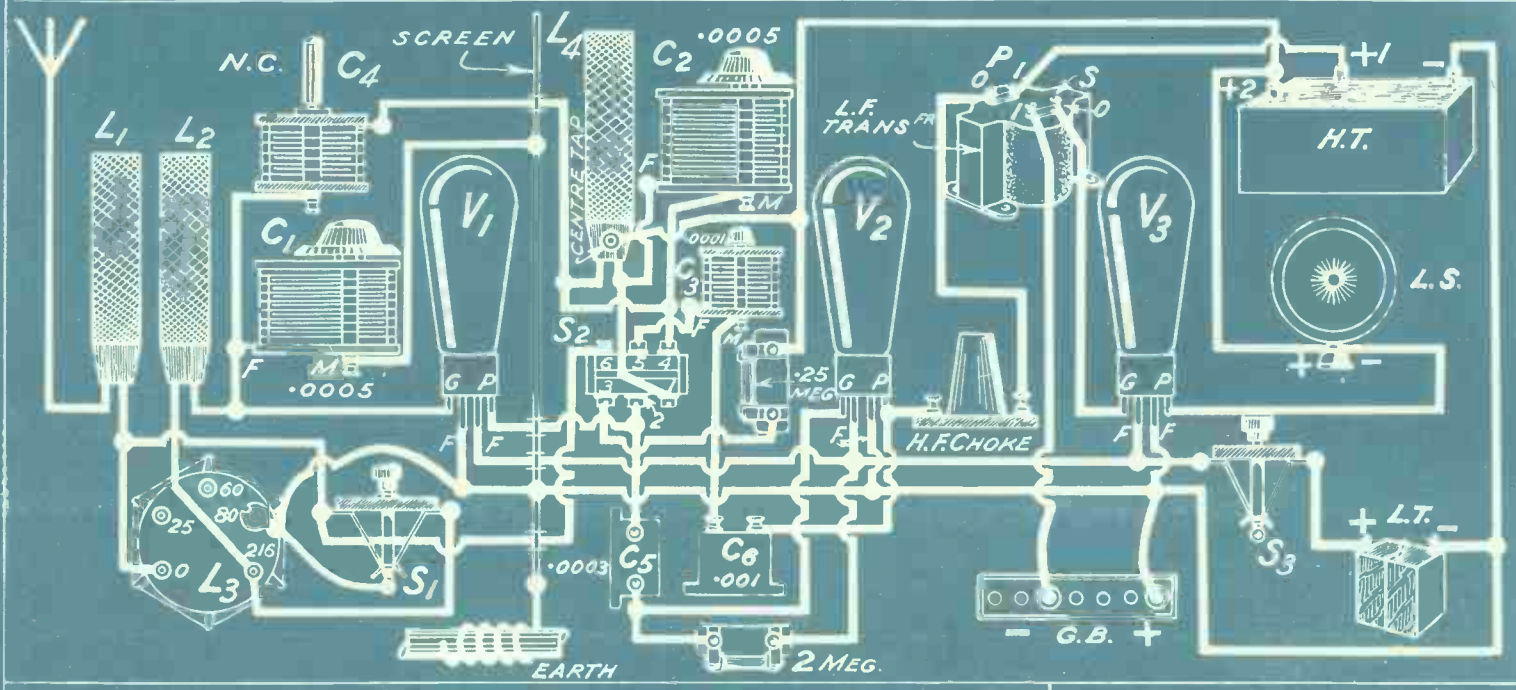
Coil sizes: 25 or 35 in L_1 (100 for 5 X X, etc.), 60 in L_2 (250 for 5 X X) and 50 or 75 in L_3 (150 for 5 X X).

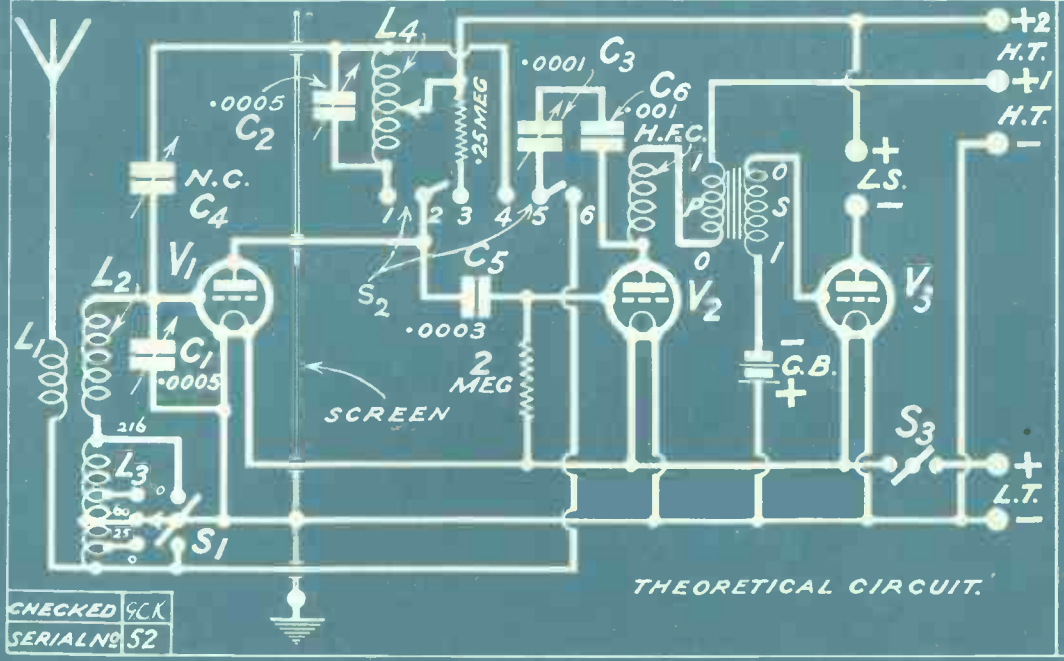


THE P.W. BLUE PRINT CIRCUIT No. 51

The "Long Range" Three.

PRICE 6d.





CHECKED GCK

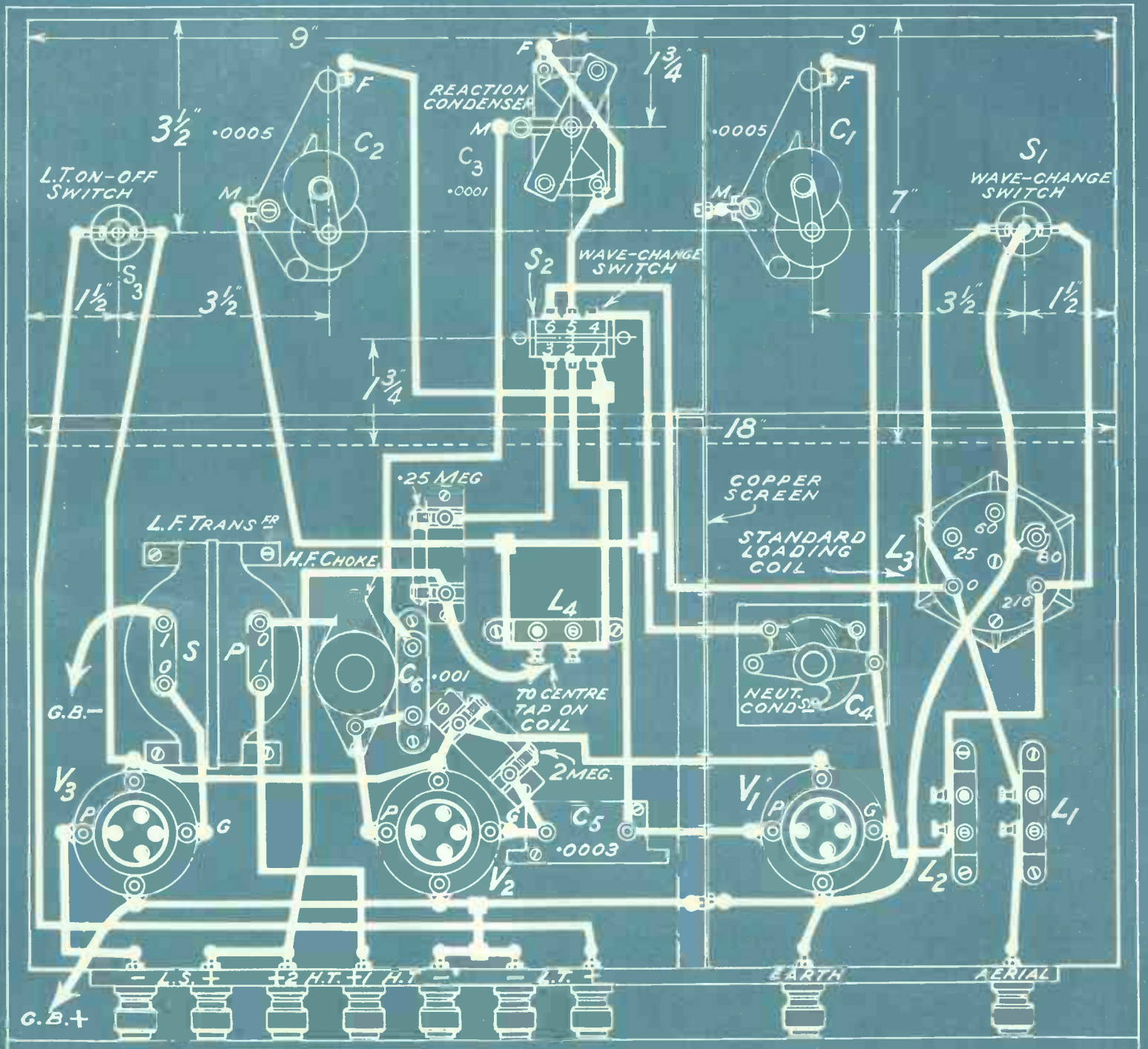
SERIAL No. S2

COMPONENTS AND MATERIALS.

1 Panel, 18 in. × 7 in. × ¼ in. or ⅜ in.
1 Cabinet to fit, with baseboard, 10 in. deep.
2 ·0005 mfd. variable condensers, slow motion or with vernier dials.
1 ·0001 or ·00015 mfd. reaction condenser.
2 Push-pull type on-off switches. (Note: One of these must be of the type commonly used for wave-change switching, i.e. with two side springs and a central metal plunger to which a third lead can be attached by soldering or otherwise. The other can be any ordinary on-off type.)
1 Panel-mounting double-pole change-over switch of a good anti-capacity type.
1 Standard loading coil.
3 Baseboard-mounting single-coil sockets.
3 Sprung valve holders.
1 Baseboard-mounting neutralising condenser.
1 L.F. transformer of fairly low ratio.
1 H.F. choke.
1 Fixed condenser of ·0003 mfd. and one of ·001 mfd.
1 Grid leak of 2 meg. and 1 of ½ meg. with holders.
1 Terminal strip, 16 in. × 2 in. × ¼ in. and 9 terminals.
1 Copper or aluminium screen, 6 in. × 10 in. (standardised type with perforations advised).
Wire, flex, G.B. plugs, screws, etc.

ACCESSORIES.

2 H.F. type valves and 1 power type.
H.T., L.T. and G.B. batteries to suit valves.
Plug-in coils Nos. 25, 35, 60 (two of last size).
'Phones and/or loud speaker.



The "Long Range" Three.

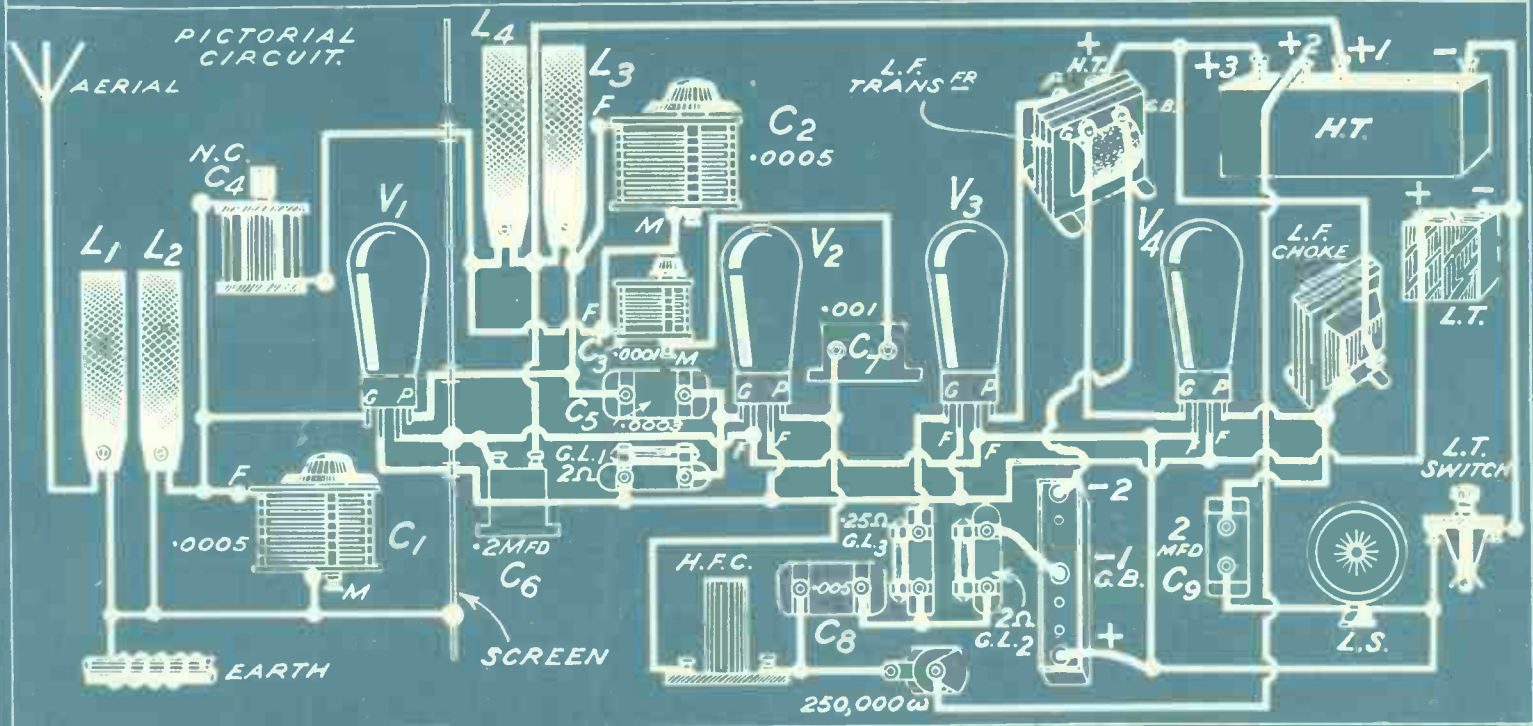
A sensitive, selective set for long-distance work, incorporating one H.F. valve, detector, and one L.F., with switching for changing over from ordinary broadcast waves to long waves. For long waves push in S_1 and set S_2 handle over to the left, as seen from front of panel. Use 25 or 35 as L_1 according to size of aerial and selectivity required (small coil, high selectivity), and a 60 in L_2 and another in L_4. Adjust selectivity on long waves by placing spade tag on flex lead on either "60" or "80" on L_3.

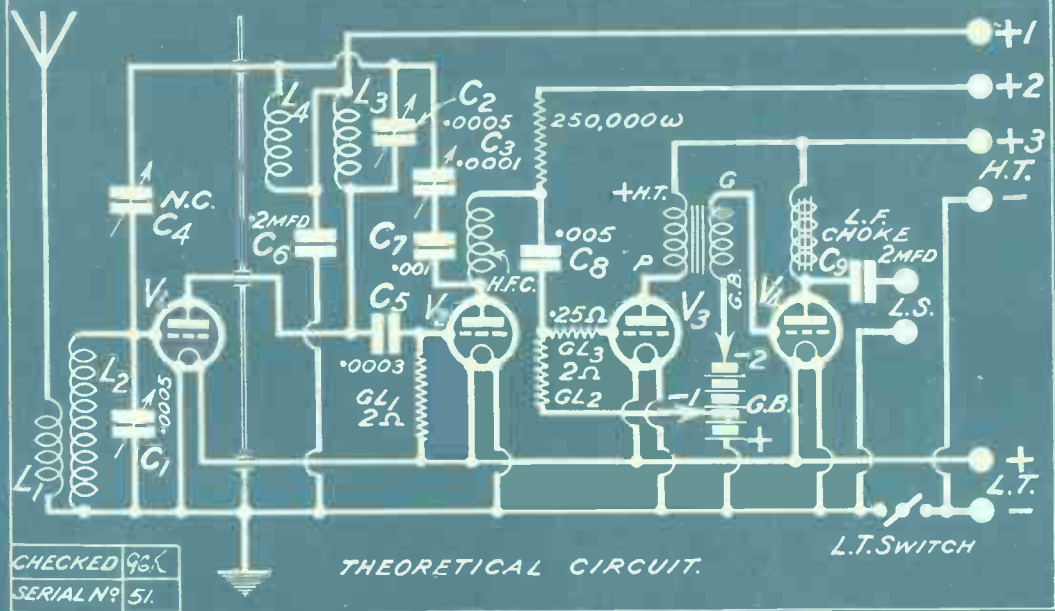
CHECKED	GCK
SERIAL No	52A

THE P.W. BLUE PRINT CIRCUIT No. 52

The "Bandmaster."

PRICE 6d.



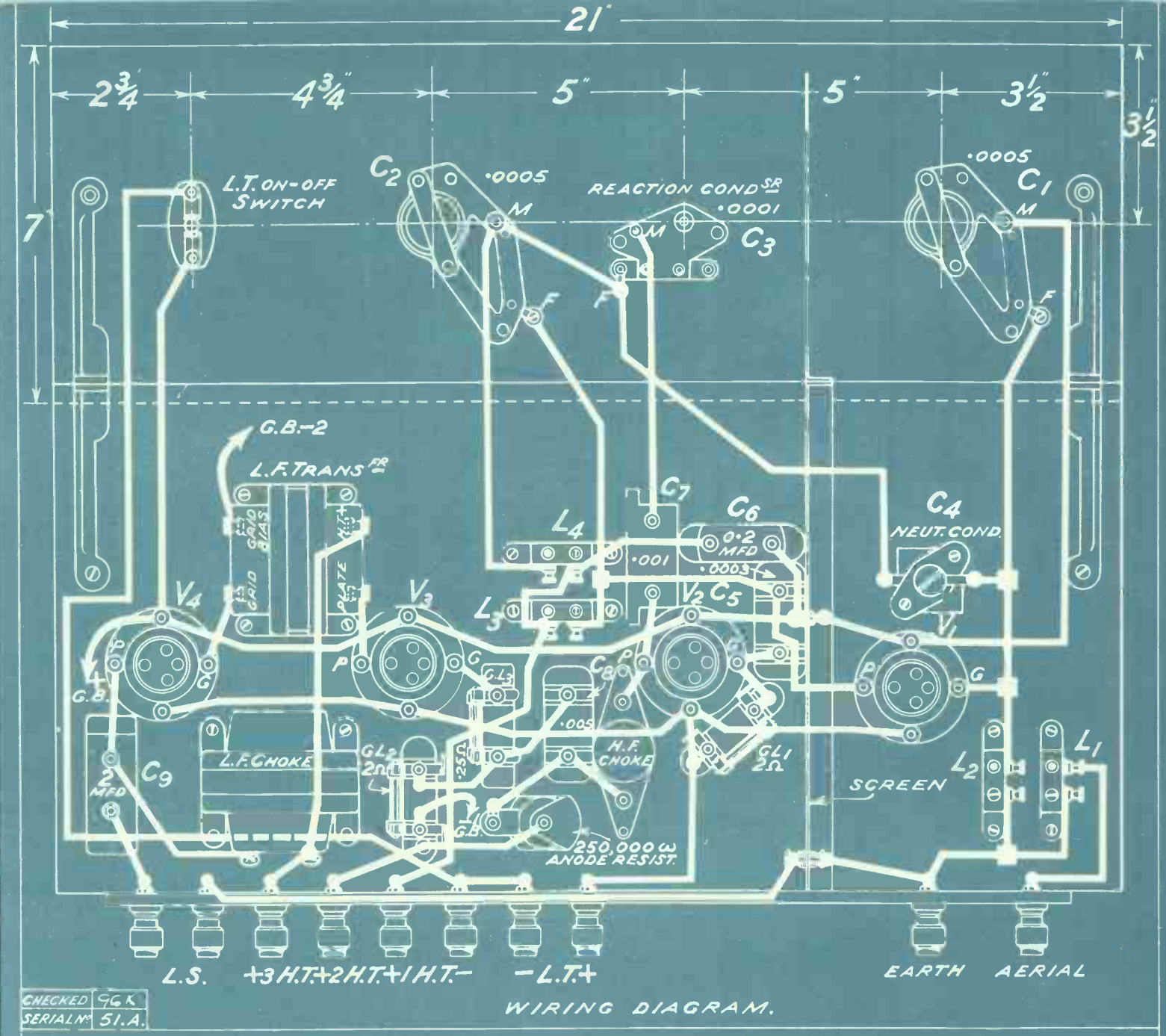


COMPONENTS AND MATERIALS.

1 Panel, 21 in. × 7 in. × ¼ in. or ⅜ in.
1 Cabinet to fit, with baseboard, 10 in. deep.
2 ·0005 mfd. variable condensers, with slow-motion drive or vernier dials.
1 ·0001 or ·00015 mfd. reaction condenser.
1 L.T. on-off switch.
4 Sprung valve holders.
4 Baseboard-mounting single-coil holders.
1 Baseboard-mounting neutralising condenser.
1 H.F. choke.
1 250,000 ohm anode resistance and holder.
1 L.F. transformer.
1 L.F. choke suitable for output filter. (About 20 henries, and capable of carrying a fair current.)
1 2 mfd. condenser.
1 ·2 mfd. condenser.
2 2 meg. grid leaks with holders.
1 ·25 meg. grid leak with holder.
1 Fixed condenser of each of following sizes: ·0003 mfd., ·001 mfd., ·005 mfd.
1 Copper or aluminium screen, 10 in. × 6 in., of standard type with row of perforations along lower edge.
1 Terminal strip, 19 in. × 2 in. × ⅛ in. with 10 terminals.
Wire, G.B. plugs, screws, etc.

ACCESSORIES.

3 H.F. type valves and 1 power type.
H.T., L.T. and G.B. batteries to suit valve.
Coils Nos. 25, 35, 50, 60, 75, 100, 150, 250 (30 and 40 would be useful also).
Loud speaker.



CHECKED 9G K
SERIAL No. 51.A.

WIRING DIAGRAM.

The "Bandmaster."

A four-valve set of high sensitivity and selectivity for long-range loud-speaker work. H.F. stage is neutralised and screened. Arrangement of anode circuit can be modified to suit different H.F. valves. For a high-impedance type use No. 25 as L_4 and No. 50 as L_3. For a lower impedance try No. 30 as L_4 and No. 40 as L_3. (L_4 No. 75, L_3 No. 150, will serve for long waves.) For L_1 use No. 25 or 35 (75 or 100 for long waves), and for L_2 No. 60 (250 for long waves).

POPULAR WIRELESS, October 27th, 1928. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

RADIO PICTURES AND THE B.B.C. (See Page 369.)

Popular Wireless

Every Thursday PRICE 3d.

No. 334. Vol. XIV. INCORPORATING "WIRELESS" October 27th, 1928.

Contents

Set Assembly Simplified
Tracking Short-Wavers
THE "BANDMASTER"
The B.B.C. and The Music-Halls
THE "ANY-MAINS" TWO
The Baffle Board
L.F. or R.C.?

This view, taken at Start Point on the coast of South Devon, shows one of the seven lighthouses which are to be fitted with radio beacons under a new scheme. Our cover photo gives a view of the lighthouse and shows the rocky nature of the coastline.

WHY WORRY WITH BATTERIES?

Model "B" L.T.,H.T.&G.B. Eliminator.

By substituting Cosmos A.C. Valves for your existing valves the new Met-Vick Model 'B' Eliminator enables you to dispense with batteries altogether, and operate straight off your Electric Supply.

Connected to a wall plug or lamp socket, the model "B" will provide you with heater current for your A.C. valve filaments, 5 tappings for the high tension supply to your valves, and automatically regulated grid bias taps for your last stage.

Model "B" Eliminators can also be obtained for supplying H.T. and G.B. only.

L.T., H.T. & G.B.
£8 0 0
A special model for 25 periods is supplied at £10 0 0
List M.S. 4745.

Prices of 'Met-Vick' Model 'B' Eliminators for providing 180 Volts on the last valve. Complete with S.P. 41 U rectifying valves. 100-110 volts or 200-250 volts, 40-100 periods.

Ask for leaflets shown.

H.T. & G.B.
£7 7 0
A special model for 25 periods is supplied at £9 5 0
List M.S. 4746.

These eliminators are eminently suitable for the operation of the Met-Vick A.N.P. receivers described in leaflets S.P. 7117/2 and S.P. 7117/4 and for 3 and 4 valve receivers listed in leaflet M.S. 4742.

