

"P.W.'s" SPECIAL VALVE NUMBER

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 327. Vol. XIII.

INCORPORATING "WIRELESS"

September 8th, 1928.

*Outstanding Features in this Issue*

## FOR THE NEWCOMER

(2nd Article)

ABOUT MODERN VALVES. "S.G.'s" AND PENTODES

THE "FLEXIBLE" THREE

CHEAPER WIRELESS.

FACTS ABOUT VALVE-HOLDERS.



# EXTENDING a Famous Line

In addition to the already renowned K.C. Condenser, Dubilier have now produced three new models. Well designed and well made of only the best materials, they maintain the standard of Dubilier efficiency.

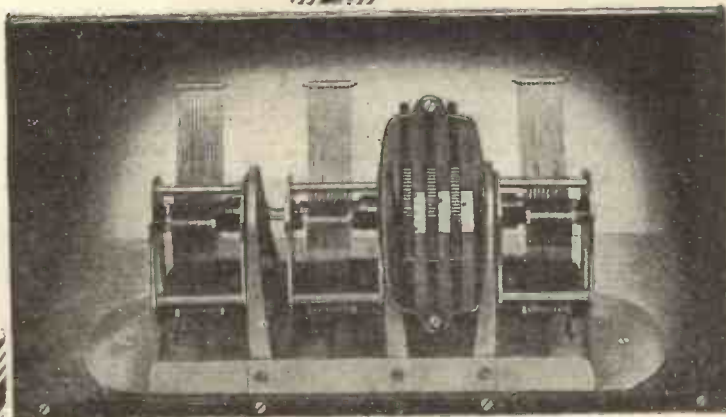
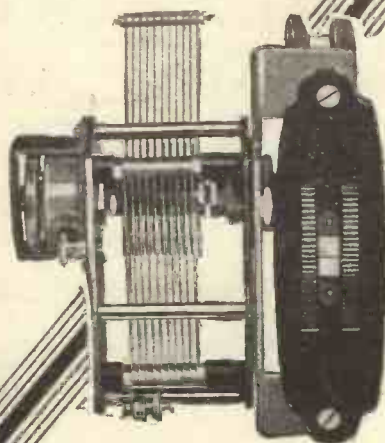
"K.C." Condenser with drum-control and slow-motion device (illustrated on right).  
·0003 or ·0005. **15/6**

"K.C." Triple Condenser (illustrated below), consisting of three ·0003 or three ·0005 units.

**38/6**  
Combinations of ·0003 and ·0005. **40/-**



"K.C." Condenser (illustrated above), without Knob, Dial or Slow-motion device. **8/-**  
·0003 or ·0005.



Come and see these Condensers at

**STANDS**

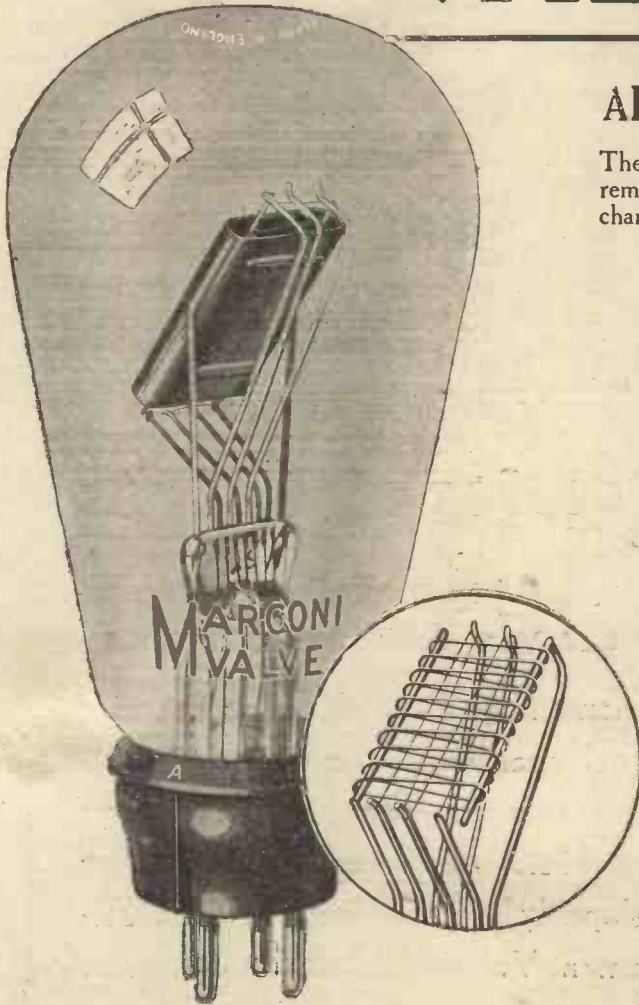
**102 - 103**

Radio Exhibition,  
Olympia,  
September 22 to 29.

**DUBILIER**  
CONDENSERS

Advt. of Dubilier Condenser Co. (1925), Ltd.,  
Ducon Works, Victoria Road, North Acton, W.3.

# Marconi VALVES



TYPE P625.

**DULL EMITTER, LOW FREQUENCY, POWER AMPLIFYING VALVE.**

**NOMINAL RATING.**

Filament Volts	60 max.
Filament Current	0.25 amps.
Anode Volts	250 max.
Anode Current, max.	24 m/amps.
At Anode Volts 100.	Grid Volts 0.
Amplification Factor	6
Impedance	2,400 ohms.
Normal Slope	2.5 Ma/v.

Marconi P625 is a new super-power valve which will be welcomed by all moving-coil enthusiasts. Its power output at 250 volts H.T. is sufficient to drive such a speaker at full volume. The low impedance matches the average high-resistance coil, while the high magnification gives increased volume for a given input.

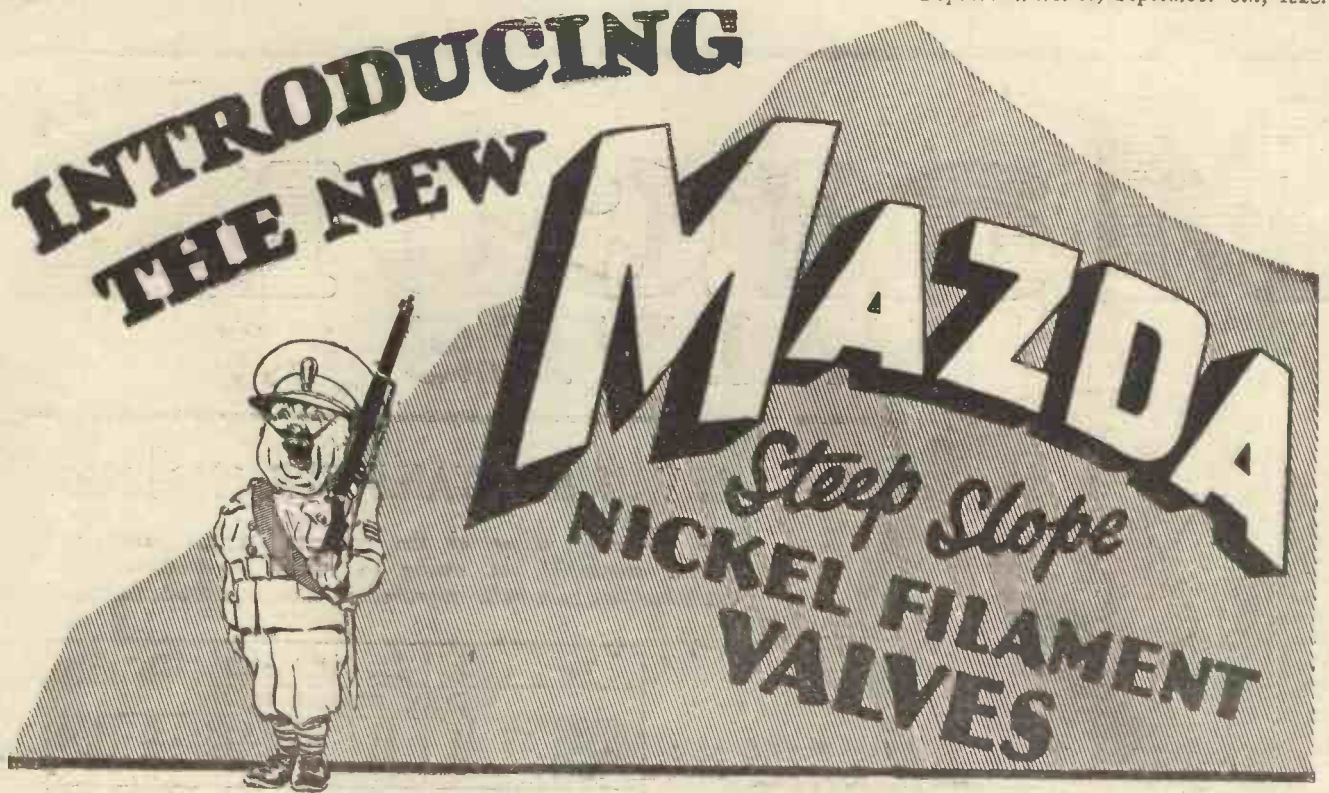
## ADVANCE DETAILS FOR 1928-1929.

The following valves of the present Marconi range will remain standard, but owing to certain developments the characteristics have been improved as shown in the table below.

Type	Fil. Volts	Fil. Amps.	Anode Volts	Impedance	Amplifn. Factor	Price s. d.
<b>GENERAL-PURPOSE VALVES.</b>						
D.E.L.210 ..	2.0	0.1	150	12,000	11	10 6
H.L.210 ..	2.0	0.1	150	23,000	20	10 6
D.E.L.410 ..	4.0	0.1	150	8,500	15	10 6
D.E.L.610 ..	6.0	0.1	150	7,500	15	10 6
<b>RESISTANCE-CAPACITY-COUPLING AND HIGH-FREQUENCY AMPLIFYING AND RECTIFYING VALVES.</b>						
D.E.H.210 ..	2.0	0.1	150	50,000	35	10 6
D.E.H.410 ..	4.0	0.1	150	60,000	40	10 6
L.S.5 B. ..	4.25-5.25	0.8	400	25,000	20	25 0
D.E.H.610 ..	6.0	0.1	150	60,000	40	10 6
D.E.5 B. ..	5-6	0.25	150	30,000	20	12 6
<b>POWER AMPLIFYING VALVES.</b>						
D.E.P.215 ..	2.0	0.15	150	5,000	7	12 6
D.E.P.240 ..	2.0	0.4	150	2,500	4	15 0
D.E.P.410 ..	4.0	0.1	150	5,000	7.5	12 6
L.S.5 ..	4.25-5.25	0.8	400	6,000	5	25 0
L.S.5A ..	4.25-5.25	0.8	400	2,750	2.5	25 0
D.E.5 ..	5-6	0.25	140	7,000	7	12 6
D.E.5A ..	5-6	0.25	150	4,000	3.5	12 6
D.E.P.610 ..	6.0	0.1	150	3,500	8	12 6
<b>SCREENED GRID VALVE.</b>						
S.625 ..	6.0	0.25	180	175,000	110	22 6
<b>INDIRECTLY HEATED CATHODE VALVES.</b>						
K.L.1 ..	3.5	2.0	150	3,750	7.5	15 0
K.H.1 ..	3.5	2.0	150	33,000	40	15 0

**NEW TYPES of Marconi Valves which will be introduced during next season.**

Type	Description	Fil. Volts.	Fil. Amps.	Anode Volts.	Imp.	Mag.	Price s. d.
P.425	4 v. Super Power Valve	4.0	0.25	150	2,300	4.5	15 0
P.625A	6 v. Super Power Valves	6.0	0.25	180	1,600	3.7	15 0
P.625	General Purpose 6v. Valve ..	6.0	0.25	250	2,400	6.0	15 0
H.L.610	A.C. Directly Heated Cathode Valve for Res. Cap. Coupling or H.F. ..	6.0	0.1	150	30,000	30	10 6
H.0.8	A.C. Directly Heated Cathode Valve, General Purpose ..	0.8	0.8	150	55,000	40	15 0
P.0.8	A.C. Directly Heated Cathode Valve for L.F. ..	0.8	0.8	150	17,000	17	15 0
S.0.8	A.C. Directly Heated Cathode Valve with Screened Grid ..	0.8	0.8	150	6,000	6.0	17 6
S.215	2 v. Screened Grid Valve ..	2.0	0.15	150	200,000	160	25 0
P.T.235	Pentode Valve ..	2.0	0.35	150	200,000	170	22 6
					55,000	90	25 0



## A wonderful new series of Valves

This new series of valves, invented at Rugby and made and guaranteed by the largest and most up-to-date electrical organisation in the world, possess unique qualities. The reason lies in the use of a *nickel filament*.

### **Nickel Filaments mean Steep "Slope"**

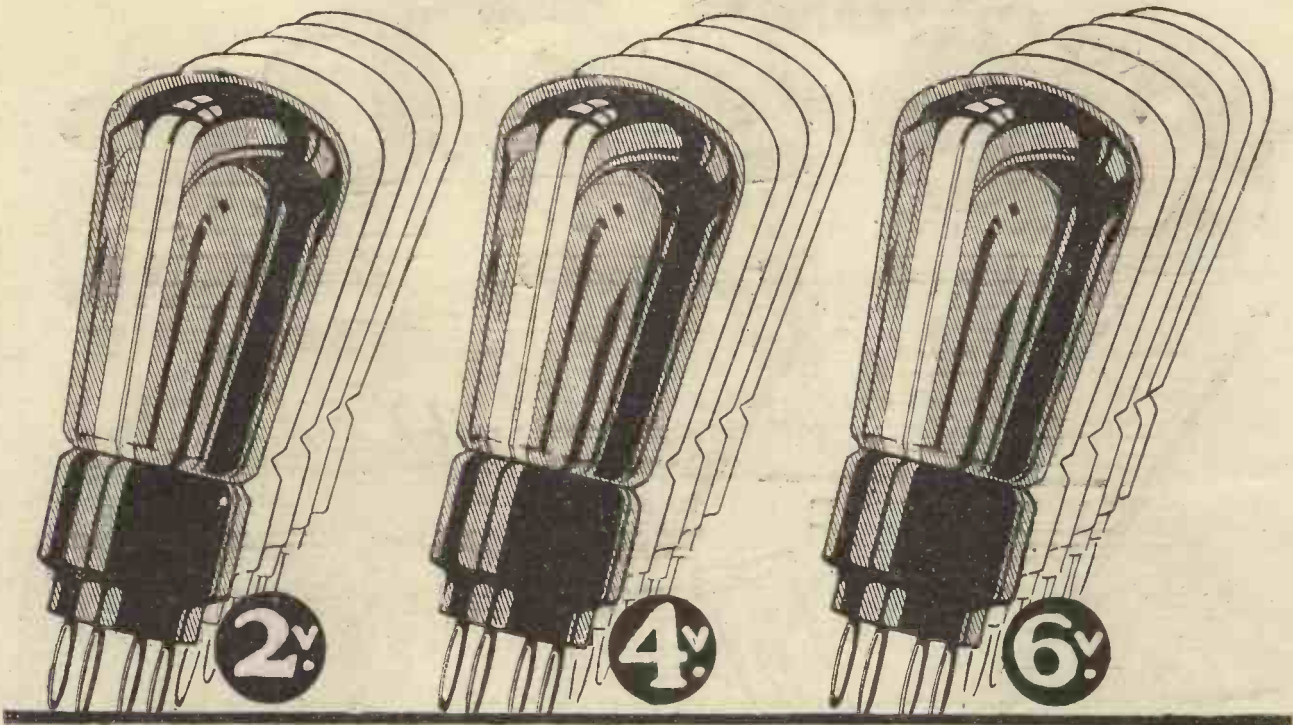
The quality of a valve is indicated by the mutual conductance or "slope" figure. Nickel filament valves have higher slope values than any other valves of corresponding types.

### **Steep "Slope" means better results**

Remember that "slope" is the only real measure of the essential goodness of a valve, or of its value to you as a listener. Because of the higher slope value of Mazda Nickel Filament Valves they are better valves.

To ensure the best reception and the longest life for your valves, you must use Mazdas.

*Ask for the Valves with the Nickel Filament, they cost no more than ordinary valves*



## The New Mazda Valves are made in 2, 4 and 6 volt types

Mazda Nickel Filament 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—the real indication of the goodness of a valve.

### TWO VOLTS

Type	Max. H.T. Volts	Ampl. Factor	Imp. ohms	Slope
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	Max. H.T. Volts	Ampl. Factor	Imp. ohms	Slope
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	Max. H.T. Volts	Ampl. Factor	Imp. ohms	Slope
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

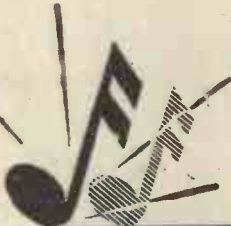
The prefix letters indicate the purpose of a valve, and the figures which follow, the filament volts and amperes. For example:—L.F. 215 represents a 2-volt low frequency amplifying valve, taking 0.15 ampere.

**Free Book :** Ask your dealer for the Free Booklet giving detailed characteristics of the new range of Mazda Valves. To the technically inclined it gives positive proof of the superiority of the Nickel Filament Valve: for the non-technical it contains some valuable hints to bear in mind when choosing a valve.

The British Thomson-Houston Co. Ltd.

**National Radio Exhibition Olympia**

# Cossonor for



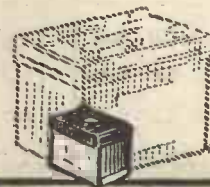
**VOLUME**



**LONG LIFE**



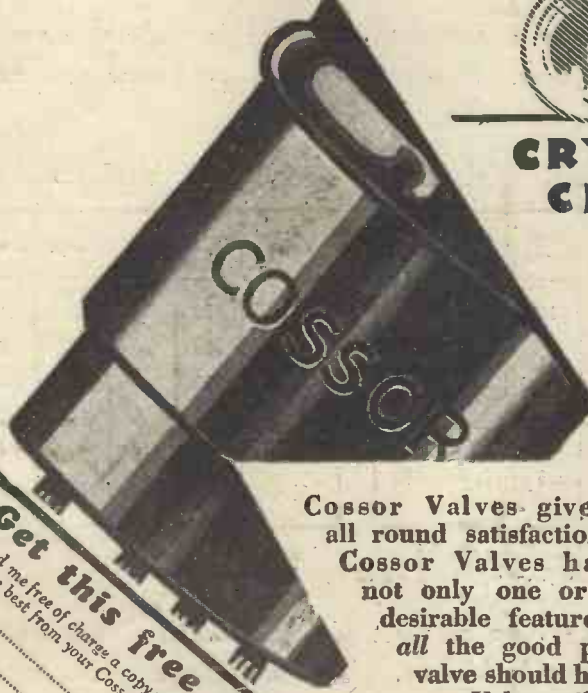
**CRYSTAL CLARITY**



**ECONOMY**



**DISTANCE**



Cossonor Valves give all round satisfaction. Cossonor Valves have not only one or two desirable features but all the good points a valve should have. Cossonor Valves will definitely improve the performance of any Receiver. Use them in yours.

**Get this free Book!**

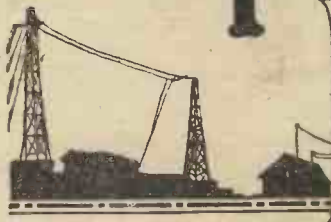
Please send me free of charge a copy of your 48 page book "How to get the best from your Cossonor Melody Maker."

Name .....

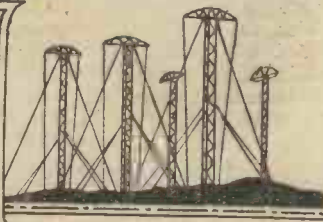
Address .....

P.W., 8/9/28.

# Popular Wireless



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 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,  
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## RADIO NOTES AND NEWS.

The 3 L O Telepathy Test—Look Or Listen?—B.B.C. News and Talks—The Regional Scheme—Vest-Pocket Radio—Ultra-Short Waves.

### Identity of Stations.

**B**BROADCASTING authorities are still hunting for the ideal means of making clear the identity of a station to listeners of any nationality. My contribution to the problem is to suggest that a register of all known broadcasting stations be compiled in Esperanto by all broadcasting authorities and sold, with quarterly supplements, to such listeners as are interested. All stations to announce their names in Esperanto. This is a job suitable for Mr. A. R. Burrows to tackle.

### 3 L O (Melbourne) Telepathy Test.

**A** MONTH or so back I advised you that 3 L O was arranging another "telepathy" experiment, and I am now able briefly to describe the result.

Six objects were placed, one at a time, before a committee of three (two gentlemen and a lady), and listeners were asked to "concentrate" on the said objects. The objects were: 1, ash-tray; 2, ball of twine; 3, pair of scissors; 4, paper clip; 5, electric torch; 6, pair of headphones.

### And the Result.

**O**NE person visualised an ash-tray, but placed it as No. 5. Several saw coiled string, and one person a ball of wool. Scissors were "seen" by 160 persons, only one of whom correctly placed it as No. 3. One N.S.W. person saw an electric torch, and no one mentioned objects 4 and 6. The most popular objects were books, vases, coins, flowers, pencils, watches, clocks, pipes, knives, spoons

scissors, umbrellas, animals (mostly cats), glasses of ale and perfume (mostly from women).

### Also Ran.

**J**UST to demonstrate further the completeness of the *fiasco*, I may mention that amongst the things supposed to have been "seen" were: Map of Tour de France, fingers holding a match, white dot, paper relating to Shrine of Remembrance, wind freezing, lights, thick circle, map with blue sea, yellow pumpkin, announcer, Chinaman's glory, pewter money-box, canary and cage, feathered article. There is no evidence, in *this particular test*, in favour of the idea that mind can communicate with mind by other than the usual methods which have been

in vogue for ages—speech, writing, signs, etc.

### Commercial Note.

**I** LEARN that Mr. W. H. Lynas, late of Graham Amplion, Ltd., has accepted a seat on the Board of the reconstructed Burndept Company. As Mr. Lynas is a "live wire," Burndepts are to be congratulated.

### Look or Listen?

**T**HE U.S. Federal Radio Commission has authorised six stations to experiment in television on wave-lengths, 140.1, 70.05, and 61.19 to 63.79. This is dreadful! The DX man soon will be at a loss to know whether he must don headphones or spectacles, or wear those instruments in series or parallel!

### A Little DX.

**M**Y attention has been drawn to the results obtained by R. L. W. (S. Australia) on a single-control 8-valve super-neutrodyne receiver, which has four stages of H.F., and rejoices in the name "Udisco." Each station logged has been heard and definitely identified on loud speaker. The selectivity of this set may be judged from the fact that the number of stations received, if equally spaced round the dial, would work out at about two per dial degree.

