

# The Constructors' Competition: Your Last Chance

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 232. Vol. X.

Scientific Adviser: SIR OLIVER LODGE, F.R.S.

November 13th, 1926.

## Special Features

**EIGHT-PAGE SUPPLEMENT FOR CONSTRUCTORS**

EDITED BY PERCY W. HARRIS, M.I.R.E.

Can Wireless Help the Farmers?  
The Multiplex Valve  
Aerial Efficiency

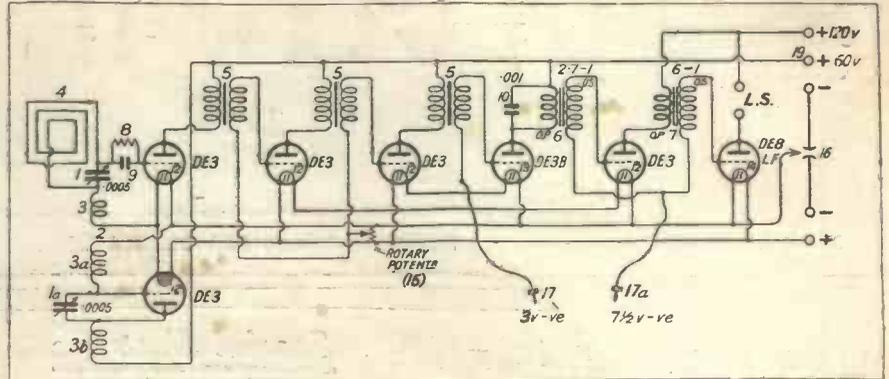
Home-Made H.T.  
Novel Rectification  
Selective Reaction



**72**  
PAGES  
Price 3d.  
as usual

Our cover photograph shows Mr. Singleton, of Wolverhampton, operating his amateur transmitting station. Mr. Singleton has succeeded in carrying out two-way tests with a New Zealand amateur, on 45 metres and over comparatively lengthy periods.

*In making a Super-Het everything depends on the Components*



# Marconiphone and STERLING Radio Components

The arrangement consists of a Detector Valve connected to a tuned frame aerial and associated with a separate Oscillator Valve. Following the Detector are two stages of Intermediate-Frequency Amplification and a second Detector Valve, the intervalve coupling being effected by three Marconiphone Intermediate-Frequency Transformers (5). The sixth and seventh valves are Low-Frequency Amplifiers coupled by means of Marconiphone Ideal Transformers, so ensuring purity of reproduction and ample volume. L.T. and H.T. supply to all valves are controlled by means of a simple battery switch (16).

**COMPONENTS REQUIRED.**—2 Sterling Square Law Geared Condensers '0005 mfd. 1 Sterling Triple Coil-holder. 3 Sterling Coils:—

	Pick-up.	Oscillator.
( 250- 550 )	1 R.2691B.	2 R.2691D.
(1,000-2,000)	1 R.2691B.	2 R.2691H.

1 Sterling Frame Aerial, Portable Folding Type. 3 Marconiphone Intermediate Frequency Transformers. 1 Marconiphone Ideal Transformer, ratio 2·7-1. 1 Marconiphone Ideal Transformer, ratio 6-1. 1 Marconiphone Gridleak (mounted), 2 megohms. 1 Sterling Fixed Condenser, '00025 mfd. 1 Sterling Fixed Condenser, '001 mfd. 7 Sterling Non-Pong Valve-holders. 5 Marconi D.E.3 Valves. 1 Marconi D.E.3B Valve. 1 Marconi D.E.8 L.F. Valve. 1 Sterling Rotary Potentiometer. 1 Marconiphone Battery Switch. 2 Wander Plugs. 1 6-volt 30-amp.-hr. Accumulator. 2 Marconiphone 60-volt Dry Batteries. 9 Terminals. 1 Ebonite Panel.

Fuller details regarding the above will be found in our booklet, "CIRCUITS FOR BUILDING RADIO RECEIVERS," which contains complete information and diagrams for the construction of various types of sets. Copy free on request.