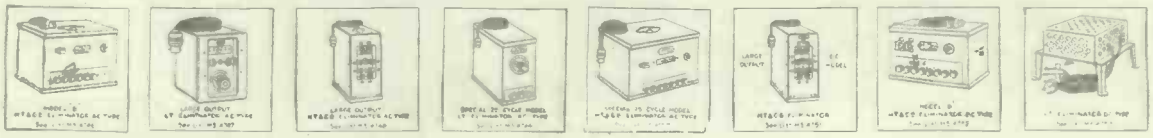
MET-VICK
ELIMINATORS

Other types of Met-Vick Eliminators for A.C. and D.C. circuits are briefly referred to below and the corresponding leaflet numbers given.

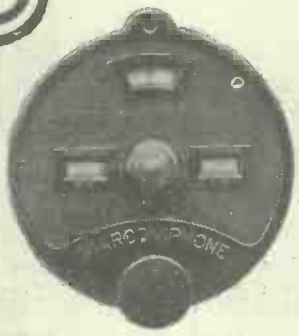
Ask your own dealer for copies or write direct to

Metro-Vick Supplies Ltd., 155, Charing Cross Rd., London, W.C.2.

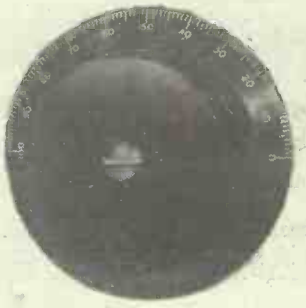
See us at
STAND No. 30
Manchester RADIO Exhibition.



NEW MARCONIPHONE CONDENSERS



Slow Motion Dial.



Fast and Slow Motion Dial.

To secure satisfactory results from your receiver you should make sure that it is built with Marconiphone components throughout. The great resources of Marconiphone enable this world-famous organisation to pursue the most vigorous and untiring research. All Marconiphone components bear the stamp of finished workmanship and unerring accuracy in design.

SLOW MOTION DIAL.

An inexpensive dial with conventional edge drive, the knob being below the scale opening. Fits standard spindles. Price 5/9.

FAST AND SLOW MOTION DIAL.

A high-class concentric drive dial for fast and slow movement. When correctly fitted no back-lash is possible, and the reduction ratio of 18 to 1 allows for the finest adjustments. This is a quality component, and as such is most reasonably priced. Price 9/-.

LOGARITHMIC VARIABLE CONDENSERS.

High class but moderately priced variable condensers with ball and friction bearings. Nickel-plated finish. The vanes are shaped to give equal spacing of stations over the whole dial, and two capacities will be available. Prices: ·0003, 15/-; ·0005, 18/6.

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A range of mica dielectric condensers for grid circuits, R.C. units, H.F. by-passing, etc., all fitted with terminals and soldering tags and contained in neat, moulded cases. Prices 2/6 and 2/-.

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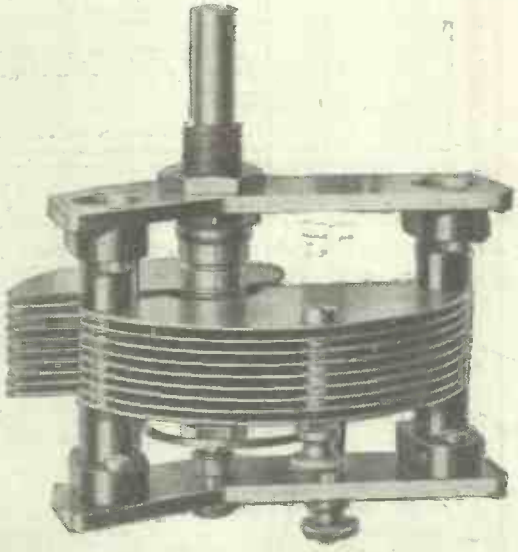

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THE MARCONIPHONE COMPANY, LIMITED,
(P. Dept.), 210-212, Tottenham Court Rd., London, W.1.

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Popular Wireless

Scientific Adviser:
Sir OLIVER LODGE, F.R.S.
Editor:
NORMAN EDWARDS.
Technical Editor: G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS, P. R. BIRD, G. P. KENDALL, B.Sc. A. JOHNSON RANDALL.

RADIO NOTES AND NEWS.

Real Radio Drama—School Wireless—Beware the P.O.—Lead or Iron "Earths"—Commercial Candour—A Human Document—Triumph of Radio—A Pat for 5XX

Real Radio Drama.

SO it has happened! A radio drama of kidnapping, impersonation, and clean "get-away." Berlin was the scene. A mild Socialist was billed to broadcast some of his own special, harmless dreamstuff. He is tricked and whisked off in a car while a Communist takes his place before the "mike" and shoots off clouds of red-flaggery into the ether before anyone in authority twigs the mischief. Well, I invite that Communist to come and kidnap a few B.B.C. "items" I could mention.

A Strange Error.

IT appears to me that there is a strange misapprehension rife concerning the meaning of television. I had come across a number of instances of complete error in this regard, and attributed them to inattention, but the other day someone "posh," speaking at a big dinner, showed plainly that he thought that television is a kind of X-ray apparatus which is extra strong, and can be operated over long distances. If any of you think that—and I don't believe any of you can be such gossoons—if you think a televisor will enable you to see what next door have in the pantry, you haven't read your "P.W." properly!

School Wireless.

YOU have all read about the Kent Education Committee's famous experiment in school radio, and the report of that body, over which the B.B.C. chortled so. Very good! Now, I like to hear both sides of a question, so recently finding myself seven fathom deep amongst Kentish schoolkids, I held an unofficial enquiry, the result of which satisfied me that they have no time for radio without music. They seem to think it a mean trick to try and fatten them by electricity. Still, what do the education cranks care?

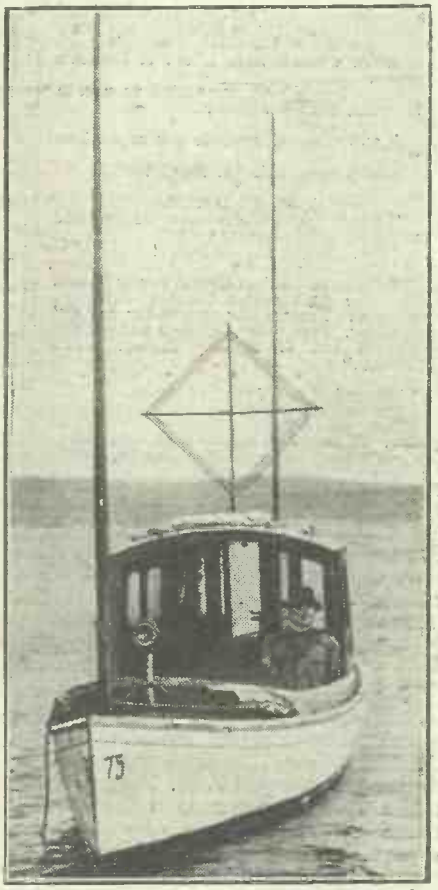
Another Little War Done.

IT is good news that the friction between the B.B.C. and "variety" is diminishing, so much so that the General Theatres Corporation is to conclude arrangements for regular broadcasts from the Palladium. I should think that this crack in the ice heralds the general break-up of the Great Ice Barrier so zealously preserved for so long. In the U.S.A. radio and the "amusement" business are joining hands in no uncertain manner, so we are really behind that country for once.

Imperial League of Opera.

SIR THOMAS BEECHAM'S scheme for the foundation of a permanent opera in this country, which he has been describing by radio, seems to me to be well worth supporting. What do you think about it? A contribution of 10s. per annum will earn you a rebate on tickets for the performances, and will help to maintain opera to be broadcast for the benefit of all listeners. Yes, I think I will dash half a Bradbury on Beecham.

"MOTOR-BOATING."



This radio-controlled motor-boat has a dummy for crew, and will find its way automatically to the point where the control radio apparatus with a corresponding wave-length is calling it.

Beware the P.O.

AN unfortunate pub-keeper of Wickham fell down his stairs with a paraffin lamp and caused a bonny blaze. As a side-issue the fire injured some telegraph wires in front of the hostelry, and down came the Post Office upon the victim like a wolf on the fold, claiming damages. The judge evidently thought there had been enough damage already, for he dismissed the action. So if you drop your accumulator down the stairs and startle the dog into biting the postman in the back verandah—beware the P.O.!

All About Pipes.

IN a recent Note I asked for information about gas and water pipes, because they give such varied results when used as "earths." The response has astonished me; I did not dream that so many "P.W." readers are master-pipers. The information they give astonishes me also. Some say gas and water pipes are run in both iron *and* lead. Some say that nearly all water pipes are of iron and that the gaspipes are invariably of lead, and some say that waterpipes are always leaden.

Lead or Iron "Earths."

EVIDENTLY the Pipe Faculty has several schools of thought or the plumbers have several practices. However, one obliging gentleman puts the root of the matter very plainly, and as he is an A.R.San.I., I think what he says goes. "Water pipes are certain conductors with a relatively low conductivity, whilst gas pipes are very uncertain conductors with a chance of the conductivity being higher in certain cases, viz., where the electrical connection between every gas pipe is perfect the higher conductivity of iron would render the gas pipe a better conductor than a lead pipe in the same house." Thanks to all pipists who wrote to me. Plumbers' jokes are now off!

(*Continued on next page.*)

NOTES AND NEWS.

(Continued from previous page.)

Commercial Candour.

IN a statement on the outlook in radio to-day, Mr. D. Sarnoff, Vice-President and General Manager of the Radio Corporation of America, said: "But the fact remains that television as a service to the home is not yet apparent around the corner. Television is still in the laboratory and the world must wait until another art breaks out of the chrysalis of experiment." Plain words from one who is in a position to know what is what—and what is not.

Worse Aerial—Better Results?

A WRITER in the "Shields Daily News" advances an idea which is quite new to me. He says: ". . . If it is desired to receive the foreign stations it frequently happens that an indoor aerial is better." His point is that an efficient outside aerial produces a wipe-out by the local station. Well, "Rados" may be right, but I do not see what is to prevent a proportionate wipe-out on an indoor aerial. What do my Barts. say?

The Down-Grade Uncle.

I THOUGHT that the most uncomfortable place for a broadcaster must be the aeroplane which flickered over New York while "Lady Lindy"—or someone—had a civic welcome for doing something—or someone. But when I read about the gent. at Los Angeles who broadcasts small talk while dropping in a parachute—I knew I had struck a good new egg. It seems that this chap is quite vivacious until the chute opens; then, the fun dies out of his life and all he has to do is to kill time while he floats down. What about a dose of this for Uncle Rex? Or Percy Pitt?

B.B.C.'s Moneybags.

THE Revenue Account of the B.B.C. for the year ended March 31st, 1928, shows that of a total of £1,135,000 collected in licence fees, only £800,959 reached the B.B.C.'s till. The Treasury collared £192,166, for nothing, and the Post Office £141,875—for the huge expense and labour of collecting the fees. I suppose the Treasury bit is a sort of entertainment tax. Ha, ha! Jolly good, that!

A Human Document.

HERE'S part of a letter from a man whose sufferings would "draw iron tears down Pluto's cheek." He says, "I had a crystal set and heard Writtle in the old days before the B.B.C. Thought radio so fine that when broadcasting began I went all out and paid £60 for a three-valver made by a firm of good reputation. Can't keep on spending, so have still got the brute. It consists of half a hundredweight of ebonite and brass studs; uses obsolete valves, has 12 controls and no stability; eats current by the kilowatt (*sic*) and gives me 2 L O and 5 G B only—sometimes—perhaps." I advise him to insure his set heavily and fasten it to a lightning-conductor.

Take Warning.

DON'T criticise the B.B.C., or something 'orrible may happen to you. F'rinstance, here's friend Percy Scholes has resigned his job as music critic of the B.B.C. and is off to Switzerland where he is going to compile a book about music and do other tonic sol fa things with semi-breves and fugues. (Note my musical, technical style!) What really happened, I suppose, is that Mr. Scholes turned up at Savoy Hill one fine morning, full of shredded wheat, vim and criticism, ready to slate even Beethoven, and, being shown a 2 L O programme, said, "But where's the music?" So he is going.

Triumph of Radio.

AFTER more than a quarter of a century of struggle the "radio way" has established itself as the future means of long-distance communication. The Eastern Telegraph Cable Co. has had to join hands with radio in order to save its life. And the great International Telegraph and Telephone Corporation is now boldly entering the radio field and is seeking radio concessions in most of the Central and South American republics. Imitation is the sincerest form of flattery. Radio wins.

SHORT WAVES.

Music-hall Broadcasts will add a little variety to programmes.
—"Daily Mirror."

* * *

Fan: "I got a new radio set, Jim."
Neighbour: "Is that so? What kind is it?"
Fan: "I don't know, but I call it 'Football Radio.'"
Neighbour: "Why is that?"
Fan: "There's a lot of whistling in it."
—"Radio News."

* * *

It seems whene'er I tune my set
The same refrain I always get!
This very song, upon my word,
At least a thousand times I've heard.

Ye gods on high! It's here once more,
Well, wouldn't that just get you sore?
By Golly! Now at last I see
What's meant by RADIO FREQUENCY!
—"Radio News."

(Note.—We think he must have listened in to 2 L O and has heard "Cherry Ripe.")

* * *

"Some people say that wireless entertaining demands a new type of artist. I don't think so," says Mr. Will Oakland, America's Radio King, in a recent issue of one of London's dailies.
A new type of programme might be more to the point, don't you think?

* * *

A correspondent writes to ask us what an "I.W.W." set is.
Sounds rather as if "It Won't Work."

* * *

TIME TO RETUNE.
"How do you like the programmes sponsored by the Goodstone Rubber Co.?"
"Aw. They *tire* me to death."

* * *

To Miser Skinflint, of Moonee Ponds: Thanks for your good wishes for the Melbourne Hospital. You are fifty-nine to-day and still counting. Look inside the piano and you will find it full of notes.—"Popular Radio Weekly."

* * *

I have talked with dozens of fairies,
I have walked with goblins and gnomes,
But my wish is to be as clever as thee (B.B.C.)
And be heard in 4,000 ohms (homes).
—C.L.G., "Evening News."

Radio Society Note.

TO announce the winter session of the Radio Society held at the Peckham Literary Evening Institute, County Secondary School, Peckham Road, S.E.15, assistant secretary, Mr. H. Nayler. I am told that the programme is specially interesting, and all radio enthusiasts are assured of a hearty welcome. We shall be pleased to make further announcements, but please remember that "P.W." requires "copy" well in advance of relevant dates.

Do You Crackle?

IF you—or properly speaking, the receiver—crackle, here is a possible source of the phenomenon. C. T. (Sevenoaks) says that he has definitely traced such noises to bad connections between the lead-out wires of valves and the tops of the valve-pins. The wires generally run through the pins longitudinally and are soldered to the tips. Feasible—and worth noting—if your valves happen to be un-British or oldish.

A Pat for 5 X X.

IT is not often that Big Dave comes in for a kindly word, and that not because he doesn't "carry" but because he is, thanks to the B.B.C., not very attractive. But a ship's operator writes to say that he got excellent and sustained reception of 5 X X whilst off the Canary Islands (otherwise "Ham's Hell"), about 2,100 miles distant. Hilversum and Paris were back numbers, and all the X's seemed to be down on the short waves. His lucky night!

The Cow's Enemy.

THERE was the German professor who, I reported some weeks back, kills mice by radio. Now we have the Austrian professor who kills bacteria by the same means. This gent. alleges that he can keep milk safe for democracy for a whole month by bombarding it with H.F. oscillations. I think Cissie the Cow ought to hear of this. The moral is, if you hear the milkman talking radio, make sure the milk is not more than a fortnight old.

"In a Plain Van."

WHY is it that many folk are so vehement in their insistence that the radio set must be "a piece of furniture"? What is there more forbidding about a small box with two knobs on it than about, say, a fender, a coal-scuttle or a pipe-rack complete with juicy briars? Yet they will start back in alarm unless the proposed set is buried in a carved oak chest supported on claw feet! Who will be the first radio dealer to offer the comfort of delivery "in a plain van"?

"To What Base Uses," etc.

IN the Prussian Diet they believe in Spartan methods. It would seem that the normal session there consists mainly of a shouting match, audience against orator, and all against the President of the Diet. So now the President has a microphone and a loud speaker which ensure him an intensifying power of 75,000. But then, so has the orator, so that whilst either of them can drown the chorus, each can shout down the other. I trust that the building is not like the walls of Jericho in strength—but somewhat stronger.

Those B. Batteries.

NO, Horace! I don't mean what *you* mean. High-tension batteries *à la Americaine!* Trade returns allege that last year the U.S.A. exported 23,500,000 flashlight batteries. Personally, I am not sure that all of them had their proper ration of volts; but I am not out for libel this week, so I'll let that pass and ask whether that big figure is not due to the craze for battery eliminators which seized the States and thus left the manufacturers with a surplus of dry batteries.

ARIEL.

Pictures to Rescue BROADCASTING?

Captain Fulton operating one of his Fultograph machines.

5XX is to start broadcasting pictures between 2 p.m. and 2.15 p.m. on and from October 30th. Is this the precursor of a programme revolution?

By A SPECIAL CORRESPONDENT.

THERE is at last a chance that the B.B.C. programmes may be rescued from the commonplace efficiency from which they now suffer.

A monopoly in Broadcasting was reluctantly conceded in this country because of alleged insuperable technical objections to competition. Any monopoly is a bad thing and a monopoly in this great enterprise is particularly bad. But the B.B.C. has done surprisingly well; nevertheless, human nature cannot be denied. The machine runs on mechanically; there is even a dreadful absence of errors.

Savoy Hill has been turned into an efficient manufactory of programmes, the composition of which can be calculated accurately in advance by a study of the previous six months. The old keenness and intensity and adventurousness that were so conspicuous in the early days of the Broadcasting Company are no longer apparent. Slowly but surely bureaucracy has crept into the system, crippling enterprise and discouraging originality.

The Saving Grace.

And now, when most intelligent critics had almost given up hope of the possibility of any reform until the licence lapses in 1936, there comes a heaven-sent chance in the possibility of broadcast pictures. Pictures must soon be included in the B.B.C. programmes, or the public will insist on a competitive service. Either way, there is a tremendous gain.

For the B.B.C. to accept the Fultograph method of picture transmission for an experimental series, however tentative, virtually means that Savoy Hill has already convinced itself that the transmission of still pictures is a practical possibility. But there is as yet no sign that the whole problem of co-ordinating pictures with the programmes has been surveyed. There is, indeed, an impression that the B.B.C. has been and still is inclined to look upon this as entirely a technical problem. It is high time, therefore, that the programme aspects were properly envisaged.

Admitting the possibility of a still-picture service, and presuming its adoption by the B.B.C. either on the Fultograph or some better method, to what extent should pictures be employed in the programme? First of all, there is the obvious service of what might be described as expediting the dissemination of standard utilities, e.g. weather charts and bulletins, dress designs, maps for schools, and music scores.

Illustrated Talks.

The value of wireless to the farmer will be enormously enhanced when he can be sure of a more or less permanent record of weather conditions by merely leaving his wireless set turned on. All that genus of talks which is designed to serve some practical purpose in everyday life will be greatly improved when illustrations become possible. Sir Walford Davies' "Foundations of Music," for instance, will be made even more attractive with some illustrations. So far so good. There is reason to believe that the B.B.C. is considering the utilisation of pictures to supplement the standard utility services, but what about the much bigger problem of enriching and widening the whole scope of broadcast programmes?

All the main talks descriptive of personalities or places or both should carry their illustrations. There is room also for a daily cartoon. It would pay the B.B.C. to employ the most original and popular cartoonists for special series. Talks on eminent people, past or present, would be given actuality if accompanied by portraits of the subjects. Great functions would be much more effectively described "in parallel with" appropriate photographs.

But I have not yet mentioned the really important side of the potentialities of broadcast pictures. We have heard a good deal lately about the dullness and inadequacy of the broadcast news bulletins. It is notorious that listeners generally are more justifiably discontented with this part of the work of the B.B.C. than with any other. I know the stock reply is that the news agencies and not the B.B.C. must take the responsibility for any shortcomings in the bulletins, but I am not concerned with internal arrangements.

The fact is that, for whatever reason, the B.B.C. news bulletins leave much to be desired. They lack human interest and they are "officialese." What in the world has this to do with pictures? Everything, I think. For it is very unlikely that the B.B.C. will be able at least for some years to induce the news agencies to allow the bulletins to be greatly expanded.

But pictures are at hand and therein is the secret of revolutionising the bulletins. The "O.B." van which carries the B.B.C. flying squad to all the interesting events that are so well covered by the spoken word should have an attendant picture van. When the chronicler is describing a Rugger game or the Boat Race, he will do so in the knowledge that most of his listeners have a visual image of the background.

"Picture Van" Wanted.

Then, whenever a big story "breaks," a B.B.C. picture van, "standing by," should be on the spot as soon as the most alert reporter from Fleet Street. In the case of a railway accident at four o'clock, it should be possible to transmit a picture of the disaster to millions of homes by six o'clock.

But there is something more needed than even the most perfectly-equipped picture van and the most alert staff. The B.B.C. attitude towards news will have to change radically. There is at present altogether too much "grandmotherliness" about the policy of selecting news for broadcasting.

I am told by a friend at Reuter's that the B.B.C. officials responsible for taking the news for the bulletins are absolute amateurs, with no training or experience whatever in dealing with news.

It is, indeed, remarkable if the news bulletins are entrusted to officials without any knowledge of their business. Savoy Hill prides itself on doing things differently from other organisations — that is, they fondly believe they can dispense with experts anywhere.

"Amateurishness."

But the news is finding them out. It reveals all the futilities of amateurishness and "uplift." This spirit must be exorcised, and then, with the aid of pictures, the bulletins will become the most popular and exciting parts of the programmes. If there is a big murder case on, the B.B.C. now ignores it. If news values were properly appreciated, these big stories would be followed as closely and carefully as in any great newspaper.

The B.B.C. can afford to lose no time in creating its special picture organisation.

THE MANCHESTER RADIO EXHIBITION.

During this week and next a great Radio Exhibition is being held in Manchester, and the following details of the outstanding features of the show will be of interest to all prospective visitors.

FROM A SPECIAL CORRESPONDENT.

AFTER the official opening of the Manchester Radio Exhibition by Mrs. Phillip Snowden—the only woman Governor of the British Broadcasting Corporation—the show will be open to the public until Saturday, November 3rd, and Manchester, which already has four successful exhibitions to its credit, is confident that this display at the City Hall, Deansgate, will be the brightest, biggest and best show of all.

Apart from the actual exhibits, there are many attractive features. Probably the most fascinating one, from the point of view of the "P.W." reader, is the series of constructional competitions for set-builders. This side of the Exhibition's activities has been arranged by the Manchester "Evening Chronicle," which is providing £250 in prizes for the successful entrants.

Such a handsome offer is sure to attract "the boys," and all who fancy their weight with a soldering-iron, but in addition to this there is plenty to appeal to the non-technical listener. For instance, music-loving Manchester will roll up in thousands for the concerts, to be held nightly, in the Concert Hall.

Some Leading Lines.

One excellent feature of these concerts is the arrangement by which at certain times a microphone will be switched in by 2 Z Y, to radiate the concert to all its listeners.

As a large proportion of the exhibitors at Manchester were showing the same novelties and lines a few weeks ago at Olympia, and as this show was reviewed recently in some detail in "P.W.," it will be unnecessary to describe again in detail the various excellent sets, components, and accessories which will be displayed to tempt purchasers. But a brief mention of certain leading lines will not be out of place, for radio progress is such that unless one goes prepared, much of great interest may be missed in a big show of this kind.

Belling & Lee, Ltd., for instance are showing their tempting terminals; "Brandes" have their lateral action variable condenser, and the British Ebonite Co. weigh in with a strong display of all kinds of panels, etc.

Pocket Soldering Outfit.

British Thomson-Houston Co., Ltd., have the new "Mazda" valves as well as their other bargains, whilst S. G. Brown, Ltd., show the "Cubist" loud speaker and the new Brown intervalve transformer; "Brownie" Wireless ("the firm that brought the Royalties down") are showing components and complete sets, which are sure of public support. The Celestion Radio Co. will show you how to obtain celestial music, and H. Clarke & Co., Ltd.—a Manchester firm—are right on the spot with Atlas coils, etc., whilst the "Climax" Radio Electric, Ltd., regard their exhibit as the climax.

E. K. Cole, Ltd., cater for everyone who has electric light available, and A. C. Cossor, Ltd., valve and melody makers, will show you not only the valves but the set to put them in.

Will Day, Ltd., will be showing a pocket soldering outfit that will lure 2s. 6d. from your pocket before you know where you are, whilst Dubilier's will be there to show you the last thing in condensers.

NEXT WEEK

"P.W." will publish a

Critique of the Manchester Radio Exhibition

from the pen of our Special Representative in Manchester,

Mr. J. F. CORRIGAN, M.S.C., A.I.C.

Eastick's is a stand that no constructor should pass; Ever-Ready's will demonstrate just the batteries that you need, whilst Ediswan's will tempt you with valves for every purpose, sets for the valves ("R.C. Threesomes" at that!) and nearly anything else you may fancy.