### How They Romped In.

**R.** L. W.'s "bag" can be summarised as follows: 120 stations in Australia, Tasmania and

(Continued on next page.)

## THEY "LISTEN-IN" ALL DAY!



This is a corner of a testing-room in a large radio factory, and the men are busily engaged in thoroughly checking the capabilities of the finished receivers. In the centre can be seen a device used for testing the quality of reproduction of electric gramophone sound boxes and their associated equipment. (Burndept Wireless, Ltd.)

## NOTES AND NEWS.

(Continued from previous page.)

New Zealand, 59 of which can be heard at L.S. strength in daylight at any time they are operating; 46 U.S.A. stations; 10 Japan; 6 Philippines; 3 India; 2 Canada; and 3 S. Africa; and 1 each in China, Burma, Malaya, Java and Germany; 195 in all. A number of other stations in India, Europe, etc., have been heard, but not identified by call-signal. Well, it is a remarkable performance, even for eight valves. K. L. W. has an earful!

## B.B.C. News and Talks.

R. P. (Glasgow), has sent me some correspondence which passed between him and the B.B.C. He complained of the length of the bulletins and the quantity of talk. In reply the B.B.C. definitely indicated that the news was piled on for the benefit of rural listeners who have no access to evening papers. This is in defiance of the law of "the greatest good for the greatest number," a law the B.B.C. quote when it suits them. I think that R.P. pinned them down quite neatly on this point, and as they did not reply we may take it that "Programmes," whoever he may be, is still pinned.

## Postscript.

I MAY add that "Programmes" told R. P. that the B.B.C. do not recognise it as a "serious grievance" if a programme from 6.30 to 10.30 or 11 p.m. contains 45 minutes of talk. R. P. therefore instanced the programme of the night on which he replied; it had 85 minutes talk, i.e., about 31 per cent. No reply! The "odd" to R. P. Shuffle the pack!

## DX Broadcasts.

THE "fading" effect, which is the worst obstacle to consistently successful long-distance re-broadcasting, is being tackled by the B.B.C. in the following manner. Arrangements will be made for several stations in the distant country to transmit the same programme. The signals from these stations will be separately received over here, and then the output of all the receivers will be combined, and the result ought to be that the "fading" will be smoothed out. Some four or five transmitting stations will be used, on wavelengths between 16 and 50 metres.

## The Regional Scheme.

THIS said that the autumn will see a tremendous hustle in the "regional" programme scheme for the Northern and Scottish stations of the B.B.C. The programmes of Manchester, for instance, will do full justice to the genius of Leeds, Bradford, Liverpool, Sheffield, etc., and even when the stations at those places are replaced by the new high-power station at Manchester, their studios will be maintained for the convenience of local artistes.

## Captain Ariel's Finals.

GRACIE FIELDS from 2 L O, 5 X X, and other stations on September 10th. Saturday (September 8th) a programme from Cardiff, "On the Beat," being a tribute to the police force. September 13th. 2 L O. A Swiss national programme, in-

cluding yodelling. September 7th. A new, humorous, one-act play, "Pride, or Beginners, Please!" originally written for James Welch, from 2 L O. Towards the end of September you should look out for Miss K. Hamilton's turn. She is a "discovery," specialising in impersonations which are said to be marvellous. Thos. Handley is preparing a new revue for 2 L O and 5 X X called "Tommy's Tours."

## Patron Saint of Radio.

NOT to be outdone by the motorists and airmen, who have respectively elected St. Christopher and St. Raphael their patron saints, the radio operators of the French Navy have chosen Joan of Aro for theirs, and have proclaimed her to the accompaniment of an elaborate procession. Owing to an unfortunate incident, over

## SHORT WAVES.

A Scotsman recently admitted into a London hospital had his head jammed down the horn of a loud speaker. It was afterwards ascertained that, in the church from which the service was being broadcast, the collection box had been upset.

Radio Beginner: "I'd like to buy a radio set with a real large circuit."  
Set Builder: "For the love of Pete, why?"  
Radio Beginner: "Because I read in the Radio Information book that a short circuit is often the reason why your set doesn't work."—"Radio News."

He listened in to music  
From several different States,  
To jazz and opera and humour,  
Which stations dissipate.  
For three hours he listened keenly—  
For great was his delight;  
Then he rose and yawned and muttered:  
"There's nothing on the wireless to-night."

"Wireless set in a motor car," runs a headline in a daily paper.  
He must have swallowed his whisker.

A man at the Mansfield Police Court recently said: "He swore terribly at me in a broadcasting voice."  
Perhaps he was an announcer!

A new charabanc used by American tourists is fitted with armchairs, earphones, glass-topped tables, and a kitchen. When the traveller has listened-in, lunched, played cards, and had a sleep, there is always the scenery to look at.—"London Opinion."

If George Washington had had a wireless set he would never have had his reputation!

The best type of loud speakers are found between one and twelve months old.

Here lies the body of dear old Joe,  
Who died through listening to 2 L O.  
He heard them announce a reduction in the licence fee,  
He never recovered—R.I.P.

which radio men had no control, it is impossible for English radio men to share Joan with her countrymen, but if any need a patron saint, St. Elmo seems fairly apropos.

## Vest-Pocket Radio.

IT depends on the size of the pocket, of course, but the set used by Prof. Esau, of Jena University, for transmission on very short waves, is said to be no bigger than a cigar-box. He uses ordinary receiving valves and claims to have got 15½ miles with a power of less than one watt. Prof. Esau, it is reported, can kill mice and rabbits with very short waves. Pure waste of "juice," I call it; might just as well kill flies with dynamite.

## Ultra-Short Waves.

THERE is, however, a vastly important bit of the spectrum available for experiment, from 1 metre downwards, and what properties, for good or ill, may be possessed by some of the high frequencies are yet to be discovered. Ultra-violet can both kill and cure; radiant heat is beneficial in action here and dangerous there. Professor Esau kills his mouse. Other scientists cook eggs by similar means. Anyhow, for the amateur with cash and knowledge there is a virgin field of experiment waiting. Does the cancer cure lie hidden in the ether?

## Have You Done It?

PLEASE see par. on page 793, issue dated Aug. 18th. I am not the only victim, it seems. W. E. G. (Harrow), to whom I "cotton on" mightily because he and Chamber Music don't agree, had another within his sphere of influence and has kindly sent me his remedy. Which, in brief, is as follows.

## The Filaments' Friend.

THREE 5 ampere, coupling type, tumbler switches, with screws in the knobs; were mounted on a block and coupled with a strip of wood so as to form a triple-pole switch. Two small cut-outs, porcelain, were also mounted, equipped with the finest tin fuse obtainable. The wood strip was painted red and fixed so that in the "on" position it was red when roomward; in the "off" position the red faced the wall.

## Final Details.

THE left-hand pole of each cut-out went to the D.C. 220-volts mains. The other poles led to the left-hand poles of the middle and right-hand tumbler switches. The right-hand poles of these switches went to the eliminator. Both poles of the left-hand tumbler switch were connected in one lead of the accumulator. Hence, when the H.T. was "off" the L.T. circuit was also broken. Neatish!

## (My) Birthday Honour.

SEPTEMBER being the month in which I first saw the light-waves—though the occasion is now hazy in my memory—I feel that I must mark it, as is customary, by the bestowal of a Bartship. J. W. G. (Darwen) wins the coveted honour for his reception (L.S.) on a modified "Sydney" Two, using coils described by Mr. Hallows in "P.W." No. 298, of Eindhoven and Bandveng (Java), switching from one to the other and collaring the whole communication perfectly. An ideal bit of eavesdropping. Fading on Eindhoven, but Bandveng quite steady. Bartship duly awarded amidst loud cheers.

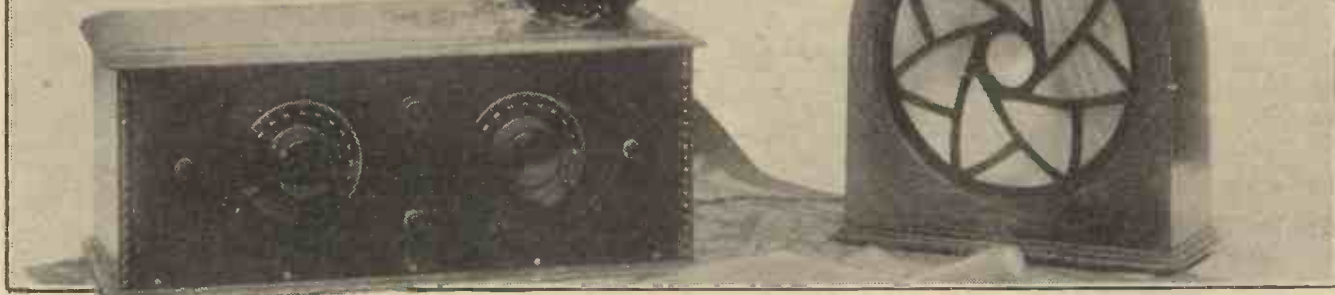
## Where the "Dough" Goes.

MY recent moan about the Post Office's share of the licence fees brings a sarcastic letter from a reader who received five printed communications from the Post Office, all different, relating to the renewal of his licence. My dear fellow, don't you know that Civil Servants conspire to keep the game going? Where would the Male Learners get jobs if the P.O. ceased to harbour them? Have a heart, old-timer!

ARIEL.



# The "Flexible" Three



IT must be amusing to those readers whose radio memories go back the necessary five or six years to note how the old favourites pass through a period of neglect and then once more become popular, or even come in again in the guise of "new inventions."

The tuning coil is a particularly good example of the process. In the early days it was practically always a simple solenoid, i.e. a single-layer winding on a cylindrical tube. Then for a few years after the war came an epidemic of fancy systems of multi-layer winding, and nothing else was considered fashionable.

Only a year or so ago the question of the H.F. resistance of coils was tackled seriously, and some real information made available on the question of the losses taking place. As a result we began to worry less about reducing self-capacity (the previous bogey) and a great deal more about the H.F. resistance problem, and so arrived the "low-loss" craze, which is still with us.

### Back to Single Layers.

The immediate result of the measurements made by various authorities on the losses in tuning coils was to send us straight back to our old love, the single-layer solenoid, and nowadays if anyone mentions a "low-loss" coil, that is what we think of at once.

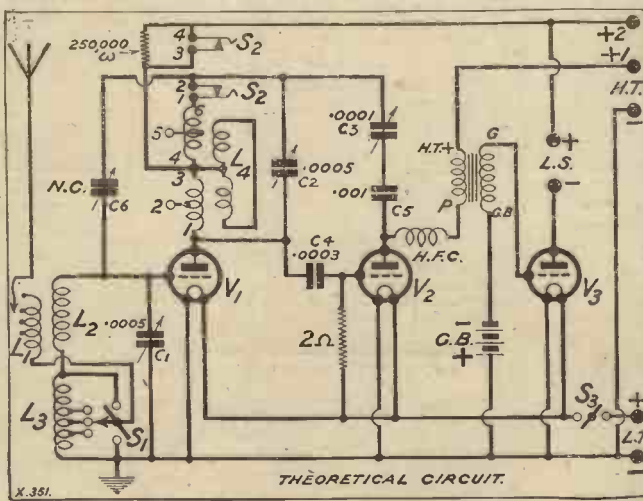
A remarkable long-distance loud-speaker set in which are several entirely novel features. But this up-to-the-minute set is easy and cheap to build.

Designed and Described by the "P.W." Research and Construction Department.

It is not to be assumed that it is impossible to produce a low-loss multi-layer coil, but it is difficult, whereas with

the single-layer system it is comparatively easy.

Something rather similar seems likely to happen with resistance-capacity coupling for H.F. amplification, once used to some extent by amateurs and then practically abandoned when broadcasting was started on wave-lengths of 250 to 550 metres. This method of H.F. coupling, of course, is quite useful on fairly long wave-lengths (1,000 metres upwards in normal circuits) giving a very fair degree of amplification, but is very poor on medium and short waves in the usual type of circuit.



### The Virtues of R.C.

On long waves it is very simple, cheap and reliable, and it has been realised in the "P.W." Research Department that here is a most valuable method of coupling for use in sets with switching for long and short waves. In these sets, it should be explained, it is extremely difficult to devise a method of coupling which shall not require an alteration of the neutralising adjustment when switching over, and which shall be reasonably free from objectionable interaction effects between the various coils, and so on. It can be done, but the resulting design (we are considering sets with a stage of H.F., of course) is necessarily a little (Continued on next page.)

- 1 Panel, 18 in. x 7 in. x 1/4 in. x 1/8 in. (any good branded material). (Radion, Becol, Ebonart, Trelleborg ebonite, etc.)
- 1 Cabinet to fit, with baseboard, 10 in. deep (Raymond, Artercraft, Camco, Pickett, Bond, Makerimport, etc.).
- 2 .0005 mfd. variable condensers, preferably slow-motion or with vernier dials (Dubilier in set. Any good make, Lissen, Cydon, Igranic, J.B., etc.)
- 1 .0001 or .00015 mfd. miniature type reaction condenser (Cydon, Bowyer-Lowe, Igranic, Peto-Scott, etc.).
- 2 Push-pull type on-off switches (one must be of type used for wave-change switching. Lotus in set, Lissen also suitable).

### COMPONENTS REQUIRED.

- 1 Push-pull double-pole on-off switch (Lotus jack switch No. 8).
- 1 Standard loading coil (Burne-Jones, Paroussi, Wright & Weaire, etc.).
- 1 "Derby Three" or "Quick-Change Four" aerial coil (Paroussi, Burne-Jones, Wright and Weaire, etc.).
- 1 Baseboard-type neutralising condenser (any standard make).
- 3 Sprung valve holders (Benjamin, Lotus, Ashley, W.B., Bowyer-Lowe, Burndep, Marconiphone, Redfern, Igranic, Burne-Jones, B.T.H., etc.).
- 1 H.F. choke (Igranic, Burne-Jones, R.I.-Varley, Climax, Lissen, Cosmos, Bowyer-Lowe, etc.).

- 1 Grid leak of 2 meg. and 1 of 1/2 meg., each with holder (Lissen, Dubilier, Mullard, Igranic, etc.).
- 1 L.F. transformer (New Lissen in set. Any good make of fairly low ratio).
- 1 Fixed condenser of .0003 mfd. and 1 of .001 mfd. (Dubilier, Magnum, Lissen, T.C.C., Mullard, Igranic, Clarke, Goltone, etc.).
- 1 Cosmos A.N.P. coil (300-600 metres) and base.
- 1 Terminal strip, 16 in. x 2 in., with 9 terminals (Eelex, Belling & Lee, Igranic, etc.).
- Wire, flex, G.B. plugs, screws, etc.

# THE "FLEXIBLE" THREE.

(Continued from previous page.)

elaborate, and must be copied pretty carefully to ensure good results.

It seems likely, therefore, that readers will welcome a few designs in which the method of wave-changing, so far as the intervalve circuits are concerned, is to switch over to resistance-capacity coupling for the long waves, the aerial and secondary circuits being treated in the now more or less standard fashion of a loading coil and the special "three-point" switching scheme first introduced in this journal.

## The Ideal Domestic Set.

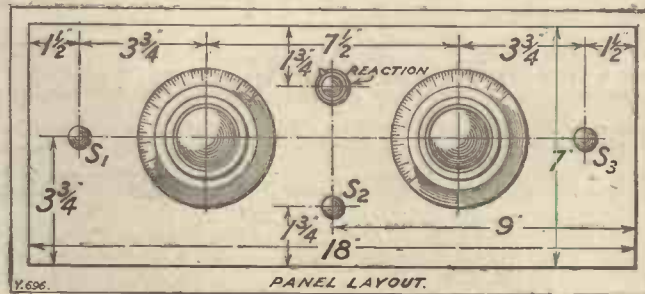
Such a set will not give quite so much amplification on the long waves as one of the type with tuned intervalve circuits

when the latter is working at its best, but it must be remembered that most of the long-wave stations are very powerful, and so are easily brought in. On the other hand, the resistance-coupled set is so easy to work that in the hands of an unskilled operator it is quite possible that it will actually bring in more distant stations than one of the more elaborate type, and this is a point worthy of consideration where various members of the family are likely to use the set.

The special advantages of a receiver on these lines are extreme simplicity of operation on the long waves (only one dial to tune), reliability (no possibility of trouble with neutralising on long waves), and

simple, straightforward construction (long-wave intervalve circuit consists merely of a resistance).

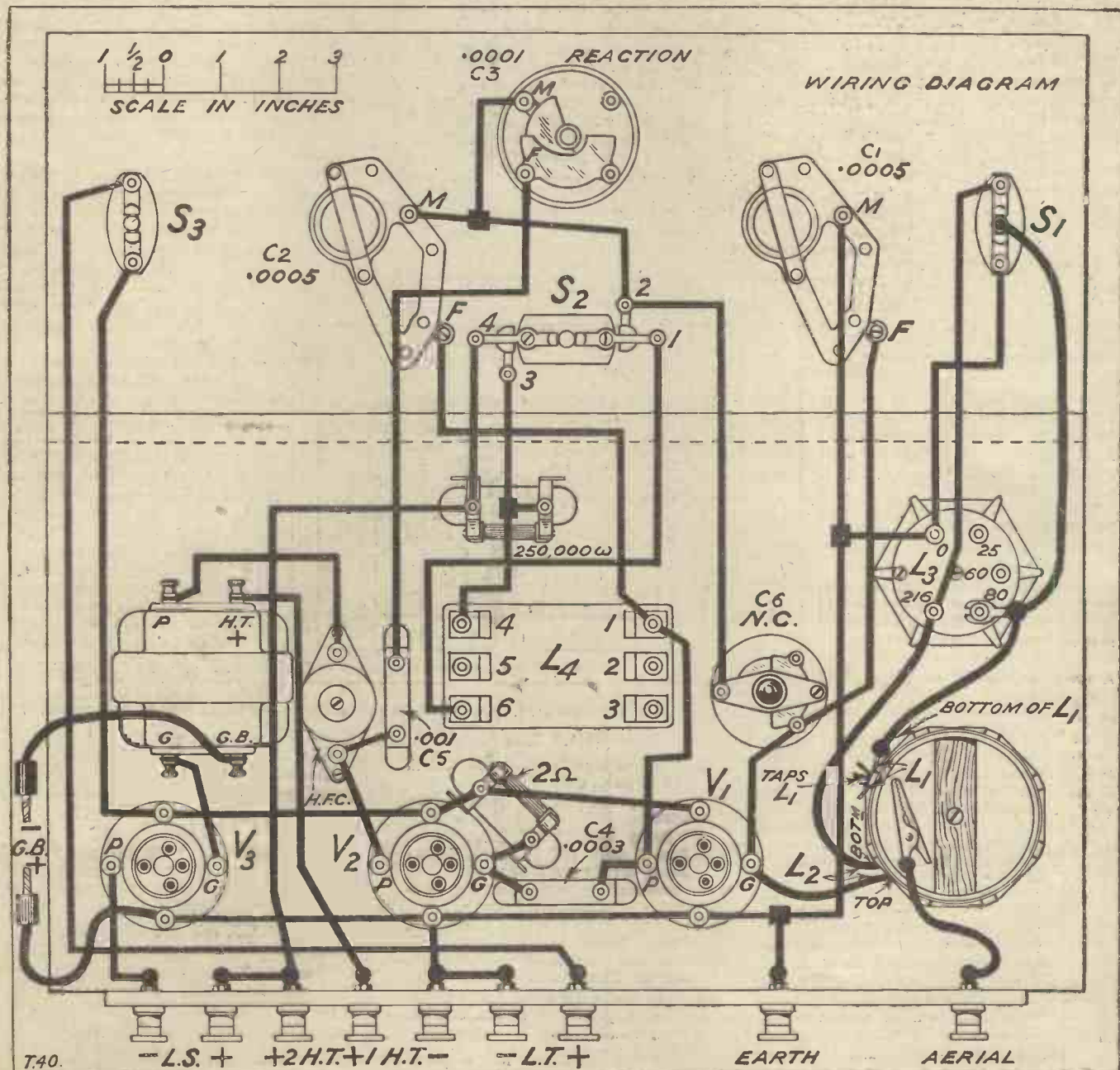
Further, it is very easy to design a highly efficient and simple system of switching to



PANEL LAYOUT.

suit such a circuit, since if the shorter wave intervalve circuit consists of the modern equivalent of the tuned anode (i.e. the

(Continued on next page.)



T.40.

-L.S.+ +2H.T.+1H.T.- -L.T.+ EARTH AERIAL

**THE  
"FLEXIBLE" THREE.**

(Continued from previous page.)

centre-tapped neutralised type) only a very slight change in the connections is needed to bring in the resistance for the long-wave range.

we have devised various schemes as a result of a great deal of experimental work in the course of the last few months, and you will see these applied in future designs.

For the present set we have adopted a particularly neat and simple device which proves to work extremely well in practice. The reaction condenser connections are left exactly the same on both wave ranges, but on the long waves a switch breaks the connection to the free end of the anode coil.

out at the centre tap and so to filament via the H.T. battery, and so they are passed back through the neutralising condenser to the grid of the H.F. valve, where they produce reaction effects of the true capacity type (not Reinartz!).

**How the Switching Works.**

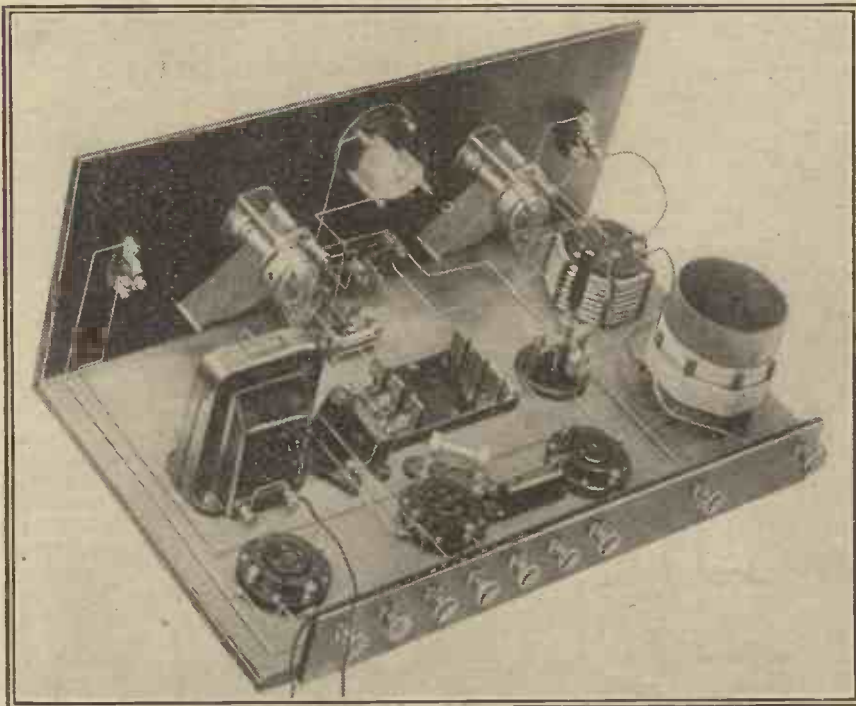
An inspection of the circuit diagram at this point will help you to understand how all this is worked out, and you will see that there appear to be two switches in the circuits between the H.F. valve and the detector, marked  $S_1$  and  $S_2$ , one which shorts out the anode resistance for reception on the shorter wave-band and the other serving to break a connection in the tuned-anode circuit to produce the required conditions for reaction on the long waves. Although these two switches are separated in the circuit diagram it should be understood that they are so drawn merely for the sake of clearness, and are actually the two parts of a double-pole switch of a special type (Lotus jack-switch, push-pull type, double-pole on-off).