## THE MARCONIPHONE COMPANY LIMITED.

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Ratios 2·7-1, 4-1, 6-1, 8-1.  
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**Marconiphone SUPERSONIC Transformer**  
20/-

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'00025 .. 10/-  
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'001 .. 13/6

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1, 25, 5, 1'0  
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All capacities.  
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**Sterling Rotary Type POTENTIOMETER**  
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**Marconiphone High and Low Tension SWITCH**  
3/6

The

# NATURAL TONE

Loud Speaker



THE  
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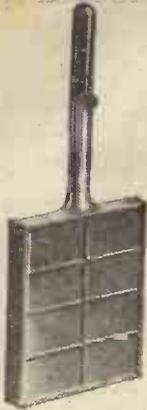
Prices £4:15:0 to £13:13:0

Other Amplion Models from 38/-

Write for Latest  
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## There is no substitute for a genuine AMPLION

## Here is the Plate



THE plate is the heart of any accumulator. A better plate obviously means a better accumulator. That used in all Oldham Accumulators is made under the famous Oldham Special Activation Process. This in itself is a guarantee of longer life free from buckling or sulphation. Observe that the

plate used in the Oldham H.T. is as carefully constructed as those used in larger Oldham Accumulators. It is ribbed to retain its active material. It is stout to prevent buckling. From first to last it is thoroughly well made and built to give good honest service.

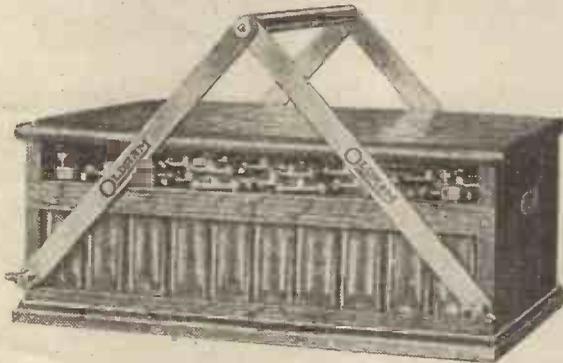
## —here is the Cell

EVERY cell in an Oldham H.T. is a miniature 2-volt accumulator. The glass containers are of the best quality—and capable of withstanding any amount of rough usage. Compare them with flimsy test tubes sometimes used. We want ours to last for several years and we build them to give good service. Look at the illustration again. Note the generous sump below the plates to catch the inevitable mud which is sure to collect after a time. This is evidence

of careful design. Without this “mud space” current would leak away and your battery would not hold its charge. Observe also that there is ample room for the electrolyte to circulate continuously around the plates. And when the accumulator is put on charge the acid spray cannot splash out of the vent. Finally, don't forget that every Oldham can be tapped at each two volts. A critical H.T. voltage is often invaluable for long distance reception.



60 volts  
complete  
as this  
**53/6**



*Gives the regular  
power flow which  
guarantees per-  
fect reproduction.*

## —and here is the Oldham H.T. Accumulator

IT is bristling with good ideas. Take its portability, for instance. Every H.T. Accumulator has to be recharged periodically—you'll want to buy one that can be conveniently carried down to the Charging Station. The stout handle on the Oldham makes carrying a very simple matter.

Perhaps you may only want 60 volts today, but if you add a power valve to your Set you'll be certain to need a higher H.T. voltage. If you buy an Oldham,

that problem is solved for you. All Oldham H.T. Accumulators are made on the unit system. Each unit consists of 20 volts. Add as many of them together as you like. One tier of three rows for 60 volts, two tiers each of three for 120 volts and a similar arrangement for 40, 80 or 100 volts. To steal a slogan from a famous bookcase it is “always complete—yet never finished.” With an Oldham you will be ready for anything. The framework of the Oldham H.T. is solidly

constructed of oak. It is a handsome piece of apparatus. When fitted with its lid and base it is ready to take its place in any room. Finally, a word of advice: The capacity of the Oldham is big—no less than 2,500 milliampere hours. It will serve any Set even if fitted with power valves. Always judge a H.T. Accumulator by its capacity. If you have been used in the past to H.T. dry batteries a revelation awaits you when you change over to an Oldham.