Ferranti's need no introduction, but if you think that you know all about L.F. transformers you will get a surprise here!

Gambrell's mustn't be missed, nor Garnett, Whiteley & Co., whilst the G.E.C. (at Stand No. 50) are showing variable condensers claimed to be the finest engineering job in the wireless industry. Graham Amplion's, too, must be visited, if only to see the "Lions" fed.

The "Igranic" exhibit is another magnet for visitors—an amazing variety of lines being handled by this go-ahead firm.

Lissen, Ltd., have taken two stands (Nos. 88 and 89), and if Olympia experience is anything to go by they will need them before they have satisfied the Manchester "Lissen-ers"! (Don't fail to see the gramophone pick-up here.)

The "Marconiphone" products make a show in themselves, and what with the new valves, new transformer, and the ever-popular sets this is sure to be a sort of Mecca for Manchester men.

McMichael's, too, are in the not-to-be-missed class, whilst Mullards will present you with a copy of "Radio for the Million" and a fine display of really up-to-date radio products.

Condenser-wanters will be delighted with the Ormond stand, and Oldham & Sons, Ltd., will be found to have dropped in from Denton with a selection of accumulators that will want a lot of whacking.

Some Final Bargains.

The stand of Peto-Scott Co., with its wide variety of products, must on no account fail to attract your attention, for this firm caters for those enthusiasts whose pockets are not able to keep pace with their ambitions—the Easy Payment way!

The well-known Formo components of Arthur Preen & Co., Ltd., are always worth attention, and there is sure to be something here to compel the most hardened Aberdonian to bid a reckless farewell to his "saxpence."

Messrs. R.I. & Varley need no introduction, but don't allow familiarity to breed contempt when their stand looms in sight, for the "R.I." sign is a synonym for quality goods that need inspection to be truly appreciated.

Redfern's "Ebonart" panels with the new moire water-silk surface designs cannot fail to attract set-builders, and as measuring instruments, voltmeters, ammeters, etc., are now recognised as a necessity, and not a luxury, Sifam's are sure to be beset by buyers. The Standard Wet H.T. Battery Co., too, should be visited at Stand No. 69; whilst Vandervell & Co. will have many old admirers as well as new friends.

Finally, Ward & Goldstone must not be missed, nor Wright & Weaire, who are supplying the much-in-demand Standard Loading Coils for "P.W." sets.

HENRY FORD OPENS NEW YORK'S SHOW.

Henry Ford, "famed for flivvers," attended the opening of the World's Radio Fair, New York, and is here shown (centre) with (right) Thomas A. Edison, the famous inventor.

The "BANDMASTER"

This outstanding four-valver possesses the unusual feature of great flexibility in the H.F. circuit. In an extremely simple manner you can arrange the H.F. stage to give different degrees of selectivity, and to suit very different types of valves. The set is highly sensitive, can be adjusted to give very good selectivity, and has put up an exceptionally good performance on test. A free Blue Print of this set was given away in our last issue. Designed and described by the "P.W." RESEARCH DEPARTMENT.

ONE of the most difficult things to achieve in sets with one or more H.F. stages is to provide for the efficient use of different types of H.F. valves with considerable variations in their characteristics. In the great majority of sets some form of H.F. coupling is used which suits one particular type of valve best, so that if the very finest results are desired it is necessary to try various types until the most favourable one is found.

In most cases the differences observed between one valve and another are not very great, but it remains a fact that to get the best results with any given H.F. coupling it is necessary to pick a valve type with suitable characteristics, often by trial and error. The reason is, of course, that the H.F. coupling (split-primary transformer, centre-tapped tuned anode, and so on) is a more or less fixed affair, and to obtain certain desirable effects one has to use a valve of a suitable impedance.

Specially for the Experimenter.

For example, with the split-primary type of H.F. transformer of the standard 6-pin variety a valve of from 12,000 to 20,000 ohms impedance usually gives the greatest amplification, whereas for a higher degree of selectivity one of rather greater impedance, say 20,000 to 30,000 ohms, will be preferable. The point is that the coupling itself is a fixed device, and the only way to obtain variations in behaviour is to use valves of varying impedance according to the effect desired.

From the point of view of the experimenter who likes to have everything directly under control in his set this is something of a defect, and the "Bandmaster" Four has been produced specially to meet the needs of this type of constructor. In this design we have introduced a very simple but effective and novel scheme which enables an adjustment to be made to suit H.F. valves of varying impedance, or to get various degrees of selectivity from a given valve.

The circuit which we have used for the H.F. valve is actually of the neutralised tuned-anode type, the special feature being in the method of arranging the tapping on this circuit. Normally, of course, a centre-tapped coil is used here, connected up as follows: One end goes to the anode of the valve, the centre tap is wired to H.T. positive, and the other end is left "free" to provide the "equal and opposite" potentials which are fed back by means of the neutralising condenser on to the grid to stabilise the valve. The anode tuning condenser, of course, is connected right across from one end of the coil to the other.

Now, if you could move this tapping about along the coil, instead of keeping it at the centre, you would find that you could get interesting and useful variations of selectivity and amplification. Further, you would discover that you could, by adjusting the tap, arrange the circuit to get the best results from any H.F. valve, or even from one of still higher impedance and amplification factor, such as the R.C. type.

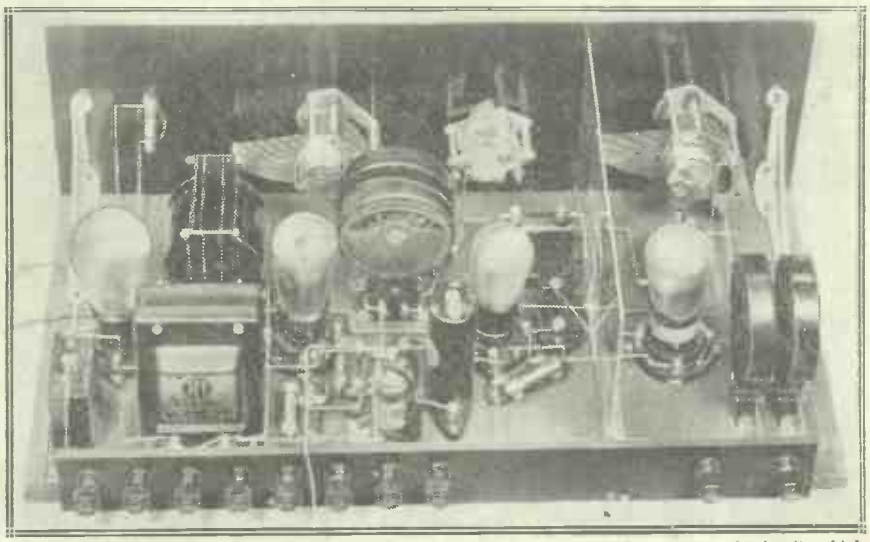
What you would notice would be, roughly, this: With the tap at the centre you would get a certain degree of selectivity, and on moving it nearer to the anode end of the coil you would get greater selectivity, while on moving it in the opposite direction you would obtain precisely the opposite effect, i.e. tuning would become flatter. What you are really doing, of course, is to include varying amounts of the coil actually in the anode circuit of the valve, since only that portion between the tap and the anode end is so included.

Effect on Selectivity.

The effect on selectivity is the same for any type of valve, that is, the smaller the portion of the coil included in the anode circuit the sharper the tuning, but the effect on signal strength is not quite so simple. You will find, in general, that signals are weak if the tap is placed so as to include too little of the coil in the anode circuit, but it does not follow that they get stronger and stronger the more you shift the tap to increase the amount of coil in the anode circuit.

On the contrary, there is usually a best

(Continued on next page.)



Here you see a general view of the interior of the set. Note the two coils in the anode circuit, which enable you to get the effect of a variable tapping.

"THE BANDMASTER."

(Continued from previous page.)

position for the tap from the point of view of signal strength, and the actual location of this depends largely on the impedance of the H.F. valve. A high-impedance valve calls for the tap to be placed so as to include a good deal of the coil in circuit, whereas a lower impedance type will work better with a smaller amount of the coil in the anode circuit, i.e. with the tap nearer to the anode end.

You will see, then, that to get the very best from the split tuned-anode circuit it is distinctly desirable to be able to vary the position of the tap, but this generally means the use of a special coil, which is undesirable in most cases for obvious practical reasons (how most people do hate winding coils!) and so the usual practice is to employ a centre-tapped coil.

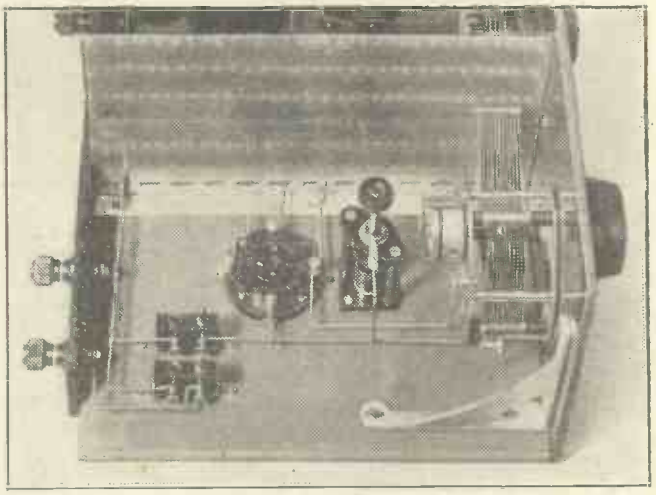
Simple But Effective.

This is quite a good compromise in most cases, and is readily available in a variety of sizes, but it lacks the element of adjustability to suit conditions which appeals to the more advanced constructor. In the "Bandmaster" Four we have used a scheme which enables you to get a very good degree of flexibility with perfectly standard coils, not even centre-tapped, such coils, in fact, as most constructors are pretty sure to have about the place.

How the scheme works is quite easy to understand: Instead of using a single coil with a tapping, the anode circuit contains two smaller coils connected in series. Now, the tapping on the circuit is taken to the junction between the two coils, and it is evident that by varying the relative sizes of the coils we can get the effect of a movable tap, with all the benefits which we have seen.

For example, if the coils are of equal size, we have a centre tap, while if they are of unequal size we can place them either way round, and so get two alternative arrangements of the tap, giving high or low selectivity, and suiting a high- or low-impedance valve. As a matter of fact, by choosing suitable combinations of coils the effective position of the tap can be varied quite considerably, but we must leave the actual details until we are dealing with operating matters.

We have gone into this question of the arrangement of the H.F. stage rather fully because it is something of a new departure in the split tuned-anode type of receiver, and the constructor who will choose an advanced design like this generally likes to understand pretty clearly how it works. This is the main feature of the "Bandmaster" Four, and constitutes its claim to originality. It does this particular thing definitely better than other designs of its type, while it performs its other functions at least as well as any other set of a similar nature.



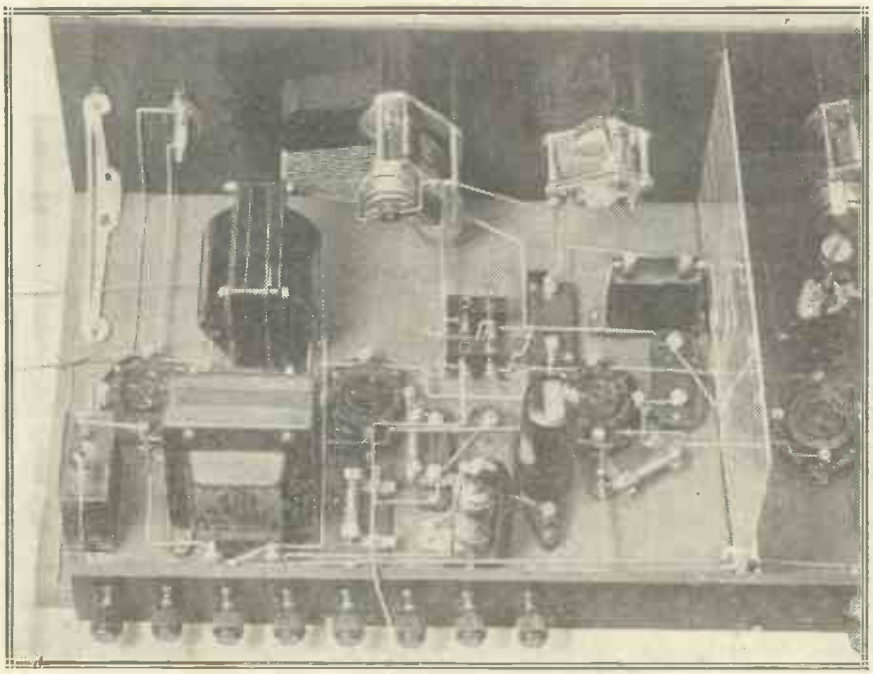
The H.F. end is remarkably simple. Note the ease of construction which results from the use of a standard perforated screen.

The detector valve functions on the leaky grid principle, and is provided with reaction of the Hartley type, i.e. a reaction arrangement which functions by virtue of the tapping on the tuned-anode coil, which is also, of course, in the grid circuit of the detector.

Following the detector comes a resistance-capacity-coupled stage of low-frequency amplification, composed of separate components, i.e. anode resistance, grid condenser, and grid leak. You could, of course, use a self-contained R.C. unit here if you desired, but you should take care to get somewhere about the same values of anode resistance and grid leak as those indicated on the blue print. Just one point perhaps requires explanation in connection with this stage. You will see that in series in the lead which goes to the grid of the third valve there is a grid leak of $\frac{1}{4}$-megohm value, and the purpose of this is to check the tendency of all L.F. amplifiers to become unstable as a result of the presence of stray H.F. currents.

The value of this resistance is not at all critical, and anything between about 50,000 ohms and $\frac{1}{4}$-megohm will serve. Actually, we used a $\frac{1}{4}$-megohm type in the original because this is the lowest value grid leak available in many makes. If, of course, you happen to choose a make in which one of 100,000 ohms ($\frac{1}{10}$-meg.) is to be had in the grid leak range, by all means use it.

The third valve is coupled to the fourth (i.e. the last stage) by means of a transformer, and it is to be understood that any good make can be used here. We should like to emphasise this point a trifle, for the set is one capable of giving very good quality indeed, and it would be a great pity to handicap it by using a poor component here. If you consider it essential to cut down the total cost, try to do it on the cabinet, terminals, variable condensers and panel, for economising here will affect the appearance rather than the performance.



The L.F. end is very carefully arranged to enable really good quality to be obtained with suitable valves.

Safe Economies.

The cabinet, of course, is an obvious matter, terminals are very much a matter of convenience, variable condensers chiefly affect convenience in operation (modern cheap types are mostly rather lightly built but are not inefficient electrically) and the panel can perfectly well be of good dry wood, since there are no points of high H.F. potential thereon except the reaction condenser, and slight losses here only mean that the set requires a very slightly greater reaction setting to bring it up to its most sensitive condition. Actually, the losses in a good, well-dried wooden panel are extremely small.

The set is provided with an output filter circuit for the loud speaker, consisting of a heavy duty L.F. choke (R.I.–Varley 28/14 pattern, or other good make), and a 2-mfd. Mansbridge-type condenser. Such a filter is strongly advised wherever a super-power valve is used, for the heavy anode current of such valves is bad for any ordinary

(Continued on page 406.)

RADIO REFRESHERS

Some easily-made receiver improvements and some hints on running a set which will increase its effectiveness.

By J. ENGLISH.

LOUD speakers of the horn and cone types suffer a gradual loss of efficiency where the output leads of the speaker are wrongly connected to a set with no output filter. Under these conditions the steady anode current of the last valve tends to demagnetise the magnets of the loud-speaker unit. This results in weaker and weaker signals as time goes on, and it may be some time before you realise what is happening.

It is then generally too late to reverse the connections and the only thing to do is to return the unit to the manufacturers who, in most cases, will repair the damage for a small charge. The same thing, of course, happens to the 'phones if wrongly connected to the receiver, and, if possible, they should be compared with another pair known to be in good condition.

Saving the Speaker.

An improvement which is well worth while making in all sets where the last valve is a power valve is to substitute choke by-pass output for direct output to the loud speaker. This modification consists of a special output choke, wired in the anode circuit of the last valve, one side of the loud speaker being connected to one end of this choke through a 2-mfd. fixed condenser, and the other side to L.T. negative. This obviates all risk of leakage when the loud-speaker leads are extended to other rooms and, there being no direct anode current through the loud-speaker windings, the magnets cannot be demagnetised. The efficiency of the output system is also considerably improved.

The importance of such accessories as H.T. and L.T. batteries is apt to be overlooked. Too often the efficiency of these accessories is taken for granted and the receiver blamed for poor results and defective quality. The H.T. battery is more often than not the source of such troubles, due chiefly to its high internal resistance producing L.F. instability and even oscillation at audible frequencies. The internal resistance of dry batteries increases considerably as they become run down, and is sometimes quite high even in wet cell and accumulator batteries due to one or more defective cells.

It will, therefore, repay you to overhaul very thoroughly all your batteries and sources of power supply, replacing dry H.T. batteries by fresh ones, preferably of large capacity. Search carefully for and replace cracked or leaky containers in wet and accumulator batteries, and clean up any busbars or terminals which have suffered corrosion through creeping of the electrolyte.

When testing your H.T. batteries with a voltmeter it is as well to remember that a cheap instrument may give very misleading readings. Such a voltmeter might take quite a considerable current, more than the total anode current of your receiver, and certainly more than is good for the battery. Under such an excessive load the voltage of the H.T. battery as measured by the voltmeter is much less than its actual value when working under normal conditions.

Whether you decide to instal a new H.T. battery or not, it is essential to go over every H.T. wander-plug, cleaning them up and, where necessary, gently prising apart the split pins so that they fit firmly and soundly in the battery sockets. I have known of cases where insecurely fitting wander-plugs have been responsible for some queer and erratic faults.

The same attention should be given to all battery connections with the view to obtaining clean and firm contacts at all points of attachment to the battery, whether H.T., L.T., or grid-bias cells.

In the majority of cases the filament current supply will be derived from accumulators and the principal attention required here will be to the terminals and connecting lugs. These should be removed, any corroded parts scraped clean, and when replaced all terminal parts should be well smeared with vaseline. As in the case of H.T. batteries, it is just as important to ensure a sound contact at the points of attachment.

"I have known of cases where insecurely fitted wander-plugs have been responsible for some queer and erratic faults."

Your Battery Leads.

For preference, leads to the accumulator should be fitted with substantial spade terminals, thus making quite sure of a large area of firm contact. Before the winter season commences it is well worth while having your accumulators overhauled at a re-charging station, where expert attention can be given to any faults which may be present.

When you are feeling more satisfied about the general health of your batteries, it is as well to examine all the battery leads as a final precaution. These are quite important connections and should not be made with haphazard lengths of any wire which comes first to hand. The best wire for such leads is high quality flex of generous gauge, soundly insulated and covered. In any case you should examine each battery lead to see that the insulating covering has not deteriorated.

Neglected Terminals.

The attachment points at the receiver end should also receive the attention of a piece of fine emery paper. Very often the leads to the set are made to terminals right at the back of the cabinet where they remain neglected and forgotten. Under these conditions the amount of tarnish and corrosion which can take place is surprising.

All this dirt must, of course, be removed, and terminals and the ends of battery leads brightened up with emery paper, following up with a light smear of vaseline, which prevents further corrosion, and actually improves contact, despite the fact that it is itself an insulating substance; exactly how it does it is still something of a mystery, but the fact is a well established one.

PRACTICAL POINTERS

NEVER try and drill a hole in ebonite unless the exact position has been punched in, otherwise the drill is bound to wander.

* * *

If you have trouble when drilling holes which should be in exact alignment through the bit "wandering," try using one of the little rose bits, which ensure the holes being exactly in the punched position.

* * *

Testing a dry cell by the glow from a flash-lamp battery is rather hard on the cell, as the average bulb requires far more current to light it than is normally drawn from the cell.

* * *

Slight clicks and scratching noises in your set may be due to a neighbour who is adjusting his H.T., or to a "crystal fiddler."

LATEST BROADCASTING NEWS.

THE B.B.C. AND BAIRD TELEVISION.

SIR HENRY WOOD — NATIONAL WIRELESS WEEK—FOR FLAPPERS ONLY—Etc., Etc.

The B.B.C. and Baird Television.

ON October 9th, Admiral Carpendale, Captain Eckersley, Mr. R. H. Eckersley, Mr. Gladstone Murray, and Mr. C. Atkinson, of B.B.C. headquarters staff, witnessed a special demonstration of Baird television in Long Acre. As a result of the report of this delegation, the governors of the B.B.C. decided to have nothing to do with Baird television in any circumstances.

It remains to be seen whether the P.M.G. will be induced to grant a separate licence to the Baird Company. Inasmuch as pictures without sound are of little value, it looks as if any licence to the Baird Company would violate the B.B.C. Charter. The probable outcome of all this will be that the Baird Company will abandon the idea of broadcasting and will fall back on gramophone reproduction.

Sir Henry Wood.

Savoy Hill seems disposed to invite Sir Henry Wood to do yet another season of Proms at Queen's Hall. This is a reversal of the previous tendency, and is due to consideration of the very strong hold which Sir Henry has on the affections of London music lovers. Even if the B.B.C. thinks it can improve his orchestra, it is unlikely to disturb his arrangements for the season of 1929. But Sir Thomas Beecham has still to be reckoned with, and he is believed to have worked out some other scheme for the Proms.

National Wireless Week.

National Wireless Week, which begins on Sunday, November 11th, will be marked by special programmes. These, with few exceptions, will be broadcast from all stations throughout the country. It can be said that round about the middle of November is perhaps the most important period of the year both to the wireless trade and broadcasting; the Olympia Exhibition is beginning to produce results, and this year will find a larger number of listeners with new sets than ever before.

The week opens with the first broadcast of the Armistice Day Service from the Cenotaph in Whitehall. The proceedings will begin at 10.30 a.m. with music by bands from the Brigade of Guards, there being a pause at 10.50 when the King places his wreath at the foot of the Cenotaph. The chimes of Big Ben will be heard at 11 o'clock announcing the Two Minutes Silence. The usual order of service, exact details of which have not yet been decided by the Home Office, follows until 11.20.

The broadcasting of the service will be carried out over the special permanent lines which are now available between the Cenotaph and Savoy Hill, microphones being placed at the Lectern and in a tree, as was done when the British Legion Service was relayed from Whitehall on Whit Sunday. So that listeners throughout the Empire may have an opportunity of hearing the service it will also be transmitted from 5 S W.

The afternoon programme is to start an hour earlier than usual, as arrangements have been made to broadcast the gigantic meeting arranged by the authorities of St. Martin's Church, to take place in Trafalgar Square. There will be music by the Guards massed bands, and mass singing, followed by short addresses and prayer.

The evening service that night will be relayed from St. Martin-in-the-Fields, when it is expected "Dick" Sheppard will preach. Then following the News, the Great Remembrance Festival, organised by the "Daily Express" in conjunction with the British Legion, will be relayed from the Royal Albert Hall.

The Festival, which will be under the musical directorship of Dr. Malcolm Sargent, will include many of the old war-time songs, and lively music by the bands of the Coldstream, Welsh and Scots Guards as they move about the well of the hall in a manner designed to recall certain incidents of the war.

Short addresses will also be given by Admiral of the Fleet Earl Jellicoe, President of the British Legion, and the Rev. H. R. L. Sheppard.

There are many other outstanding features throughout the week, such as special vaudeville programmes, concerts by favourite artistes, a musical comedy programme, a revue, and what most listeners have come to regard as a great treat—the once-a-year Birthday Programme given by the B.B.C. staff at Savoy Hill, which will be heard at 10.20 on Wednesday, November 14th.

CIRCLING "THE SQUARE."

The "Six-Sixty" Klansmen promenading recently round Trafalgar Square in connection with their new "Mystery" Receiver.

For Flappers Only.

The recent broadcast discussions on topics calculated to stimulate the interest of the newly franchised army of flappers is to be followed by three talks under the general title of "Questions for Women Voters." The first talk on how laws are made will be given in the London studio on Tuesday evening, November 6th, by Professor H. J. Laski, of the London School of Economics.

Few people are better qualified to deal with the subject than Professor Laski, who has been Professor of Political Science in the University of London since 1926, besides being the author of many books. His talk is designed to give a simple explanation of the working of Parliamentary procedure.

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

LOW-CURRENT FUSES

FLASHLAMP PROTECTORS—ACOUSTICS—ARTIFICIAL CONTROL, ETC., ETC.

Low-Current Fuses.

THE making of fuses which are to operate at very low currents—for example, a fuse which will protect the filament of a dull-emitter valve carrying 50 to 100 milliamps is a very different matter from making ordinary fuses such as are used for protecting electric lamps on a house circuit.

An ordinary electric-light fuse is made from tin, or an alloy having a very low melting point and the fuse is unaffected in ordinary use until the current approaches the limiting value when the fuse soon becomes hot and melts. If this type of metal could be drawn exceedingly fine, it is probable that a precisely similar principle could be relied upon for making fuses to burst at currents of a few milliamps.

But the manipulative difficulties involved are such that it becomes necessary, in practice, to abandon this principle and to change over to quite a different one.

Flashlamp Protectors.