All this may look a little complicated on paper, but there is no need to worry on that account; just build the set according to the practical diagrams, and you will find that it gives the results you want, whether or not you understand exactly what happens when you push in the wave-change knobs!

Now for a few details: the aerial and secondary circuits consist of a special primary and secondary single-layer coil on a tube for the shorter waves, while for the long waves a standard loading-coil is switched in, and gives an auto-coupled circuit. Both these coils can be bought ready-wound at a very moderate figure. Note that the position of the clip on the aerial tapplings (winding  $L_1$ ) can be varied to give a suitable degree of selectivity.

On the long waves it is again possible to adjust the degree of selectivity to suit

(Continued on page 898.)



The "wave-change" which enables you to go from the 2 L O and 5 G B band to that of 5 X X, Hilversum, etc., is accomplished without coil-changing, and is by no means a complicated scheme, as you will be able to judge by the above photo.

The photographs you see on these pages illustrate the first set of this type to appear in "P.W.," and since it will be something of a new departure to many readers we have gone into the whys and wherefores somewhat fully.

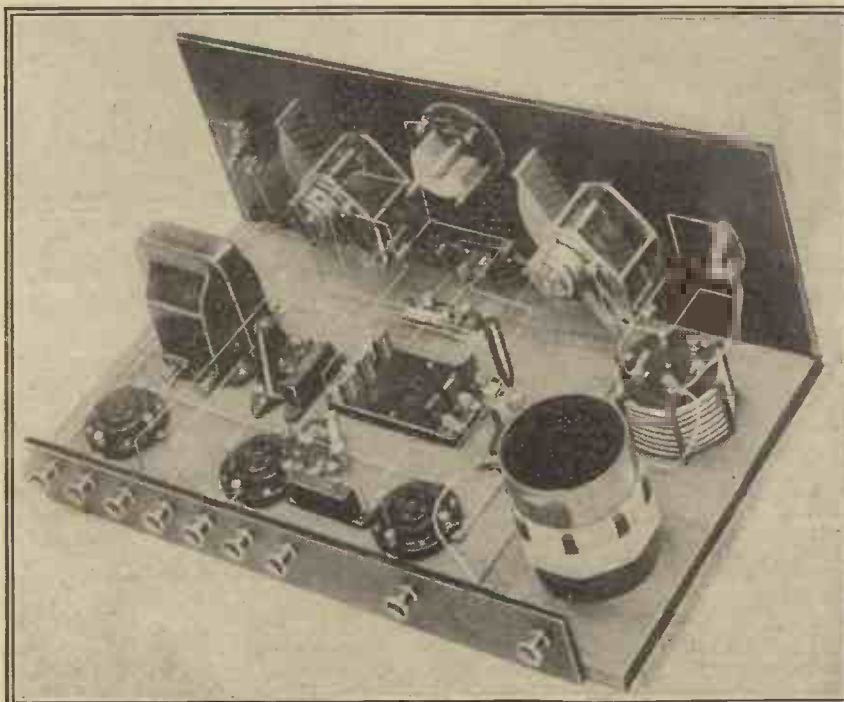
There is just one more general point to consider which applies to all these circuits using R.C. coupling for the long waves, before we go into the details of the present set in particular. This is the question of how to get reaction on the long waves; and if you consider a moment you will see that it is rather an awkward one.

**A Problem—and the Solution.**

For the shorter waves the obvious thing to do is this: in the normal centre-tapped, neutralised, tuned-anode circuit one side of the tuned circuit is wired to the plate of the H.F. valve, the centre tap goes to H.T. positive, and the other side is left "up in the air" to provide the equal and opposite potentials which are fed back through the neutrodyne condenser on to the grid to stabilise the valve. Now, if we connect our reaction condenser back from the plate of the detector valve to the free end of the tuned anode we shall get reaction of the well-known "Hartley" variety, since the tuned anode really forms the grid circuit of the detector valve.

This is all very well for the shorter waves, but what about the long range, where the tuned anode is not used? It is obviously no use trying to react into a resistance. Well,

The reaction currents can then no longer take the normal path through half the coil,



The back-of-panel lay-out is perfectly simple and straightforward, and, although compactness has been achieved, there is no crowding of components. If you compare this photo with the wiring diagram on the opposite page you will be able to identify all the various parts used.

# CHEAPER WIRELESS.

A Welcome Reduction in Radio Prices is Likely in the Near Future.

By THE EDITOR.

OUR readers have probably noticed in the press the announcement that a special Tribunal of the Patent Office have decided to exercise their powers for the compulsory issue of certain licences at rates lower than those stipulated by the Marconi Company.

The decision has arisen out of an application sought by the Brownie Wireless Company, Ltd., who asked for a compulsory licence at a lower figure than the licence issued by the Marconi Company, the holders of certain patents which the Brownie Company wished to utilise in order to put on the market two-valve receivers at lower prices than those now prevailing.

## "A Virtual Monopoly."

As our readers are well aware, the Marconi Company holds many of the most important patents in use to-day. They have, indeed, a virtual monopoly of these most important patents, which cover practically every type of well-known broadcasting receiver of an efficient character.

The case has aroused a good deal of interest and, as it is of great importance to our readers, we propose recapitulating some of the salient features of the case.

The licence which the Marconi Company offered to applicants who wished to build commercial receivers incorporating their patents was of a nature which demanded 12/6 per valve holder, and the Brownie Wireless Company considered this royalty scale unreasonable and prejudicial to trade.

## The New Royalty Charges.

The Patents Office Tribunal, after carefully considering the evidence given by both respondents and applicants, decided that the patent royalty fee of 12/6 per valve shall be reduced to 5/- for the first valve and 2/6 for each additional valve in a set, or, alternatively, the royalty fee may be 10 per cent on the wholesale price of the complete wireless set without accessories.

The following table of comparison will show the result of this decision:

Sets	Old Fee.	New Fee.
1-valve .. ..	12/6	5/-
2-valve .. ..	25/-	7/6
3-valve .. ..	37/6	10/-
4-valve .. ..	50/-	12/6
5-valve .. ..	62/6	15/-

The Tribunal also stated that the larger question, viz., whether the trade or industry of the United Kingdom is prejudiced by a refusal of the respondents to grant licences in general on reasonable terms, arises specifically in this case, for evidence has been put in which, according to the Counsel for the applicants, goes to show that there is a general discontent in the trade with the terms on which licences have been granted.

But, apart from specific evidence, the larger question must in any case arise, because the terms offered to the applicants are the terms on which the majority of the two thousand licences have been granted, and if they are unreasonable terms in



Some members of the Hackney and District Radio Society enjoying a concert tuned in on the P. W. "Birthday" Four.

relation to the applicants, it would *prima facie* seem that they would prejudice the trade in general.

"Although," stated the Tribunal, "the conclusion at which we may arrive may logically involve the implication that the applicants have established the general case of prejudice to the trade of a class of persons as well as prejudice to their own trade, we have in fact only one specific application to deal with, and this decision can go no further than to define the relief to which the applicants themselves may be entitled."

## "Unreasonable Terms."

Consequently, our readers must not expect to find at the Wireless Exhibition at Olympia a general wholesale reduction of prices because of this decision.

In fact, Mr. Mullard has pointed out that it would appear that only the Brownie Company will immediately benefit by the new royalties, because, as he understands the decision, the manufacturers who are under licence from the Marconi Company have to give a year's notice before the licence can be terminated.

The Brownie Company also alleged that there had been an abuse of monopoly rights. In connection with this, the Tribunal stated: "We have found that it is in the public interest that a licence should be

granted to the applicants, and we have found that the lines on which the licence is offered are unreasonable terms and prejudicial to the trade."

Another point made by the Tribunal is that: "Broadcasting has become a feature of our national life, and a commercial policy which may exclude large sections of the public from its full enjoyment is not, we think, a justifiable policy."

A period of twenty-one days before the issue of an order embodying the above terms is allowed, so that the applicants and respondents may agree on the terms of the licence.

## THE "FLEXIBLE" THREE.

(Continued from previous page.)

conditions, and this is how it is done; in the wiring diagram and photos you will notice that there is a flex lead which goes to one of the terminals of the loading coil. Well, this can be attached either to the terminal marked "60" or that marked "80," and gives the greatest selectivity on the former, the loudest signals being obtained.

The split tuned-anode circuit is provided by a Cosmos "A.N.P." semi-fieldless coil, which enabled us to dispense with the screening usually desirable in a set of this type. Just one point in connection with this

coil: it does not matter which way round you insert it in the holder.

## Using The Switches.

General constructional details are all quite clear in the photos and diagrams, and we can go on now to operating matters. First of all, note that for ordinary broadcast reception the wave-change switches should be pulled out, and for long waves they must be pushed in. Next, remember that the tuned anode is only used on the shorter waves. On long waves all tuning is done on the left-hand dial, and the right-hand one must be set at zero.

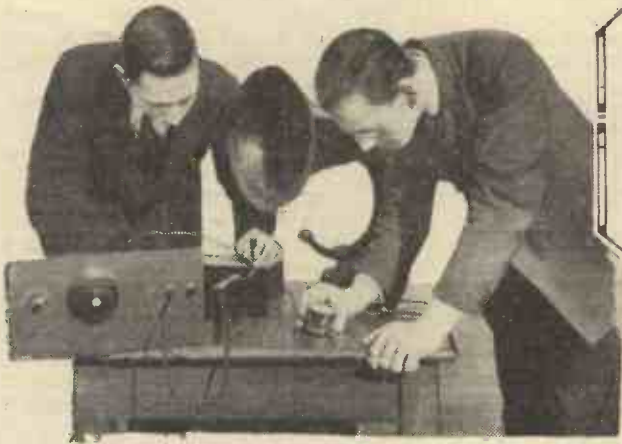
Reaction is adjusted in the normal way on long waves, except that if you find the set oscillates too easily you can check it by increasing very slightly the setting of the right-hand tuning condenser.

Finally, as to results. The set was tested on an indoor aerial hung in the loft of a two-storey house. (Adverse conditions are always chosen for our standard tests, since readers can then be pretty sure of at least equalling our results.)

The local station, distant 15 miles, came in at great strength without reaction, as did 5 GB with the aid of a touch on the reaction condenser. Stuttgart, Hamburg, an unidentified Spaniard, Toulouse and Brussels came in on the loud speaker on the shorter waves, while on the long waves 5 XX and Radio-Paris were audible on the speaker, and were easily separated. With headphones it was found easy to tune in another twelve stations at good strength and without interference.

(Note: Instructions for neutralising this set will appear in next week's "Radiatorial.")

# THE NEWCOMER TO RADIO



This is not a theoretical treatise on radio, nor is it a mass of generalisations and platitudes which lead you nowhere; it is something much more fascinating and useful. By means of a skilful mixture of "how a set works" and "how to built a set," the author brings before you the real delights and advantages of radio as a hobby. And in easy steps you can actually build a powerful valve set even if you have hitherto had no wireless or electrical experience whatsoever.

## 2. AMONG THOSE WIRELESS WAVES.

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

**I** ENDED my last week's article by putting forward a series of direct questions. You may not be able to find the answers to some of them for a week or so, but gradually you will discover that all such little difficulties as they represent can easily be smoothed over. Here and there,

a complete set all ready for working. In a very short time you will have a one-valver which, if you so desire, you can experimentally operate and actually listen to broadcasting before going on with the rest of the work. The next step, that of extending the instrument to two-valve power, will merely mean the addition of a few simple parts, so that even from the point of view of assembling a set not a stroke of the previous work would have been wasted.

the assembly of this receiver will be reached in three easy stages, and what I hope will be the most interesting part of the business is that at the end of each stage you will have

eye to see exactly how the set is constituted. One is able to visualise at a glance the characteristics of every part used in the assembly, and, from an electrical point of view, exactly how the set operates.

I am not going to try to make you start thinking this circuit out. At the present moment it must look a very puzzling affair—perhaps, even, perfectly meaningless. What I am going to do is to take you through the circuit, step by step, each step corresponding with the progress made in the actual building of the set. Now don't start screwing up your forehead. I ask for no concentration on your part; indeed, I trust you will find the business entertaining.

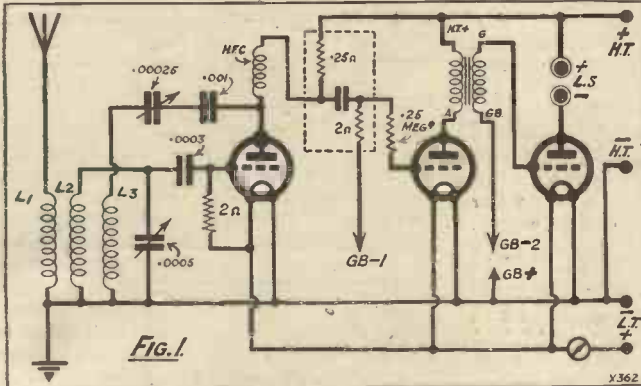
### What Is Broadcasting?

Leaving Fig. 1 alone—and I may as well say we shan't come back to it for several weeks—turn to Fig. 1a. This is a different proposition, isn't it? Well, I must say that I hope you will understand pretty well what Fig. 1a indicates, before I write "Finis" to this week's article, and if, by any chance, you have grasped the significance of Fig. 2 by that time, then you will have made more progress than you will at the moment be able to appreciate.

Now, exactly what is broadcasting? Literally, it means spreading out something equally in every direction. But a broadcasting station does not send out speech and music through the air in the same way as does a brass band from the bandstand at the seaside. Actually, the air is not used in radio.

If all the air in the world were suddenly

(Continued on next page.)



This drawing illustrates the actual circuit or composition of the powerful and modern three-valve receiver which is to be built in easy stages. Do not be dismayed if this diagram conveys absolutely nothing to you, but keep it by you for future reference.

we shall have to make compromises, but that need not worry us yet. But it is high time for us to take a fairly deep plunge and get our programme moving.

First of all, let me make it clear that this series of articles is not intended as a mental exercise. I want to get you interested in this radio business, and you need not fear that I am going to start lecturing. I have thought of a scheme—a novel one, I believe—which is going to enable us to explore together the fascinating "innards" of a radio receiver, and, at the same time, you can, if you so desire—and it will render the work all the more valuable if you do—build a set in easy steps.

### Three Set Steps!

Now, just a word or two about this particular set and how I am going to deal with it. The completed instrument is built as a three-valve set, and you will be able to see exactly what it looks like if you refer to the accompanying photographs.

The set in its final form is a very popular type. It is capable of giving really good loud-speaker results from a number of broadcasting stations. The completion of

freak assembly. It will not differ from a good, straightforward design, not built in progressive steps.

I need hardly point out—for it is indeed obvious—that from a financial point of view my scheme has its attractions, even for those who do not want to be fascinated by the theory of radio. In building the set by instalments you will, as it were, be buying your set in instalments, for there is no need to purchase the gear for the complete three-valver in one lot.

The drawing marked Fig. 1 is what is known as the theoretical diagram of the circuit of the set. The circuit laid out in this symbolical form enables the practised



And here is the very set itself. We would particularly draw your attention to its compactness, dignified appearance, and the simplicity of its controls. (There is only a station-selection dial and a "strengthener" to operate.) Despite the step-by-step assembly the result is a normal, first-class receiver.

# THE NEWCOMER TO RADIO.

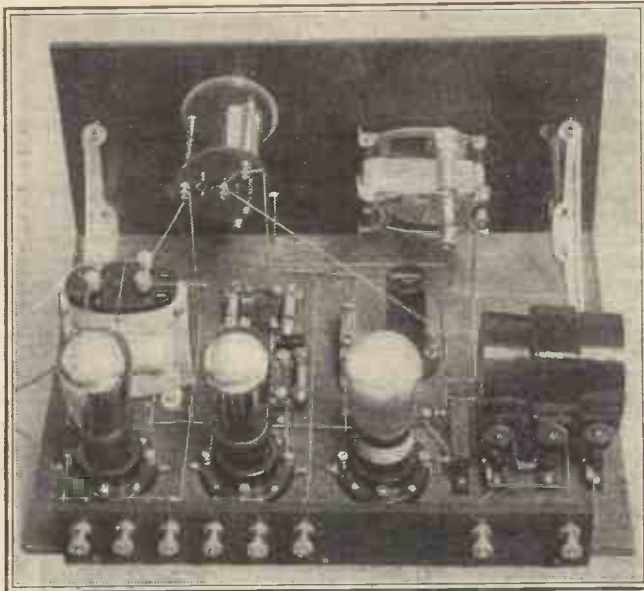
(Continued from previous page.)

sucked away by the moon, or something else, 2 L O could still go on sending its concerts to anyone who was alive to pick them up on a wireless set. No; wireless waves are not air waves. There is presumed to be a substance known as the ether, which is the basis of all space and everything in it.

If you take a glass vessel such as, for instance, an electric-light bulb, which has all the air removed, ether still remains present, and there is ether in solid substances such as iron, wood, and so on, soaking through them, just as water soaks through a sponge. But ether is not a gas or a liquid, as we know such, and you must not confuse it with the ether that is used as an anæsthetic. It is a substance quite outside our physical comprehension, for it cannot be seen, smelt, or felt. As a matter of fact, you have got to use a great big slice of imagination to grasp the idea that there is anything such as this ether in existence.

### Hundreds of Vibrations !

When a broadcasting station starts to operate it sets this ether into vibration. You set the air into vibration when you speak. The vibrations in the ether caused by a radio station are fairly great in the



The neatness of the receiver is extended to its "innards," which you are shown above. You do not have to purchase all the parts and fix and wire them up at once; the work is accomplished in very easy stages, and you can leave off at any stage and still be in possession of a complete set !

immediate vicinity, but tend to die away at distances.

There are hundreds of broadcasting stations in the world, and every night every one is busily engaged in vibrating this ether. But, fortunately, a radio set does not have to receive everything that comes its way. It has the power of selecting just that one vibration it requires, or rather the vibration of the broadcasting station to which the operator desires to listen.

You see, the vibrations from different

broadcasting stations differ in what is known as wave-length. If two stations at equal distances away from a receiver were both sending on one wave-length, no set on earth would be able to select either the one or the other.

It is by using different wave-lengths that we are enabled to make our selection; and wave-length means exactly what you have probably guessed. You have seen long waves in the sea, and you have seen small ripples on ponds. Both of these watery disturbances are exactly the same sort of thing, but the one, the ocean wave, is very many times longer than the ripple in the pond.

As a wave in the ether cuts through the aerial wire optimistically hung up by a radio enthusiast, it generates in that wire a current of electricity. Exactly what constitutes electricity, you need not worry about at this juncture. Just think of it as something that flows through the wire just as water flows through a pipe.

But this you must bear in mind. The electricity generated flows backwards and forwards through that aerial wire. By an aerial wire I mean any length of copper or wire of other metal slung between a tree and a chimney, or two poles, with one end joined to the earth, that is, by burying it in the ground, or tying it to a water-pipe, which itself goes to the ground.

You never can have just one wireless wave or other vibration, any more than by dropping a stone in a puddle you can make just one ripple. There must be a series of ripples extending from the centre of the disturbance and dying away the farther they get away from it.

Anyway, as a wireless wave ripples past the aerial wire, a current of electricity starts off from the one end of this, dashes to earth, then dashes back again, and keeps on repeating the process, getting weaker and weaker until it has died away.

Now let us take the series of waves or ripples of ether which in the normal way

would cut a wireless aerial. The first wave starts a current of electricity dashing down the aerial, and if the next wave comes along before that current has gone very far another current of electricity will start off to follow it, and the second current will meet the first current as this starts dashing back again and the two will tend to wash each other out.

### Clash of Currents.

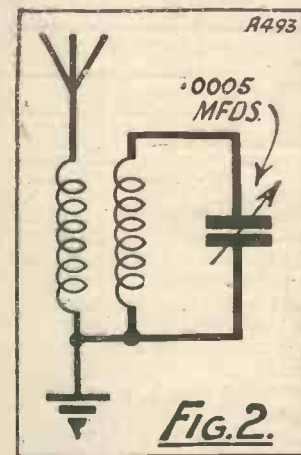
Supposing the second wave were so long in coming along that the current of electricity generated by the first wave had had time to dash from one end of the aerial to the earth and back again, and then start off a new journey before the second wave came along to generate another current of electricity.

In this case, again, there would be a clash of two currents starting at different times and a subsequent "washing-out" process. It is obvious that if we want to have a current of electricity dashing about in our aerial, unimpeded and indeed reinforced by each successive wave as it arrives, then we must arrange so that our aerial is, electrically speaking, just that long that each current of electricity generated has time to complete one round journey before the next current is evolved.

When we have arranged this, we are what is known as "tuned in," and it is by setting our aerial to such conditions that we arrange to have it operated by the wave due to any one particular wireless broadcasting station.

### How We "Tune."

You could tune an aerial easily enough merely by increasing or shortening its actual length, making the journey for that current of electricity longer or shorter by this means. But that would be a tedious operation. We can do it in a much easier



Carefully compare this diagram with Fig. 1, of which it is a section. It illustrates the first step in the building up of the three-valve set.

manner than that. We can do what is electrically the same, by giving that current of electricity more work to do on its journey. We can make it race round and round a lot of wire coiled up, which makes it put out what is known as a "field of magnetic influence."

This is an area of force similar to that which is developed by any current of electricity passing through any conductor, but the force is much more intense when the conductor wire is coiled up. It is concentrated. You need not worry too much about all these details. Just a smattering of essentials will help you, and is all that you will need.