### 10d. per volt

60 volts, £2-10-0    100 volts, £4-3-4  
80 volts, £3-6-8    120 volts, £5-0-0  
Complete with polished aluminium handles  
Solid Oak Base, 3/6 extra



**Special Activation  
Process Accumulators**

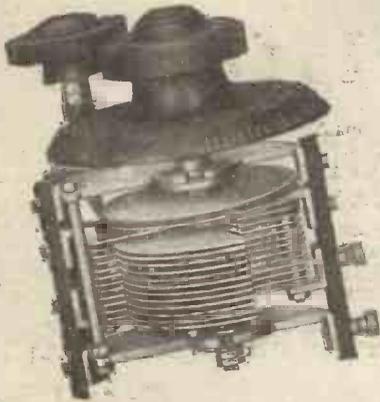
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Gilbert Ad. 6276



The "Cosmos" Condenser



The "Cosmos" Spring Valve Holder.



The "Cosmos" Rheostat.



The "Cosmos" High Frequency Choke Coil.

# Cosmos

(RADIO COMPONENTS)

ensure reliable sets.

THOSE constructors who desire smooth working, reliable and neat-looking sets, use "Cosmos" Precision Components.

## "COSMOS" LOW LOSS SQUARE LAW SLOW MOTION CONDENSER

The "Cosmos" Condenser is a slow motion condenser with absolutely no backlash, either when new or after use. This desirable feature is accomplished by the use of a spring belt held in tension, which permits coarse tuning with the large knob, and a 10:1 slow motion with the small knob.

Cone bearings allow for adjustment and the slow motion bracket can be mounted for remote control.

The Condenser for fine tuning.

Slow Motion	{ '00025 mfd. ..	14/9
	{ '0005 " ..	15/6
Ordinary	{ '00025 " ..	12/-
	{ '0005 " ..	13/-

## "COSMOS" ANTI-VIBRATION SPRING VALVE HOLDER

The shock-absorbing element in the "Cosmos" Valve Holder is not a stiff flat spring or sponge rubber which absorbs moisture, but a separate spiral spring for each leg. This construction gives maximum elasticity.

Price for Panel or Baseboard Mounting : 2/9 each.

## "COSMOS" RHEOSTAT & POTENTIOMETER

The "Cosmos" Rheostat is strongly constructed to give a smooth, reliable and continuous contact. The contact arm moves round the inner side of the winding, and is thus protected from accidental damage. It takes up little space, and is one-hole fixed.

PRICES :	"Cosmos" Filament Rheostat			Potentiometer
	6 ohms 1 amp.	20 ohms .4 amp.	34 ohms .2 amps.	300 ohms —
Each	4/6	5/-	5/-	6/-

## "COSMOS" HIGH FREQUENCY CHOKE COIL

Suitable for use in reflex circuits or in circuits similar to the Reinartz. The sectionalised windings have the lowest possible self-capacity (5.5 mmfd.) and an inductance of 55,000 microhenries.

Owing to its small inductive field, which lessens the chance of stray capacity or inductive coupling, it is far more suitable for use as high frequency choke than large inductance coil.

Price for H.F. Choke Coil 6/6 each.

Ask for copy of Folder No. 4117/6.

## METRO-VICK SUPPLIES LTD.

(Proprietors : Metropolitan-Vickers Electrical Co., Ltd.)

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## GUIDES FOR WIRELESS CONSTRUCTORS

*The Two Latest Numbers Now On Sale Everywhere.*

### MODERN LOUDSPEAKER SETS

This book contains straightforward, amply illustrated directions for constructing three of the latest valve sets. The first is a two-valve household loudspeaker set. The second is a sensitive three-valver incorporating a novel reflex principle which will receive European stations with ease. The third set described is a four-valver including every possible modern refinement.