As everyone knows, a useful type of fuse for currents of not less than about 250 or 200 milliamperes (that is, about $\frac{1}{4}$ to $\frac{1}{5}$th amp.) is a small flashlamp, but here the conditions are rather different and the filament of the flashlamp, when nearing the bursting-point, glows in the usual way.

If it were not enclosed in a vacuum it would be impossible to rely upon its operation in this way, as it would rapidly become oxidised when it approached a red heat, and it would not act satisfactorily as a fuse at all. Therefore, it is essential in that case to enclose the fuse in an evacuated bulb.

Not very much attention seems to have been given to the problem of making a really satisfactory fuse for very small currents—a fuse, for example, which will carry up to 90 per cent of its bursting load without any appreciable change for very long periods and yet which can be relied upon with reasonable certainty to burst when the current increases somewhere between 90 per cent and 100 per cent of the rated load.

Acoustics.

The possibility of the 2 L O studio being moved from Savoy Hill to another part of London raises once more the interesting

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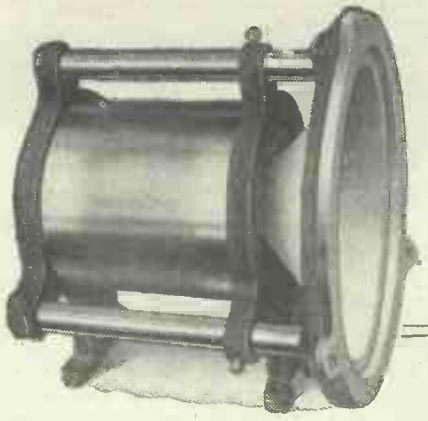


THE BAFFLE BOARD.

You will no doubt have noticed that complete moving-coil speakers are invariably provided with large wooden front pieces or with large and deep cabinets having no backs. Do you know why, and how important these things are, and what effect they have on reproduction?

By C. E. FIELD, B.Sc.

IT is now generally recognised that the moving-coil speaker is the type capable of giving the most perfect reproduction of speech and music at present obtainable.

Unfortunately, the units advertised for sale, either complete or for home assembly, usually lack one important component—the baffle board.

A baffle board is no mere refinement, for without it the quality of reproduction from the moving-coil speaker unit falls below that provided by many ordinary types of cone speaker.

The feature which renders the moving-coil speaker so superior is largely the natural quality imparted to the tone by faithful reproduction of the bass notes, but this is only rendered possible by the use of the baffle.

How Sound is Produced.

The difference between the moving-coil speaker operating without the baffle, and inferior types of cone speaker, is that whereas in the latter case the speaker unit does not respond faithfully to very low notes, in the former case the speaker responds, but most of the energy produced is absorbed without being radiated as sound waves.

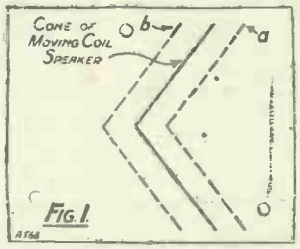


FIG. 1.

In order to see how the baffle board prevents this absorption, let us consider first the action of the moving-coil speaker.

In Fig. 1 is shown a diagram of the cone of a moving-coil speaker, which is assumed to be moving backwards and forwards like a piston, between the positions shown in dotted lines at *a* and *b*. On very low notes, this movement occurs, perhaps, 30 times per second, which means that a complete movement from the central position to *a*, back to *b*, and forward again to the centre occupies a space of $\frac{1}{30}$ second. Currents representing very high notes, on the other hand, may cause the cone to move as rapidly as 5,000 times per second.

These movements of the cone give rise to correspondingly rapid waves in the air which give to our ear the effect of sound.

Here it must be explained that *air waves* are not the same thing as *puffs of air*.

An air wave is an *impulse*, produced by compression, and always travels at the same speed of roughly 1,000 feet per second about 700 miles per hour).

It is difficult to say just what air waves would look like if we could see them—they would certainly not look like waves on water. Perhaps an impression can be gained by watching the "quivering" of the air over the chimney of a locomotive,

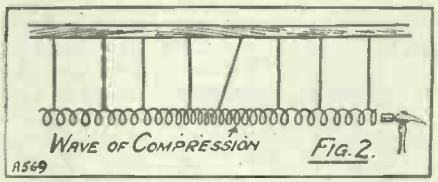


FIG. 2.

or over a domestic gas ring. An idea of the action of an air wave in a tube can be gained by suspending an open spiral spring horizontally, by threads, and tapping one end with a hammer, as shown in Fig. 2. A wave of compression will travel along the spring, and this will be easily followed because the sprials will be closer together in the portion under compression.

We might venture, then, to draw pictures of the air round the cone of a moving-coil speaker when in its most forward and backward positions, as shown in Figs. 3 (*a*) and 3 (*b*) respectively.

As the cone moves backwards and forwards, then, the air both behind and in front of it is alternately compressed and rarified, and sound is heard in both areas.

Now, it will be evident that when, for instance, the air in front of the speaker is compressed by a forward movement of the cone, that behind it is rarified by the same movement.

Low Notes and High Notes.

Consequently, the sucking action of the rarified portion tends to drag the air which is, as it were, squeezed out by the compression of the front of the cone, round to the

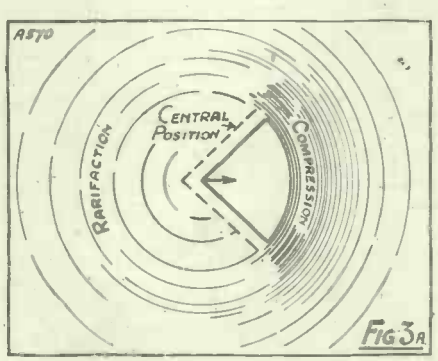


FIG. 3A.

back, the result being that instead of sound waves being radiated into the room in front of the speaker, they simply pass over the edge of the cone to fill the rarified portion behind.

The reverse takes place when the cone moves back again, and air is thus simply swished backwards and forwards without much sound energy being radiated either to the front or rear.

It has already been mentioned that sound waves travel at a fixed speed of about 1,000 ft. per second, so that if we assume that the path over the edge of a cone, from front to back, is 1 ft. in length, we see that it will take sound waves about $\frac{1}{1000}$ second to cover the distance.

If the cone is vibrating to a low note, at say, 30 vibrations per second, it will take $\frac{1}{60}$ second to pass from its most backward to its most forward position, which is a very long time compared with the $\frac{1}{1000}$ second required for a sound wave to travel over the cone.

Hence, in this case, a wave can pass from front to rear before the cone has moved backwards appreciably, and a large amount of sound energy is thus lost.

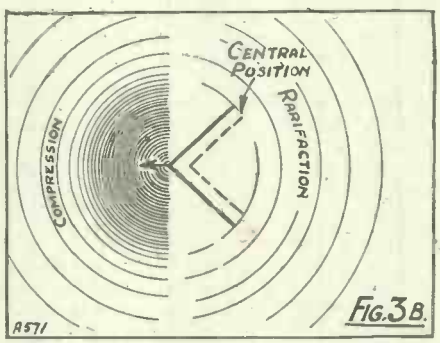


FIG. 3B.

If, on the other hand, the cone were vibrating to a high note, at say 2,000 times per second, the time occupied in a complete forward or backward movement would be only $\frac{1}{4000}$ second, so that before sound waves could travel far towards, say, the rear of the cone to fill in the rarified portion of the air, the cone would be moving back and the air behind would be once more compressed, and the sound waves would be radiated out into the room.

Barred by Baffle Board.

Evidently, then, low-frequency waves, i.e. low notes, will suffer much greater loss than will high ones.

An obvious remedy is to make the path from the front to the rear of the speaker so long that even in the case of the lowest notes the cone will have completed the greater portion of its travel before any waves have passed round it.

This is accomplished by means of the baffle board, which is simply a barrier between the front and rear of the edge of

(Continued on next page.)

TRANSFORMER TROUBLES.

By A. S. CLARK.

QUITE a number of sets employing two transformer L.F. stages give trouble to the constructor when he comes to test them. Generally the difficulty consists of either a high or low-pitched howl, which persists in spite of the positions of the tuning controls. Sometimes it takes the form of acute distortion.

Low-Frequency Oscillation.

In both cases the cause is nearly always the same, namely, low-frequency oscillation, which is produced by L.F. currents being fed back to one of the L.F. valves. Sometimes the oscillation takes place at audible frequencies, and sometimes at inaudible, and this explains the difference between the two symptoms mentioned above.

It is not possible to give a definite cure for the troubles mentioned, and one which will always succeed, but a number of things may be tried, and generally one or more of them will solve the trouble. The suggestions given in the following paragraphs should therefore be tried by those who either have trouble with a Det. and 2 transformer L.F. set, or who are not satisfied with the quality from such a receiver.

The first point to receive attention should be the transformer connections.

Start by changing over the leads to the primary of the first L.F. transformer, and then try the receiver. If results are worse, change the connections back to their original positions. If, however, a slight improvement is noticed, or matters seem the same as before, leave them in the new position.

Should results be quite all right after changing the primary leads, there is no need to proceed further; on the other hand, if they are not, the next step is to try reversing the leads to the secondary of the first L.F. transformer. Again test the receiver, and adhere to the same instructions as given for when the primary leads have been changed.

Generally, the above suggestions will effect a cure, but if they do not, there are still ideas to be carried out. The instability may be caused by H.F. currents getting through to the L.F. side of the set. To prevent this, either an H.F. choke or a resistance of about 250,000 ohms should be inserted in the grid lead of the first L.F. valve. That is between the grid and the first L.F. transformer.

The next thing to suspect is the H.T. battery. If this is run down or of a high resistance it can easily cause instability. It should, therefore, be tested with a voltmeter while on load, that is to say, while the set is working. If its voltage is as it should be, try shunting a 2-mfd. fixed condenser across the H.T.+ tap and H.T.—.

By-Pass Condenser.

There is one more useful thing to try, and that is to earth the cores of the L.F. transformer. If these are of the shrouded type, the core can be earthed as well as the shroud, by taking a wire to one of the clamping bolts which pass through the transformer. Sometimes a terminal is specially provided for earthing.

Where ordinary swinging-coil reaction is employed, it is imperative that a by-pass condenser be connected either across the primary of the first L.F. transformer, or from the side of the reaction which is not joined to the plate of the detector valve, to L.T.—.

In particularly troublesome cases, a useful line along which to experiment is the insertion of anti-motor-boating devices. Whilst the idea is really borrowed from elimination practice, it is sometimes very effective.

REALLY FINE RADIO RESULTS!

A crane working near the London broadcasting station becomes strongly charged up by the energy transmitted, and workmen have received shocks when handling the bucket. To prevent this, the large "egg" type insulator shown above has been inserted.

THE BAFFLE BOARD.

(*Continued from previous page.*)

the cone, arranged as shown diagrammatically in Fig. 4.

It must not be imagined, of course, that the baffle serves in any way as a sounding board. In fact, the volume of sound heard from the front of the speaker is, on the whole, reduced by its use. It should be pointed out, also, that a small baffle is no more suitable for a small speaker than for a large one.

There is no hard and fast rule as to the size of a baffle board, but in general it is advisable to provide an air path from front to rear of 6 ft. or more in length. This does not mean that a board of 3 ft. radius should be employed, for the waves do not travel straight up the front edge of the baffle and down the back, but take a more circular path as indicated by the dotted lines in Fig. 4. A radius of 2 ft. is therefore ample for most purposes.

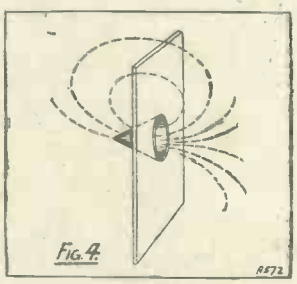


FIG. 4.

Design of the Baffle.

Unless the speaker is to be used in a very large room, a board of about 4 ft. square is apt to be the reverse of ornamental, but a flat, square board is not at all necessary.

There is, in fact, plenty of scope for the handyman in constructing an artistic baffle.

It might, for instance, take the form of a shield, or a large fire screen.

Since the chief requirement is simply a long air path between the front and the back of the cone, one solution to the difficulty is to mount the speaker in a relatively small cabinet with an open, or gridded back, the front, sides, bottom and top all forming part of the baffle. The edge of the cone, of course, must come flush with the front of the cabinet.

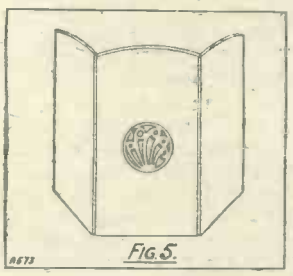
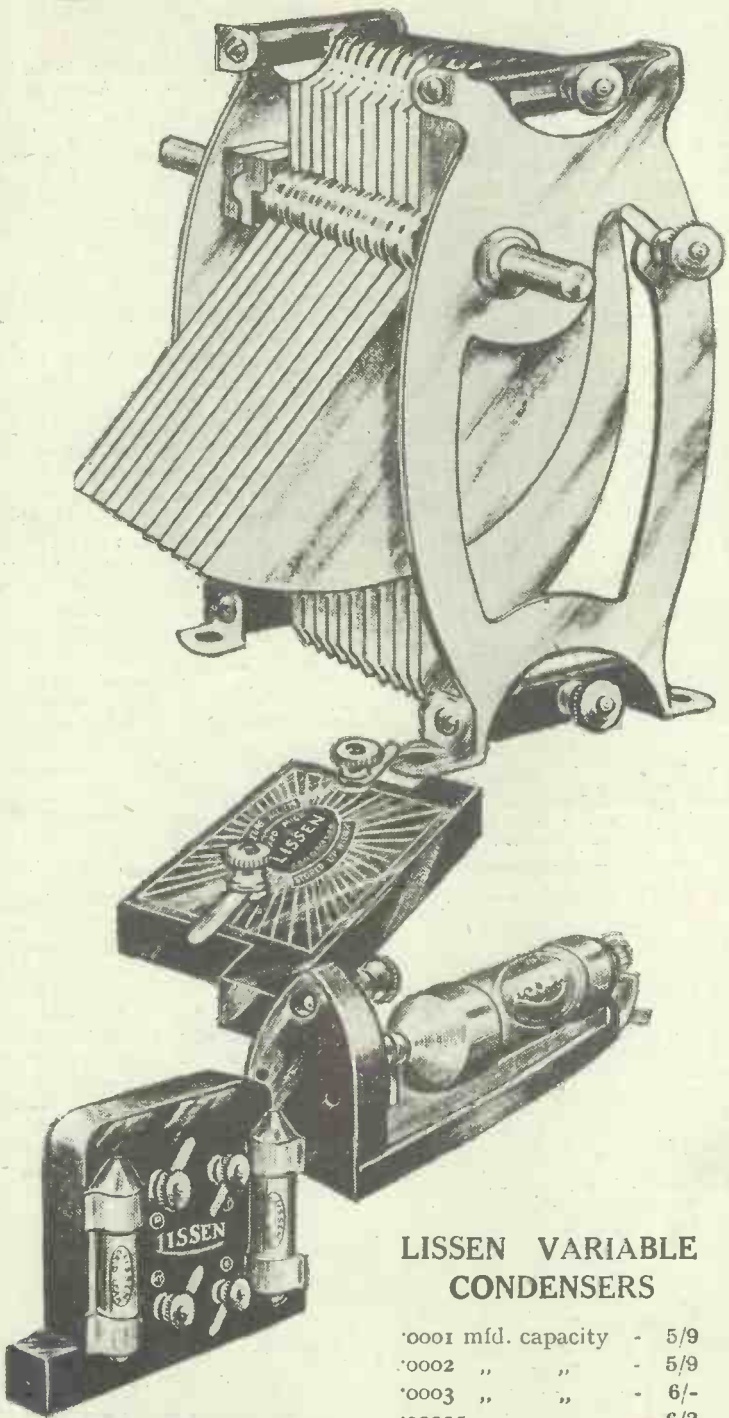


FIG. 5.

Another method is to make the baffle in the form of a screen, which can be folded and put away when not in use, a collapsible bracket being provided to mount the speaker unit. (See Fig. 5).

In conclusion, let it be once more emphasised that a baffle board is a *necessity* if a moving-coil speaker is to be worth using. The experimenter who considers buying a speaker of this type, but has no intention of fitting a baffle, would do better to buy a first-class cone speaker, which would in such circumstances give better results and cost two or three pounds less.

Lissen consider that you know best —



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THE B.B.C. AND THE MUSIC-HALLS.

During the whole of the history of the B.B.C. there has been a continuous series of changing relations with Theatre and Variety interests. What is the position to-day?

By THE EDITOR.

IT is to be hoped that the announcement made by the B.B.C. recently that arrangements had been made with the General Theatres Corporation for extracts from the revue at the Palladium to be broadcast on October 22nd will result in a complete revision of the antagonistic policy which has hitherto existed on the side of the theatres and music-halls with regard to the B.B.C.

As our readers know, ever since broadcasting began there has been continual bickering on the side of the theatres and music-halls with regard to the privileges, etc., of the B.B.C., and although various broadcasts of excerpts from theatre plays, etc., have been made from time to time, there never really has been a successful understanding between the two industries concerned.

Hitherto there has been a ban on broadcasting by music-hall stars, and this ban has been rigorously enforced by music-hall managers. In quite a number of cases stars who have refused to acknowledge this ban and who have accepted offers to broadcast have suffered inasmuch as their contracts with music-hall managers have not been renewed.

Ignoring a Ban.

Although the General Theatres Corporation have decided to make a new move and to ignore the ban, and thus co-operate with the B.B.C., the movement for a new understanding between the music-halls and the B.B.C. has not yet been completed, for the ban is still in operation in most parts of the country.

The Secretary of the Variety Artistes Federation said the other day that music-hall managers have never had the pluck to enforce the ban rigidly, and this seems to be a half-hearted admission of the realisation that the policy of antagonism to the B.B.C. and non-co-operation is one which has now proved itself to be futile and injurious to the best interests of all parties concerned.

Although a member of the Committee of the Entertainment Proprietors Association has stated that the policy of the Association in opposition to broadcasting of music-hall turns remains unchanged, we understand that there is every likelihood of a complete new agreement being reached between the B.B.C. and the music-hall interests, and that in the near future further broadcasts from various music-hall turns will be made and a new policy agreed upon.

Co-operation and Goodwill.

Obviously the theatres and music-halls cannot go on ignoring and, by ignoring them, suffering themselves. The B.B.C. can help them and they can help the B.B.C., and it is much better to have a spirit of co-operation and goodwill than a spirit of boycotting and mutual misunderstanding.

We hope that now that the General Theatres Corporation have made the right move, other music-hall managers will take the hint and revise their policy with regard to co-operation with the B.B.C.

* * *

At the Conference arranged between the B.B.C. and the British Institute of Adult Education at York recently, Sir Henry Hadow, Vice-Chancellor of Sheffield University, who occupied the chair, referred to the objections advanced against broadcasting as an aid to adult education (in POPULAR WIRELESS and elsewhere), and said that while there might be pupils who, whilst having the technique of their subject, would be unable to make the best use of their ability by broadcasting, that did not interfere with the fact that there were a great many people who combined a unique and complete knowledge of their subject with a remarkable power of exposition and display.

Layton and Johnston two popular music-hall artistes, who are well known to listeners.

Sir Henry further pointed out that it was objected that broadcasting did not furnish the personal touch and the same kind of educational feeling as was obtained in the class-room. "That," said Sir Henry, "is the common fallacy of objecting to something because it is something else."

Unconvincing Arguments.

If the broadcasting system was to be the only one in the country, or in the world, then there might be something in the argument, but when they could combine it with study circles and make the lectures a basis for discussion, and systemise it all in courses and the like, the whole of the objections fell to the ground. Sir Henry believed that there is no better augury for the future of adult education in this country than that the B.B.C. has taken it to its aegis and has shown such care for its welfare in the future.

"I believe," said Sir Henry, "we are on the threshold of one of the greatest educational developments this country has ever seen. It is not going to supersede the class or individual teacher, or shut up all our schools, colleges and places of instruction. But it is going to supplement them and give them proper guidance and direction. There is not one among those of us who belong to the teaching profession who will not get personal and infinite good out of the co-operation of these great institutions."

Sir Henry's arguments, although interesting, do not seem to carry much conviction when he refers to education in connection with broadcasting. Sir Henry is a very great authority on education, but if his argument is carried to a logical conclusion, we can only suppose that he means that any medium which reaches a big public should also be used to supplement educational measures in this country.

PRACTICAL RADIO REMINDERS.

PANELS should be kept scrupulously clean and free from dust, as, apart from the bad appearance, it has a detrimental effect upon insulation.

* * *

When looking for a cheap cabinet or for a good method of staining a box, do not forget the possibilities of leatherette or American cloth, which, glued down carefully, is capable of giving very pleasing effects.

* * *

To hide screw holes in cabinets, collect the dust obtained when sandpapering and mix this with seccotine, which makes an excellent filling.

* * *

Do not drop your telephones or knock them unnecessarily, as the permanent magnets of these (or of loud speakers) are injured by mechanical shocks.

When two equal resistances are connected in series, the total resistance is doubled. When two equal resistances are connected in parallel with each other, the total resistance is halved.

* * *

When installing a new earth, do not forget that it is a good plan to bring the lead up through a gas-pipe, down which water may be poured to moisten the soil around the earth plate in dry weather.

THE B.B.C. AND TELEVISION

(OFFICIAL ANNOUNCEMENT)

In agreement with the Post Office, the B.B.C. required a studio demonstration of the Baird television apparatus before considering whether there should be public experiments in which a B.B.C. station would participate. A demonstration took place at the offices of the Baird Television Development Company, Ltd., on October 9, and was attended by administrative and technical officials of the Corporation.

The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify trial through a B.B.C. station.

The Board of the Corporation has decided that an experimental transmission through a B.B.C. station shall not be undertaken at present. The Corporation would be ready to review this decision if and when development justified it.

Some practical gadgets which can easily be fashioned from simple materials and which enable otherwise awkward little jobs to be carried out quickly and effectively.

By G. V. COLLE.

WHEN constructing a radio set, especially if it is at all complicated, the builder usually finds that the amount of work involved is quite as much as expected, if not more, so that any useful tips to reduce the time expended in fiddling with small parts are always welcomed.

The first little temper-preserving device which the writer wishes to introduce is that shown in Fig. 1. This gadget is to support wood screws while fixing them in position, such as through the lugs on L.F. transformers, where the thickness of metal

Fig. 1.—A gadget for supporting wood screws.

is not sufficient to make the screws self-supporting.

It may be contended that a bradawl would serve the purpose, since it should give the screw a start in the wood, but unfortunately, in the writer's experience, this is not always so, and an arrangement such as shown has been found far more satisfactory in practice.

A Miniature "Crowbar."

The miniature "crowbar" as it appears, can be constructed from a strip of brass measuring about $\frac{3}{8}$ in. by $\frac{1}{8}$ in. or slightly less, or two tools of the same type, one being thicker than the other for screws of different lengths, can be made by more ambitious constructors.

Failing either of these suggestions, one can obtain a pair of long-nosed pliers and file half round "nicks" in the inside of the jaws somewhere at their extremity, the screws being gripped in the slots, so as to prevent them from falling sideways when the screwdriver is applied.

An arrangement for dealing with terminal heads which are fitted in awkward places is illustrated in Fig. 2. It sometimes happens the head falls off a terminal fitted at the bottom of a component, and although the head can be easily recovered, yet the problem is how to refit it, assuming there is no room for inserting two fingers and at the same time allowing a rotating movement so as to screw the head back.

Most terminal heads have a recess cut in them and this can be utilised to accommodate a piece of No. 16 or 18 S.W.G. copper wire bent to form a loop to go round the recessed part.

Another Terminal Device.

It will now be seen that the wire replaces the fingers for gripping and the hand can be devoted to rotating the head when opposite the screwed shank of the terminal. Once a start has been made on the screw the head can be tightened up against the wire with a pair of flat-nosed pliers.

We will now assume the terminal head does not possess a recessed part, but is perfectly round, except for a milling around its top; the problem can still be overcome, but by a little gadget as shown in Fig. 3.

This tool consists of a flat strip of metal having a small piece of round metal rod of a diameter sufficiently small to fit inside the screw of the terminal head; fixed to one end. The piece of metal can either be riveted in a hole in the metal strip, soldered, or screwed in.

To fix the terminal head, it is only necessary to place it on the little rod projecting from the flat strip of metal and press the clamping face of the terminal head against the screwed shank of the terminal and repeat as given above for recessed heads.

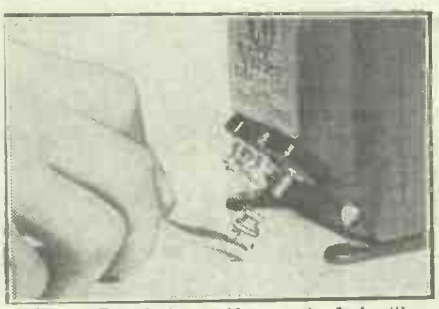


Fig. 3.—This device enables one to deal with round terminals of ordinary types.

The last suggestion is in connection with *metal* screws which are inaccessible to an ordinary electrician's screwdriver. When the screws are of the cheese head type, the problem is very simple, as such screws can be tightened by a pair of strong-jawed pliers having roughed jaws.