But now I have brought you up against the first actual radio "component" with

(Continued on page 926.)

# "S.G.'s" and PENTODES

The redesign of the screened-grid valve and its general release by the majority of the large valve concerns, together with the coming of the five-electrode high-mag. amplifier, bid fair to place quite a new complexion on radio-receiver design this season. Some details concerning these new valves.

By KEITH D. ROGERS.



A Six-Sixty Screened-Grid Valve.

ABOUT this time last year we first came across what is known as the screened-grid H.F. valve, and it

was introduced at the wireless exhibition last September. Since then there has been some sort of a lack of interest in the valve among the public, except perhaps among the very few, and the unfortunate fact that it called for a special mounting no doubt has had a lot to do with the lack of popularity that valve seems to have enjoyed.

In addition to this, it has not been available in all makes or in all voltages. This year, however, all these things are remedied and we see the screened-grid valve redesigned and available in two-, four- and six-volt types. The immediate result of this should be a great increase in the popularity of the valve, for there is no doubt about the fact that the new screened-grid valve, as placed upon the market now by all the big valve concerns, is a really good proposition and a thoroughly reliable article.

Recently I have been carrying out a number of tests with these valves, and have come to the conclusion that every one of them, and every voltage—two, four and six—is completely satisfactory. Different makes and different valves vary slightly as regards their characteristics, but all are sensitive, all are capable of bringing in distant stations with a wonderful purity and strength.



The Cossor Pentode. Note the terminal on the base for the H.T. grid.

### Practical Details.

As regards the screening of the valve, this is usually best done by a vertical screen across the base-board, the H.F. valve being placed on one side of the screen and the anode circuit on the other side.

These valves are available, as I said, in all voltages, and the filament consumption is only about .1 or .15 amp. The Cossor and Ediswan screened-grid valves are slightly different in operation from the Mullard, Six-Sixty, Osram and

Marconi, etc., in that they have a slight amount of filament lag due to the type of filament employed; but this is of no account, and because this valve has a certain amount of lag when it is first turned on, any readers who have those valves should not be in any way doubtful as to whether they have a good valve or not.

That lag is merely the filament heating up, and has no effect whatever on the actual performance of the valve, and once the valve is turned on and is going—and, mind you, the lag is only a fraction of a second—it will give as good results as the others.

The screened-grid valve is a special H.F. valve capable of giving wonderful long-distance reception. It does not need neutralising. The Pentode is a high-magnification, last-stage L.F. valve, which in the one valve will provide results equal to two ordinary L.F. stages.

Now the screened-grid valve is at one end of the scale, so to speak. It is right up at the H.F. end of the set, and will deal with the incoming signals, giving them a tremendous boost up; but recently there has also been brought out a valve for the other end of the scale, to give the signals already in the set a tremendous boost up before they go out into the loud speaker. This valve is known as the Pentode or five-electrode valve.

On the Mullard list it is known as the "Pentone," which is a trade name, but the other valve manufacturers are calling it the Pentode. It is on the market in various types and various voltages, the two-volter taking about .3 amp. and the four and six taking about .1 amp. or .15.

The peculiarity of this valve is that it has three grids. The outer grid, that nearest the plate, is connected to the filament of the valve inside the valve itself; the next grid is brought out to a terminal on the base of the valve; and the inside grid is taken to the grid pin of the valve and is used as the electron flow controller.

The one brought to the outside pin on the valve is connected externally with the H.T. positive terminal which feeds the anode of the valve. The valve has a four-pin base, and will plug into any ordinary

set, so that it is completely interchangeable as regards the plugging-in part, the external terminal being taken by a piece of flex to the H.T. terminal.

The only "snag" about this valve, if it really can be called a snag, is that you cannot plug it into the output stage of any old receiver with absolute certainty of success.

### Two Stages in One.

The input voltage to the last valve is usually fairly large, and will tend to overload the Pentode. What the Pentode is really designed to do is to take the output from a detector stage straight on to its grid through the usual coupling, and then it will give it a magnification approximately equal to that of two stages of L. F. amplification. On test we find that this is so, and that the Pentode valve does give a wonderful amplification.

It cannot take a heavy input, but it will give a big volume output, so that to all intents and purposes, if you have an H.F., Det. and 2 L.F. receiver you can scrap one of the L.F. stages and use the set as an H.F. Det. and 1 L.F., a Pentode doing the work of the two L.F. valves you previously had. The Pentode should have a great future: It should be popular amongst all short-wave enthusiasts and will, I am sure, be extremely popular amongst those who confine their attention to ordinary broadcasting.

The Pentode is available in all the main makes—Cossor, Ediswan, Mullard,

Marconi, Osram, Six-Sixty, etc.—they are all bringing them out, so that you will be able to go to your favourite valve maker and get a Pentode, and be sure that that Pentode will be a really good one.



The Mullard "Pentone"



Most of the screened-grid valves are being made with the anode terminal on the top of the bulb.

**WET H.T. BATTERIES.**

The Editor, POPULAR WIRELESS.

Dear Sir,—Some time ago you asked your readers to let you know how they had fared when using wet H.T. batteries, so I pen the following, as I am sure the information will be useful to other readers of our mag.

In August, last year, I purchased two 60-volt units; these were made up in two tiers in a handsome case with glass dust cover and carrying handle. The sacs were the No. 2 and the cost was £2 the lot.

I at once filled them and put them on to my Hale two-valver with an S.T. 21 and Stentor 2, taking 6 milliamps. The set is used about two to three hours daily during winter and half that time in summer, and, normally, brings in London and 5 GB at full loud-speaker strength and about a dozen Continentals at quiet strength on the speaker.

Some six months ago I substituted a D.E.P. 240 super-power valve in the last stage, and the set was then taking about 8 milliamps. Now, after a full year's working, the battery is still going strong, bringing in London and 5 GB at splendid volume without distortion; but, owing to the voltage having dropped and the extended daylight, foreigners are not now received very well.

The set has sometimes been used as much as 10½ hours a day without the slightest trouble from the battery, and has several times been left on all night; in fact, only a week ago, it was left on for over 30 hours and when noticed was quite dead, but on changing the accumulator started off as well as ever.

The battery looks the same as when I first received it, not the slightest trace of creeping or corrosion, and it has only been touched about six times to top up with water. It still runs perfectly quietly; in fact, when the London "mike" is switched off you cannot tell by listening at the speaker whether the set is on or off. When I do have to make it up again it is only the sacs that will require renewing this time, and, on inquiring the price, find that my next year's H.T. will cost me 16s.

Surely no other form of H.T. can give such satisfactory service. Let me wish our mag. continued success.

Yours truly,

C. O. BOWLES.

Surbiton.

**SMOKING H.T. I**

The Editor, POPULAR WIRELESS.

Dear Sir,—On reading the article in this week's issue, on Smoking H.T., I thought perhaps my experience might interest your readers, and also be a warning to them.

I am always building new sets which never, by any chance, go into a cabinet. I had recently finished a new four-valve set, which I was very proud of. Having listened in all the evening, switched off, the family retired to bed and left the dog (a pup, three months old) in the room, asleep. The set, I must say, was in the window recess.

The dog, I think, heard cats, or something, during the night, and jumped up on to the window-shelf. This I only presume. We did hear him barking, but being used to it did not trouble to come downstairs. My next-door neighbour came down; he heard the barking, and said he also smelt burning. It was fortunate for us he did so. He looked through our front window—the wireless set was burning merrily and the curtains were on the point of bursting into flames! The dog had put his feet on the L.T. accumulator, shorted the leads, which burnt through, trodden on the bare wires of the set, shorted the H.T. and L.T., and mixed them all up together. The accu-

**CORRESPONDENCE.****WET H.T. BATTERIES****SMOKING H.T.—A WIRING SUGGESTION.**

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.

mulator was destroyed, large holes had been burnt in the celluloid cover, the carpet was ruined, and four brand-new valves burnt out. The baseboard of the set was utterly ruined, and the panel as well.

Yours faithfully,

B. DE MEZA.

Bolton.

**THE "ALL-PROGRAMME" THREE.**

The Editor, POPULAR WIRELESS.

Dear Sir,—Have been meaning to write you for some time to express my appreciation of the "All-Programme" Three. I made this up in April last and have logged a very large number of stations. Among those identified, the following will give you an idea of its range: Budapest, Madrid, Hamburg, Langenburg, Leipzig, Cologne, Edinburgh, Cork and, of course, Hiversum and Radio-Paris (the last-named providing a programme any time during its broadcasting); and there are many more unidentified.

I am using P.M.I.A., P.M.I.L.F. and P.M. 2 (P.M. 252 is really needed on 2 LO and 5 GB, volume very great), R.C.C. unit, 10,000 ohms, 1 condenser and 2 mfd., and Marconiphone 4-1 transformer. Aerial fair, 20 ft., screened by trees.

I have made up quite a number of three-valve circuits, including the "Sceptic's" Three; but the "All-Programme" Three is far the best. Selectivity is as good as can be expected from a detector and 2 L.F., on the broadcast band, but rather flat on the high wave, 5 X X coming in all round the dial, with coil tapped in centre. I should have mentioned that the stations named were all received at loud-speaker strength, and some were too loud for comfortable listening. Wishing you every success.

Yours truly,

S. H. BOTTOMLEY.

Chingford, E.4.

**THE "ANTIPODES ADAPTOR."**

The Editor, POPULAR WIRELESS.

Dear Sir,—As one of those who made application for the star model of the "Antipodes Adaptor," I should like to tender my thanks to Mr. Kelsey for such a splendid unit. I have not written in before, as it was simply the U.S.A. adaptor. Now, however, 3 LO (Melbourne) has had the grace to remove this stigma, and all is well!

**A**LTHOUGH we must not start "looking forward" to the winter, it seems that it is speedily approaching as far as the "DX-hound" is concerned, for the distant stations are breaking through in fine style once more. 3 LO has lately operated my moving-coil loud speaker with sufficient strength to fill the house several times, and 2 X A D. is sufficiently consistent to be regarded as a never-failing alternative programme to London! We never know, naturally, when these favourable conditions may peter out again, but I myself do not think that is likely to happen now before next spring.

**Short-Wave "Supers."**

I was recently struck by the way in which a short-wave super-het apparently eliminated "conditions." Making two standard tests, one on P C J J and the other on 2 X A F, very little variation in the strength of either station could be noted from night to night, although with the two-valve "low-losser" there was fifty or sixty per cent. variation in the strengths of both stations within three days or so!

The super-het certainly is not within

**SHORT-WAVE NOTES.**

By W.L.S.

the reach of everyone, but if one cares to make the necessary initial outlay there need be no fear of many difficulties in either the construction or the operation of the set, and the degree of certainty with which station after station can be tuned in is delightful.

I should very much like to be able to form some idea of the percentage of short-wave listeners who use a small indoor aerial in place of their full-sized outdoor one for short-wave work. Personally, I find that 8 ft. of bell wire taken up to a nail in the wall will often give results that are absolutely indistinguishable from those obtained with the usual aerial.

**Quieter Background.**

To some degree this is due to the fact that such a small aerial can be far more

Owing to hand capacity I have modelled my unit on that well-thought-out design, 3 S.W., using the same condensers. P C J J, 2 X A F, K D K A on 27 metres, are all excellent signals, especially the former. In fact, P C J J would fill a hall easily on most occasions! 2 X A F and K D K A come in with "monotonous regularity"—a splendid phrase I have culled from "Modern Wireless," by the way!

Naturally, there are numerous other stations, but those mentioned afford me most pleasure.

In conclusion, just a few words to our converted sceptic, Mr. Elston. Mr. Elston, you got a thrill with six broadcast stations; now let us hear what delirious, delicious sensations you receive when you pick up these far-away stations. Build the A.A. or take advantage of my original offer to "Aerial," which still holds good! We do not often meet a man who is thrilled with receiving six stations on three valves. Let us, therefore, take care of him!

Yours faithfully,

W. A. E. ROWETT.

St. Austell, Cornwall.

**WATER-PIPE EARTH FAILS.**

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the article by Mr. J. F. Corrigan and his conclusion "that nothing beats a well-soldered connection to a main water-pipe as an efficient and perfectly reliable earth," I can quite easily demonstrate the contrary in my fifth-floor flat. An earth connection of a single strand of rubber-insulated copper wire of stout gauge was very carefully and efficiently soldered to the main water-pipe which serves each floor and is therefore of considerable length. Signals on three valves (without reaction) at 1½ miles from 2 LO were very poor, and on an ordinary crystal set were almost inaudible. The earth was tested by means of a lamp and a milliammeter on the D.C. lighting mains, the negative side of which is earthed, and the milliammeter showed no perceptible loss.

Then an earth connection was soldered to a gas-pipe. The volume on a three-valve set was then overwhelming, and signals in headphones from a crystal set could be heard across the room.

I have demonstrated this curious circumstance to a number of people, but the explanation is still to be sought. I think it is due to the inefficiency of the aerial, which is 85 ft. of insulated wire arranged in line with 2 LO aerial masts along a corridor.

I wrote to one wireless journal (not "P.W.") for an explanation of the mystery. In return I was strongly recommended to adopt a copper earth buried in the ground, and warned of the danger of using a gas-pipe. And I live on the fifth floor of mansion flats, as I pointed out!

Yours truly,

EREBUS.

**A WIRING SUGGESTION.**

The Editor, POPULAR WIRELESS.

Sir,—Having noticed a suggestion in a recent issue of "P.W." for securing all components to the baseboard, wired underneath, I am heartily in agreement with this arrangement. Not only would it make wiring easier, but would considerably shorten the lengths of wire by going direct from point to point. There are many who would welcome this system.

Surely there must be at least one enterprising manufacturer who will deviate from the usual design.

London:

Yours truly,

AWE.

tightly coupled to the set than can the outside aerial, with its relatively high capacity; but there is the additional advantage that a quieter background and fewer atmospherics are usually provided by the small aerial, whilst the loss in signal strength, if any, is out of all proportion to the reduction of these unwanted noises.

**A Good Idea.**

Several owners of transmitters use a guy-wire of their mast as a short-wave aerial, or some similar scheme. This has, in their case, the additional advantage that the main aerial can be left permanently connected to the transmitter, thus eliminating a change-over switch, with its inevitable losses, and allowing them to work duplex, providing that the station with whom they are in touch is not using a wave-length too close to their own.

I myself find that with the transmitter working on 23 metres it is quite possible to receive stations on any wave above 24 metres or below about 22.3 metres, provided that there is no harmonic of the transmitter which causes interference,





THE man who walks into a wireless dealer's and emerges a few moments later with a neatly made spring mounted and perfectly fitting valve holder for the expenditure of a shilling or so is rather apt to take his good fortune as a normal state of affairs. He is certainly unlikely to realise the bother which valve holders caused in the early days of broadcast reception.

Again, it is not generally realised that we owe the presence of the peculiar arrangement of pins on a valve base to the French, whose valve design the British copied slavishly immediately after the war. Then by way of a change we copied the American design, still retaining the French base. Before long, however, we began to evolve designs more distinctly British, although all along the French base has been retained and is now standard in Europe.

**Early Efforts:**

With the arrival in England of this type of valve experimenters had to find some form of mounting, and all the early valve sets were made with four separate valve sockets mounted on the ebonite panel, great accuracy in drilling being necessary if a good fit was to be obtained. Fortunately these early and very bright emitter valves, any one of which took a filament current in the neighbourhood of one whole ampere, were not "pongy," and so we had no need of any spring mounting. After a while component manufacturers realised that there would be a market for valve holders made up accurately with four sockets fixed in some suitable holder, and the first complete valve holders made their appearance.

Some—the best kind—consisted of the four individual sockets sunk into a cylindrical piece of ebonite, but many, alas!

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An article of particular interest and value to all constructors.

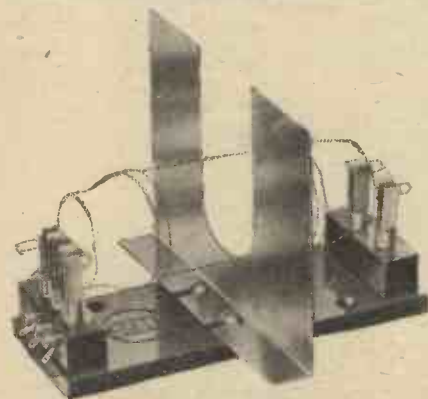
By PERCY W. HARRIS, M.I.R.E.

\*-----\*

were made of very unholy moulded material resembling ebonite in appearance only and smelling like a boot factory in flames as soon as a soldering iron came near them. I remember rejecting many which had very

In saying this I am not referring to the great majority of antiphonic valve holders now sold, where the actual solid material between pins is really a thin shell of bakelite. I am actually referring to valve holders consisting of a solid block of insulating material as deep as an inch.

One would have thought that the responsible manufacturers would have put out accurate holders at that time, but many were so badly made that no existing valve would fit them. Many were visibly out in their dimensions, and matters were not helped by the fact that it was a little time before all the manufacturers agreed on the exact spacing of their pins.



The special S625 holder for screened-grid horizontal valves made by Marconi and Osram Companies.

high leakages between pins, some even with a dead short!

At that time we were so anxious to get results of any old kind that we did not trouble about high-frequency losses, but tests I have recently conducted on some of the older holders reveal that high-frequency losses between the grid and filament pins were extraordinarily high. Even to-day it is inadvisable to use a holder with a large amount of solid material between pins.

**Dull-Emitter Troubles.**

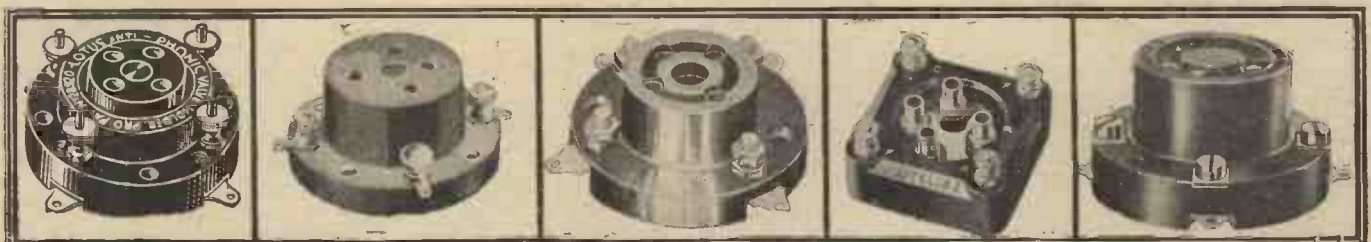
With the arrival of the dull-emitter valve we gained considerable economy in filament consumption and lost our old freedom from microphonic noises. Early experiments showed that it was necessary to mount the holder on spongy rubber or some kind of shock-proof support, and I think Messrs. Burndept were the first to produce the modern antiphonic valve holder. Certainly we owe the name "antiphonic" to them.

Before long other valve-holder manufacturers joined the ranks of makers of good valve holders, until we have a superb collection of first-class holders to choose from.

Although we call these holders antiphonic, and it is generally assumed that they largely remove, if they do not totally eliminate, the microphonic trouble, much depends upon the particular kind of valve used.

In my opinion the biggest advantage of this type of holder is not so much its anti-microphonic properties, but the fact that it automatically adjusts itself at the angle at which the valve is pulled out, and saves

(Continued on next page.)



A selection of typical modern valve holders. Left to right: The Lotus antiphonic holder; Redfern special rubber holder; Ashley Telephone Co. valve holder; the Bowyer-Lowe "Whiteline" holder; and, lastly, the Burndept antiphonic holder, makers of the first anti-pong types.

## FACTS ABOUT VALVE-HOLDERS.

(Continued from previous page.)

considerable strain on the base. Furthermore, its light springy movement insulates the valve from sudden violent shock which would otherwise be transmitted to it if, for example, the table gets kicked or some heavy object is dropped near the set.

This valuable property largely prevents filament breakage, although it is said the modern filament is very strong, and apparently is used by some valve manufacturers to tie elephants to aeroplanes or some such thing as that kind (see advertisements).

### Moulded Bakelite.

Most modern valve holders are made from moulded bakelite, an excellent material when properly cured and having the great virtue of giving accurate moulding. This is very important when we come to things like spacing of sockets in a valve holder. All kinds of methods of spring suspension are used, and in practically all cases terminals are fitted.

Sometimes the metal strip which forms the soldering lug is continuous with the actual metallic socket, and in other cases it consists of a separate piece of metal, either pinched on to or soldered on to the metal forming the socket. In the best types projections or other means are provided to prevent the central moulding carrying the socket to be pressed down on to the base-board or being pulled too far up when a valve fits tightly.

Means of preventing the valve being pushed down on to the baseboard are rather important in some cases, particularly where a metallic base is being used, as in some cases where very complete shielding is required. If the holder is so made that the springs or pins can be forced down so as to touch this conducting base, then a dangerous short circuit will occur and perhaps destroy the valve.

### H.F. Losses.

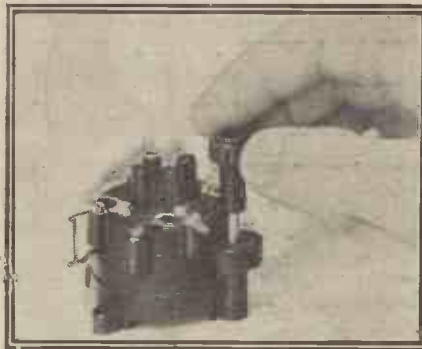
High-frequency losses become more and more important as we get down on to the very short waves, and while most of the good modern valve holders can be used in short-wave sets, they are not all as efficient as one another. For the very short waves I would suggest the type of holder where as much as possible of the solid insulating material is removed from between the separate sockets, thereby giving a maximum of air space here. A number of valve holders are so made.

Pure rubber also has fewer losses than

bakelite, and measurements show that the Redfern Rubber Co.'s holders are very satisfactory on short waves. Messrs. Bowyer-Lowe make a special holder which is as air spaced as it is possible for any holder to be, although, candidly, it is not so strong as their Whiteline.

### Poor Signal Strength.

In my tests I occasionally find a valve holder which has bad high-frequency losses, which means that the use of such a holder in a high-frequency stage is equivalent to placing a high resistance right across the tuning coil, which drops signal strength, spoils selectivity, and fails to do justice to the circuit; but these examples are rare, and do not occur among the holders which are reviewed and used from time to time in "P.W." sets. Here again we have an example of the importance of buying goods



One Harlie valve holder incorporates a variable resistance in its base.

of known reputation and avoiding unknown brands on which the makers have not the courage to place their name.