**CONSTRUCTORS USING THESE BOOKS CANNOT GO WRONG.**

### PICTORIAL BLUE PRINTS

This book consists of an up-to-date and comprehensive range of blue print diagrams drawn in a simplified pictorial style so that the amateur constructor cannot possibly go wrong when building up a set on the lines of any of the circuits with which the book deals. There are 11 circuits in all.

**6<sup>d</sup>.  
EACH**

**AT ALL NEWSAGENTS AND BOOKSTALLS EVERYWHERE.**

### Valves to match Battery Output

Really wasteless wireless at last. Ask your dealer to show you the all-British Lustrolux 406 H.F., 406 L.F. and 412 P. The three valves together call for a current consumption of 24 amps. only. They will work perfectly when the accumulator voltage has dropped to 37. They can be coupled direct to the accumulator if desired, eliminating the rheostat without the least fear of a burn-out.

#### PRICES :

406 H.F. 406 L.F. .. 9/- each.  
412 P. .... 15/- each.

There's a Lustrolux valve to meet your every requirement, whether for 2 v., 4 v. or 6 v. accumulators or for primary cells, and for long range, selectivity, volume, and purity of reproduction, Lustrolux will please the most critical.

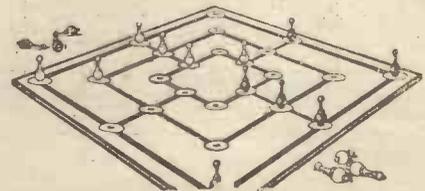
Send for Lustrolux List A. It gives full details of the whole range, and also particulars of the Lustrolux Valve Repair Service.

**LUSTROLUX LTD.**  
West Bollington, Near Macclesfield

# LUSTROLUX

*Everybody's Playing It!*

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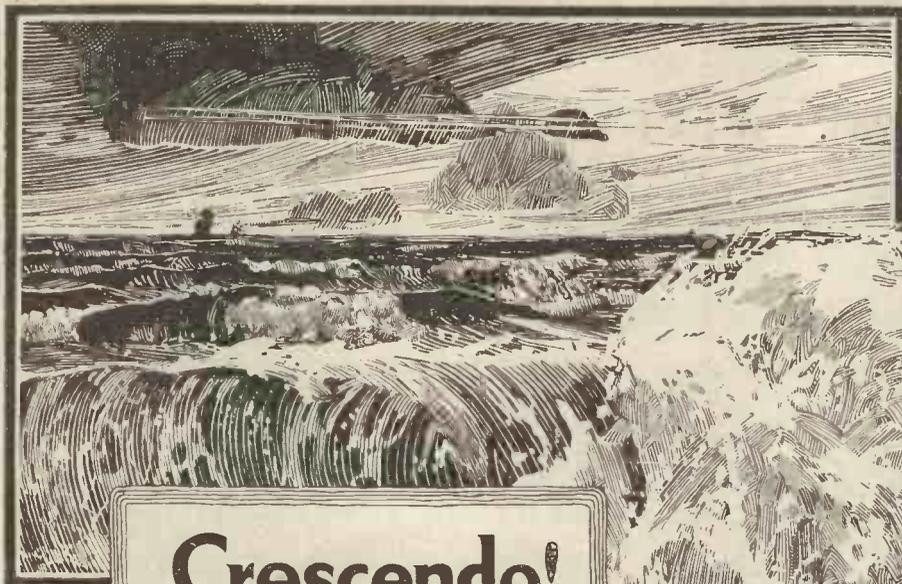


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*The Famous Game of Shakespeare's Day  
JUST THE THING FOR LONG EVENINGS!*

*On Sale at all Newsagents, Book-  
sellers, Bookstalls, Toy Dealers  
and Stores. Buy Yours to-day!*

**1/6**



# Crescendo!

Faint twitterings of sound across the ethereal void, murmurs of music as from a muffled band, mysterious and unidentifiable noises—these were the phenomena after which the ears of early broadcast listeners eagerly strained.