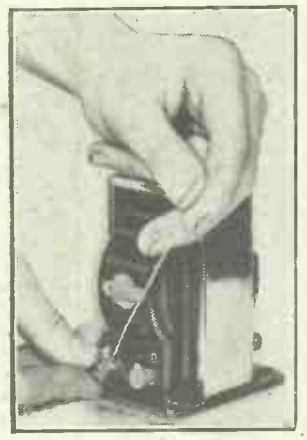
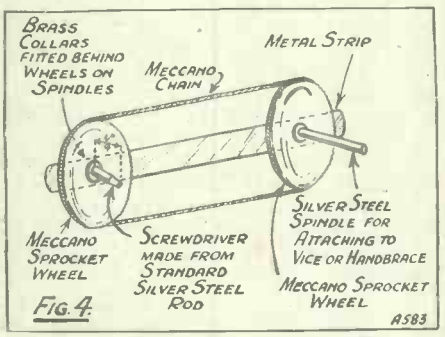


Fig. 2.—A tool for tightening terminals.

With countersunk and roundhead screws, however, some other method has to be adopted and a simple machine, which can be varied according to individual skill and



which might overcome the difficulties, is shown in Fig. 4. It can be constructed from Meccano parts and performs the functions of a remote "control" screwdriver, the initial drive being supplied by an ordinary handbrace.

The Screwdriver.

The actual screwdriver can be a piece of standard Meccano silver steel rod cut to the required length and ground to a screwdriver point, while the latter can be arranged to operate either facing the user or away from him, depending on the position of the screw.

A machine of this nature, simple though it is, will hardly be needed by the casual set builder, but active amateurs who frequently build receivers will find such a device invaluable.

The description of an active amateur transmitting station.

By G. A. JEAPES.

FIRST smitten with interest in radio matters as a schoolboy in 1913, it was not long before a huge card cylinder was wound with huge quantities of wire and fitted with a slider, then a detector devised, using as a rectifying agent a piece of "fused silicon" of doubtful qualifications. A pair of 'phones next came along, which to me cost a small fortune (I believe thirty-five shillings).

"Delicate Apparatus."

Having "wired up" these pieces of "delicate apparatus," an aerial was erected, using the then popular aluminium aerial wire. This being complete, ears were strained whilst scratching the crystal with a stiff brass point (cat's-whiskers weren't thought of then), and after scraping the slider along the coil many times a faint signal was heard. Yes, it surely was F L (Eiffel Tower) sending out her time signals! Gee! What DX! But now times have altered, signals from Paris are no longer full of thrills!

To-day one sits and listens, and even effects two-way communication with stations in every corner of the globe.

At Station 2 X V there are now two receivers, one a short-wave set using a regenerative detector followed by two stages of L.F. amplication, which is used for experimental work, and the other is a broadcast receiver operating a coil-drive speaker. There are two transmitters, both capable of being tuned from about 15 to 50 metres.

Low-power Transmitter.

The low-power transmitter (up to 15 watts) has a "choke control" modulator for sending speech at will. This small set uses an LS5B Osram valve, and the modulator an LS5 of the same make. With this small set, and an input of about 8 watts, telephony has been transmitted to other amateurs all over England, also to Copenhagen, and C.W. Morse communication has been effected with Australia, Tasmania, Canada, U.S.A., etc.

Most work has been done on 23 metres, but Australia and Tasmania were worked using a wave of 33 metres. An accumulator supplies microphone current, whilst another feeds the filaments. A 100-volt H.T. battery supplies grid bias to the modulator valve.

There are two transformers; these are used to transform the 200-volt 90-cycle A.C. mains for various jobs, one is home constructed, and feeds 600-volts H.T. to the rectifying valve immediately above, and at the same time lights its 9-volt 3-amp. filament. This valve then hands on the rectified A.C. to two T.C.C. condensers and home-made choke. These smooth out the ripple and pass along a fairly smooth supply of H.T. to the transmitter just described on the top shelf. It is well here to mention that all transmitters at this station use the well-known tuned-grid tuned-plate circuit.

A larger transformer delivers 1,500 volts either side of the centre tapping. These two portions of voltage are handed up to two quarter-kilowatt rectifying valves directly above it, whilst the filaments which consume 4 amps. each are fed by a home-made transformer.

After full-wave rectification is effected, the 1,500 volts now D.C. passes up to a 4-mfd. T.C.C. condenser, and thence through the home-made filter choke. The smoothed D.C. H.T. then passes to the main transmitter.

In the main transmitter, which is designed expressly for Morse working, a real effort has been made to get it "lo-loss" as far as possible. No panels are used, and the components are just fixed to the wood frame in the most convenient places to suit the circuit in use, everything thereby being well-spaced and nicely accessible. The voltmeter shows the feed to the filament of the valve, which is heated from a separate winding on the H.T. transformer. The condensers used are receiving condensers, which have been pulled to pieces and double spaced to avoid "flash over," and even now this sometimes occurs if the set is detuned slightly.

The left condenser tunes the grid circuit and the right tunes the anode. Two fixed condensers fixed down below are home made, in order to avoid the expense of high voltage ones, and are made from copper foil interleaved with photographic plates from which the emulsion has been carefully removed.

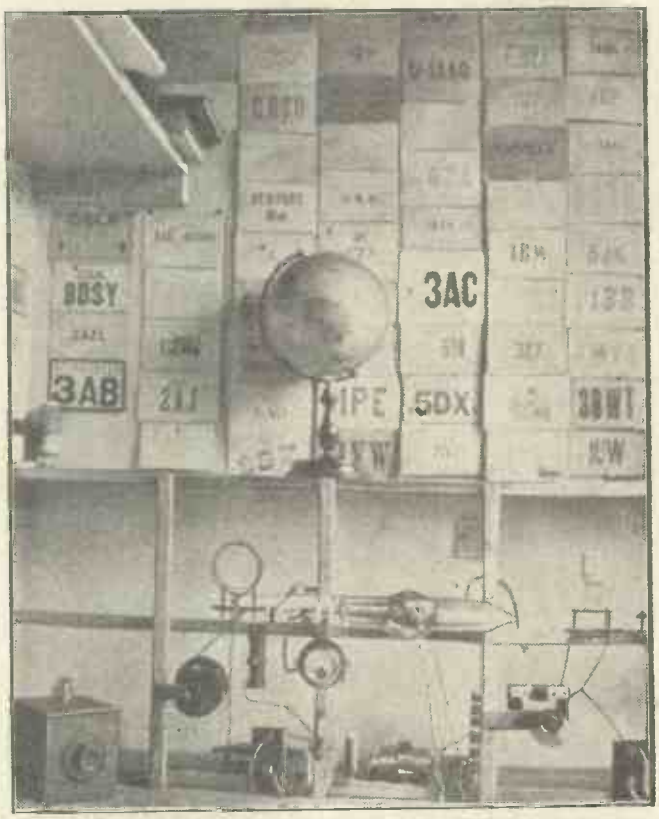
World-wide Success.

With this transmitter coupled loosely to an aerial 28 ft. long and about 30 ft. high world-wide communication has been effected, and the following countries are amongst those which go to its credit: Australia, Tasmania, New Zealand, Uruguay, Chile, Canada, Africa and practically every state in U.S.A., including Texas, Dallas, California, Oregon, Washington, etc. The numerous cards on the wall are all confirmations of the good work done.

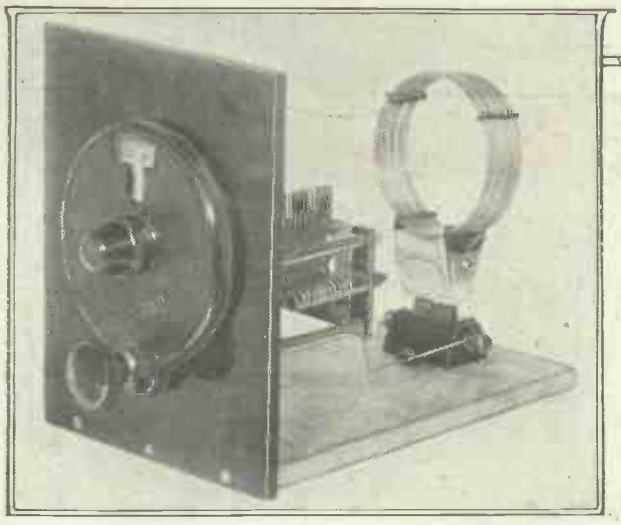
The aerial just described is used at this station for all jobs, including transmission, reception, and also broadcast reception.

No earth or counterpoise is used on either transmitter; only just the aerial is coupled with a two or three-turn coil, this is then tuned for maximum radiation with a shunt condenser, maximum radiation being denoted either by hot wire ammeter in the aerial wire or by the brilliancy of a Neon gas lamp held near the wire. The method varies with the wave-length owing to the moving of voltage and current nodes in the aerial circuit. Actually, at this station with the aerial described, the Neon lamp method is used for 23 metres, and the ammeter for 45 and 33 metres.

A low power outfit such as described firstly is by no means a costly item, and it is surprising that so few take the plunge into this most interesting and fascinating branch of the hobby, but in case these few lines have stirred up the reader's interest, I would give a word of sound advice, and that is to make the first step a good one by joining the Radio Society of Great Britain, which will see you over many of the initial difficulties.



A section of 2 X V's transmitting gear. Mr. Jeapes has a fine collection of "Q S L" cards. These are postal reports of reception results.



TRACKING SHORT-WAVERS

With this simple unit, which is fully described, you can locate the short-wavers, and calibrate your set closely with the greatest of ease.

By G. P. KENDALL, B.Sc.

WHAT about having a shot at the short waves this winter? Even as early as the time of writing the American stations are beginning to come in excellently, every night, on quite small sets, and there are now so many interesting transmissions on the short waves that there is evidently a very fascinating time awaiting us during the coming dark evenings.

If you have not already experienced it you can have little idea of the real thrill you get when you switch on a simple little two-valver, pick up a lusty carrier-wave, resolve it after a little wangling of knobs, and hear a rather nasal voice announcing itself as "Schenectady, New York," and going on to read a list of baseball scores and winners at "this afternoon's Saratoga races," then giving a time signal which you will notice is five hours behind your own clock. After this the station will usually go over to one of the big New York hotels for a preliminary musical programme, and you realise that it really and truly is 2 X A D, one of the short-wave relay stations of W G Y, working on a wave-length of 21·9 metres.

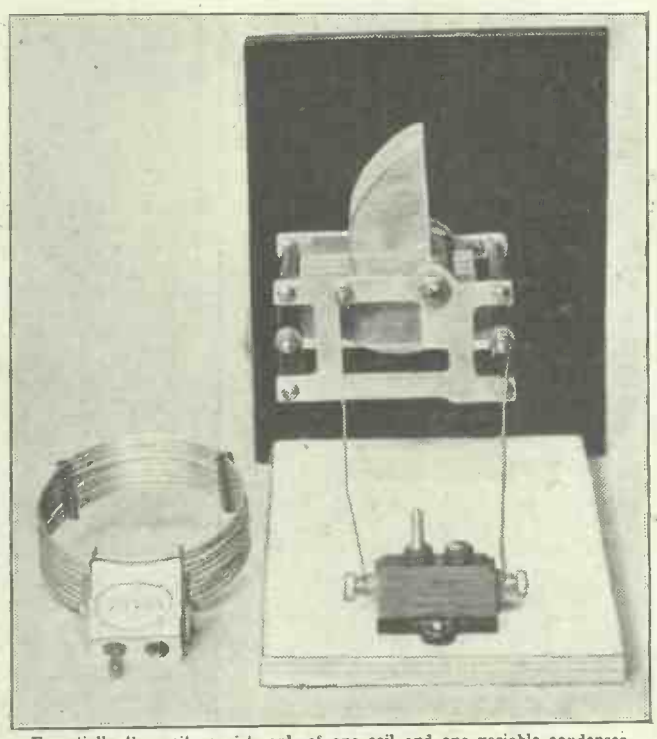
An Easy Station.

This is now one of the easiest really distant short-wave stations to pick up, coming in almost any night after eleven p.m., and earlier as the evenings grow darker, usually with very good quality, since it is almost free from "night distortion," and does not very often fade badly. Again, on nights when 2 X A D is not on the air, you will generally find that 2 X A F, another relay of the same station, but on 31·4 metres, will come in at very fair 'phone strength on two valves.

Further into the dark evening season that veteran of short-wave transmissions, K D K A (Pittsburg, U.S.A.) on 63 metres, will begin to come in, often with the characteristic violent fading and night distortion which at one time was thought to be an unavoidable feature of short-wave work at long distances. Actually, it has proved to be more a matter of the actual wave-length used, many of the shorter-wave stations being practically free from distortion and fading much less than K D K A.

A still more regular transmission is that of the Dutch station, P C J J, which works on 31·4 metres, and is often so strong on two valves that it can be put on the loud speaker, and practically always with three. This station transmits some really excellent programmes on several evenings a week, and is very easy to identify, since it announces in both Dutch and English, with frequent mentions of call-sign and wave-length.

Now, most people have by now realised that there is nothing very mysterious or difficult about a short-wave set, for it is merely a matter of picking one of the more recently published designs for a two- or three-valver, making it up with reasonable care to ensure a good copy, using a fairly freely oscillating valve as the detector, and spending a little time in learning to get the right reaction setting *just* off the oscillation point. (Don't forget that actually oscillating on a short-wave carrier is even more inconsiderate than the same procedure on the upper waves, since the resulting interference carries further.) If you attend to these points you can be just as sure of success as with an ordinary broadcast receiver.



Essentially the unit consists only of one coil and one variable condenser. And it is just as easy to use as it is to make.

There is, apparently, however, still a lurking suspicion in the minds of many constructors that there is a catch in it somewhere, since they do not see how they are to spot the desired station among the host of amateur transmissions, or to get an idea of the wave-length the set is tuned to at any particular moment, and I hope to convince them with the suggestions which follow that these difficulties, too, can be overcome in a very simple way.

As a matter of fact, it is quite true that it is decidedly difficult for the comparatively unpracticed listener to find out where he is with a new short-wave set, where to look for any given station, and so on, but the difficulty is capable of being overcome in a very simple fashion, as you will see.

How To Do It.

What you want is just to get hold of a few calibration points, from which you can very quickly work out the approximate settings for other stations, which will be quite easily picked up when you know within a few degrees where to look. The easiest way to obtain such calibration points is simply to borrow a wave-meter from a better-equipped friend, but since very few readers will be lucky enough to be able to do this I propose to show how you can make up an extremely simple little measuring unit (I avoid the word "wave-meter" because it suggests something complicated to most people!) and calibrate it for yourself.

Simplicity Itself.

This is what you want: First, a small panel, say 7 in. × 7 in., and a baseboard about 9 in. deep. On the panel mount a variable condenser of ·0005 mfd. (a vernier dial is helpful but not really essential), and on the baseboard an ordinary single coil holder. Wire these in parallel, i.e. one side of socket to moving vanes, other side of socket to fixed vanes, and the job is done!

(*Continued on page* 387.)

Every Enthusiast needs these very useful BURNDEPT Components

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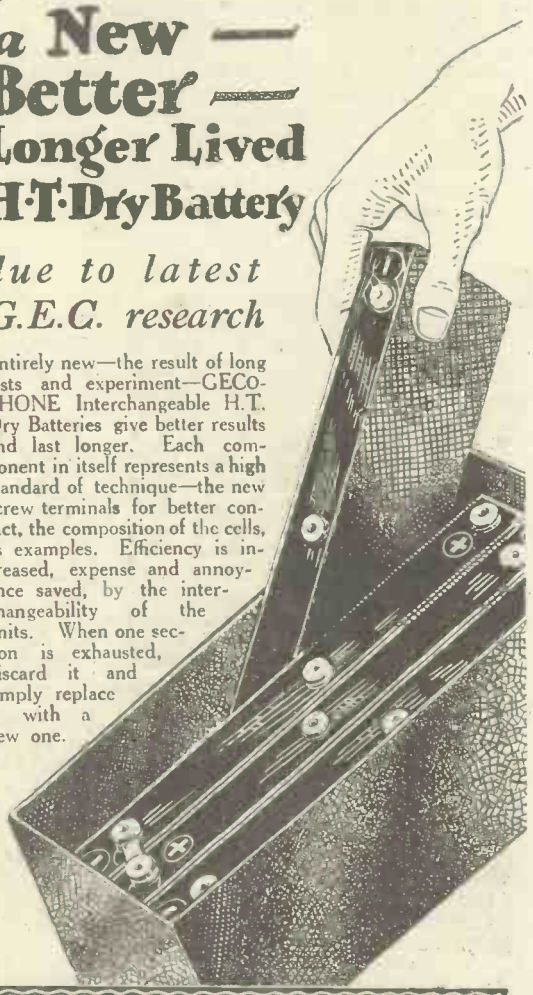


GECOPHONE

INTERCHANGEABLE H.T. DRY BATTERIES

With Screw Terminals

REDUCED PRICES:

Standard Capacity Type	L.4900 65v. **10/6**	L.4901 100v. **18/6**	Super Capacity Type	L.4903 66v. **21/-**

MADE IN ENGLAND

Sold by all Wireless Dealers

TRACKING SHORT-WAVERS.

(*Continued from page* 385.)

This little unit constitutes what is called an absorption wave-meter, and nothing simpler or more helpful as an adjunct to a short-wave receiver can be imagined. This is how it is used : In the socket you must put a plug-in coil from any of the well-known short-wave series (Igranic, Atlas, DX, etc.), of roughly the same size as the tuning coil in your receiver.

Thus, if you are using in the set a coil of, say, five turns, which is about the usual size for the 20 to 40-metre wave-band, you should put a 4-turn plug-in short-wave coil in the measuring unit. Now make the receiver oscillate anywhere on its tuning range, put the unit with its coil within a few inches of the coil in the set, and turn the dial slowly. Presently you will hear a click and the set will stop oscillating, then as you turn the wave-meter dial a few degrees further there will be another click and oscillation will start again.

Very Accurate Readings.

If the unit is held close to the set these clicks will be fairly far apart, that is, the set will be prevented from oscillating while the meter condenser is turned through quite a band of degrees, say, five. As you take the meter further away, you will find that this band gets narrower and narrower, until finally the two clicks come almost on top of each other, and you get a very sharp and definite indication.

This denotes that the meter and the set are tuned exactly to the same wave-length, and if you can get the meter calibrated, you will always be able to measure the wave to which any short-wave set is tuned. Such a calibration, by the way, is particularly definite and permanent, since there is nothing to vary in the meter, so long as you are careful always to use the same coil therein, and to avoid treating it at all roughly.

Simple Calibration.

Calibration is not so difficult a problem as you might fear, and if you have a friend who possesses a short-wave set on which he knows the settings for a few of the more important stations, it is simplicity itself; just take your unit round and transfer these points to it direct from his set. Then you can draw a calibration "curve" on squared paper, plotting wave-length vertically and dial reading horizontally, the result being roughly a straight line if the condenser is a square law or log mid line type.

If you don't want to go to the trouble of actually drawing a graph, you can simply record the settings for the stations you have got the points for, and refer to them whenever you want to tune a set to one of these stations.

Getting the First Points.

If you don't possess the necessary friend complete with calibrated receiver, you can still get an approximate calibration in this way ; use the same make of coil, vernier dial and condenser as those in the unit seen in the photos accompanying this article, see that the connecting wires are each about five inches long, place the coil and condenser in roughly similar positions, and then you can be pretty sure that your calibration will be within a few degrees of the one obtained for the original unit, which, incidentally, is in constant use with the various short-wavers produced for publication in "P.W."

Now, probably the most interesting wave-band on which to make a start is that from 20 to about 35 metres, and fortunately there are enough regular and fairly easily received stations distributed over these waves to make calibration quite simple. These are as follows : 2 X A D (21·96 metres), 5 S W (24 metres), 8 X K (Pittsburg) (27 metres), and 2 X A F and P C J J (both on 31·4 metres).

I can give you the settings for these stations on the original unit, and you should find that your own calibration is within a few degrees, so that when you have picked up, say, 5 S W (the short-wave Chelmsford station which relays 2 L O) and noted the discrepancy between the reading you obtain and the one I give below, you can estimate pretty closely where to look for the other stations, and so get an accurate calibration as you pick them up. (Once you know to within a few degrees where they are likely to come in, you will soon be able to pick them up if you listen at the hours given in "World Radio").

In the original unit the parts first incorporated were these : Cyldon ·0005-mfd. log-mid-line condenser, Igranic "Indigraph" dial, Igranic No. 4 short-wave coil. With these parts the readings were as follows : 2 X A D, 26½ degrees, 5 S.W., 31½ degrees, 8 X K, 36 degrees, P C J J and 2 X A F, 48 degrees.

In order to make the data as widely useful as possible, the following parts were fitted into the unit and a fresh calibration obtained. the figures being these : 2 X A D, 50 degrees, 5 S W, 58 degrees, 8 X K, 66 degrees, P C J J, 88 degrees. In this case the condenser was a Lissen ·0005 mfd., the dial a plain 0–180 degree pattern, and the coil the same as before.

With the aid of one or other of these calibrations you should very easily be able to put an end to the "lost" sensation apt to afflict the comparative beginner when making a start on short waves, or for that matter, anyone first trying out a new short-wave set.

MR. BAIRD AT LONG ACRE.

Mr. Baird at the new transmitting apparatus in Long Acre, London, W.C.2. It is stated that he has been granted an experimental licence for this station. The results of his tests with the B.B.C. awaited with the keenest interest.

USING OLD FIXED CONDENSERS.

MOST amateurs have one or two spare fixed condensers on hand, but not everyone knows that a great many sets would greatly benefit by the addition of a "·001." The idea is that in condenser-controlled reaction sets (popularly called "Reinartz reaction") the reaction condenser should have a fixed condenser of about ·001 mfd. in series with it, to prevent H.T. shorts.

To insert the condenser, first of all examine the connections to the reaction condenser. In most sets you will find that one of its sets of plates is connected to H.T.+ (possibly via reaction coil), and the other set of plates is connected to the filament wiring. All you have to do is to break one of these leads and connect the condenser in series. In other words, cut the lead and take one of the ends to one side of the fixed condenser and the other end to the other side of the fixed condenser.

There will be no alteration to reaction effects, etc., but now, if the reaction condenser plates are accidentally shorted, no damage will result from stray H.T.

Which Type of Valve Shall I Use for Best Results—L.F. or R.C.?

A Practical Article by DUDLEY KEITH.

AT first sight the title of this article may give the impression that a dissertation on L.F. coupling is to be commenced, but it is not so much with the choice of coupling that I wish to deal as with the types of valve which can be used for R.C. and L.F. couplings.

It is well known by most that because one valve is termed an R.C. valve or another has the classification of L.F. it does not necessarily mean that the valves cannot be used for anything else, nor does it mean that either valve, and that valve only, must be used when the mode of amplification being employed comes under the category in which the valve is placed. In other words, if you are using resistance-capacity coupling in your receiver, just because it *is* resistance-capacity coupling it does not mean to say that you *must* use an R.C. valve.

Only a Rough Guide.

And put another way, because a valve is not called an R.C. valve it does not necessarily mean that you must never use it with resistance-capacity-coupling.

The classification of radio valves is quite a broad one. In some ways it is inadequate, but it gives a rough idea of the type of valve being referred to, so that when you see R.C. against any particular valve you know that that valve is suitable for resistance-capacity-coupling, and has a fairly high magnification factor and a high impedance and so on.

But these R.C. and L.F. valves are also suitable for types of work other than that which their nomenclature might suggest. The R.C. valve makes a very good detector when followed by resistance-coupling, but it also makes a good H.F. valve with tuned-anode coupling, besides being eminently suitable for resistance-coupling in either H.F. or L.F. stages.

Similarly, the L.F. valve may be used as a detector, as an H.F. valve in transformer-coupled stages (although in these positions it is not so likely to be as efficient as an H.F. valve), and, of course, it can be used in L.F. stages, where it may be transformer- or resistance-coupled.

Question of Overloading.

The whole trouble in choosing valves is to know when to choose and when to leave any particular valve alone. There is no golden rule regarding the choice of a valve. The best way, of course, would be by trial and error, but as this is an expensive business, the best thing we can do is to profit by other people's experience and always keep upon the safe side.

The "safe" side in valves usually means that a certain amount of amplification may be lost, but it also means that purity of reproduction will be maintained. To ensure being on the safe side one has to be moderately sure that at no point in the receiver is any valve overloaded by being given too much input. Also, the valves must not take such plate currents as to saturate transformers or chokes should they be used in the set, nor should they have impedances which are too high. The *main* thing is to see that they are not overloaded.

Overloading takes place for two reasons. Too much input for the type of valve to handle, or too little H.T. This latter means that the characteristic curve of the valve is restricted, so to speak, and therefore the valve cannot take anything like a reasonable input without overloading. Increase of H.T. and readjustment of grid bias very often gets away from slight overloading, but if this is at all serious, then one should change the valve and use one with a longer straight part to its slope, even if it has less magnification powers.