Here is a tip which many readers may find useful. On several occasions sets have been brought to me which are giving trouble either by noises or complete absence of signals. On examination they have shown that the terminal shank has worked loose in the valve holder and is no longer making proper connection to the particular socket.

Removing the valve holder and tightening up the screw underneath and the locknut on top always cures the trouble. If you are suspicious of your holder it is worth your while removing it and seeing if it is quite tight. Trouble of this kind almost invariably happens on valve holders made from poor insulating material, which softens at the slightest application of heat.

You should carefully examine every contact of your valve holders when purchasing them to see if by any chance a faulty one is present, though with modern holders this is not a frequent occurrence.

## INTERESTING ITEMS.

**R**UNNING down of the H.T. battery is the commonest form of distortion in a set?

Always undo the H.T. + leads before you alter anything inside the set itself. Failure to take this simple precaution costs listeners thousands of pounds for new valves every year.

If you think your telephones are faulty put them on in the ordinary way and place one of the tags between your lips. Rub a key or similar piece of metal gently against the other 'phone tag. If a scratching sound is heard in both earpieces corresponding with the rubbing you may be pretty sure that the 'phones are in good and sensitive condition.

### Don't Oscillate.

If your set howls, whistles, or chirps when you are tuning-in, write to the B.B.C., 2, Savoy Hill, London, W.C.2, or to your local station, and ask for their free booklet on oscillation and how to handle a set. (It is well worth a stamped, addressed envelope.)

It appears that the B.B.C. is now taking an active part in the reformation of criminals. At Wormwood Scrubs it is stated there is a class of sixty prisoners who systematically follow the educational talks from Savoy Hill.

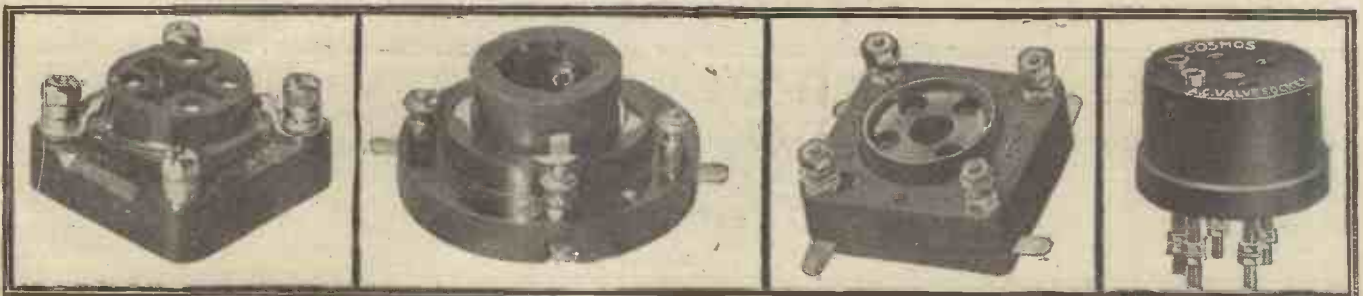
From October 1st a photographic service will be sent out from the Vienna broadcasting station between 4 p.m. and 8 p.m.

Listeners in the Nurnberg station's area have complained of a general loss in signal strength from this station ever since it changed its wave-length from 303 to 249.1 metres.

### Useful Protection.

The point of contact between the aerial and the lead-in tube should be cleaned periodically, and it is not a bad plan to coat the joints with petroleum jelly to minimise the effect of the atmosphere.

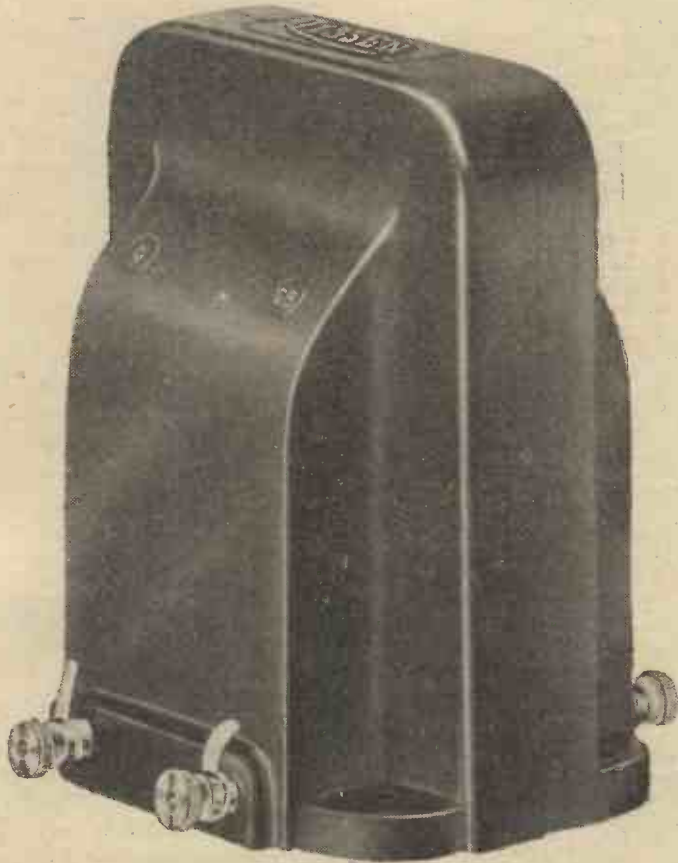
A thin strip of tinfoil inserted in series with the H.T. lead makes an excellent fuse, and the current which a strip of given thickness and width will carry can easily be determined by experiment.



Here we have another selection of holders, namely (left to right), the 'Vibro' holder; the low-loss sprung holder made by Messrs. Wright & Weaire; the new Formo holder; and, finally, the Cosmos A.C. mains valve-holder for panel mounting.

# The 1928 advance in Transformer design

Radio technique has taken another vast step forward during 1928. Lissen have produced a Super-Transformer of which the results can only be described as astonishing. It is incomparably better than any transformer obtainable to-day no matter what the price, because it employs principles of transformer design which have only now been made available. In the months to come, the 1928 season will stand out as the season of the introduction of the Lissen Super-Transformer.



The Lissen Super Transformer enables radio to reproduce the music of the studio with almost stereoscopic effect ; each note is cut like a cameo out of a background of utter silence. The high notes are crystal clear, the deep notes retain their sonorous beauty. Immediately you replace any ordinary transformer with the Lissen Super Transformer you will recognise that here indeed is the ultimate perfection of purity in radio reproduction.

No other transformer, no matter what its price, can compare with the Lissen Super Transformer because in certain ways Lissen will be found to have anticipated the experience of the future. It represents once again the Lissen standard of value to the uttermost penny—a saving in price to the transformer-buying public which can only be compared to Lissen's earlier and now historic "value for money" campaign.

PRICE **19/-** Ratio 3! to 1

This latest transformer represents value in high-priced transformers to the last degree. It represents a big saving to the transformer-buying public in comparison with every other high-priced transformer available.

The 8/6 Lissen Transformer has enjoyed the largest sale of any transformer ever marketed. To-day it still stands unchallenged for value. To-day it is still far better than many expensive transformers offered to the public. It will still be retained in the Lissen range.

## 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.

LISSEN LIMITED, FRIARS LANE, RICHMOND, SURREY

(Managing Director : Thomas N. Cole.)

# DEFINITE CONTACT



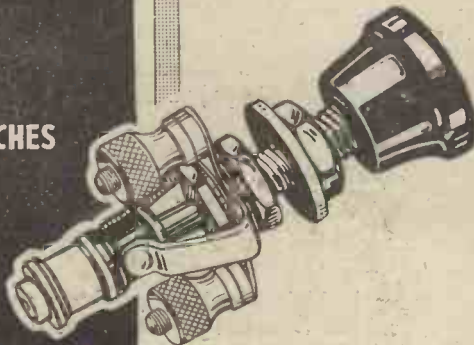
1500,000  
BENJAMIN  
VALVE HOLDERS  
have already  
been sold.

## VIBROLIDER

Perfect contact between valve leg and valve holder is the outstanding feature of the new Benjamin Vibrolider. In the Vibrolider the coils of the anti-microphonic springs themselves form the sockets for the valve legs. Therefore, while every shock is damped out from the filament, any irregularity in the spacing of the valve legs is compensated. Thus perfect contact and much improved results are assured.

PRICE  
**1/6**

*Due to its popularity the original model is still obtainable for those who prefer it. Price 2/-.*



700,000  
BENJAMIN SWITCHES  
are now  
in use.

## BATTERY SWITCH

Perfect contact is also achieved in the new Benjamin Battery Switch. Two sliding arms ensure a double and, therefore, more certain contact while the action of the switch is simple and positive. Terminals are provided for ease of wiring and one-hole fixing is standardised.

PRICE  
**1/3**

*This switch can be obtained without terminals. Price 1/-.*

Fit Benjamin Components in your set this season and enjoy your radio more.

# BENJAMIN

## ELECTRIC LIMITED

BRANTWOOD WORKS, TOTTENHAM, LONDON, N.17.



# ABOUT MODERN VALVES

Originally a British invention, the thermionic valve has gradually increased in efficiency and favour until at the present time there are upwards of 300 different receiving valves upon the British market. In this article some brief remarks upon modern valves are made, and advice given as to the best means of utilising these scientific marvels.

By KEITH D. ROGERS.

IT is impossible in the short space at our disposal to go very deeply into the technique of modern valves, but in these four pages it is hoped that a certain amount of valuable information will be obtained by the reader with regard to the many and various types of valves that are now on the market, and how he may use them to the best advantage in his set.



A recent B.T.-H. valve—the B.12—a super-power valve for really heavy work.

We have long passed the day when the man in the street could pick up an average valve and ask with legitimate doubt whether it was a good one. In the old days we might look at the valve and say "We'll have to try it and see if it is O.K."; but to-day, with the present consistent methods of manufacture, we can safely assume that all valves placed on the

market by reputable firms can be typified as good ones.

Where the trouble comes to-day is in the suitable choice of a valve, owing to the tremendous number of types that are on the market.

In a fortnight's time many of you will be going to the radio exhibition at Olympia, where you will see for yourself representative valves of nearly all the types available on the British market, and if you look at them very carefully you will see what a bewildering array they make and how difficult it is to choose valves for any set unless you go about it in the right way.

### A Question of Impedance.

I think that the problem is in a great number of cases due to the fact that instead of the reader or the constructor memorising the valves and classifying them according to their types, he tries to remember the names, and that is where he is at fault.

Take, for instance, the D.E.5, which is a well-known valve and has been on the market for many years. He may read in an article that he should use a valve of the D.E.5. type, but he looks through the various lists, and he will not find any other valve with anything like the name D.E.5, or, perhaps, D.E. anything else. What he

will find is Cossor L.F., Ediswan E.S.5.L.F., Mullard P.M.6, Six-Sixty something else, and a score of others which might or might not come within the mark, but nothing resembling the name D.E.5 will be found. So he becomes fogged and uncertain as to what he can use.

### Confusing Names.

The whole trouble is in the nomenclature of the valves. Now I want readers not necessarily to forget the names of various valves on the market, but to put the names second in their thoughts, and to think in terms of impedance and magnification factor. Filament voltage and current are not quite so important, and they will find that the choice of valves is far more simple.

For instance, if a valve of the D.E.5 type is wanted, all they have to remember is that the D.E.5 has an impedance of about 8,000 ohms, and they look for a valve with an impedance somewhere around that figure. They find the Cossor L.F. valve has 10,000 ohms, which in most cases is quite near enough. They find that the P.M.6 has an impedance of 6,000 ohms,

a little low perhaps, but in most cases all right, and so on, and then among new valves they will quickly find their way. You will find a large number of valves with impedances somewhere around the same figure, so that from the point of view of impedance those valves are suitable. *It does not matter what they are called.*

Now, from the point of view of magnification, this only affects the set as regards the strength of signals it will give and the amount of grid swing the valve will carry.

A valve with a very high

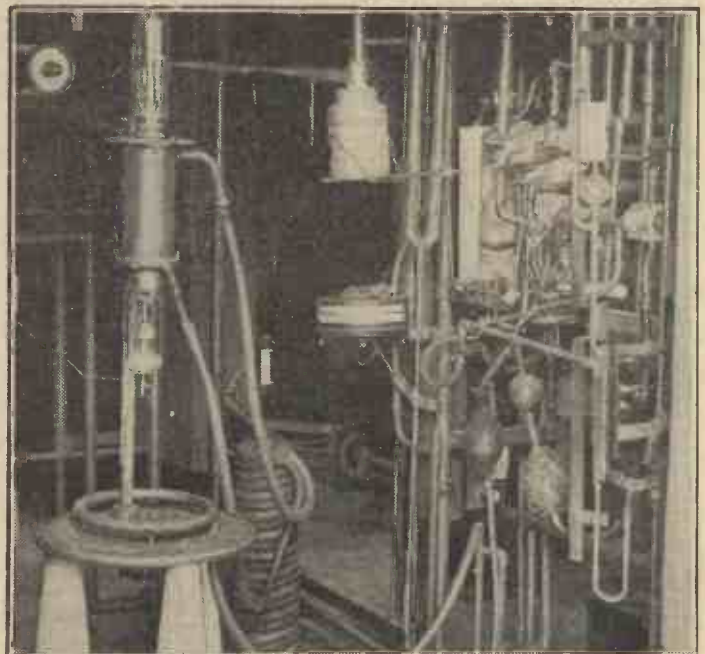
magnification factor has a fairly steep curve, of course, and will not carry a large swing on its grid, so that you want to have a magnification factor somewhere about the same (8 to 12), not more. As a matter of fact, the Cossor valve will have a magnification factor of 10, the D.E.5 will have a magnification factor of somewhere about 7, while the P.M.6 has a factor of somewhere round about 6, and so on.

The magnification factors of valves having impedances somewhat alike are usually also alike, except in the case of freak valves such as the five-electrode valve and other special types, where the magnification factor varies tremendously and does not seem to go hand in hand with the impedances.

### The Best Way.

So you will see that in choosing valves for your set all you have to do is to translate the names of the valves recommended by the makers of the set into impedance and mag., or the impedances and magnification factors if they recommend them by impedance and magnification, and choose

(Continued on next page.)



A corner in one of the large valve factories, showing the exhausting apparatus used to obtain the high degree of vacuum required in a modern transmitting valve. (G.E.C.)

# ABOUT MODERN VALVES

valves having characteristics similar to those specified, if you do not wish to use the actual valve that may be mentioned.

Do not worry about the names. It does not matter what you call a valve so long

done towards eliminating either of those classes and having only 2- and 6-, or only 4-volters. The three classes seem to be still running parallel, and there seems to be no hope at present of simplifying matters and cutting down the number of valves by cutting out one or other of the classes.

From the point of efficiency the 2-volter is rapidly gaining on the other two, and the other two may be said to be practically even in this matter of efficiency, with perhaps the exception of the very big super-power valves such as the L.S.5A., D.F.A.7, B.12, etc.

### 2-4- or 6?

Thus, if a man sees a set which he wishes to build and is undecided as regards to valves, and wants to use 2- or 4-volt valves where 6-volters have been specified, he can rest assured that in the majority of cases he will find the 2-volt will suit him just as

well as 6, but may not be able to carry quite the same volume without distortion at the output stage when he uses a 2-volt power valve as when he uses a 6.

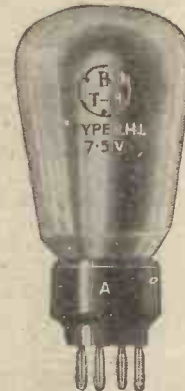
Otherwise the efficiency remains very much the same, and especially is this the case of the screened-grid valve, which has been redesigned this year, and which is now placed on the market in very much improved types.

Perhaps the screened-grid valve is one of the most notable additions to the valve list this year, for it will be remembered it appeared last year in various forms, but

did not meet with great acclaim, and since then it has been totally redesigned. The old S.625 of the Marconi and Osram people has not been taken off the market, but in addition to this everybody in the valve world has come into line and redesigned the screened-grid valve on the four-pin basis, having the screened grid, the main grid and the two filaments coming out of the valve base to fit the ordinary valve holder, with the anode terminal placed on top of the bulb of the valve.

You will see some of these in the photographs herewith, and you will see that it makes a very neat job and makes for ease in building a receiver; screening is not rendered any more difficult, and the fact that you use an ordinary valve holder is a great advantage, special components thereby being rendered unnecessary.

As regards its amplification factor and general characteristics, the new screened-grid valve is certainly very greatly improved; in fact, I think it safe to say that the average 2-volt screened-grid valve of to-day is as good as the 6-volt screened-grid valve of a year ago, which is saying something, for this 6-volter was a very good valve.



The R.H.1—a special power H.T. rectifier for mains units.



FEELING THE PULSE OF THE VALVE. Every valve has to be thoroughly tested to see if it conforms with the required standard of efficiency and physical properties before it is sent out on to the market.

as it has certain characteristics and so long as those characteristics are the ones you want.

### New Releases.

And now let us discuss some of the new valves which are on the market and which may be said to compose the programme for 1929. On close examination you will find that they are many and varied, but on the whole are very good examples of valves. As usual, there are complete ranges of 2-volt valves, 4-volt valves and 6-volt valves. So far nothing seems to have been

### Special Detectors.

Accompanying the screened-grid valve we find now one or two special detectors, such as the P.M.4 D., which are high-magnification valves, specially suitable for detection, and which incidentally make very good first-stage L.F. amplifiers. This increase in magnification power at the beginning of the set, of course, calls for redesign in the latter part of the set, and so we find that a new range of power valves and super-power valves have been brought out by



On the left is the P.R. valve, one of a series of British valves sold for the remarkably low price of 3s. 6d. Next to this is the new Osram screened-grid 2-volter, and next again is the Cleartron power valve C.T. 25 X. Then we come to the Six-Sixty 415 P.P., a power valve for 4-volt accumulators, while following this is the Cosmor S.S. 415 P.P., a famous super-power valve. To the right of the Cosmor is a Dario L.F. valve, and then in the centre we find the Marconi full-wave rectifier, U.5.

# VALVES—(continued from previous page).

many firms, and these valves are all tending towards the low-impedance high-magnification types. Even the famous D.E.L. 610 (13,000 and 13) is now changed to 7,500 and 15.

We also now have the P.625, a large power valve marketed by Marconi and Osram, taking only 0.25 amp. at 6 volts and having an amplification factor of 6, with an impedance of only 2,400. That is a wonderfully efficient characteristic, and for ordinary work and for really good loud-speaker work this valve should be extremely suitable.

If, however, it is found that this will not carry quite enough or give quite enough power as in, perhaps, the case of a moving-coil speaker, where very big volume is required, we find the P.625A takes the same filament current and voltage with a magnification factor of 3.5 and an impedance of only 1,700 ohms, a notable addition to the market. This is an exceptionally good valve, and is well worth consideration, because it gives really big volume.



The K.L.1—the first British A.C. valve.

Messrs. Ediswan have also put on a new power valve, the P.625, which has an impedance of 3,000 and a magnification factor of somewhere about 3. This also is an extremely useful valve.

### The Pentode.

Then, of course, we must not forget that although we have gone in for big magnification in the H.F. stage by virtue of the screened-grid valve, and special detectors, and, to cope with the increased signal strength, special output L.F. valves, it is not always necessary to have so many valves in a receiver.

Take the ordinary four-valve set having a screened-grid valve, a detector, an L.F. valve, and then a big power valve for the last stage. It has been found that by a suitable arrangement of this the last two valves can be made into one, so that we can make that four-valve set into a three-valve set having the same strength of output.

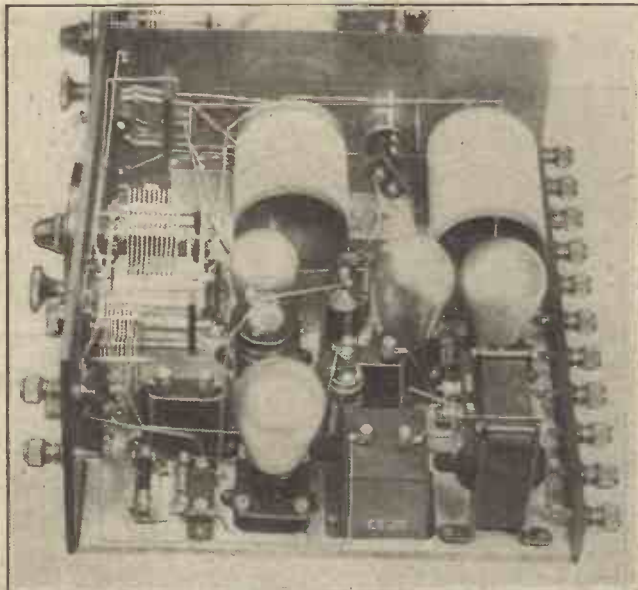
This brings us to the introduction of the pentode, a remarkable three-grid valve, which has been recently put on the market by most of the big firms. The pentode is like any other valve, with its ordinary four pins, but it also has a single terminal on the cap.

### Three Grids.

What happens inside the valve is this: You have your plate taken to the ordinary plate pin. Next to the plate you have a grid which is taken inside the valve to one of the filament pins. Next inside that there is another grid which is taken to the terminal on the base of the valve, and which is externally connected from there to the same H.T. positive tapping which feeds the anode circuit of the valve, and inside this other grid there is a final grid which controls the electron feed and is connected to the ordinary grid socket on the valve holder.

The other two pins, of course, are the filament pins. Now by this arrangement a tremendous magnification can be obtained. The impedance of the valve appears to be very high, but in practice this high figure does not seem to have the same effect that it would with an ordinary valve. So far,

the valve has not been greatly experimented with outside the valve works, and we are unable to say what output circuits are most suited to it, but there are many sets on the market already, and will be seen at the show



THE L.F. END OF A MODERN RECEIVER. It should be noticed that an output filter and super-power valve are employed, while in the background the one end of an S.625 screened-grid valve may be seen.

in a fortnight's time, using this pentode valve.