That phase has fortunately passed, and no listener is content unless he can obtain from his set, not only a clear and faithful reproduction of the transmitted music, but also a sufficient volume of sound to give a sense of reality to the performance. The growing demand for greater volume has been accompanied and encouraged by successive improvements in valves. To-day by means of the well-known B.T.H. ".06 ampere" valves, it is possible to operate a multi-valve receiver with the same current consumption as was previously required for a single valve set. In other words the listener can, by the aid of these valves, obtain a volume of sound sufficient to fill a large hall, with no greater consumption of current than was formerly needed for the adequate vibration of a telephone diaphragm.



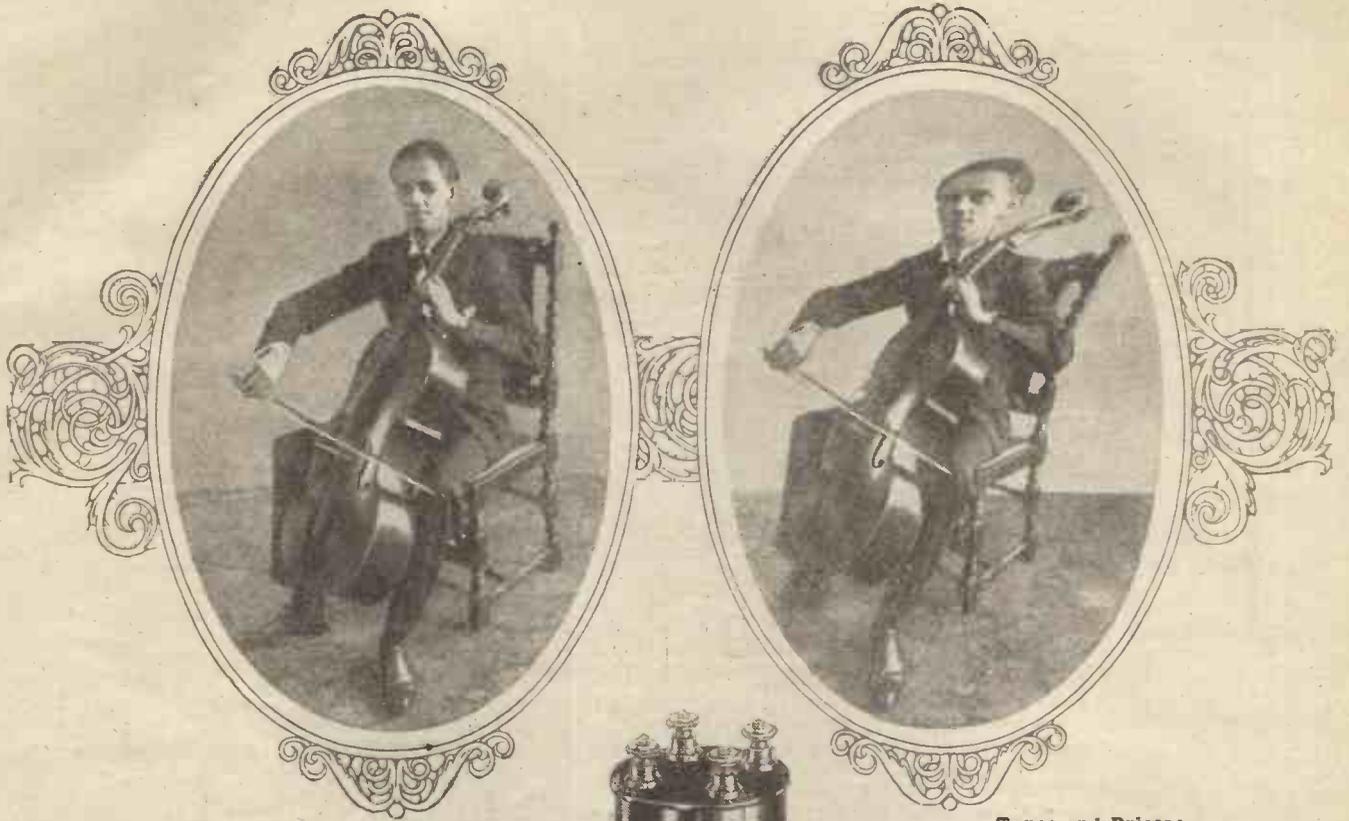
## VALVES

Ask your wireless dealer to demonstrate B.T.H. valves

2575



The British Thomson-Houston Co. Ltd.