Take the case of a three-valve set, and you will see what I mean. We will suppose that the set is being used on the local station, and that it includes a detector, resistance-coupled to an L.F. valve, and then, for the sake of argument, resistance-coupled to the last stage.

Now, because both stages are resistance-coupled, it does not mean to say that you have got to use R.C. valves. You certainly can use R.C. valves, and if you want the biggest magnification possible that is the type of valve to use, but although this will give loud speaker reception at the maximum volume obtainable with this three-valve set on the local station, you will find that resistance valves will seriously overload, and that distortion will make the results horrible.

The detector can well be a resistance-coupled valve if the resistance is not less than 250,000 ohms, but if you live near the local station it will give such a magnification that a second resistance-coupled valve will be seriously overloaded.

For the second stage, therefore, it is better either to use an L.F. valve or an H.F. valve, with comparatively low anode resistance, which will help to avoid this overloading. In the last stage one can then use a valve capable of carrying the input which you want to give it and of passing on an undistorted output.

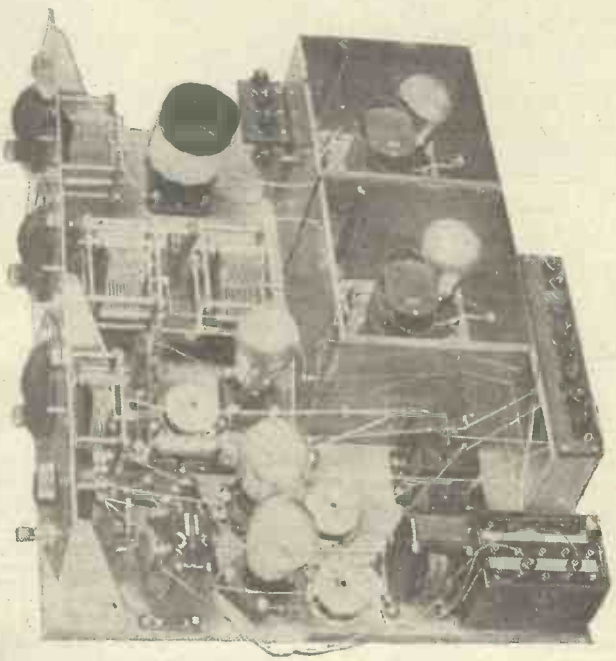
In some cases where the input to the detector is very powerful it will be impossible to use a resistance valve anywhere in the set, especially if reaction is to be employed. The writer prefers, as a rule, to use an H.F. valve as a detector (resistance-coupled to the next stage), and to use an ordinary L.F. valve in the next stage, whether that valve is resistance- or transformer-coupled. In the last stage the actual type of valve will, of course, depend upon the preceding valves, and it is only necessary that the highest magnification possible per stage should be obtained, as long as overloading does not occur.

It will be noticed that in the sets described in POPULAR WIRELESS a very big factor of safety is given, and overloading of the valves due to the choice of unsuitable valves is not at all likely to take place if the directions that are given are closely followed.

Where Sensitivity is Wanted.

Where distant stations are concerned, and if you are some distance from your nearest station, then, of course, the whole position can be reviewed again. In this case the chance of overloading is not so probable, and it will very often be found an advantage to use an R.C. or other fairly high-magnification valve instead of an L.F. valve in the first L.F. stage of a set.

Thus, in the set under discussion, the detector could be a resistance-coupled valve, and the second valve could also be a resistance-coupled, the last valve being a super-power or a power valve according to the amount of power which it has to handle. Where transformer-coupling is employed R.C. valves cannot be used, and one has to make one's choice between H.F. and L.F. valves, the impedance and magnification factors being chosen to suit the transformers and to give best quality.



A five-valver which requires careful valve choice. Here an R.C. valve for detector would give greatest sensitivity but would probably cause subsequent overloading, and one of lower impedance and magnification factor would be better.

The "LONG-RANGE" THREE

This long-distance three-valver makes use of an efficient, neutralised, H.F. stage, and is designed to receive stations on the normal broadcast and long wave-bands by means of an instantaneous change-over. A novel scheme permits the full advantages of reaction "build-up" to be obtained on both wave-bands, and the receiver is capable of bringing in a very large number of stations. A blue print of the set was given away with last week's issue of POPULAR WIRELESS.

By the "P.W." RESEARCH AND CONSTRUCTION DEPT.

AS its name implies, this three-valve set has been designed for long-distance reception. This does not mean that it cannot be used for listening to the local station. It is intended to be an all-purpose receiver, suitable for use on both the local station and 5 X X, and it is also capable of reaching out and bringing in a large number of continental transmissions at good strength. It is an ideal receiver for the enthusiast who likes to sit down and see how many stations he can tune-in in an evening.

The Aerial Circuit.

A brief description of the circuit will prove that the receiver is a thoroughly up-to-date "1929" design.

The first valve is a high-frequency amplifier, and this is a point which makes the set attractive to those readers who are unfortunately situated and who are thus handicapped by a small aerial. The function of this H.F. valve is to amplify the weak signals before they are rectified.

The H.F. valve can be called the "reacher out," because you depend largely upon the efficiency of this particular stage for your range.

The aerial circuit may really be divided into two parts. The reason for this is that the set can be used on both long and short waves without any necessity for coil changing.

The short-wave part of the aerial circuit consists of two plug-in coils. The constructor will be able to use his existing coils here because the sizes will be identical with those which he previously needed for reception on the 250–500-metre wave-band.

The Switching Scheme.

Now, when it is desired to go over to the long waves a loading coil is brought into use, and the aerial-earth circuit is completed through a portion of this coil, this part of the winding also serving for reaction purposes on the long waves.

The larger portion of the loading coil, together with the existing plug-in secondary coil marked L_2 on the blue print, now becomes the tuned long-wave circuit.

The H.F. valve is coupled to the detector in two ways. On the short waves the two-pole change-over switch in the centre of the panel is placed so that contacts 2 and 5 join up with 1 and 4 respectively.

If you follow out this arrangement, you will note that the circuit to the H.F. valve anode is via a centre-tapped plug-in coil marked L_1. The H.T. lead goes to the centre-tapping and the H.F. valve is neutralised in the usual manner, i.e. from the end of the anode coil remote from the plate of the H.F. valve. Now what about reaction?

If you examine the connections when the switch is in the position mentioned you will see that the reaction condenser is joined to one end of the centre-tapped coil, L_4. Thus reaction is obtained by making use of one half of this coil, and in practice the scheme is very successful.

Now, on changing over to the long waves the centre points 2 and 5 of the change-over switch will make contact with 3 and 6. The circuit will then be via the ·25 meg. resistance to the anode of the H.F. valve, and the scheme for the long waves then becomes straightforward resistance-coupled, the reaction condenser being joined to the bottom end of L_3. A glance at the photographs will show that elaborate shielding has not been found necessary in this design. A simple static screen across the baseboard provides all the screening so required, and there is no interaction between the sets of plug-in coils if care is taken to mount them in the positions shown.

Drilling the Panel.

Turning now to the remainder of the circuit, it will be seen that a normal leaky-grid rectifier is employed and this is followed by a stage of transformer coup'ing. This part of the circuit arrangement is quite straightforward.

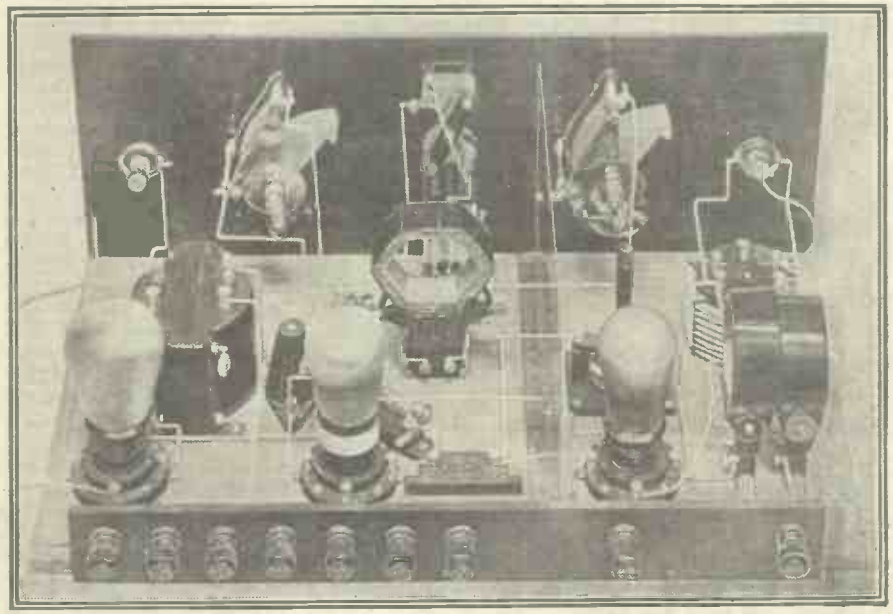
Now for a few hints on the actual construction of the receiver. The first step is to mark out and drill the panel.

The dimensions are all given on the blue print. Take a steel rule and scriber and mark off the various drilling points on the back of the panel. Then mark these centres ready for drilling with a centre punch.

Next, take your components and find out what sized holes you will need. There are three variable condensers and two switches of normal type. These in all probability will require $\frac{3}{8}$-in. diameter holes if they are all of the standard single-hole fixing type.

Assuming this to be the case, it is as well

(*Continued on next page.*)



The two plug-in coils on the right are the aerial and grid coils respectively. The one in the centre of the baseboard is a centre-tapped No. 60 coil. These are the three coils required on the medium waves.

THE "LONG-RANGE" THREE.

(Continued from previous page.)

to run a $\frac{1}{16}$ pilot drill through the drilling centres first, because this will help to stop the larger drill from wandering out of centre.

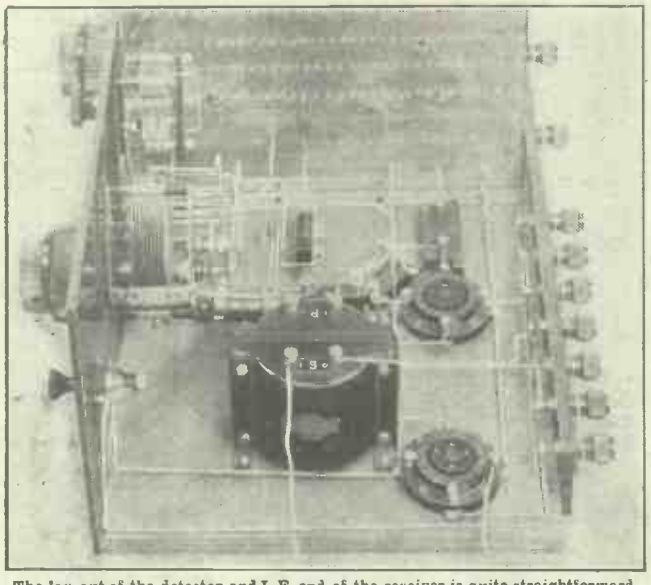
Then there is the wave-change switch S_2. The type of fixing will depend solely upon the particular make chosen. With most makes it is practically certain that a small rectangular slot will have to be made in the panel. This is by no means difficult. All that one has to do is to drill three or four holes close together in line and then to file out the slot with the aid of a small file. Alternatively a fretsaw can be used for the job.

Wiring Up.

Now secure the panel to the baseboard and mount on it the various components. Next place the screen in position, obtaining the necessary dimension proportionately from the blue print. The screen will have a number of holes at the foot to enable it to be screwed down on to the baseboard. Then commence to place the various components in position on the baseboard.

You will have no difficulty whatever in following this out from the wiring diagram. Take care to so arrange the condensers on the panels that the vanes when they are opened do not foul any of the components. Also space the anode coil holder sufficiently far from the screen to give clearance for the centre-tapped coil.

Leave enough space at the end of the baseboard for a grid-bias battery strip to be inserted between the L.F. transformer and the side of the cabinet.



The lay-out of the detector and L.F. end of the receiver is quite straightforward. Care should be taken in wiring up the double-throw switch, which can be seen near the metal screen.

Then you can make a start with the wiring. If you examine the photographs you will see that certain leads are nearer the baseboard than others. Place these in position first. Then build up the wiring in tiers, completing the leads near the panel, especially those to the double-throw switch, before you attempt any others further to the rear of the baseboard.

This is the quickest and only safe way. Use insulation covering on your wire, such as Systoflex tubing or Glazite. Make sure that you do not arrange the leads in such a way that it is impossible to remove such things as grid leaks after they are in position.

The receiver should now be ready for testing.

Take your L.T. and H.T. batteries and connect them to their respective terminals. The H.T. voltages may be: H.T. + 2, 100–120 volts; H.T. +1, 80 volts.

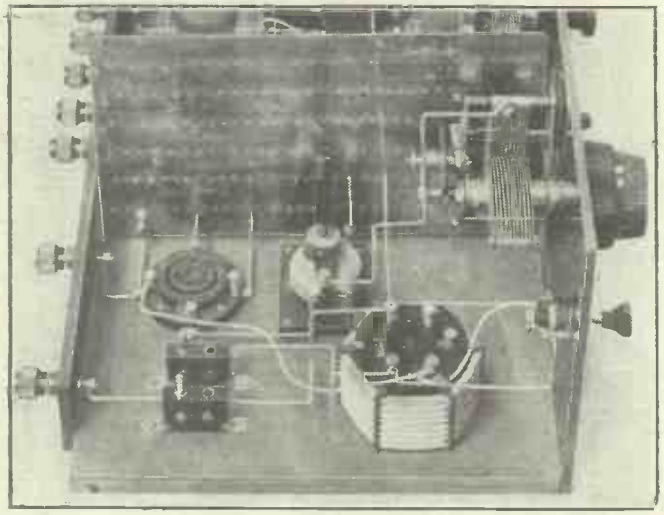
Insert a No. 35 coil in the coil holder marked L_1, and a No. 60 in L_2. In the anode socket, L_4, place a No. 60 centre-tapped. Insert an R.C.-type valve in the H.F. valve socket (V_1), an "H.F." type in the detector socket, and a power valve in the last valve holder. Connect up the aerial and earth. Switch on the valves by pulling out S_3 (or pushing it in with some makes). Pull out the wave-change switch S_1 and place the second wave-change switch S_2 in the position for "short-wave" reception.

The first operation is to neutralise the set.

Set the reaction control at minimum, and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are in step with each other it will probably be found that the set is oscillating. To test for oscillation touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular type). You will probably find that the set will only oscillate under the above conditions when the two circuits are in tune with each other, and this can be used as an indication. It is convenient to perform the operation at some point near the middle of the tuning range. Now, increase the capacity of the neutralising condenser.

Neutralising.

Test at intervals for oscillation as this is done, and you will presently find that the set has ceased to oscillate and will not recommence even when the tuning dials are slightly readjusted. Now increase the reaction a little until the set once more oscillates and again increase the neutralising condenser setting until oscillation ceases. Slightly readjust the tuning condensers again to make sure that the set is completely stable once more. Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been overshot. Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation, but cause it to become stonger.



Here we see the aerial end of the set. The small switch on the panel is for changing over the aerial circuit from medium to long waves. Note the flexible lead from the centre point of the switch to the tappings on the loading coil, and to L.T. –.

The object is to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation. It will then be observed that when the two tuned circuits are in step and the set is brought to the verge of oscillation, a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation.

Final Adjustments.

Having neutralised the receiver for the short waves, you are then ready to receive stations on the 250–500-metre wave-band. This is simply a matter of rotating the tuning dials in step and increasing the reaction control so that the set is just well below the point of self-oscillation.

Now switch over to the long waves by means of the two wave-change switches.

No neutralising will be necessary on this wave-band, and the whole of the tuning will be carried out on the tuning condenser C_1. There is a flexible lead on the switch S_1 which goes to the tappings on the loading coil. Try this on the 60 and 80 tappings to see which gives the best results. Reaction is obtained with the same reaction control as before, but, of course, the reaction turns are now part of the loading coil and not the centre-tapped anode coil, as on the short waves.

One of the advantages of using resistance coupling on the long wave-lengths is that re-neutralising is not necessary when changing over, as might be the case if a second centre-tapped anode coil were employed. With the modern R.C. valves the amplification obtainable with resistance coupling is, of course, quite high.

FROM THE TECHNICAL EDITOR'S NOTE BOOK

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.

GODWINEX VALVE HOLDER.

IN the insulating moulding of the Godwinex valve holder, a product of J. Dyson & Co., Ltd., there is a small projection adjacent to the plate socket. This is an excellent scheme, and enables one to "feel" a valve into position when the holder cannot easily be seen. I like this Godwinex holder, for it is a cleanly designed and made article. The insulation is well cut away and the whole job is sound. It is of the baseboard sprung variety, and its anti-pong properties are well up to standard.

A moving-coil loud speaker unit recently reviewed in this page. It is made by Lang and Squire, Ltd., Acton, W.3. The "pot" is rather lighter and smaller than usual, but special steel is used.

THREE HARLIE ITEMS.

Many slow-motion dials have excellent vernier controls, but fail in regard to their direct drives. Some, of course, provide only geared movements. The new pattern Harlie slow-motion dial, known as the model 15, and retailing at 4s. 3d., has an independent vernier drive which is brought into action by pressing down the appropriate knob when it is being used. In this way the designers have no difficulty in obtaining a perfectly smooth direct movement.

Personally, I prefer a fine control which is in gear all the time, but I must say that the Harlie dial has its attractive points. In fact, it is mechanically sound and its appearance is excellent. An aperture reveals a boldly marked scale and a hair-line is provided. Two circular apertures, one at each side of the circular knob, enable station identification marking to be made.

But I wonder why the designers of slow-motion dials do not get their hair-lines closer to the scales. Being a little distance away, not only can a misleading shadow be thrown, but the position of the line is altered with the angle one looks at it.

Another good new Harlie product is their Model 10 neutralising condenser. A good feature is that its design completely prevents any possibility of short circuiting. It can be mounted either on a baseboard or by means of one hole on a panel, and is a trim, robust little article. The action is smooth and the capacity-range adequate. I consider it very good value for money at 3s. 9d.

A third Harlie item is an anti-microphonic valve holder which retails at 1s. 3d. Despite this low price the article has four terminals, in addition to soldering tags, and has the appearance of a first grade component. As a matter of fact the springing is rather above the average.

RADIO CRYSTALS.

Crystal enthusiasts are not being neglected this season, and Sylvex Ltd. are putting their well-known crystals up even more attractively. Samples of "Sylverex" and "Reactone" recently reached us, and we find them as good as ever.

FERRANTI FIXED CONDENSERS.

To their steadily growing range of radio products Messrs. Ferranti have now added two types of fixed condensers. Type C1 is a high-voltage pattern intended mainly for use in H.T. supply units and in sets operated from such devices, and the C2, the lower voltage model, is intended mainly for ordinary battery-operated receivers working at relatively low pressures.

The working voltage of the C1 is 400 volts and that of the C2 is 200 volts, the respective test voltages being 1,000 and 500 volts D.C., which test voltages, say Messrs. Ferranti, "are, we believe, higher than those of any condensers of similar types." The respective prices are 5s. 6d. and 3s. 6d. each for the C1 and C2 patterns, the capacities being in both cases 2 mfd. These prices are undoubtedly remarkably low, for they are well-made components.

Internally, they are of the rolled foil pattern, and have, in consequence, low internal resistances. And I find on test, that the claimed insulation resistance for each type as being not less than 200 megohms at 500 volts is distinctly conservative.

Externally the condensers are equally satisfactory. They are contained in stout metal cases, and have substantial slotted terminals and soldering tags. Very good value for money might be a rather hackneyed phrase, but it is certainly applicable to these latest Ferranti products. That they are safe and sound one would take as a matter of course, in view of the fact that they emanate from a factory which considers tens of thousands of volts mere matters of course, and the low prices, which compare favourably with even Continental makes, are the results, according to Messrs. Ferranti, of the installation of what is claimed to be the most up-to-date condenser manufacturing plant in this country.

DARIO FOUR-VOLTERS.

I believe we have already published reports concerning the Dario super-power valve. The internal construction of this valve is of a dual nature. The filament passes in succession through two sets of grids and plates arranged in parallel. An extremely high emission is achieved by the employment of the long filament, the satisfactory characteristics being an impedance of approximately 6,000 ohms with an amplification factor of 9. This interesting Dario retails at 7s. 6d.

I recently received further samples of this type, together with some Dario Micro Specials and Dario Resistons. These sell at 5s. 6d. each. The first is of a general purpose character, the latter being an R.C.C. type. They all three operate at approximately 3·5 volts, and are remarkably economical in filament consumption, the super power taking only ·1 ampere, the Dario Micro Special requiring but half that. They are undoubtedly efficient valves and can take their places effectively in any modern sets.

A demonstration car fitted up by an enterprising moving-coil loud-speaker manufacturer. The speaker is fixed on the back of the car. The operator is adjusting the gramophone and pick-up mounted on the running-board.

I particularly like the super-power variety, and it is certainly of a unique character.

ATLAS BATTERY ELIMINATORS.

A. H. Clarke & Co. (Manchester), Ltd., have produced a new brochure describing their range of mains units. Copies will be sent post free to readers of "P.W." upon application to Atlas Works, Eastnor Street, Old Trafford, Manchester.

SET ASSEMBLY SIMPLIFIED

A few useful hints on the interpretation and use of diagrams which will help you when building your "P.W." sets.

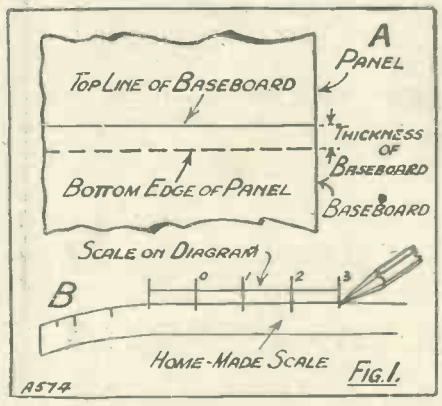
By "P.W.'s" CHIEF DRAUGHTSMAN.

A TECHNICAL diagram, if it is to fulfil the purpose for which it has been drawn, should be something more than an illustration. It should clearly and simply convey information which it would be difficult, if not impossible, to place before readers by means of the written word.

This applies particularly to the construction of apparatus, where it is necessary to give accurate details regarding panel drilling, baseboard wiring, etc.

Theoretical diagrams are undoubtedly of considerable assistance to the advanced constructor, when the wiring-up of a receiving set, or similar piece of apparatus is under consideration.

The circuits are clearly portrayed, and a set may easily be wired up from the



theorctical circuit alone. The theoretical wiring diagram does not give any details regarding the size of the panel and the baseboard or the lay-out of components, and for this reason a diagram which shows these essentials, in addition to the wiring, must in the eyes of the constructor be of primary importance. Almost every set described in POPULAR WIRELESS is illustrated by such a diagram; the back of the panel and the baseboard being shown in "plan" view, so that the wiring of the instrument may be easily followed.

The Baseboard Overlap.

It might be as well to mention here that the baseboard is shown overlapping the panel, the amount of overlap being equal to the thickness of the baseboard, as indicated in Fig. 1A. Should it be necessary to use the scale drawn on the diagram, this point may become important when measuring, as the edge of the panel may be mistaken for the edge of the baseboard, or vice-versa, if care is not exercised.

The original drawing of every set is, of course, made to scale, and on the finished diagram the draughtsman draws the scale he has used. This is reproduced with the diagram, and this is the little scale referred to above. It can be extremely useful to the home constructor. By its aid, the position of any drilling point on the panel or the position of any component can be ascertained.

It is not necessary to cut the scale from the paper. Stretch a small sheet of tracing paper over the scale, and carefully trace on it, in pencil, the dimensions given. Then cut your home-made scale to a convenient size, and gum it to a strip of stiff cardboard. Ink over your pencil lines with a fine nib—and your scale is ready for use.

Some Timely Tips.

You can, of course, if you are very careful, make your own scale any length you please by moving your tracing paper to the left as each few inches are completed, but remember that meticulous care and registration are both required if your finished scale is to be accurate.

An easier method is that shown in Fig. 1B. Obtain a small strip of white cardboard or Bristol board, place it against the scale shown on the diagram, and mark off the inches on the edge. A 12-in. scale will be found admirable for most purposes. Remember, after you have applied the scale to the diagram and found the required dimension, that an ordinary rule must be substituted for the scale rule before commencing to scribe the actual panel or mark the baseboard.

The scale rule is only for the purpose of *finding* the dimension. When it has been found, the measurement must be made on the set in actual inches.

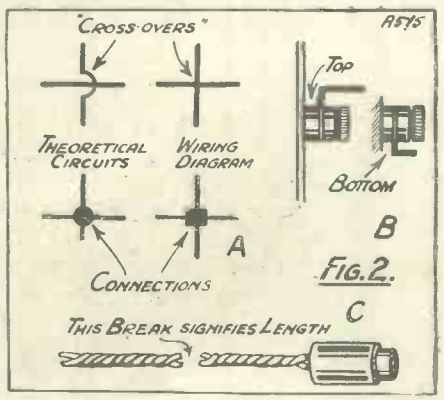
Before attempting to drill your panel, or fix it to the baseboard, make sure that it is cut square; that is, be certain that it is a true right angle. If you possess a set-square, or any instrument with two edges which will give you 90 degrees, apply it to the four corners of your panel, and if there is any error, it will at once be noticeable.