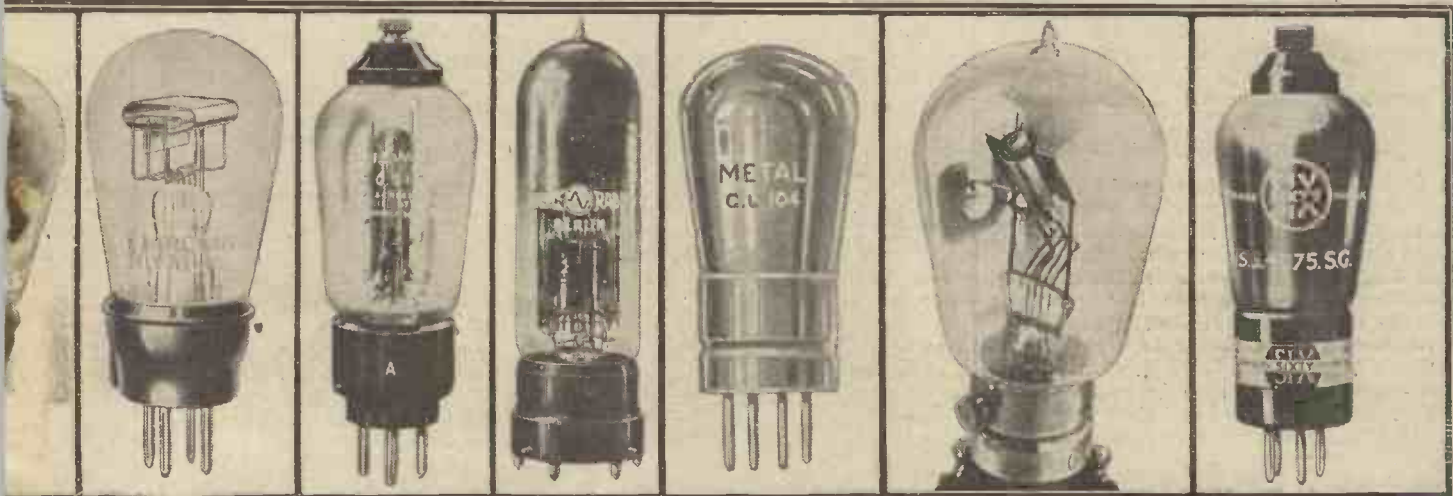
It is available in various voltages, but will probably be most popular in the 2- and 4-volt classes.

### High Magnification.

The 2-volt pentode has a magnification factor somewhere around 30 to 90, the 4-volt pentode has a less magnification factor, while the 6-volt has not yet made its debut on the market, so no details can be given.

On test this valve gives quite as much amplification as can be obtained with two

(Continued on next page.)

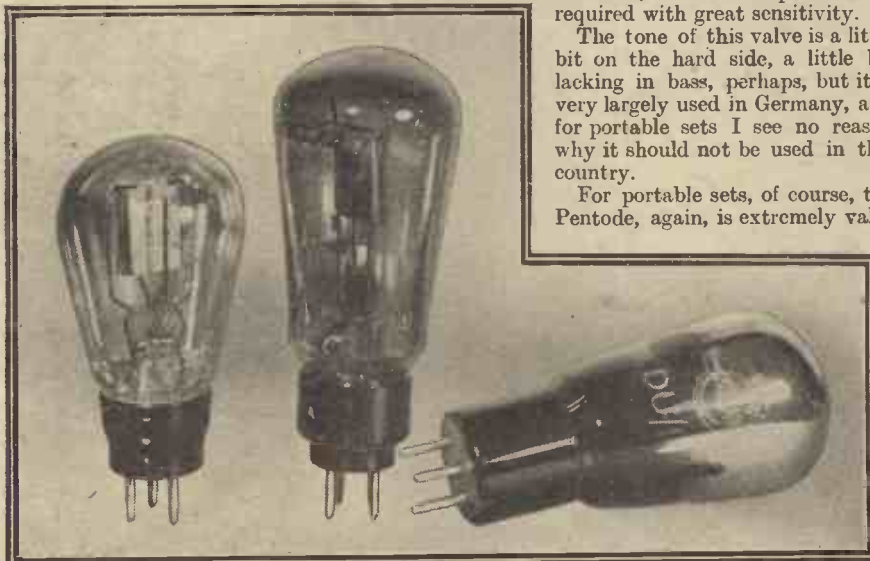


Following this is a Marconi D.E.L. and an Ediswan screened-grid valve, both for 2-volt accumulators. The Loewe multiple valve to the right of the Ediswan is a novel valve which has enjoyed much popularity in Germany. The Metal valve shown next to this is a well-known little valve, while the K.L.1 to the right needs no introduction, it being the first British A.C. mains valve. Finally, we find the Six-Sixty screened-grid valve for 4-volt batteries, taking as it does only 0.75 amp.

## ABOUT MODERN VALVES.

(Continued from previous page.)

stages of ordinary L.F. output, and as such it should have a very, very promising future provided that people who use the valve will remember that it will not take a very great input. It will give a big output, but if you give it a very great grid swing it will distort



Three popular rectifiers for H.T. supply. The U.4 (Marconi-Osram), the R.H.1 (B.T.H.), and the Mullard D.U.10.

horribly—a natural result, as it has a very steep slope and the grid can, therefore, carry only a very small input voltage.

A.C. valves have improved wonderfully since the last show, and have come into general use in many parts of the country. It has been known, of course, that in the case of some ordinary super-power valves it has been possible to run their filaments direct from A.C. without having a valve of the independently-heated cathode type.

In order to meet the demands of people who like to run their valves off A.C., and who do not want to be bothered with the independently-heated cathode type of valve, several firms have brought out a complete range of A.C. valves. These valves, in the case of one firm, take only .8 amp. at 8 volts and are designed to run straight off from a transformer, the current being controlled by a rheostat.

### Multiple Valves.

So far, these valves have made their appearance in an H.F. type, an ordinary general-purpose type of somewhere about 17,000 ohms impedance, a power valve of 6,000 ohms, with a magnification factor of 6, and a screened-grid type having an amplification factor of 160 and an impedance of 200,000 ohms. Unfortunately, so far, nothing "larger" than 6,000 ohms in the power-valve class has been brought out, so it must not be expected that these valves will be suitable to work a very large loud speaker at very great volume.

Undoubtedly, however, other power valves will come on the market soon, and meanwhile one can use for the larger type of power valve (something of the order of the

L.S.5A., or the D.F.A.7, or B.12), which has a reasonably short filament, and which can be used direct off the A.C. mains. The only trouble about this is, of course, that these valves take a higher voltage on the filament, although they take approximately the same amperage.

The Loewe multiple valve which appeared some time ago is still making headway over here, although it does not seem to have caught on to the same extent that was expected. It has, however, very definite advantages, especially for portable receivers, where compactness is required with great sensitivity.

The tone of this valve is a little bit on the hard side, a little bit lacking in bass, perhaps, but it is very largely used in Germany, and for portable sets I see no reason why it should not be used in this country.

For portable sets, of course, the Pentode, again, is extremely valu-

man who wants big power in his anode circuit.

Hitherto it has been rather difficult to arrange an eliminator suitable to deal with a couple of B.12 or D.F.A.7 valves. The U.8, however, is a power rectifier of the full-wave variety, which will give a maximum anode voltage R.M.S. of 500, with a maximum D.C. output of 120 milliamps. It has an impedance of only 250 ohms, and takes 2.4 amps. for its filament.

### Large Output.

The filament current, you will see, is a little larger than is usually the case, and the filament voltage is 7.5, but this, of course, is of no consequence, since with suitable transformers one can get any reasonable voltage and current from the A.C. mains without upsetting the wattage consumption of the mains to any very appreciable extent.

This valve should more or less revolutionise mains units, for on load a D.C. output of at least 100 milliamps can be obtained.

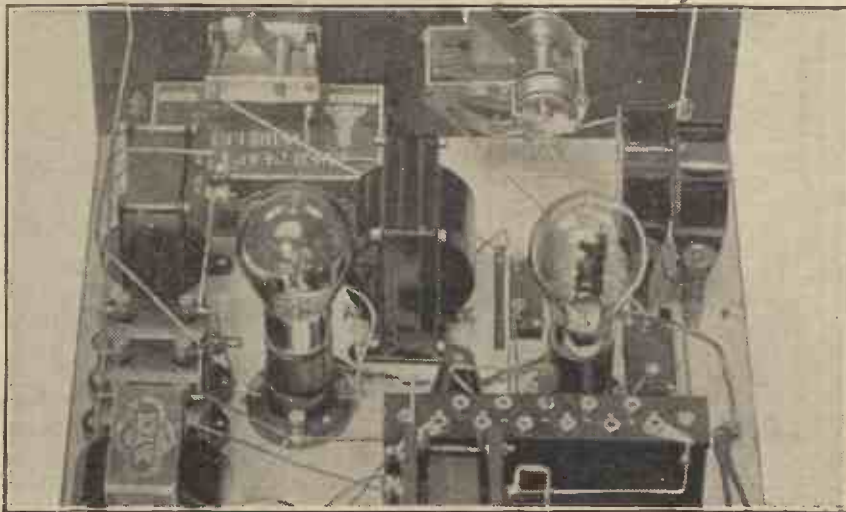
Then we have the P.R. valve, which is sold at the remarkably low cost of 3s. 6d., and which has quite remarkably good characteristics and should appeal to those to whom the price of the usual British valve is still too high.

Valves by Aneloy Products, Ltd., of East Dulwich, are too well known to require any lengthy reference in this article on modern valves. These have, however, been used by a number of our readers with very good results during the last year, and are well spoken of in all quarters.

### Good Foreign Valve.

Before I close, perhaps mention should be made of another of the more notable foreign valves which are now upon the British market. This is the Dario valve, manufactured, or rather marketed, by the Impex Radio Valve Company, and this year a remarkably good series of valves is being put on the market during the next month or so by this firm.

These valves are of the 1.8 and 3.5 volt type, and make admirable little detectors if the Micro Bivolt types are chosen, while the Dario super-power valves, though they take only .1 amp. at 3.5 volts, have very high emissions, and can handle quite large volume without distortion.



A section of an "all-from-the-mains" two-valve set employing Cosmos A.C. valves as detector and L.F. valves.



# Brandes Radio Products

*Further greatly reduced prices.*



The L.F. Transformer.

Type 1-3 (Brown Case) 12/-  
(reduced from 15/-)

Type 1-5 (Black Case) 12/6  
(reduced from 15/6)

*The L.F. Transformer giving the utmost purity and high amplification.*



The Ellipticon.

£3 : 17 : 6  
(reduced from £4 : 15 : 0)

*The Perfect Cone Unit in the acoustically perfect cabinet.*

Any of the Brandes Products to the value of £5 and over can be obtained on the Hire Purchase System.

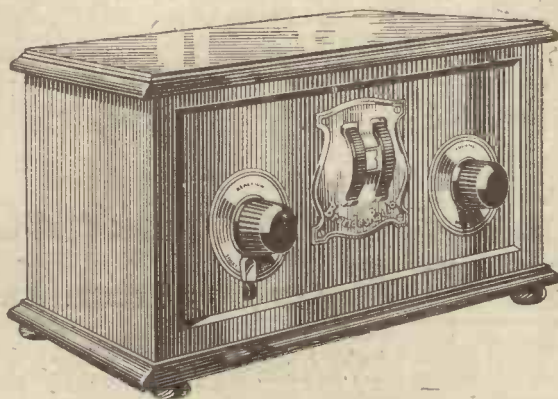


MATCHED TONE HEADPHONES

8/-

(reduced from 13/6)

*the greatest headphone value in the world.*



THE BRANDESET III A  
INCLUDING VALVES

£6 : 15 : 0

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*The set the public chose.*



Variable Condenser.

'0005 12/6  
(reduced from 15/6)

'0003 12/-  
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*Keen critical setting and more uniform separation.*



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£2 : 10 : 0  
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*Greater volume with minimum current input.*

Any of the Brandes Products to the value of £5 and over can be obtained on the Hire Purchase System.

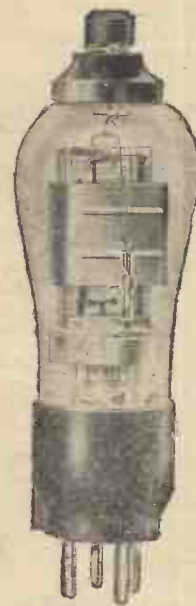
BRANDES LIMITED, CRAY WORKS, SIDCUP, KENT.



**Some Wonderful New**

**Good News!**  
for 2 volt users  
and users with  
Electricity installed  
from A.C. supply

**Osram  
Valves**



The new  
Osram  
S.215 Valve

Made in England

**S.215 A NEW SCREEN-GRID VALVE for 2 VOLT USERS**

The Osram S.625 was the pioneer of screen-grid valves and now there's one for the 2 volt user.

CURRENT CONSUMPTION	AMPLIFICATION FACTOR	IMPEDANCE	PRICE
.15.	170	200,000	22/6

These screen-grid H.F. valves will get you "distance"

**NEW VALVES for use from Alternating Current Electricity Supply**

OSRAM	CURRENT CONSUMPTION	AMPLIFICATION FACTOR	IMPEDANCE	PURPOSE	PRICE
H. Point 8	.8	40	55,000	R.C. Amplifier	15/-
H.L. Point 8	.8	17	17,000	General Purpose	15/-
P. Point 8	.8	6	6,000	Power Valve	17/6
S. Point 8	.8	160	200,000	SCREEN-GRID H. F. Amplifier	25/-

**LOOK OUT FOR THE OSRAM PENTODES!**

These wonderful new 5-Electrode power valves will shortly be placed on the market.

Sold by all Wireless Dealers

Those listeners who possess electric light from the A.C. mains have been waiting for these valves. *A complete range for the A.C. mains!*



# SUPER-POWER VALVES NOW REDUCED IN PRICE from 20/- to 15/-

**Osram  
D.E.P.  
240  
Now 15/-**

The well-known Osram Super-Power Valve, the D.E.P.240, is now reduced in price to 15/-, and is within reach of all purses.

Use this valve with a 2-volt accumulator in the last stage of your set and banish distortion. The Osram D.E.P.240 will give you mellow reception.

VOLTAGE	CURRENT CONSUMPTION	MAX. ANODE VOLTS	AMPLIFICATION FACTOR	IMPEDANCE	REDUCED PRICE
2	.40	150	4	2,500	15/-

**and NEW**

## Osram Super-Power Valves

sold at the New Standard Price of 15/-

OSRAM	VOLTAGE	CURRENT CONSUMPTION	MAX. ANODE VOLTS	AMPLIFICATION FACTOR	IMPEDANCE	PRICE
P.425	4	.25	150	4.5	2,250	15/-
P.625	6	.25	250	6	2,400	
P.625A		.25	180	3.5	1,600	

# Osram SUPER-POWER valves

MADE IN ENGLAND

Sold by all Wireless Dealers.

**REDUCED PRICES**  
of the well-known  
**Osram**  
**L.S.5 AND L.S.5A**  
NOW ONLY **25/-** EACH  
formerly 30/-

## LATEST BROADCASTING NEWS.

IMPORTANT RELAY  
CHANGES.THE BEECHAM NEGOTIATIONS—  
AN ECHO OF A "P.W." STUNT.(FROM OUR OWN BROADCASTING  
CORRESPONDENTS.)

## The November Changes.

READERS of POPULAR WIRELESS will discover little novelty in the B.B.C. announcement last week of the changes that will take place on November 1st. Briefly they are that the ten relay stations are to be put on 288.5 metres, the present Bournemouth wave-length, and Nottingham is to disappear. Relay station staffs will be withdrawn, because there will be no more local work of the kind.

It is hoped by these changes to improve by 300 per cent the service areas of Relay Stations in the industrial cities. It is high time the B.B.C. took notice of the deplorable state of affairs caused by international heterodying, and it is profoundly to be hoped that the contemplated changes will have the desired effect.

## Success of the "Surprise" Items.

The instant success of the "Surprise" items recently introduced by Savoy Hill proves that listeners are quick to appreciate any departure from the deadly set routine that has come over programme arrangements lately. It is understood that much more flexibility will characterise the autumn and winter arrangements than for the past three years. Mr. Wellington, Mr. R. E. Jeffrey, and Mr. K. A. Wright are the mechanics of this change.

## The Beecham Negotiations.

After many vicissitudes and dangers, the negotiations between the B.B.C. and Sir Thomas Beecham are stated to be nearing a satisfactory conclusion. It is quite definite that Sir Thomas will conduct for the B.B.C. in the coming season.

## Mr. Lyle on the St. Leger.

Mr. R. C. Lyle, the well-known sporting journalist, whose vivid description of the Derby was one of the features of this year's broadcasts on sporting events, is giving a running commentary on the St. Leger, which is to be run on the Town Moor Race-course, Doncaster, on Wednesday, September 12th. The broadcast will take place between 2.50 and 3.15 p.m.

## An Echo of a "P.W." Stunt.

A novel idea will shortly be introduced in the Manchester programmes which, if it is successful, may go a long way towards brightening up the winter transmissions. Briefly, listeners will be invited to answer the question "What was that?" after they have heard some well-known and distinctive local noise through their headphones or loud speakers. It may be a noise from the

docks, or a tram depot, but always something which most Mancunians should easily recognise. This is a local revival of what the B.B.C. did nationally two years ago at the suggestion and with the co-operation of POPULAR WIRELESS.

## Empire Marketing at Cardiff.

Several special programmes are being arranged for Welsh listeners in connection with an exhibition which the Empire Marketing Board is holding in the Drill Hall, Cardiff, from Monday, October 29th, to Wednesday, November 10th. These will



Miss Gertrude Laurence, the famous actress, who recently received the record broadcasting fee of £20 a minute from W E A F, the New York station.

doubtless include a speech by the Right Hon. L. S. Amery, the Secretary of State for the Colonies, on the opening day, as well as concerts having some special significance to the various parts of our far-flung Empire.

## Scottish National Players.

The Scottish National Players, who are touring the Highlands and lowlands in their caravan, halting now and then to give a performance in the little village hall or wherever they can conveniently fit up a stage, which, like their costumes and properties, they transport from place to place,

are visiting the Aberdeen Studio on Thursday, September 13th, to give a programme of traditional ballads, Scotch songs and choruses. Their unseen audience will be the largest of their tour.

## A Test-Team Talk.

The team which is to represent England in the next "Tests" against Australia sails on Saturday, September 15th. The players and their prospects will be discussed that evening in a talk by Col. Philip Trevor, the well-known authority on cricket, who has given running commentaries on this season's games between England and the West Indies. Another interesting sports talk will be heard the previous evening, when Miss Evelyn Colyer, the well-known tennis expert, will give some seasonal advice to those enthusiasts who play tennis during the winter.

## PERTINENT "PARS."

VERY short waves round about 50 metres or so do not travel along the surface of the earth like ordinary wireless waves, but are projected into space and are "reflected" by the Heaviside layer. It is this fact which gives rise to the curious "skip distance" effect which causes short-wave stations to be heard better at a greater distance than close at hand.

If a clean duster is wiped over a soldered joint while it is still hot superfluous flux will easily be removed, though if left until cold it will be almost impossible to shift it, and in time it would be certain to cause leakage and all sorts of undesirable effects.

## TECHNICAL NOTES.

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

## POPULARITY OF PORTABLES.

"TRANSPORTABLE" VARIETIES—MAINS OPERATION, Etc., Etc.

## Popularity of Portables.

THERE seems to be a very large and still growing demand for "portable" radio sets and portable gramophones. I receive quite a number of letters from readers dealing with this question, and it is difficult to make up one's mind whether the portable set is so popular because it is really portable or because it is small and compact, and often—though not always—lower in price than the more standard type. In other words, it is not easy to decide whether so-called "portable" sets are, in fact, generally used as portable sets, or whether they are located in a definite place and used as ordinary sets.

Personally, I am inclined to think that although the purchaser of a portable set has in his mind at the time the advantage of portability—and probably even the definite intention of using the set for some purpose or occasion where its portability is desired—he ends up by using the set in the more or less standard fashion.

## Transportable Varieties.

This brings us to the question, which has been attracting some attention lately, as to whether there is a demand for a portable set without batteries and designed to work, with a supply-unit, from the electric-light mains.

It is clear at once that although such a set may be small and light enough to be transportable it cannot truly be said to be portable, in the sense in which this description is now ordinarily understood. For a set to be really portable it must obviously be entirely self-contained, whereas if it relies for its electric power upon a connection to the electric-light supply it is evidently not universally portable.

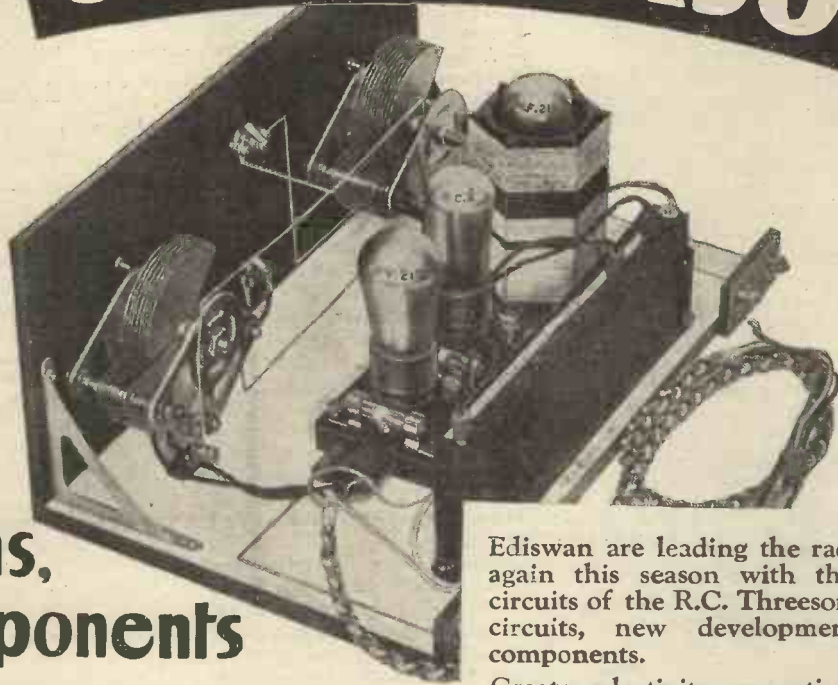
## Mains Operation.

I am inclined to think that there should be a good demand for a portable set which is designed to operate from a mains-supply unit, and I would even go further and equip

(Continued on page 923.)

# THE SENSATION OF THE SEASON

## New Circuits, New Ideas, New Components



Ediswan are leading the radio-world again this season with their 1929 circuits of the R.C. Threesome. New circuits, new developments, new components.

Greater selectivity—exceptional purity—no coil changing—easy and cheap to make.

### 2 Standard 3-valve Circuits.

Circuit No. R/3 3-valve Resistance Capacity Coupling throughout, strongly recommended to those to whom purity of reproduction is of utmost importance.

Circuit No. R/3T 3-valve with Transformer Coupling in the last stage, for greater selectivity and volume.

Choose your set and send coupon for FREE Full-size Paper Model and Instruction Book.

### COUPON.

P.W. 8/9/29.