**The wise concert-goer  
chooses his seat with  
care**

**M**AYBE it has been your misfortune to occupy a seat at a concert close to the drums. During the whole evening your impression of the music has been overshadowed by this irritating boom-boom-boom. The piping notes of the flute and the delicate tones of the oboe have been inaudible. To catch the melody your ears have had to fight through this resonant background.

Perfect reproduction of broadcast music is more often than not a question of balance. If an L.F. transformer is used which amplifies the low notes at the expense of the high ones, distortion is inevitable. You will hear the drums and the 'cellos and lose the flutes and the oboes. In other words, your seat will be too near one side of the orchestra. The regular concert-goer sits a reasonable distance from the orchestra—by experience he has learned that distance lends enchantment to the ear! The Eureka L.F.



**Types and Prices—**

**Eureka Concert Grand**

A superb L.F. Transformer hermetically-enclosed in a coppered steel case proof against atmospheric influences. Fully guaranteed. No. 1 25/-. No. 2 21/-.  
**Eureka Reflex**

For reflex work a special Eureka is available. Gives an exceptional volume of mellow clear tone. Fully guaranteed. 15/-.  
**Eureka Baby Grand**

For those who cannot afford the necessarily higher price of the larger Concert Grand we have introduced the Baby Grand. Fully up to the same high standards of workmanship. Fully guaranteed. No. 1 15/-. No. 2 15/-.  
**Eureka L.F. Choke Unit**

The Eureka Choke Unit, incorporating grid leak and condenser, is the finest instrument of its type. Fully guaranteed. 25/-.  
Transformer has been designed to give listeners a truthful rendering of orchestral music. It does not—indeed it cannot—amplify some tones at the expense of others.

By reason of its exclusive method of winding and its non-laminated core it is scientifically corrected against distortion. Just like the anastigmat lens in a camera, for instance, which is corrected to avoid giving a distorted image. Any lens will give some kind of a picture and any L.F. transformer will give some degree of amplification. But it may not be true to nature. The Eureka Transformer has now been before the public for three years. Its popularity amongst those who appreciate radio components of high quality has consistently and deservedly increased. Tens of thousands of listeners are to-day enjoying by its aid, a quality of radio music which can only be compared to the actual broadcast transmission in the studio by the artistes themselves.

Re-creates the

**EUREKA**

Living Artiste

Advertisement of Portable Utilities Co., Ltd.,  
8 Fisher Street, London, W.C. 1.



## Now, for but 65/-, comes the really handsome Loud Speaker

**B**ROADCASTING was as yet unknown when the sponsors of the now famous Brown range of Instruments placed upon the market the first Loud Speaker ever to be used in this country for Wireless purposes. 'Brown H.1' was in being when 'B.B.C.' '2LO,' '2ZY' and '5XX' were meaningless hieroglyphics. The firm which then lead the way in making Loud Speaker reproduction possible has ever since set the pace in Loud Speaker design.



The H.Q.  
20 inches high.  
2000 or 4000 ohms.  
£6 0 0

It was the Brown H3 which first brought high quality reproduction within the means of the average listener; it was the Brown HQ which brought to a realisation the ideal of a

The  
**Brown**  
H3Q  
Loud Speaker  
2000 ohms  
£3 5 0

really handsome Loud Speaker at an unprohibitive price. Now Brown once again leads the way. In the new H3Q Model, for the remarkably low price of 65/-, there is available an instrument whose appearance will enhance the setting of any room. All that is best in acoustical design gives to the H3Q a remarkable fidelity of reproduction. All that is artistic in design gives the H3Q a distinctive and pleasing appearance. For a little over three pounds you can buy a Loud

Speaker which will look well in your home and fill it with a faithful rendering of the evening's broadcast. Your dealer is selling many Brown H3Q Loud Speakers—get yours from him now.