If your panel is not true, proceed to make it so, before scribing any drilling points, or you will be almost certain to get them in the wrong place; in fact they *will* be in the wrong place if you try to find their respective positions by simply measuring from the edges of the panel with a ruler.

When wiring the set, do not always take it for granted that the *direction* of any wire shown on the diagram is the direction it takes in the set. With complicated circuits it may be essential, if the wiring is to be clearly portrayed, to show a wire out of position, but if the diagram is studied jointly with the photographs of the instrument, the correct direction of the wire can often be seen.

Joins and Cross-Overs.

Until recently, the wires crossing each other without contact were indicated in POPULAR WIRELESS diagrams by a "loop," this being identical with the practice adopted with theoretical circuits. This is no longer done. The wires cross each other in straight unvarying lines, and when a joint does exist, it is shown by a "blob." Fig. 2A illustrates the difference between the old method and the new. It is as well to mention, also, the manner in which certain components, having terminals or soldering tags mounted one above the other, are portrayed. Obviously, such components, viewed from above (that is, the "plan" view), present only one terminal to the sight, the under terminal being hidden. Without modification both both wires would appear to be joined to the one terminal.



This undesirable impression is overcome in the manner illustrated in Fig. 2B.

Fig. 2C shows the way in which a long length of wire or flex is indicated, when space does not permit of the whole wire being shown. It does *not* mean that the wire is in two pieces!

THE PCJJ SHORT-WAVE STATION.

The Editor, POPULAR WIRELESS.

Dear Sir.—We have, the last few weeks, been following with interest the correspondence published in your columns, on the signal strength of our Radio Station P C J J.

We would like to state that no alteration whatsoever has been made either in wave-length or signal strength.

In the event of any changes, a statement is always immediately issued to the Press.

Yours faithfully,
PHILIPS LAMPS LIMITED.

London, E.C.4.

A CONE IMPROVEMENT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I do not know if the following idea has been put forward before in your columns; if this is so I have not seen it.

It is for improved reproduction from cone loud speakers, and the method is to fix a cone of smaller diameter than the existing one underneath, to the same spindle.

In my case I tried it with an open type, obtaining a smaller size cone and cutting it down to about seven inches in diameter and fixing it under the original one. Of course the size could be varied for best results, and the extra cone must be free of the movement, baffle or back, and original cone. By this method I think a general improvement is affected, both in speech and music.

Yours faithfully,
R. H. KING.

Ilford, Essex.

MESSAGES FROM ZEPPELIN.

The Editor, POPULAR WIRELESS.

Dear Sir,—Whilst listening to Frankfurt-am-Main last night (2nd inst.) I heard an interesting relay of a conversation with the new German Zeppelin, from approximately 10.45 to 11.15 p.m.

The Zeppelin appeared to be asking for direction. Frankfurt replied to him, and then relayed the Zeppelin's reply through his transmitter, thus enabling listeners to follow the conversation. The Commander's name (Dr. Eckener) was mentioned each time Frankfurt spoke, also a word pronounced "Lou-Chrez" (which I assume was the Zeppelin call letters L Z).

At one time it appeared that the Zeppelin relayed through his transmitter a reply from Berlin, which in turn was relayed through Frankfurt, but I am not absolutely sure of this; but judging from signal strength it would appear that this is what happened.

Whilst the Zeppelin was transmitting there was a continual hum, and I presume this came from the engines.

If any listener happened to hear the Zeppelin direct I wonder if he would oblige me with the wave-length?

With all best wishes to POPULAR WIRELESS,

Yours very truly,
"ETHERCOMBER."
Gloucester. (Valve Baronet).

CORRESPONDENCE.

THE PCJJ SHORT-WAVE STATION

A CONE IMPROVEMENT—ELIMINATING A.C. HUM.

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.

ELIMINATING A.C. HUM.

The Editor, POPULAR WIRELESS.

Dear Sir,—In the perusal of many wireless periodicals and constructional magazines during the past few years, I have read of many cures for the prevention of hum and L.F. disturbances from battery H.T. eliminators, which include the following:—

The anode feed resistance scheme, the insertion of smoothing chokes in each H.T. supply with the necessary condensers. The insertion of H.F. chokes in each H.T. lead to valves, and even to the placing of a potentiometer across the power transformer to find exact electrical centre of rectifying valves.

In my case none of the above suggestions has proved efficacious. To all those who are similarly troubled by problems of noise and hum, due to smoothing equipment and rectifying components, i.e. in the case of A.C., and especially in those instances whereby a potential divider is used as a voltage resistance, I would advise the insertion of an H.F. choke in the common H.T.-L.T. negative leading direct from set to eliminator.

This has the effect of minimising any oscillations and disturbances returning from the eliminator to set via the L.T. negative, and thence through the valves and so to loud speaker, causing hum and distortion.

In my district the supply A.C. mains are exceptionally noisy. I have, therefore, tried all the former-mentioned "cures" without success, until I resorted to the simple method of inserting an H.F. choke between set and eliminator, as aforementioned.

Much clearer and louder signals were also obtained by this application.

I may mention the choke I used and recommend is a Met-Vick H.F. choke. This I found to have the least resistance, too much resistance causing less return H.T. negative flow to eliminator. The flow can be checked by trial with M.A. If in doubt.,

The receiver used in connection with the above is a straight detector and two L.F. transformer coupled, using 10 M.A.

I remain,

Yours faithfully,
S. M. HOULGRAVE.

A gramophone and radio set built into a stool and a moving-coil loud speaker, which fits neatly into the corner of the room, form an attractive outfit, due to Reproduction, Ltd.

THE "ALL-PURPOSE" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have recently built the "All-Purpose" Three, described in the May 19th issue (No. 311), and the result was simply astonishing. In fact, it was the result which prompted me to write you this.

I did not adhere strictly to the components recommended. I used American transformer and H.F choke, but the rest was British throughout.

On the broadcasting wave-length I am receiving Shanghai (Kellogg Switchboard and Supply Co.) daily. I can also receive Manila. Japanese stations came in at good L.S. strength when the set was first tried.

On the short waves I got P C J J and Chelmsford. (The latter at 3 a.m. local time.) I am a regular reader of your wonderful paper. The technical informations were simple and easy to understand. I follow the works of 2 D A with great zest.

Yours faithfully,
A. ROSARIO.
St. Joseph's Bldg., Middle Blk.,
Robinson Rd., Hongkong.

SHORT-WAVE NOTES.

By W. L. S.

THE amateurs have nearly all adopted the new wave-length bands by now, and certainly all the U.S.A. amateur stations are using their new call-signs incorporating "W" as the first letter. Our own stations have to add "G," and as an integral part of the call-sign, not as an "intermediate."

Thus British 2 O D calling American 2 R S will no longer send "2 R S nu eg 2 O D," but "W 2 R S de G 2 O D." Other countries are following suit with their regulations, and the whole business will, by the end of the year at least, be cleared up so that we know where people are once more.

Enormous Improvement.

On the 20-metre band especially, an enormous improvement can be noticed in the notes and general transmissions turned out by the Americans. The D.C. note is the rule rather than the exception, and although the stations are on the whole considerably weaker than they used to be, there is so little serious interference that there is no difficulty in reading signals that used to be perpetually wiped out.

What has happened to amateur telephony? Truly there are a fair number of stations in this country turning out "fone" on the 42- and 45-metre band, but when we consider the old days, and the huge number of regular workers on telephony in London only, it seems that the art has almost died out! I predict that the new conditions will cause an awakening of interest in the 160-metre wave-band for purely "local" working, and we shall probably hear some of the old familiars back at the microphones.

Candidly, although I should be the last to belittle the wonderful work the short-wave amateurs have been doing with respect to the covering of long distances with low powers, I sometimes wonder whether those who conduct their work chiefly on telephony and study systems of modulation, etc., are not those who get through the most useful work in the end.

There are so many "variables" to consider when we carry out experiments over a long range; we cannot decide on which is the better of two circuit arrangements by carrying out tests on alternate nights, or any arrangement like that, because the conditions vary at such short notice that the results might be absolutely unreliable.

When we are working, however, on a wave-length like 160 metres and over a distance of about 15 miles, we can usually tell right away whether the man at the other end has effected an improvement or otherwise, because we do not normally find any variation in the strength of his signals from day to day.

New "Yanks."

I understand that we are to have the company of two or three more American broadcast stations below 35 metres within a couple of months.

Be this as it may, the familiar W I K (New Brunswick) on 21·48 metres has just been joined by a brother station W I Y on a slightly higher wave-length.

This is probably a sign of the times, and I think we can be certain that still more broadcasting will take place on the ultra short waves this winter.

RADIOTORIAL

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 and 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.

WHAT IS A PENTODE?

PUZZLED (Birchington-on-Sea).—"What is all this fuss about Pentodes? Are they ordinary valves with a new name, or are they extraordinary valves? If the latter, how are they extraordinary? Can they be used in just any set, or must they have special circuits? In fact, what *is* a Pentode?"

Several of the points you raise were covered or touched upon in the article called "The Pentode," in last week's "P.W." Another article on the subject will appear shortly, so that a brief summary of Pentode points will be all that is necessary here.

In brief, the "Pentode" is a revolutionary type of 5-electrode valve, for low-frequency work (i.e. it is used *after* the detector, and not before, as is the case with screened-grid valves).

Whereas the ordinary valve has four outer contacts, or "pins," the Pentode has five, the extra contact being provided in the form of a terminal.

This extra contact is the chief external difference. Inside the Pentode there are what look like *three* grids, instead of one, as in an ordinary valve.

Both of the extra "grids" are placed between the control grid and the plate of the valve. That one which is next to the plate is joined, inside the valve, to one of the filament pins. The other one is joined to the additional terminal, and is intended to be connected to H.T. +.

The effect of the arrangement is to give a very high magnification, and in fact one Pentode is, in this respect, apparently equal to two ordinary L.F. valves. The Pentode cannot therefore, be plugged into an existing set and effect an immediate improvement, but details of the required modifications, etc., and of circuits suitable will be found from time to time in "P.W."

THE "INEXPENSIVE" FOUR.

F. M. T. (Erdington, nr. Birmingham).—"I have just started to construct the 'Inexpensive' Four, a set published in 'P.W.' on Feb. 11th, and I would be very much obliged if you would enlighten me on one or two points. What capacity filament resistances are used, and how are they adjusted and, once adjusted, do they 'stay put'? I have had all sorts of advice, such as the H.F. resistance should be on the panel, as it is an important control, and that one resistance should serve all four valves. I should be glad of some definite information. The aerial coil is tapped twice, and I should like to know which tapping to use. This is my first attempt at building a set, so you will perhaps excuse my ignorance."

The correct value of filament resistance to use for any valve and for any accumulator was explained in detail on page 354, POPULAR WIRELESS No. 333, Oct. 20th, issue, and once adjusted they "stay put."

Regarding the proposed alterations, we would warn you that if you try to follow all the various suggestions you will hear and read, you will come to grief without the slightest doubt, so the best thing is to choose a design because it suits your requirements, and then *stick to it.*

When the "Inexpensive" Four was designed many modifications were tried, and many were rejected, and consequently there is a reason for every position of every wire. But in your own case, situated close to 5 G B, there is something to be said for using a variable filament resistance on the panel for the H.F. valve, to control volume. You can try it, but be careful not to make the wires to this longer than necessary—it will, of course, replace the corresponding baseboard-mounted filament resistance. We do not recommend any other modification of the wiring or lay-out.

Regarding the aerial tappings, you should try *both*, and compare results. Probably you will find that for certain stations one tapping gives better results, whilst for other stations the other tapping is more efficient. (The idea of having two tappings is to cover all conditions of reception.)

(*Continued on page* 400.)

Philips Loud-speakers for all up-to-date receivers

The new Philips Loud-speaker Type 2007 has been specially designed to operate with those modern receivers that utilise the latest valve developments, such as the Pentode. Highly sensitive, this new Philips Speaker gives wonderful reproduction. The large balanced armature movement and special cone construction are able to handle any amount of power, and yet are so sensitive that remarkable wealth of tone-colour is secured. Supplied in a variety of delightful colours. Price **£5-5**

Three impedance values available to suit output valve.

Here is the ideal low-priced speaker for thousands of radio owners with 2 and 3 valve receivers. Exceptional value. Attractive appearance. Special Dual Tone Switch.

Type 2016. Price - - **50/-**

Write for complete leaflets.

PHILIPS

for Radio

ARKS

Messrs. Philips Lamps, Ltd., Radio Dept., Philips House, 145, Charing Cross Road, London, W.C.2.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 398.*)

IMPROVING SELECTIVITY.

"DYNATRON" (no address given).—"I enclose herewith diagram of a circuit which is giving a lot of trouble in the way of jamming.

"As you can see, it is a direct-coupled tuned anode, and the tuning is very broad.

"In fact, after 6 p.m. you can hear no separate station, the interference from the unwanted signals being almost equal to the wanted signals, or if not there is a continual hum, probably a heterodyne, due to the two frequencies.

"What I want to know is: Would a coil, such as used in the 'Melody-Maker,' be more selective than the present arrangement, or would it suit at all?

"I would favour any such arrangement that would take the place of the present, that would not necessitate the changing of plug-in coils, and would still cover B.B.C. and long wavelengths.

"The circuit is H.F., Det., 2 L.F. (T.A. coupling between H.F. and Det.) with reaction.

"The transformers are as per diagram, also the variable condensers.

"I shall thank you for any suggestion that shall increase selectivity.

"'DYNATRON.'

"P.S.—There is also in the market an aperiodic tuner which covers medium and long waves (made by Messrs. R.I.-Varley, price 25s.). Would this take the place of the variometer?"

As you omitted to forward your address we are answering in words rather than by diagram, but you should find no difficulty in improving selectivity if the following simple modifications are carried out.

Disconnect the variometer at present used for tuning the aerial, and replace it by the aperiodic tuner you mention, which covers both medium and long waves. (The other type of coil would necessitate rather too much alteration in your case.)

Then disconnect the plate of V2 from the reaction coil L2, and join it instead to the reaction terminal on the tuner unit. The other reaction terminal on the tuning unit goes to the first transformer primary and to its fixed condenser.

Be sure to keep the above-named two leads well spaced apart and from other wiring, or you may have oscillation trouble. Finally, try the effect of a '0001 fixed condenser in series with the aerial, i.e. between the A terminal and the aerial lead.

The reaction coil L2 will be unnecessary, so this coil holder can be disconnected and left vacant.

These alterations should greatly improve selectivity, but a further improvement can be made, if required, by neutrodyning the H.F. valve.

The only new parts required would be a standard neutralising condenser, and centre-tapped coils for L1 (the tuned anode), instead of ordinary plug-in coils. For long waves, a 200 centre-tapped coil should be used, and for ordinary wave-lengths a 60-turn centre-tapped coil.

To alter the set for this new neutralised arrangement, disconnect the H.T.+1 lead from the anode coil and condenser, and join it instead to the centre-tap on the coil, by a flex lead. Then the *end* of this joint coil and condenser arrangement (previously joined to H.T.+1) is joined to the neutralising condenser, the other side of this being connected to the grid of V1.

Neutralising is carried out as described in these columns frequently, but remember to keep all these leads short and well spaced.

TRACKING TRANSFORMER TROUBLES.

P. N. R. (Gillingham, Kent).—"People who come round to look at the set tell me that the probability is that the transformer has gone west. How can I tell whether this is the case or not?"

If the transformer can easily be moved from the set the continuity of its windings can be tested by means of the 'phones and dry-cell method. All that is necessary is a small battery to give the tell-tale double click when the 'phones leads are connected across it.

Then, if one end of the 'phone cord is connected to one side of the battery, the remaining side of this to the terminal of the winding under test, and the remaining transformer terminal is connected to the other 'phone tag, a loud click will be heard in the telephones if the winding is O.K. If, however, the winding is broken the click will either be quite a soft one, or else no click at all will be heard. The primary is the likeliest winding to "burn out," but if this appears to be O.K. the secondary winding should be tested in the same manner.

Under Working Conditions.

If the L.F. transformer cannot easily be removed from the set for test, it can be tested for breakdown under working conditions by means of a pair of telephones.

If the two or more wires which go to the primary are removed and a pair of telephones connected across this point in the circuit, the output of the receiver to the transformer can be checked. Good results in the 'phones indicate that that the primary terminals when connected will be getting their correct input.

If now one side of the 'phones is connected to one of the primary terminals and then the remaining side of the telephones goes to the wire which previously went to this terminal, the telephones will be in series with the primary. (The remaining side of the primary should be connected to its ordinary lead, thus restoring the set to its original form except for the fact that the telephones are now linked in as well).

(*Continued on page 402.*)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 400.*)

Weak or negative results will, of course, indicate that there is no connection through the primary. The shorting of the two primary terminals by a piece of wire and the consequent 'phone signals will prove without a doubt that a fault lies between these points.

If, however, under this test the primary winding appears to be O.K. and the 'phone results are still good when connected in series with the primary, the 'phones should be taken out of circuit and placed across the transformer secondary terminals instead. Failure to get results here will be a clear indication that the fault lies in the transformer itself.

Not only can the continuity of the primary and of the secondary winding be tested by means of the 'phones and dry cell, but this method can be employed to make sure that there is no fault in the insulation between the windings.

For this test, disconnect all wires from both primary and secondary. Then join one side of the battery to one of the primary terminals, one side of the 'phones to one of the secondary terminals, and then listen in when the circuit is completed by attaching the other side of the battery to the other side of the telephones. If the insulation is as good as it should be, the fact that there is no current flowing in the circuit will be indicated by the absence of a click. But if a loud double click is heard on touching the battery and telephone terminals together it will prove that the insulation between these windings has broken down.

Investigating Insulation.

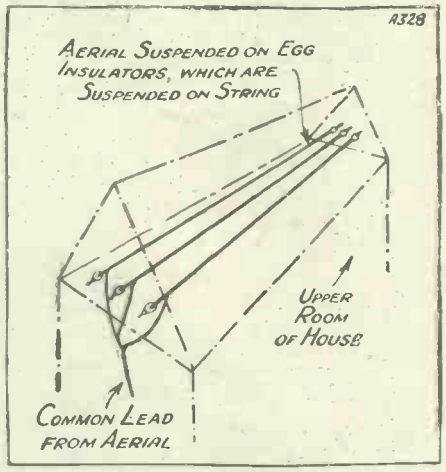
On some transformers it is the practice to provide an extra terminal by means of which the metal case of the instrument may be connected to earth. As both the primary and the secondary windings should be insulated from the earthed case of the transformer, the 'phones and dry-cell method affords us an opportunity of testing whether this insulation is correct.

In this instance the test is carried out by connecting the battery to the earth terminal on the transformer, the remaining side of the battery to the telephones, and the remaining side of the telephones to the winding under test. When this final connection is being made no sound should be heard in the 'phones, but a loud click will indicate that the winding in question is not properly insulated from the frame of the instrument.

ERECTING AN AERIAL.

R. H. C. (Woolwich).—"I never got good results on the indoor aerial at the old house, but I should like to try it again, because in this house I have a space underneath the roof which I can utilise for this purpose. My mother is practically an invalid, so that the crystal set will be used nearly all the time in the bedroom. I notice that there is a very good and convenient earth pipe running up to the cistern nearby, so this time I am going to try an indoor aerial under the roof. What form would you recommend?"

In such a case the best type of indoor aerial consists of several strands of wire in parallel with one another, and running lengthwise under the roof. The accompanying sketch shows the arrangement. but it is not necessary to limit it to three leads, though this is a very convenient number in most houses. If, however, the length of each strand is quite short, five, six, or even seven wires running closely side by side can be used, provided that the distance between them is not less than 18 in. or 1 ft., and they are not too close to a roof, pipes, or any kind of ironwork.



Every strand should be insulated at each end, as shown, and at one end they should all be joined together by a well-soldered lead and taken down to the aerial terminal on the set. It is important not to run this down lead too near to any iron or metal of any kind, or otherwise much of the energy picked up by the aerial will be wasted before it reaches the set.

(*Continued on page 404.*)

"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 a revised 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.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 402)

A SHORT-WAVE SNAG.

M. S. (Cairo, Egypt).—"Lately I am met with a difficulty upon short waves. This is, I expect, hand or body capacity. As soon as I get the carrier-wave of 5 S W a terrible roar accompanies music or speech. Unless I do not move from my place or hold my breath I am not capable of hearing at all anything but a terrible roar. The same difficulty happened in the following circuits: The 'Sydney' Two, the 'Antipodes Adaptor,' the 'All-Purpose' Three, and the 'Two-Thirty Five' (which appeared in the last issue of 'Modern Wireless'). I am aware always to put moving plates of the variable condensers to earth potential, also I use the aluminium panel. Will you let me know how to cure this?"

It is not likely that you would have had the same trouble in all these sets unless you have been using the same (or some of the same) components in them all. It is possible for one faulty component, such as a dud grid leak, or a dud grid condenser, to give rise (in any set in which it is used) to peculiar effects upon the short waves.

Possibly, however, it is not one of the components but one of the other associated connections to the set. In your case, we should say that it is probably the earth lead which you have been using all this time. Although you may take it for granted that the connection is a good one, it is possible that it is either broken underground or else that the soil surrounding it is not sufficiently moist to give good reception.

We should certainly try overhauling the earth connection completely, starting from the earth terminal of the set and making sure that not only the wire itself (which should be of thick gauge) is perfectly sound and satisfactory, but that it goes straight, without a high resistance joint anywhere, to a really good connection with moist soil, or else to a large capacity-earth of the counterpoise type. Be sure to use the earth leads as short as possible, because a long lead itself often gives rise to the effects you mention.

THE MICROPHONE.

A. F. L. (Oldham).—"As I still have my old loud speaker on hand and do not use it, I should like to try the stunt of employing this as a microphone by means of which speech can be heard from the new loud speaker which is attached to the set. I understand, as far as I can make out, all that is necessary is to insert the old loud speaker (which is to act as a microphone) in series with the grid and input of the first low-frequency amplifying valve, but I am not very clear myself as to how to do it on the actual set; especially as I want to utilise a switch, if possible, so that it can be cut in or out of circuit at a moment's notice.

"Is there any really easy way of doing this without modifying the wiring very much, and, if so, would you please give me the point-to-point connections in words, as I find these are easier to follow than the conventional sketches."

You are right in assuming that it is necessary to add only the old loud speaker in series with the grid of the first amplifying valve in order to be able to "transmit" speech from the loud speaker. When placed as stated the effect of a voice close to the diaphragm is to set up voltage variations across the grid and filament in exactly the same way as an ordinary received signal, so that the voice which is transmitting is heard in amplified form from the output of the set.

The simplest form of switching is an ordinary make-and-break switch, which should be wired across the loud-speaker terminals, i.e. across the old loud-speaker which is to be used as a microphone. In this position, when the switch is in the "off" position the loud speaker will be inserted, but when it is in the "on" position it will in effect completely short the loud speaker.

The point-to-point connections of such an arrangement are as follow: The grid of the first amplifying valve is joined to the secondary of the first L.F. transformer. The other side of the secondary of the first L.F. transformer is connected to one side of the on-and-off switch and to one side of the speaker which is to be used as a microphone. The other side of this loud speaker, and the other side of the switch are joined together and taken to grid-bias negative. This completes the wiring.

Incidentally, it should be stated that it will be necessary to disconnect either the aerial itself or some vital part of the valve set in order that the receiver shall not receive broadcasting at the same time as the speech, which would otherwise be imposed upon it. A convenient method of doing this is to pull out the detector valve or one of the tuning coils.

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speaker, and, moreover, the voltage drop across the speaker windings when they are connected straight in the anode circuit without a filter is considerable, and means that the full H.T. voltage cannot reach the valve.

Another advantage of the output filter is that where the proper connections are used it is a valuable preventive of L.F. howling due to a high-resistance H.T. battery or badly by-passed mains H.T. unit. In general, then, it is assumed that wherever a large valve is used in the last stage an output filter will be employed, as a separate unit if it is not actually provided for in the design. (It is left out in some of our sets for special reasons occasionally.)

Use a Large Valve.

When only a fairly small valve is to be used in the last stage, on the other hand, it is permissible to dispense with the filter and wire the loud-speaker terminals direct between H.T. positive and the plate terminal of the valve socket, with a considerable reduction in the cost of the set. Such a course is not really advised in the case of the present receiver, however, since it is capable of giving powerful signals which really call for a super-power valve to handle them properly.

Now as to constructional matters. You will find the set rather unusually easy to build, bearing in mind its size, since every part used is a standard component, and the ay-out is a very easy one to follow. General details as to panel drilling and component mounting are not likely to be needed by any reader likely to build this receiver, since its appeal is definitely to the man who has had a certain amount of experience and appreciates special features.

The wiring of the set is best done with a fairly stiff gauge of wire, and for all those leads which run through the screen some sort of covering is essential to prevent "shorts" (Systoflex or Glazite). The original was wired throughout with Glazite, for the sake of uniformity, but if you prefer the appearance of bare wire you can, of course, use it for all other leads than those just mentioned.