To the EDISON SWAN ELECTRIC Co., Ltd.,  
123/5, Queen Victoria Street, London, E.C.4.

Please send FREE Paper model and Instruction Book as selected.

Name.....

R/3	<input type="checkbox"/>
R/3T	<input type="checkbox"/>

Address.....

C.S./T.1 Please cross against Model required.

# EDISWAN R.C. THREESOME 1929 CIRCUITS

These circuits are specially designed for the famous Ediswan Valves,  
H.F.210, L.F.210, R.C.2 and P.V.215.

## FROM THE TECHNICAL EDITOR'S NOTE BOOK



## ANOTHER NEW MAGNUM PRODUCT.

IT is very gratifying to note that Messrs. Burne-Jones, Ltd., are retaining their screw-headed terminals in all their latest productions. It is an innovation which will appeal strongly to the practical constructor. There will be few builders of sets who have not experienced trouble, at one time or another, in the tightening of the terminals of components awkwardly placed for this operation.

But this excellent terminal arrangement seems to be only one of several very



The slotted terminals can clearly be seen in this photo of the Magnum holder.

good points in the new Magnum anti-phonic baseboard-mounting valve holder. Another good feature is the skilful way in which the insulation material is cut down to a minimum, and this cutting away, together with the employment of high-class material, results in the device having very low high-frequency losses. Indeed, it is, in this respect, far ahead of many components that have come to my notice. And the anti-pong qualities of the device are also of a high order.

In a modern valve holder one expects to find the sockets sunk in order to prevent accidental shorts occurring, but in the Magnum holder the openings seem to be designed so that they actually facilitate the correct insertion of the valve. I notice, too, that although the pins of valves make excellent contact in this Magnum holder there is no gripping action which tends to make the removal of the valve a difficult and precarious task. Altogether it seems to me to be a thoughtfully designed and cleanly produced piece of work.

## BRANDES BATTERIES.

In a recent report I referred to a Brandes B.S.60 type of H.T. battery costing 9s. 6d. but this should have read B.P. There is a B.S. in the Brandes group, in fact there is a B.S.60, and a B.S.99. The B.S.60 actually costs 12s. 6d., and the cells are of larger size. This is the type recommended by the makers for general use; they do not advocate discharges exceeding 5 milliamps in the case of the B.P. varieties.

A B.L.60 model has two and a half times the capacity of the B.P. and costs 17s. 6d., while the B.E.60, which is designed primarily for multi-valvers, costs 21s. and has over three times the capacity of the B.P.

## A MOVING-COIL LOUD SPEAKER.

I recently had on test a Lang & Squire moving-coil loud-speaker unit. It is somewhat smaller and lighter than most others, but it is claimed that a special steel used in its construction enables it to develop the necessary strong magnetic field.

The "pot" is wound for a 6-volt supply, but on measuring the current, I was rather surprised to find that it takes no less than three amperes. But I also noticed that the gap in which the coil operates is fairly wide, and I came to the conclusion, afterwards proved correct, that the unit must suffer from this in regard to sensitivity.

The centring is carried out by three strings which can be tightened by means of screws. I expected these strings to develop resonance effects, but, curiously enough, they failed to do so. As moving-coil speakers go, the most careful tests show that this Lang & Squire production can only be regarded as a very insensitive example. I could only obtain "two-valve volume" with a four-valve set working all out. In reproduction this unit again failed where moving-coil speakers are popularly presumed to excel; there was hardly as much true bass present as there is in an ordinary cone speaker. Nevertheless, I am bound to say that on the upper register the reproduction was bright and clean.

## LISSEN'S NEW TRANSFORMER.

I find it very hard to keep pace with Messrs. Lissen's these days. No sooner

have I tested and written up a new Lissen component than along comes yet another addition to the ever-increasing range of components due to the famous Richmond factory. But I am not grumbling and, as far as I am concerned, the Lissen people can keep up their steady rate of development.

As I am always saying, we never can have on the market too much, high-class radio gear retailing at low prices. And Messrs. Lissen's certainly seem to have the knack of simultaneously building up to quality and down to prices. Their new L.F. transformer, for instance, I find, subsequent to a series of careful comparative tests, has few equals at any price, and the constructor who is out for both maximum volume and greatest purity of

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.

reproduction need have no hesitation in including one in his receiver.

No doubt readers will find the accompanying photograph of interest. It shows, at the extreme left, a complete Lissen Super Transformer compared with one which has been dissected. The casing, it will be seen, is a moulding and has to be broken to get at the interior of the article. The core is heavy and is scientifically built. The windings are accommodated on three formers, this enabling the closest coupling with extremely low self-capacity to be obtained.

On the extreme right of the photograph you will see one of the core stampings which has been removed. I have included this to show you how the core is assembled, and it should be noted that the splits do not overlap, for the stampings alternately face in different directions.

The fixed condenser, which is connected across the primary winding, is built into the back of the casing as shown in the photograph.

Lissen's have certainly scored another "bull's-eye" with their L.F. transformer.



The scientific design of the new Lissen L.F. transformer is revealed in this photograph. Note the fine cut and closely assembled core stampings of special iron and the sectional windings. The component has a very low self-capacity.

# NO RADIO WITHOUT DARIO DARIO VALVES

DARK EMITTER  
RADIO MICRO

AT NEW  
REDUCED  
PRICES!

AT NEW  
REDUCED  
PRICES!

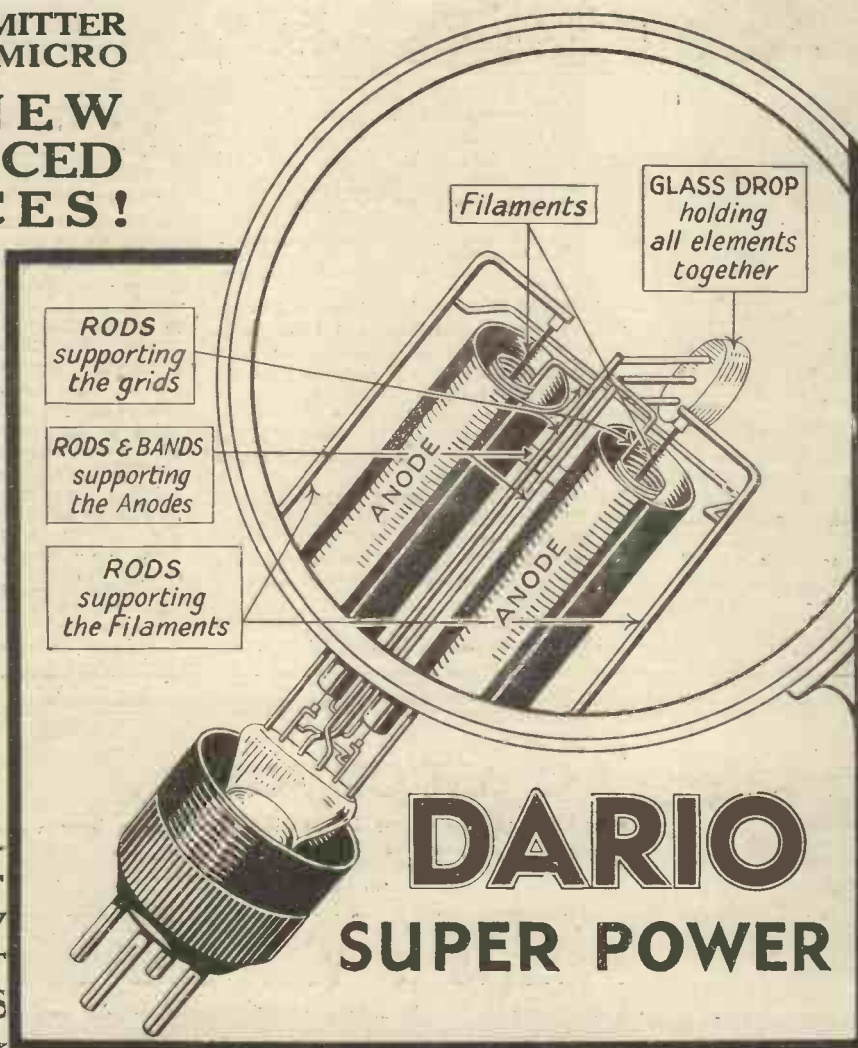
SUPER  
POWER  
VALVES

FOR LOUD  
SPEAKER  
RECEPTION

2 and 4  
VOLTS

**7/6**

GREATEST  
ECONOMY  
AND BEST  
RESULTS



GENERAL  
PURPOSE

and

R.C.C.

VALVES

2 and 4  
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WONDERFUL  
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FOR YOUR  
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## DARIO SUPER POWER

**ECONOMY**—DARIO Valves cost less than other valves.  
 —DARIO Valves consume less than other valves.  
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DARIO Valves give more emission than other valves—  
 DARIO Valves are more sensitive than other valves—  
 DARIO Valves give purer music than other valves—

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DEALERS' Enquiries are welcomed and will be attended to promptly.



## 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. Ellis, 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.

#### CRACKLING FROM A MAINS UNIT.

H. J. W. (Lowestoft).—"Back in the spring I bought a mains unit from a friend who was leaving the town. He had used it about six months, and all that time it went perfectly.

"When I first had it I tested it out all one evening, and found it in perfect condition. Since then I have not used the set much until last week, when I switched on and found that reception was rather marred by a crackling

sound—not all the time, but kind of irritating.

"It so happens that the man I bought it from is staying here on his holiday, with a neighbour, so when I met him I mentioned the crackling trouble, and he offered to look over it for me. He knows a bit about electricity, and after he had tested it all thoroughly, (set as well), he declares the mains unit is absolutely O.K.

"The fault which causes the crackle is not in the set either, but it is in the house lighting, he says, and we noticed that it is in the evenings when it is troublesome, there being four or five lights in use on the premises after dusk.

"I have examined all these lights, and none of them appears to be flickering, yet every

evening there is this continuous disturbance. Do you think it would be worth while having an electrician examine the lights, or does the absence of a flicker there prove that they are all O.K.?"

The fact that the lights show no flicker when in use is no guarantee that they are not at the bottom of the trouble. If one of the switches or contacts is a little faulty, and giving intermittent contact and slight sparking, it is quite possible that the lighting circuit is the culprit. The light may appear to be steady all the time, because the bulb's variation of brilliance does not respond to a make or break with the speed necessary to show up such a fault. But the effect of the sparking would be very clearly heard on the wireless set, where even a small and distant spark can give rise to abominably loud disturbances.

We should explain the trouble to an electrician, and get him to look over the wiring with a view to remedying any loose contacts or switches. Provided you are right in assuming that the unit and set are faultless, we have no doubt that remedying a poor contact in the house-wiring will cause the symptoms to disappear.

#### STRENGTH OF RECEIVED SIGNALS.

"MORSE" (Letchworth).—"Thanks for that list of abbreviations you gave in Radiatorial a few weeks ago—how I have puzzled my head over some of them in the past, to be sure! I find short-wave work twice as interesting now that I know what the stations are saying to one another.

"But there is one thing that puzzles me a lot, and I hope you can clear that up like you did the abbreviations. I mean 'R5,' 'R2,' etc. Apparently the R followed by a figure means the strength of reception, but what is the recognised meaning of the groups?"

"I am sure many of those who follow the doings of amateurs in other countries would be glad to know the meaning of the various R's."

The "R" system of indicating audibility or strength of reception originated with the American Radio Relay League—the strongest body of organised radio-amateurs in the world. Members of the "A.R.R.L.," as it is called, handle a great deal of

(Continued on page 920.)



HOW TO SECURE YOUR BATTERY  
Buy one of the "Ripaults" batteries listed below, fill in the coupon and post it together with your dealer's receipt to reach us not later than first post Monday, September 24th, 1928.

#### STANDARD CAPACITY (Chocolate Label).

60 volt 10/6      99 volt 16/6

#### DOUBLE CAPACITY (Blue Label).

45 volt 11/6   60 volt 15/6   90 volt 22/6

#### TREBLE CAPACITY (Orange Label).

45 volt 15/-   60 volt 19/6   90 volt 29/6

#### QUADRUPLE CAPACITY (Black Label).

45 volt 18/6   60 volt 23/6   90 volt 36/6

## To Everyone

who between September 1st and 22nd, inclusive, buys a

RIPAULTS SELF-REGENERATIVE H.T. DRY BATTERY  
(the Battery that gives 50% Longer Life).

WE WILL SEND FREE AND POST FREE A

RIPAULTS 9 VOLT GRID BIAS BATTERY.

To the sender of the first coupon opened in our mail each morning from Sept. 3rd to 24th, inclusive, we will also present Free and Post Free a

RIPAULTS 99 VOLT STANDARD  
SELF-REGENERATIVE H.T. DRY BATTERY.

We know that our Batteries are the most efficient ever made, and we want you also to prove to your own satisfaction that they not only give 50% Longer Life but enormously increase the quality of reception of your receiver.

FILL IN THIS COUPON. I hereby certify that I purchased, on the date shown, the "Ripaults" Self-Regenerative H.T. Dry Battery as covered by the enclosed receipt from my Local Dealer.

NAME.....

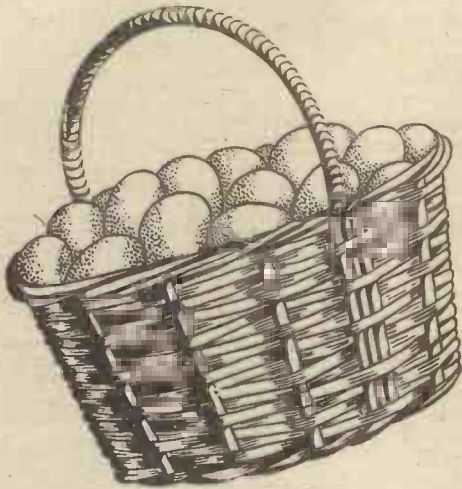
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Write in BLOCK letters and POST to:—

RIPAULTS LTD., 1, King's Road, London, N.W.1.

# RIPAULTS SELF-REGENERATIVE H.T. DRY BATTERIES.





## WHICH IS NEW LAID?

**B**UYING cheap, untried condensers is like buying eggs. You buy on trust. You cannot tell the quality of an egg by its outward appearance. Neither can you judge a condenser by looking at it.

That is why you should insist on seeing "T.C.C." on the condenser you buy. Then you know that you are using a condenser that has behind it a 22-year-old reputation. You know that it has passed rigorous factory tests. It is guaranteed accurate to a minute degree; reliable to a point almost of infallibility.

It will pay you to buy "T.C.C."—the condensers in the green cases.

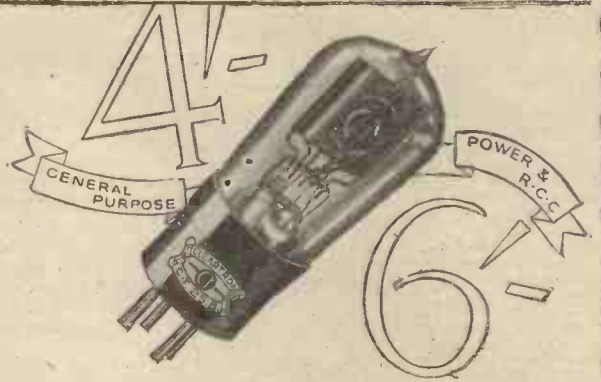
Specified for the  
Cassor "Melody Maker"



# T.C.C.

Advr. Telegraph Condenser Co., Ltd., Wales-Farm Rd., N. Acton London, W.3.

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## To pay more is to pay too much

Test Cleartron Valves against any other make you know and your own experience will prove their amazing efficiency.

Cleartron Valves are British. They are inexpensive for the same reason that every valve should be inexpensive—the present cost of materials and the high efficiency of modern plant makes it profitable to produce first-class valves and sell them at these prices.

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Cleartron Valves are made in 2-, 4- and 6-volt types for every purpose in wireless; General Purpose Types cost 4/-; Power Types, 6/-. They are unsurpassed for signal strength, purity of reception, and length of life.

Dealers everywhere are stocking them. If they are not yet obtainable in your district, order direct, giving name of your usual dealer. Meanwhile, send the coupon for new descriptive brochure.

# CLEARTRON

## ALL-BRITISH VALVES

### FREE POST THIS COUPON

CLEARTRON (1927) LTD.  
(Sales Dept. 5), 21, Cumberland St., Birmingham.

Please send me your new brochure describing the characteristics of all types of Cleartron Valves.

Name.....

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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 918.)

important traffic in the way of telegrams to and from out-of-the-way places. (In fact, the U.S. radio amateurs have more than once been able to perform national services owing to the efficacy of their short-wave relay system.)

In order to promote good working between the different stations it became necessary to have a standard series of abbreviations to indicate the various signal-strengths. This was the original "R" system as applied to radio, and given in the Rules and Regulations of the A.R.R.L.

- R1.—Faint signals, barely audible.
- R2.—Weak signals, barely readable.
- R3.—Weak signals, but readable.
- R4.—Fair signals, easily readable.
- R5.—Moderately strong signals.
- R6.—Strong signals.
- R7.—Good, strong signals, readable through lots of interference.
- R8.—Very strong signals, several-feet-from-phones stuff.
- R9.—Extremely strong signals.

### TWO-VALVE BLUEPRINT WANTED.

X. Y. Z. (London, W.C.2).—"I want to build a two-valve set (det. and L.F.) with reaction (plug-in coils) from the following parts:

- 1 L.F. transformer; 1 '0005 variable condenser; 1 2-way coil holder; 1 2-meg. grid leak; 2 valve holders; 1 filament rheostat; '0002, '0003, '0005, and '001 fixed condensers.

"Would you kindly let me know the number of your Blueprint for my purpose?"

Full details for building a set of the type named will be found upon the "P.W." Blueprint No. 11.

This can be obtained upon written application to the Technical Query Department, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The price is 6d. per blueprint, and in addition to the postal order a self-addressed stamped envelope must be enclosed with your application.

### AN OLD-FASHIONED REFLEX.

E. D. W. (Luton, Beds.).—"Owing to financial stringency I have had to give wireless the go-by for several years. This year I am starting again, and I am surprised to find that nobody these days seems prepared to use an old-fashioned crystal-valve reflex circuit, such as I used with great success some three and a half years ago.

"At that time I used to get Aberdeen on the loud speaker several nights in succession, and I thought nothing of Newcastle, Glasgow and other British stations. Yet my friends who have four-valve sets do not ever hear these British stations, they tell me, so I am determined to build, if possible, a reflex receiver on the old-fashioned lines to try what I can do with it.

"I have the following parts on hand:

- One 50- and one 75-turn plug-in coil and coil holder;
- One '0005 mfd. variable condenser;
- One '0003 mfd. variable condenser;
- One three-to-one L.F. transformer (good make);
- One crystal detector;
- One rheostat;
- L.T. battery;
- H.T. battery;
- One valve holder; and
- Several small fixed condensers.

"Is this all I shall need, and how shall I connect up?"

**DON'T FORGET  
YOUR SEPTEMBER  
MODERN WIRELESS**

**NOW ON SALE**

You have all the parts on hand, and the old-fashioned reflex to which you refer, of the type which was so popular several years ago, was connected up as follows:

Aerial to one side of the fixed coil holder, to one side of the '0005 variable condenser, and to the grid of the valve. Remaining side of this coil and condenser are connected together and to earth, to one of the secondary terminals on the L.F. transformer, and to a small fixed condenser of about '0002 mfd.

The remaining sides of the secondary of the L.F. transformer and of this small condenser are connected together, and to one of the filament sockets on the valve holder, to one side of a large fixed condenser, to H.T. negative, and to L.T. negative. The remaining filament terminal on the valve holder is connected to one side of the rheostat, the other side of which goes to L.T. positive. H.T. positive is connected to one of the 'phone terminals, the other 'phone terminal being connected to one of the primary terminals on the L.F. transformer, to the remaining side of the large fixed condenser previously referred to, to one side of the moving coil holder, and to one side of the '0003 variable condenser.

The remaining sides of this coil holder and condenser are connected together and to the plate of the valve and also to one side of the crystal. The remaining side of the crystal is connected to the remaining side of the primary of the L.F. transformer.

This completes the wiring. Note.—In a great many cases it was advisable to shunt a '001 mfd. or smaller fixed condenser across the primary of the L.F. transformer when used under these conditions, but this may not be necessary with the more modern types of transformer available these days.

We do not think it is so easy to tune in Aberdeen, etc., as previously, and we think you are wrong in assuming that this is due to the different circuits. As a matter of fact, it is extremely likely that the conditions in the ether vary, for some inexplicable reason, and a set which a few years ago would have brought in Aberdeen quite easily may now, even if worked under precisely the same conditions as regards voltages, etc., be quite unable to repeat that performance.

### "BE PREPARED."

"Ex-SCOUT" (Shoreham-on-Sea, Sussex).—"What is the method of testing out transformers, etc., with a dry cell and 'phones? I should like to know how to do this properly as I want to get ready for the bad weather,

(Continued on page 922.)

# Recognised leaders in the design of

FOR THE 1928 SOLODYNE



B.B.C. Coils:

Aerial Circuit 1 Ref. LAA 5 } £2-5-0  
H.F. Transformer 2 Ref. LAT 5 } Per Set  
5-pin Bases 3 Ref. LB } including bases

Daventry Coils: (Pat. No. 285,723)

Aerial Circuit 1 Ref. LAA 20 } £2-5-0  
H.F. Transformer 2 Ref. LAT 20 } Per Set  
Additional Bases Ref. LB. . . . . 2/- each.



1 Lewcos Wavetrap . . . . . 13/6

## Solodyne Coils

As manufacturers of the special coils used in the original 1926 Solodyne, Lewcos established a leadership which is still unchallenged. New developments necessitated many alterations when the designers were producing the coils for the 1928 Solodyne. But again LEWCOS will give you that extra selectivity and efficiency that constructors have learnt to expect from all Lewcos Coils.

Obtainable through all good radio dealers.

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AND SMITHS LIMITED,  
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**LEWCOS**  
(REGD.)

# COILS and WAVETRAPH for the 1928 SOLODYNE



ADJUSTABLE SPINDLE OF INSULATING MATERIAL

**FOR EASIER TUNING** fit your condensers with the Ethovernier Dial shown below. Fine tuning is quite a simple matter—due to the 18-1 ratio. No gears—no noise—no backlash. With Etholog and card scales.

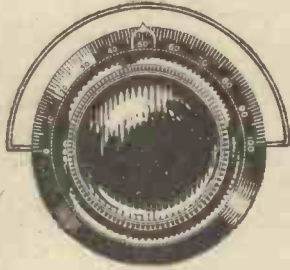
Price 6/-

**FOR INCREASED SIGNAL STRENGTH** and absolute freedom from hand-capacity, fit these Burndept Variable Condensers. Insulated spindle and metal earth shield.