The Disc.  
2000 ohms.  
Black and Gold  
£7. 7. 0.  
Oxydised Silver  
£8. 8. 0.

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**E**VEN before Columbus discovered America the Aztecs evolved a method of treating raw rubber to give it greater resiliency and preserve it against decay. Balls of rubber taken from the Temple of Palenque (shown above) are still in existence. After five hundred years they are as pliable as when the priests first kneaded them into shape. What the secret of their manufacture was, no one can say precisely. It has died with the inventors. The process, however, obviously used little heat for it is the heat used in vulcanising to-day which ultimately causes the rubber to lose its nature—or as we say, to perish.

Heat, too, has a destructive effect on many other substances. Take the filament of a wireless valve as an example. Here—if it is a bright emitter—the filament is incandescent. It crystallises and becomes very brittle. Ultimately it fractures and the valve is useless.

But in the latest Cossor valve, heat has been practically banished. The new kalenised filament gives off a powerful flow of elec-

trons without the suspicion of a glow. As a result it can never become brittle. Even after several thousands of hours of use it is still quite supple.

This time-defying filament, besides functioning at such a low temperature, is also won-

derfully economical in current. It consumes only one-tenth of an ampere at 1.8 volts. Or, to give a definite example, an accumulator lasting 10 hours at a charge with a 2-valve Set using bright emitters, would last more than 200 hours if these wonderful new Cossor Valves are used. **A free gift of 190 hours of broadcasting every time your accumulator is charged!**

Because these new Cossor Valves will give you such long and economical service—with a mellowness of tone which is truly remarkable—you are wasting money every day you retain your present valves in use.

Available in three types: Black Band for Detector use, Red Band for H.F. use, 1.8 volts, 1 amp. consumption, 14/- each. Also Stentor Two Power Valve, 1.8 volts 15 amps. consumption, 18/6.

## The Aztecs knew that heat destroys

# Cossor Point One

# Popular Wireless

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## RADIO NOTES AND NEWS.

Armistice Day—2 L O's Traffic Cop—The Radio Bug—America in Daylight—The Boon of Broadcasting—New Stations Coming—"Pay as You Listen."

### Armistice Day.

THE arrangement of the programmes for a day of national mourning is no easy task, but the broadcasting for this day of a thousand memories has been well arranged. Commencing with a Canterbury Cathedral service, the features include a speech by Viscount Grey on the League of Nations, an "In Memoriam" concert, Evening from Westminster Abbey, and—"Back to the Army Again"—The Roosters Concert Party.

### "Happy Returns."

THE actual anniversary of the B.B.C.'s birthday is not until Sunday, November 14th, but it has been decided to celebrate it on Saturday. A specially written radio revue has been arranged to start at 7 p.m. It is entitled "Happy Returns," and the cast will include our old friend Tommy Hendley, and other microphone favourites.

### When Geneva Rules the Waves.

EUROPE'S scheme for order in the air is still somewhat "in the air" at the time of writing, but it was expected by the B.B.C. and Continental authorities that at first there would be a settling down. Those who hoped for an immediate haul of long-distance stations must not be too impatient. Eventually, perhaps, we shall be able to start at the bottom of the scale and tune in a station at every degree, like going up a flight of stairs—but not this week!

### Europe's Ether Police.

WHEN Europe's broadcasting chiefs decided upon ending the wave-length muddle, they agreed it was

essential to co-operate on wave-meters. It was decided that all Europe's wave-meters should be made in Brussels, and forwarded from there to the stations concerned. They are made in Belgium under the direction of M. Brailard, the Belgian expert, and when passed as correct, they are despatched to the various stations to do point duty, and to keep the transmissions upon the exact wave-length.

### 2 L O's Traffic Cop.

THE "traffic-cop" for 2 L O arrived from Brussels at the end of last month, and it is interesting to note that this wave-meter is not of the crystal-control type. Essentially it is a coil and condenser, across which a lamp (or a galvanometer) is fixed. The in-

and started spinning a web across two twigs.

"Hey, Pop! Come here," said Lennie.