By the way, it makes the constructional work very much easier if you use for the screen one of the new type standardised for our sets, which are ready cut to size, and prepared for mounting, with the necessary holes for screws drilled in suitable positions. Further, they are provided with a row of perforations right across the lower edge, so that connecting leads can be passed through whenever desired. This is a great convenience in practice, since it means that there is no drilling to be done, and there need be no fear that the efficiency of the screen is impaired. The effect is negligible.

Now we come to the point of placing the finished set on the operating table for its first test, and here there are various practical tips to be given which will help you considerably.

First, as to valves. As we have already explained, the H.F. stage is specially arranged to enable you to get the best results of which it is capable from any particular valve by adjusting certain coil sizes (L_3 and L_4), and hence you can use a great variety of types in the first socket with good results. Actually, this means that there will be much less difference in results with various types than in most sets, yet in general it is well to note that a fairly high impedance, high amplification factor valve is rather to be preferred.

For example, one of the lower impedance R.C. valves, with a rating of 40,000 to 60,000 ohms, is good, and should be chosen if you are actually buying a new one for the set. If it is merely a matter of going through your stock and picking one of those available, it is to be noted that one of the H.F. type, with an impedance of from 15,000 to 30,000 ohms, is also quite good, and you will find these are included in practically every well-known make (Mullard, Cossor, Ediswan, Cosmos, B.T.H., Marconi and Osram, Six-Sixty, etc.), and can be of either 2- or 6-volt filament rating. The set works quite well on two-volters, and they should obviously be chosen where economy is a very vital factor.

The Early Stages.

For the detector and first L.F. positions the requirements are not critical, and good results will be obtained with any valves of the H.F. or general-purpose types, with impedances of from 15,000 to 30,000 ohms, provided they are of good makes. For the very best results it is advisable, however, to pick a definite H.F. type of 20,000 to 30,000 ohms for the detector, and a rather lower impedance (small L.F. or general-purpose type) of from 10,000 to 15,000 for

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the first L.F. stage. For the last stage a power or super-power valve is the only possible recommendation for real quality, and it should certainly be a super-power type if your H.T. supply can stand up to the load involved. (This means that it must be a double or treble capacity if it is of the dry type.)

Voltage Requirements.

H.T. voltages, you will find, should be pretty much the standard ones for a set of this type, i.e. 90 or 100 volts on the H.F. valve (H.T.+1), 60 or 70 on the detector (H.T.+2), and the maximum available on the L.F. stages (H.T. +3). The only adjustment needed here is that of the voltage on H.T.+2, which may require a little alteration to get the best reaction effects.

Coil sizes are given in a brief form on the blueprint, and a few further notes may be of assistance. As regards the aerial coil L_1, the usual rule applies, i.e. the larger the coil the flatter the tuning, hence a small size should be used where high selectivity is needed. Small sizes, however, give slightly less volume, and hence it is a matter of compromise.

Coil Adjustment.

It is in the anode circuit that the main adjustment is needed, as you will have gathered already. The two coils in series (L_3 and L_4), which constitute the tuning inductance here, must be of sizes which add up to about a No. 60 or 75 (for the lower wave-band), and by juggling with their sizes you can get all sorts of different degrees of selectivity and suit the impedance of widely differing valves.

For example, with equal sizes you have a centre tap, which gives reasonable selectivity and will suit moderately high impedance valves. If you use a No. 50 in L_3 and a No. 25 in L_4 you have roughly two-thirds of the "coil" in the anode circuit, which gives lower selectivity with a given valve, and is suited to a higher impedance type of valve.

TERSE TECHNICALITIES.

IF an L.T. battery has to be stood aside for several weeks, remember that it should first be properly charged.

* * *

When threaded brass rod has to be cut it is a good plan to screw several nuts on to the rod, as when these are removed they will tend to straighten out any small irregularities in the thread due to the cutting.

* * *

When wiring up a set, remember that it is the high-frequency leads which are of the greatest importance, and these should be kept as short and direct as possible.

* * *

When constructing a multi-valver, remember there is a lot to be said for concluding the filament wiring first.

TRANSFORMER RATIOS.

HAS it ever occurred to you that if we knew how to design a suitable transformer, we should hardly ever require more than one stage of amplification?

In the low-frequency portion of an amplifier, signals are magnified partly by the valves and partly by the intervalve transformers, when these are employed. Thus, to take a very simple case, we might have a detector valve coupled by a transformer with a ratio of transformation of two-to-one, to a small power valve working directly into the loud speaker.

Bulky and Inefficient.

If the magnification due to the detector was 10, and that due to the power valve was 5, the total magnification obtained would be, roughly, $10 \times 5 \times 2 = 100$ times. If the transformer ratio were 5 to 1, instead of 2 to 1, the total magnification would be about 250. Still further amplification would necessitate the addition of another valve.

Now, why could we not use a transformer with a ratio of, say, 50 to 1, and use it for coupling the detector directly to a very big power valve, and thus obtain all the volume we required, even if the original signals were very faint?

To begin with, in order to deal with low notes, a transformer must have a great many turns of wire on its primary winding, to give what is known as a high primary inductance. In fact, the more turns the better, providing that the resistance of the winding can be kept from getting too high. If the ratio of transformation were 50 to 1 the secondary winding would then need to have fifty times as many turns.

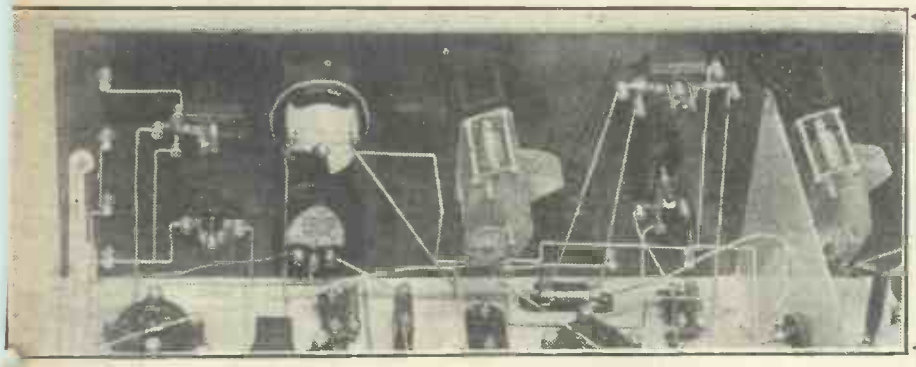
Even if this was not impossibly expensive and bulky, the very fact of its having so much wire on it would prevent it from reproducing high notes, for the turns would serve as thousands of little condensers which would by-pass the high-note currents instead of allowing them to pass round the winding.

Question of Voltage Drop.

There are other equally serious objections to extremely high ratios of transformation, largely bound up with the somewhat mystical requirements of "impedance matching," but these cannot be dealt with here.

Since all the voltage in the output circuit of a valve is split up between the transformer winding and the valve itself, the voltage spent on the former should be as high, and on the latter as low, as possible. Hence, a valve of high internal resistance, such as a detector valve, will require to be followed by a transformer of much higher primary impedance (i.e. resistance effect) than will a low-resistance power valve. For this reason, a transformer for first-stage working is more difficult to design than one for connection between two power valves.

It is therefore a wise plan, unless transformers of known suitable design are available, to employ resistance or choke coupling in the early stages of an amplifier, and reserve the use of a transformer, preferably of a low transformation ratio, for use before the last power valve.



CONNECTING CONDENSERS

A save-you-money article telling how to combine condensers to get different capacities.

By A. NIGHTINGALE.

CONNECTING condensers together is both safe and profitable—safe because a condenser is an insulator, and no matter where you connect it in your set you will short nothing and burn out nothing; profitable because connecting two condensers together alters their effective capacity, thus giving you in effect a third or a fourth condenser.

This joining condensers together is simplicity itself. Here are the rules. Every condenser, whether fixed or moving, has two terminals. We will call one (it doesn't matter which) the A terminal, and the other the B terminal. Having done so, let us see how two condensers can be connected together to form a third. Let's suppose that they are two fixed condensers, and that both of them have a capacity of ·0005 mfd. stamped upon them.

Four Capacities with Two Condensers.

Although you have only two condensers here, there are really four! How? Let us connect them together and see.

Each condenser has one A and one B terminal, as stated previously. If we join the two A terminals together and to a flexible lead, and join the B terminals together by another flexible lead, we shall have an A and a B lead. The capacity across these two leads will *not* be ·0005 mfd. (which is the capacity of either one of the condensers), but it will be ·001, which is the result of ·0005 plus ·0005 mfd.

When joined in this way condensers are said to be connected "in parallel."

You will notice that when two or more condensers are connected together in this way, their capacities are *added together*. That is to say, the total capacity across the leads A and B will always be greater than any of the single capacities. Is there, on the other hand, any method of getting a *smaller* capacity?

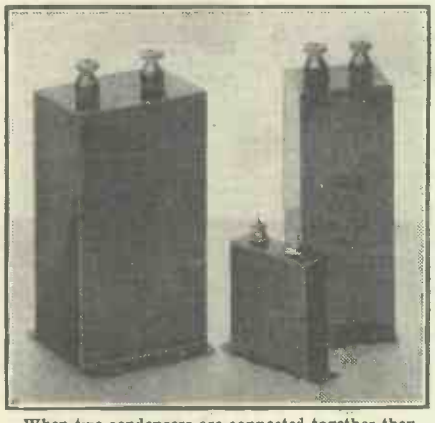
Measuring Instruments Unnecessary.

There is. Imagine that we are starting again with our two original ·0005-mfd. condensers. But this time, instead of connecting A to A and B to B, and having an A and a B lead left, we will connect them differently. We will connect the A terminal on one to the B terminal on the other. Leave this as permanent connection, and turn your attention to the remaining terminals on the two condensers.

On one condenser you have an A terminal left, and on the other the B terminal. If you put flexible leads under these two terminals you will still have an A and B lead, but what will be the capacity across these? Actually, although these are both ·0005-mfd. condensers, the total capacity of the two connected in this way will be only ·00025 mfd. This is a smaller capacity than either of the two separate condensers, so it is evident that by connecting in this way one can get a *fourth* capacity out of the *two* condensers.

To summarise, if we start off with two ·0005-mfd. condensers, and they are not connected together at all, we have only two condensers. If they are connected "in parallel" as first described, we have in effect a third condenser, which is larger. If, however, they are connected in series (that is, joined up A–B, A–B, etc., etc.) we have in effect a fourth condenser which is smaller than either of the separate ones.

Now, in order to join condensers together effectively and profitably, we must know their final capacity across the leads. Instruments to measure this are extremely expensive; but there is no need to measure



When two condensers are connected together they give a third capacity which is different from that of either of the separate condensers.

it. There is one instrument that does not measure, but can *calculate* it, and that instrument is your good old headpiece, or brainbox. Once you know the rule you can always calculate what the resulting capacity will be.

The rule for connecting condensers in parallel is simplicity itself, and has already been given. As stated, if you join all the A's together and all the B's together, all you have to do is to put down the separate capacities, add them up, and there you are! You ought to be able to do it mentally, it is so easy, and just to make sure you have the idea we will give two examples here. (The answers to these you can write in pencil and then compare them with those given in the next paragraph.) The first example is, suppose you have a ·0001 and a ·0003 condenser connected together in parallel, what will be the total capacity? The second example is, suppose you have a 1-mfd. condenser and a ·001-mfd. condenser connected in parallel, what would be the total capacity of this pair?

There is no catch in it, but as brain tests are all the rage, we might as well introduce them into wireless. The answers to these two foregoing examples are ·0004 mfd. and 1·001 mfd. respectively.

Capacities In Series.

Having finished the above brain test—(did you get it right?)—what about condensers *in series*? Unfortunately, this is not so simple. If you look at a text-book you will find that the rule is stated like this: "For condensers in series, the reciprocal of the total capacity of these is equal to the sum of the reciprocal of the individual capacity."

That, no doubt, is true. But if you are a little out of touch with your Eton, Harrow, Oxford or Cambridge days, you may have forgotten totally what a "reciprocal" is. So let us look at it in a different light altogether. In a nice, homely, friendly sort of way.

Let us take our two original ·0005-mfd. condensers and connect them in series. To add a touch of life, we will call one of them Jim and the other Bill. Jim's capacity is ·0005 mfd. Bill's capacity is ·0005 mfd. What is the capacity of Jim-Bill *in series?*

First put down the capacity of Jim. Divide that figure into one. Put down that answer. Then leave Jim for a moment, and put down the capacity of Bill. Divide Bill into one. Put down that answer. Now add those two answers together. Finally divide that last total into one, and you have your final answer, i.e., you have the capacity of Jim and Bill, in series.

We will have one more example of connection in series, just to make sure. This time we will take three different condensers and we will call them, just for a lark, Faith, Hope and Charity. Faith has a capacity of ·001. Hope also has a capacity of ·001. Charity has a capacity of ·002 (you will notice that the greatest of these is Charity!). What is the total capacity of Faith, Hope and Charity in series?

A Final Example.

First of all you put down Faith's capacity, ·001, and divide into one (the result is a thousand). Then you take Hope's capacity, and divide that into one (again the result is a thousand). Then you take Charity's capacity (·002 mfd.) and divide that into one. The result is 500. Now add the three results together and you get a total of 2,500; and the last step is to divide *that* into one. The answer is 0·0004, and that is the total capacity of those three condensers in series.

No matter how many condensers you have in series they can be reckoned out in the same way.

SOLDERING SIMPLIFIED.

By P. R. BIRD.

WHEN faced with a new set to build, does your heart fail you when you think of soldering? There is a pleasure in choosing the cabinet and the buying of components is sometimes a sheer joy, especially if you can get a bargain or two. The mounting up of the parts, too, is rather an attractive business, and many of us who sit at a desk all day find, with a strange satisfaction, that we are quite adepts with a screwdriver! But when the components are all in place and everything is screwed down, do you feel "up against it" when it comes to the soldering?

If so, I hope the following hints, will prove helpful, although I am afraid there is nothing novel about them; but if in the past you have had difficulty with soldering you may be suprised to find how much it can be simplified by following these few simple rules.

Mistake Number One.

Let us in imagination follow the problems of John Listener when soldering up a set. Having mounted all the components in place and ascertained that the panel fits nicely, that the condensers all move without fouling the coils, etc., he hurriedly opens his soldering tin, glances at the iron, and starts soldering right away. That is mistake number one!

Soldering being a separate part of the process, it is a good plan to pause before commencing. Clear the deck. Put the cabinet out of harm's way, pick up all the screws, etc., clear away the tools you have been using, and leave yourself an empty bench, except for the set itself and the soldering kit.

Although the set may appear to be quite ready for business, the probability is that John Listener has forgotten all about the filing. All filing should be carried out before the flux tin is opened, so that all terminal ends and other points which will carry a soldered joint should be filed first.

A Tip for Filing.

Although the filing is done in a few moments it is suprising how much metal dust is caused by this, and the careful workman places the set in such a position that the specks of metal dust fall straight on to the bench or floor, and do not spread over the variable condenser vanes, valve holders, etc., where they can cause any amount of trouble. (If the filing is done while the set is still dry such damage is comparatively slight, but the difficulty of removing brass dust from a "well-fluxed-up" set has to be experienced to be believed!)

Still resisting the temptation to open the flux tin, John Listener should next look for a small brush (an old shaving brush will do nicely), and before going any further every speck of metal dust should be brushed off the set with this. When this has been done, and not till then, the actual soldering can be embarked upon.

If John Listener is unfortunate enough

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SIMPLIFIED SOLDERING

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to have to heat his iron by means of a fire he will soon be in trouble from accumulations of smoke, cinder, etc. Even the cleanest fire is very dirty compared with gas, for instance, but a very great improvement can be effected by a little tin, such as a mustard tin. If this is placed in the heart of the fire, and the glowing coal heaped around it, the end of the soldering iron may be placed in the tin, where it will be protected from cinders, etc.

A Heating Hint.

The more fortunate John Listener does his soldering on a gas stove. But how often is the large gas ring flaring away unnecessarily, and how often does the iron roll off the stove, or amongst the bars, because it will not stay exactly where it is put? If only John Listener would light the smallest ring on the stove (preferably one of the "keep-the-kettle-on-the-boil" variety) and would place near it a large cloth, on which the soldering iron could be laid, he would find it possible to get the point of the iron exactly in the centre of the flame. Arranged thus, even the smallest burner will provide plenty of heat without wasting the gas.

The tinning of the soldering iron is rather a troublesome business, and not everyone realises that there is no necessity for tinning all four sides of it equally well. After the first tinning all round, only two, or even one of the sides need be retinned, and used for working.

Remember, too, that not only should the iron be tinned, but so also should the wires to be soldered. If they are clean a touch of the flux followed by a touch of the hot iron will spread a blob of solder over each surface. Then the actual soldering is the simplest thing in the world, for all that is necessary is to place those two surfaces together, hold them still, and to heat them both equally with the hot iron.

Keeping Clothes Clean.

Once having learned how easy it is, John Listener is apt to get excited, and, leaning over triumphantly to make yet another perfect one, places his elbow in the open flux tin! To the great detriment of his suit of clothes!

Try punching a small hole in the lid, big enough to pass a match through, and then keep one nice, long, clean match for applying the flux, replacing it in the hole as you go along. (I still remember the man who put me wise to this trick, and the gratitude with which I regarded him!)

Finally, John Listener should remember the finest dodge of all in soldering—clean up as you go. To do this keep a soft cloth at hand all the time and as soon as the joint is made and whilst it is still hot, wipe it over with the cloth. All the flux on the joint will be liquified by the heat, and one wipe with the cloth is sufficient to remove it completely. If you should forget to do so, after a few moments have elapsed a greasy deposit of cooling flux starts to form on the wires, which will pick up every spot of dust and dirt it can gather in. You will find it almost impossible to remove this once the flux is cool, so that if you wish to make soldering a pleasure do not forget to clean up as you go.

STEERING BY RADIO.

By SEXTON O'CONNOR.

THERE are many ways in which wireless can be utilised to assist in the navigation of aeroplanes, ships, and similar craft. Perhaps the best-known example is the use of the direction-finder at sea.

In actual practice there are several methods by which a ship can get its bearings by radio.

The direction of the incoming waves from a known "beacon" station on land can be analysed by means of a frame aerial on the ship, and the process repeated on a second station, so that two "direction lines" are found. The ship must then be located at the point where the two lines meet when plotted out on a map.

Getting "Bearings"

Or the ship simply calls up a given land station and asks the latter to find out the direction of the ship as given by a frame aerial located at the land station. In a few minutes this information can be transmitted from the land station back to the ship. The same request is then transmitted by wireless from the ship to another land station. Presently back comes the required information from the second land station.

The ship's navigator has now got his "bearings" relatively to two known points on land and, by plotting them out on a map, he can fix his position at the point where they intersect. This method, although practically the same as the first, gives a more accurate result, because the manipulation of the rotating frame aerial or "radio goniometer" used for analysing the direction of the signal wave can be carried out under more ideal conditions at a land station than on board a moving ship.

A third method depends upon the use of a rotating beam of wireless waves. A frame aerial or a miniature "beam"

(*Continued on next page.*)

STEERING BY RADIO.

(Continued from previous page.)

transmitter is installed at a convenient spot near the coast, and sends out a directed ray of signal energy which sweeps round the horizon at a definite rate in much the same way as a lighthouse sends out a rotating beam of light.

On board the ship, the navigator listens-in to the heterodyne note with a chronometer in his hand. Taking the simplest case, he hears a note of constant pitch growing in strength to a maximum as the beam of energy sweeps across the ship in its circular path, and then dying away to silence. This sequence is repeated, say, once every thirty or sixty seconds, according to the rate at which the "wireless lighthouse" revolves.

Ingenious Scheme.

This, in itself, is not sufficient to give the required information. In addition to sending out a steady stream of wireless waves, the letter "N" is transmitted automatically—say, as the radio beam points north—and the letter "S" as it crosses the southern point of the compass. The eastern and western points could be similarly indicated, if necessary.

The actual transmission is effected by a set of contacts fixed on the base of the transmitter and co-acting with the rotating part of the frame.

The navigator now listens for, say, the signal "N" or "S." Directly he hears it, he starts the chronometer, and keeps it going until the steady CW note in the 'phones reaches its maximum strength.

In this way, the chronometer actually measures the time interval between the true "N" point and the ship's bearing. By arranging the indicator hand to move at the same speed as the rotating wireless beam, it shows the ship's bearing directly on inspection.

A NEW KIND OF NATURAL HISTORY.

WONDERS OF ANIMAL LIFE.

Successful Fortnightly Work.

WHEN natural history is treated in the way in which it is pictured and described in WONDERS OF ANIMAL LIFE it becomes easily one of the most fascinating subjects under the sun. There is almost no end of the interesting revelations in this work concerning the lives, habits and customs of the inhabitants of the animal kingdom. Each fortnightly part is arranged to include special articles on mammals, reptiles, birds, fishes and insects; each article written by an acknowledged expert.

The demand for Part 1 has already been very great and intending purchasers should secure a copy with the least possible delay. This part includes a wonderful Colour Plate in which there are 198 pictures of animals in their natural colours. The complete work will contain over 2,000 photographs and numerous colour plates. It will be completed in about thirty fortnightly parts, price 1s. 3d. each.

TECHNICAL NOTES.

(*Continued from page 374.*)

question as to how far reliance for acoustic effects should be placed upon the natural acoustic properties of a room or building and to what extent it may be preferable to employ methods for the artificial control of acoustic effects. Incidentally, the reason for the move of the 2 L O studio—if it should be moved—is really connected with the more ordinary problem of finding accommodation for a full operatic performance.

At one time broadcasting studios and gramophone recording studios (especially the latter) were chosen for their acoustic features and in a rather crude way attempts were made to modify or improve the acoustic properties to suit requirements. I have even seen in recording rooms horizontal wires stretched at intervals across the room, apparently according to the old-fashioned belief that such wires materially improve the acoustics. This belief is to be classed with the old idea that the sun makes a fire go out!

Artificial Control.

In the modification and control of the acoustics of a studio a great deal can be done by means of what are known as artificial echoes and by a skilful manipulation of loud-speaker reproductions of the original sound, introducing time intervals of various fractions of a second, it is possible to simulate the characteristics of all kinds of "rooms," from a drawing-room to a cathedral.

New Valves.

The G.E.C. have sent me a number of samples of their most recent Osram valves, and although I have not yet had time to try these as thoroughly as I hope to do, I should like to take the opportunity of mentioning some of their special characteristics. They incorporate some considerable improvements or previous types and one of the most important new features is a special process by which the filament is provided with a tenacious coating of highly-emitting electron material. In the majority of cases the amplification factor is increased by 10 to 20 per cent, the impedance in the case of the H.F. valves being increased and in the case of the L.F. power valves being decreased.

Screen-Grid.

The new 2-volt single-ended screen-grid valve—Osram S.215—has also been forwarded to me for examination. This was marketed on September 1st, and so is fairly familiar to my readers by now. This valve has the extraordinary amplification factor of 170 with an impedance of 200,000 ohms, special care having been taken in order to provide a rigid construction.

I have also received some of the A.C. valves, the H. Point 8, H.L. Point 8, P. Point 8, and S. Point 8, which operate on a filament voltage of ·8 volts with a filament current of ·8 amp. The first is for R.C.

(*Continued on next page.*)

TECHNICAL NOTES.

(*Continued from previous page.*)

amplification; the second H.F. and general purpose; the third power-valve, and the fourth screen-grid H.F. The K.H.1 and the K.L.1 are also included, these being, of course, well-known valves using the indirectly-heated cathode, the first being H.F. and detector and the second L.F. and general purpose.

I hope to say more about these valves at an early date.

Some Eliminator Hints.

I receive many communications from readers on the question of making up high-tension eliminators for their own use, and it may be useful to give a few general hints on some of the points which most frequently arise.

Provided a reliable rectifier is used (I am thinking, of course, of eliminators for use on alternating-current mains) and proper components, there is really nothing very much to go wrong, and it is largely a question of proper mounting and correct and careful wiring.

You should bear in mind, in the first place, that inasmuch as you have a transformer at one end and choke coils at the other, both of these generating alternating-current flux, it is important to guard against any inter-acting fields which may cause alternating-current hum. The simplest remedy is to place these units sufficiently far apart and in positions in which the fluxes will not be likely to inter-act seriously.

Screening.

Instead of using busbar it is preferable to use rubber-covered wire, since the voltages handled in the H.T. unit are fairly high and it is just as well not to take any risks.

Metal cases of transformers, chokes, and condensers should be connected to earth, and it is not a bad plan to place an electro-magnetic shield, such as some pieces of thin sheet iron (so-called "tinplate") serves the purpose excellently) over the entire assembly when completed.

Motor-Boating.

If motor-boating is encountered, a larger condenser for the "tank" or last filter condenser should be used; values up to 10 or 20 microfarads will generally cure motor-boating and improve tone quality, especially on sustained bass notes.

At the high-frequency end, an H.F. choke may be introduced in the positive high-tension lead with a 0·1 microfarad condenser shunted across the positive H.F. plate lead and the high-tension negative.

If a valve rectifier is used, care should be taken not to overload it, since, although it may act fairly efficiently for a time, its life will be materially shortened by overload.

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