"Square Law." '00007 or '0001 mfd. Price 13/6

"Log Law." '0003 mfd. Price 15/-  
'0005 mfd. Price 15/6

Calibrated Scales. 150-3,000 metres. (for Log Law-type). Price 1/6



## BURNDEPT Components give best results

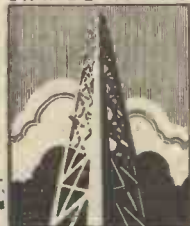
— always

BY experts and amateurs alike, BURNDEPT high-grade components are being used all over the country . . . if you are going to build a set you want the very best results, don't you? Then use the components with the BURNDEPT reputation and experience behind them. Details of the entire range on request.

# BURNDEPT COMPONENTS

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RADIO EXHIBITION OLYMPIA

A.J.W.

# RADIO WEEK!

SEPT. 22<sup>ND</sup> TO 29<sup>TH</sup>

THE NATIONAL  
**RADIO EXHIBITION OLYMPIA**  
11 A.M. TO 10 P.M. DANCING

ADMISSION 1/6 DAILY  
TUESDAY SEPT. 23. UP TO 5 P.M. 2/6

# OLYMPIA

SEPT. 22<sup>nd</sup> to 29<sup>th</sup>



Organised by the Radio Manufacturers' Association

1H

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 920.)

when we have to fall back on radio for most of our evening amusement."

### THE "PHONE AND DRY CELL" METHOD OF TESTING.

Defects in the wiring of a receiver, or those arising from faulty components, may often be detected by a very simple series of tests with a pair of 'phones and a dry cell.

To carry out these tests, one tag of the 'phones should be connected to one terminal of the dry cell, and two flex leads should be connected—one to the remaining 'phone tag and the other to the remaining terminal of the dry cell (a flash-lamp battery is quite satisfactory).

These two flex leads, if now touched lightly together, will produce a strong double click in the 'phones, one click when they make contact with each other, and another when they are separated again. They may thus be used for testing for continuity in leads, etc., since the loud double click is ample evidence that everything is satisfactory.

A fault in a coil-holder, for instance, such as a break between the terminal and the plug or socket to which it is connected, may now easily be detected, since if one flex lead is connected to the terminal and the other to the side of the holder to which the terminal should make connection, absence of the double click is positive evidence that the component is faulty.

On the other hand, if one of the flex leads is connected to the socket of the coil-holder and the other to the plug, if a double click is heard, there is a short-circuit across the holder.

Similar tests may be made with valve-holders, both by testing for a connection between each terminal and its socket, and testing for short-circuits between the sockets.

Variable condensers may also be tested by this method, a short-circuit between the plates giving rise to the usual double click, which should not be present if the condenser plates are properly insulated from each other in the usual way.

It is, of course, essential to see that all leads are removed from the components under test, and also that no coils are in position in the coil-sockets when these are tested.

Complete circuits, also, may be tested in this manner. For example, if the A.T.C. is in parallel with the A.T.L., in a simple tuned aerial circuit,

one flex lead placed on the aerial terminal and the other on the earth terminal will give a certain test for continuity between these points.

It will be seen from the foregoing that this method may be extended to tests for almost any component or circuit.

### INTERFERENCE FROM NEIGHBOUR'S SET.

S. C. (Gillingham, Kent).—"Why is it that my neighbour's set upsets my set? As soon as he switches on I might as well switch off!"

## "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," 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.

Cases of this kind cannot, as a rule, be cured by one party only, but the co-operation of both parties concerned is desirable. The trouble generally arises

from the use of small sets which necessitate the use of a large amount of reaction, and as a rule the certain cure is for both parties to build larger sets, preferably employing neutralised H.F. stages.

Sometimes a cure can be effected by making sure that a different earth is used by each receiver, and sometimes the use of a small condenser in series with each earth lead will improve matters.

Another really direct cure is to separate the aerials to as great a distance as possible, and to refrain from using reaction even in such a way as to cause the set almost to oscillate.

### WINDINGS OF SPLIT-SECONDARY H.F. TRANSFORMER.

"WINDMYSELF" (Cowley, Oxfordshire).—"For the ordinary broadcasting wave-lengths, 250 to 500 metres or so, what wire and number of turns, etc., should be used for an H.F. transformer, split-secondary type?"

For this type of coil the secondary winding is usually 130 turns of number 28 D.S.C. wire. It is wound on in two separate windings of 65 turns each, upon a two-inch former.

The primary winding consists of twenty turns of No. 30 D.S.C. on a 1½ in. former, placed centrally inside the secondary.

The connections to the pins are as follow:—One-half of the secondary winding across pins 3 and 4; the other half of the secondary winding across pins 5 and 6; primary winding across pins 1 and 2.

### A FOUR-VALVE BLUEPRINT.

E. C. (Cheshunt, Herts).—"Can I get a "P.W." Blueprint for building a 4-valve set?"

There are three different 4-valve sets in the "P.W." 6d. Blueprints, i.e. Nos. 28, 36, and 43.

Blueprint No. 28 is a "A Straight Four-Valve" (H.F., Det. and 2 L.F., with switching). This set is suitable for loud-speaker reproduction at moderate distances, using three valves. Continental and other distant stations can be heard on the loud speaker when the fourth valve is "on."

Blueprint No. 36 is the "Spanspace Four" Receiver, consisting of H.F., Det. and 2 L.F. stages. This is a sensitive and selective set for long-range loud-speaker reception, and is provided with switching on the low-frequency side.

Blueprint No. 43 is the well-known "Inexpensive Four"—a simple and easily-built 4-valve set for

(Continued on page 924.)



## NEW VALVE HOLDER

ANTI-MICROPHONIC  
SHOCK ABSORBING

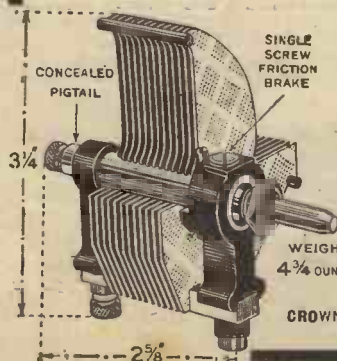
BAKELITE through-  
out, including BASE  
PLATE. Practically  
DUSTPROOF.



Price 1/3

Price 1/3 each.

## New "De Luxe" Model CONDENSER



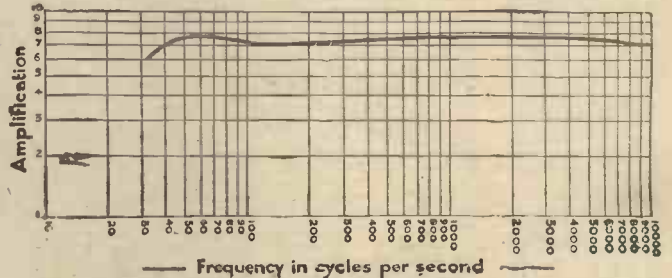
This Condenser has an ingenious NOISELESS "PIG-TAIL" incorporated in a manner unobtainable in any other Condenser.

IN FOUR CAPACITIES.

Capacity.	PRICE
.0005	6/- EACH
.00035	
.00025	
.00015	

WEIGHT 4.3/4 OUNCES Send for full Catalogue and Booklet, "L.F. AMPLIFICATION," post free.

CROWN WORKS, CRICKLEWOOD LANE, N.W.2.  
Phone: Hampstead 1787.



## Look at this curve

It shows practically distortionless amplification between 30 and 10,000 cycles—the whole audible range. It was obtained from a three-stage amplifier embodying the Igranic Dual Impedance Coupling Unit—the new low-frequency interval coupling which eliminates grid choking and gives the most faithful amplification of any coupling yet designed.

Try it in your next set. Our List will give you full particulars of its principle of operation.

## THE IGRANIC DUAL IMPEDANCE COUPLING UNIT

Price 30/-

IGRANIC ELECTRIC CO., LTD.  
149, Queen Victoria Street, London, E.C.4

Works: BEDFORD.

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

**WHILE GOOD RECEIVERS  
ARE DESIGNED, SO THE  
W.B. ANTI-PHONIC HOLDER  
WILL BE SPECIFIED**



**Prices: 1/9 with terminals  
1/6 without terminals**

*Ask your dealer, or write to us about the famous Whiteley-Boneham range of Loudspeakers, 47/6 to 84/-*

**Stand No. 120 at Olympia.**

**WHITELEY BONEHAM & CO. Ltd., Nottingham Rd., Mansfield, Notts.**

NOW ON SALE

# WIRELESS CONSTRUCTOR ENVELOPES

**Envelope No. 1.—THE "RADIO" THREE.** A famous loud-speaker set which you can build in an hour or two—no soldering and a wide range of components to choose from.

**Envelope No. 2.—THE "CONCERT" FOUR.** Made of standard parts, all easily obtainable, this is a highly-sensitive long-distance set, giving powerful reproduction of wonderful quality on 3 or 4 values.

*In these envelopes you will find every detail of the set simply explained, photographic reproductions and diagrams are included as well as a full-size Blue Print.*

**AT ALL BOOKSTALLS Price 1/6**

*By post, 1/9, from Wireless Constructor Envelopes, the Amalgamated Press, Ltd., Bear Alley, Farringdon Street, London, E.C.4.*



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**RADIOTORIAL QUESTIONS AND ANSWERS**

(Continued from page 922.)

long-range loud-speaker work. As in the other cases above, the circuit is the favourite combination of H.F., Det. and 2 L.F. stages.

**I.E.E. RULES FOR AERIAL.**

"NATHANIEL" (Wolverhampton).—"I understand that amongst the recommendations recently formulated by the Institute of Electrical Engineers was one dealing with the connection of the aerial to a set run from D.C. mains. Can you tell me what the substance of this recommendation was?"

The recommendation referred to was No. 133 B. which reads as follows:

"Aerial.—Where radio apparatus is connected to direct-current supply mains, the aerial shall only be connected to the apparatus through a double-wound high-frequency coupling transformer adequately insulated for a test pressure of 600 volts, or through a condenser inserted in series with the aerial circuit and immediately adjacent to the aerial terminal. The above transformer or condenser should preferably be incorporated in the apparatus or should be placed as close as possible to it."

**EXACT FILAMENT VOLTAGE.**

S. A. (Chippenham).—"Since buying a voltmeter I have been surprised at the big difference in the volts applied to the valves when the accumulator is changed. It is troublesome to alter the various fixed resistors every time, to compensate, so I have wondered if there is an easy method of levelling up the whole set, or otherwise 'steading' the voltage from the accumulator?"

The simplest solution in such a case seems to be to employ a master rheostat, that is, a rheostat which is in series with the low-tension accumulator and which, therefore, feeds the current to the various valves, each valve, of course, having its own fixed resistor. This master rheostat, since it is in series with the various valves in parallel, and since it carries the combined filament current for the whole set, will usually be of a fairly low resistance.

Generally speaking, you will find that a rheostat with a maximum resistance of 5 ohms will meet the case. An important point to notice is that the resistance element of this rheostat should be capable of carrying the total filament current for the whole set without overheating. In the case of a multi-valve set, the total filament current may be as much as 1 ampere.

It is a further advantage if the master rheostat has definite "on" and "off" positions. In this case, it can be used as an L.T. battery switch, and if a simple L.T. battery switch has previously been installed, this may be removed and replaced by the master rheostat, so that there is nothing to duplicate or to add to the controls.

Obviously, when a freshly charged battery is put in, the master rheostat should be turned to the "off" position, and then it should be turned "on" and the resistance in circuit gradually reduced until the voltage applied to each valve-with-resistor is of the correct value. As the voltage of the freshly charged battery gradually falls to normal, the resistance in the master rheostat can be reduced accordingly. It is possible by this means to ensure an almost perfectly constant voltage, but fortunately with modern valves this is not essential, and generally the voltage variations due to charge and partial discharge are not worth worrying about.

**CONDENSER CONNECTIONS.**

A. J. W. (Bramley, Yorks).—"Can you give me the connections for a D.P.D.T switch to change over an aerial condenser from series to parallel, and vice-versa, keeping the fixed vanes joined to the grid all the time? I think it was given in Correspondence in 'P.W.' some time ago, but now, of course, I can't find it—just when I would like to try to overcome hand-capacity which is troublesome with my present arrangement."

The arrangement to which you refer was as follows: The D.P.D.T. switch contacts are numbered along one side 1, 2 and 3, and along the other side are called A, B and C, A being opposite 1, etc. Then the wires are joined to the various switch contacts in the following manner:

No. 1 is joined to B, and to the moving vanes of the variable condenser.

No. 2 is joined to the aerial lead.

No. 3 is joined to the fixed plates of the variable condenser, to one end of the coil, and to the grid lead of the first valve.

A is left without any connection.

B is joined as stated above.

C is joined to the earth-lead, to the remaining end of the aerial coil, and to filaments, etc.

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**THE NEWCOMER TO RADIO.**

(Continued from page 900.)

which we will have to deal. This is the coil, which is, as I have indicated, nothing but a length of wire coiled up. I expect you will have gathered that the larger the coil you use the more suitable does the aerial become for the reception of longer waves.

But if during its journey the current of electricity is asked to fill up a sort of electrical tank, again its progress is going to be impeded and the time of its journey lengthened. The condenser is another component which figures largely in radio, and this is a kind of electrical tank, and a variable condenser is a condenser whose electrical size, or in other words capacity, can be varied at will.

**Our First Simple Diagram.**

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Fig. 1A is a combination of the symbols of all the things I have been talking about. The top vertical line, having two small, oblique branches, represents the aerial wire. This is joined to a coil which is shown there as a spiral. This coil is, in turn, connected to earth, the sign for this being at the very bottom of the diagram. Across the coil is connected the variable condenser, the sign for this being two horizontal lines obliquely through which passes an arrow. The arrow indicates variability. If you remove the arrow you have the sign for a fixed condenser the capacity of which cannot be altered.

**Visualising What Happens.**

See if you can visualise a current of electricity dashing down from that aerial, taking time to travel round the turns of the coil and time to fill up that condenser to its capacity, and so on to earth. And don't forget the process is repeated in a reverse manner, and that the current keeps dashing backwards and forwards, being given new strength for another kick off, as it were, at the arrival of every wave or vibration in the ether; that is, so long as its journey is electrically arranged in time with the arrival or completion of the vibrations.

In Fig. 2 two coils are shown, and the energy is passed from the one to the other. We are going to deal with Fig. 2 in a very practical manner indeed next week, as it marks the first step in the actual assembly of the set. You will realise that we are now rushing ahead and that I haven't time to go into elaborate details regarding every piece of gear we encounter. But my explanations are amply supplemented by other articles which appear in "P.W." and which I hope I am preparing you to read with appreciation and interest.

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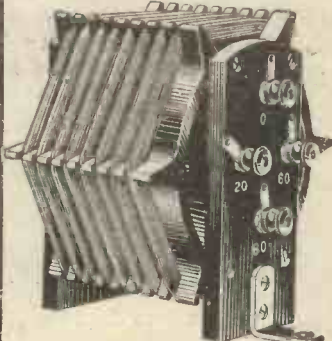
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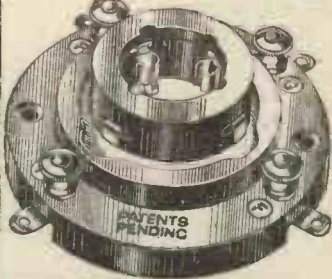
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## TECHNICAL NOTES.

(Continued from page 914.)

the set with self-contained batteries, or, if you like to put it the other way round, make a completely self-contained portable set adapted alternately to draw its current from the light mains instead of from its own batteries. In this way, the set may be used in the home without any tax upon its necessarily limited battery-capacity, whilst it would at the same time be truly portable on being disconnected from the mains-supply unit and it could then be taken in the car or wherever desired.

Whilst in use in the home it would also be very readily transportable, and could easily be moved from one room to another, taking its attendant supply-unit with it.

You will notice that in the above remarks I am assuming throughout that we retain one of the most essential features of a portable (or even of a transportable) set, namely, the absence of an outside aerial.

### Insulated Wire.

I wonder how many experimenters have at different times said hard words about the manufacturers of insulated wire, for not making it easier to bare the ends of the wire in a neat and satisfactory way? Although an apparently simple matter, it is surprising what a large amount of time and temper can be lost in preparing a few lengths of wire for an experimental hook-up! If you use too sharp a knife, you probably cut through most of the copper strands, while if the knife is too blunt, it is impossible to hack through the insulation. Having eventually made a way through the insulation and reached the copper conductor, you then find either that the insulation has an annoying habit of slipping back like a sleeve, so that the nicely prepared bare copper end is missing when wanted, having disappeared again into the sleeve of insulation, or that you are left with a tangled mass of cotton fibres from which it is very difficult to distinguish and extricate the required copper strands.

### "Staybak."

An American wire manufacturer (evidently an experimenter himself) has now put on the market what he describes as "the speediest hook-up wire" for the experimenter. The insulation is arranged in such a way that you simply push it back in order to obtain a bare end, and, what is more, having been pushed back it obligingly stays back. This docility is obtained by braiding the insulation into a specially elastic tubular form and then treating it with a wax preparation including a small percentage of resilient ingredient which ensures, in the words of the maker, that "it stays put."

### Dynamic Speakers.

Everyone who uses an electrodynamic loud speaker knows how important it is to have an adequate and properly constructed baffle-plate. In order to appreciate the importance of this, it is only necessary to try the effect of omitting the baffle altogether. Indeed, it is no exaggeration to say that upon the choice of a baffle of proper dimensions and of suitable material, as well as the correct placing of the baffle in relation to the sound radiator, depends to a very large extent the quality of the reproduction and the performance of the speaker generally.

### Need for Baffle.

The reason a baffle is necessary is because there is "leakage" of the atmospheric vibrations around the edges of the diaphragm or sound radiator. This is sometimes expressed by saying that the radiation from the back of the diaphragm tends to neutralise that from the front of a diaphragm.

This, however, is hardly the correct explanation, or perhaps I should say it is not the complete explanation. As a matter of fact, there is always leakage of the motion around the edges of a diaphragm, but in cases where the diaphragm is comparatively large and the degree of movement (or the "amplitude" of vibration, to be more precise) is comparatively small, it is not really necessary to guard against the "edge effect."

### Edge Effect.

But in the electrodynamic speaker the diaphragm is, as a rule, comparatively small, and the amplitude of motion may be quite large. Consequently, in the absence of a baffle there will be considerable mutual interference between the radiation from the front and that from the back of the diaphragm, and there will also be appreciable losses due to the "sliding" of the air past the edges of the diaphragm. It is to prevent these effects that the baffle is introduced.

### Extension of Diaphragm.

The baffle is, in effect, equivalent to a very large extension of the area of the diaphragm without the corresponding increase of the mass and consequent reduction of amplitude for a given driving-force. The radiation from one surface of the diaphragm is kept away from that from the other surface of the diaphragm until a distance where the mutual interference is negligible. Moreover, the "slipping" effect at the edges of the diaphragm proper is also largely prevented.

### Addition of Trumpet

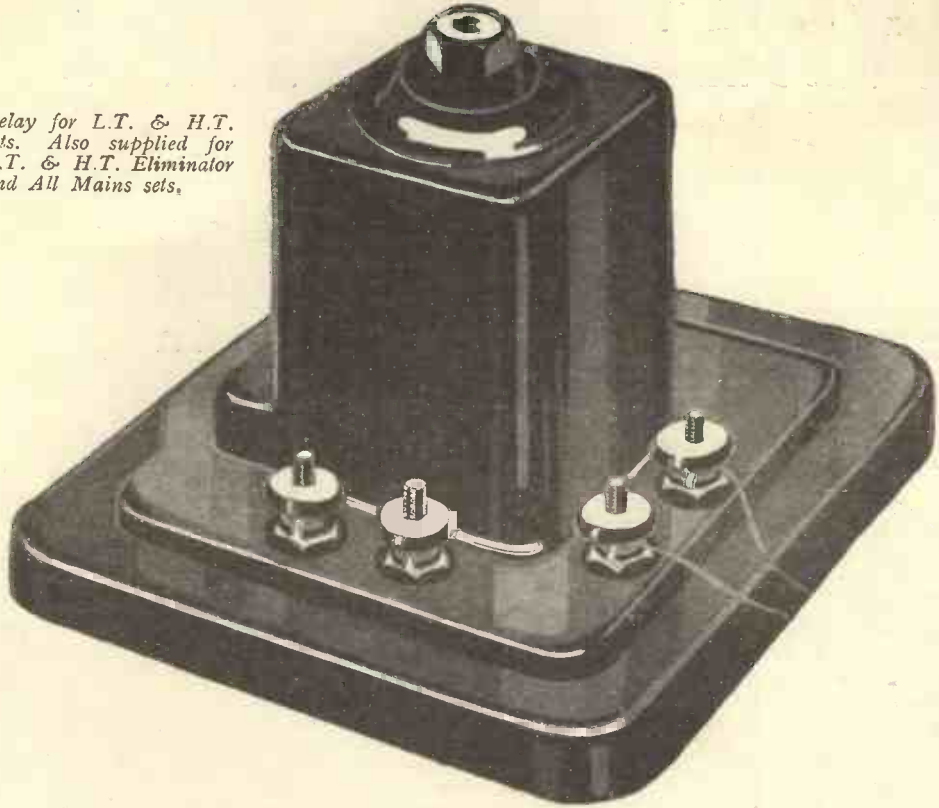
The addition of a trumpet to an electrodynamic speaker has generally been regarded as both unnecessary and undesirable, as one of the main claims made for this type of speaker is its uniform response over the audio register; this would inevitably be affected by the addition of any ordinary type of trumpet-amplifier. Furthermore, the volume obtainable from the dynamic speaker is, as a rule, quite adequate without the need for any ordinary acoustical amplifier or directional device.

Nevertheless, I pointed out in these Notes some time ago that there was an advantage to be obtained, not only with dynamic speakers, but with other types as well, in making use of the natural reflecting and reinforcing properties of the junction of the walls of the room at a corner. In other words, the corner of a room forms a natural and very large "reflector," the whole of the room comprising, in effect, the interior of a trumpet. The resonant frequency of the reflector thus obtained is outside the practical range.

### "Corner" Effect.

It is interesting to note that a well-known American company have now put upon the market a dynamic speaker in which use is made in precisely this way of the "corner" effect of the room, as well as the ordinary baffle. The speaker is adapted to be fitted into the corner of the room, and in this way the effects described are obtained.

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