"Whatja want?" says Pop.

"Look at this bug, Pop. He's gonna put up a wireless!"

### Germany Going Ahead.

BRITAIN'S wireless licence holders now number well over two million, and next in Europe comes Germany, where steady increases continue every month. At the beginning of September the number of licences held in Germany was 1,258,199.

### Curious Atmospherics . . .

HERE is a curious experience that befell a Newton Heath (Manchester) listener.

He was recently listening in from a crystal set, stroking a cat that lay at his feet. Simultaneously with every stroke he noticed atmospherics in the 'phones. But thinking they might be caused by movement of his body and the flex cord, he tried stroking the carpet instead of the cat. He found that only by stroking in one place could he obtain the atmospherics, and there they appeared even when the cat was stroked by somebody else.

### . . . Caused by a Cat.

THE curious noises seemed so inexplicable that later the attention of Sir Oliver Lodge was drawn to the incident. Sir Oliver recalled a somewhat similar effect that he noticed in his early experiments, when using a coherer as detector. He attributes the noise to little sparks, caused by stroking the dry cat, and sufficiently powerful to affect the neighbouring wireless set.

Has any reader of "P.W." noticed a similar effect?

(Continued on next page.)



| Mrs. Rhoda Thake, a centenarian listener who thoroughly enjoys listening to broadcasting.

strument will be fixed to the wall near the 2 L O transmitter, and if the latter's wave-length is O.K. the lamp glows continuously. If the main transmitter gets out of tune the little lamp sulks, and will not glow until the wave-length is right again. The accuracy is of an extremely high order, and the traffic-cop is so sensitive that allowance has to be made for variations due to heat and cold.

### The Radio Bug.

LITTLE Lennie, spending his first day in the country, watched a big spider. It swung down from a branch,

## NOTES AND NEWS.

(Continued from previous page.)

### Some Circle.

THE Birmingham Radio Circle is not a mere circumference, round emptiness. During the Birmingham Radio Exhibition it started to make rings round the visitors, and collected a nice little £265, to endow a cot at the Birmingham Children's Hospital. It's not every Circle that can pay away £265 and remain all square, is it?

### America in Daylight.

WRITING of a recent Sunday morning, a Worthing reader says, "Tuning in at 9.40 a.m. to listen for any amateurs on the low-wave band, I was startled to hear at terrific 'phone strength an American voice, speaking to the Philippine Islands. Waiting for the call sign, it turned out to be 2 X A F, Schenectady, New York, making a special transmission to Australia, Shanghai, etc. There was brilliant sunshine here, and daylight more than half-way across the Atlantic."

### Special Trans-World Transmission.

THE set used on this occasion was a three-coil-tuner, described in "P.W." about a couple of years ago, followed by a resistance-coupled amplifier. Schenectady has been asked to confirm this reception, but in the meantime, any reader who was puzzled by powerful American signals at the hour named can be pretty sure he was hitched up to hear America calling Australasia and the Far East.

### "Ariel's" Announcements.

I HAVE been asked to make the following announcements:

1. Will Mr. R. Anderson, of "London," who wrote to a well-known firm recently about their Battery Eliminator, communicate at once with the firm in question? His request to them cannot be complied with, because he forgot to enclose his address!

2. The North London Experimental Radio Society meets at Holly Park Schools, Holly Park Road, N.11. Particulars from hon. sec., 61, Carey Street, Lincoln's Inn, W.C.2.

### Beam for Portugal.

THE Portuguese Government is establishing a beam wireless service between the mother country and the Portuguese Colonies, and some of the stations are already under construction. The Marconi Co. announce that sites have been chosen, and construction commenced at Lisbon, Cape Verde Islands, the Azores, and in East and West Africa. The stations in the scheme that will work on the short-wave beam system are being erected at Lisbon, Loanda and Mozambique.

### The Boon of Broadcasting.

"BROADCASTING is the greatest boon that has come to the nation in modern times," said Sir Wm. Noble, in opening the third Manchester Wireless Exhibition at the City Exhibition Hall. Dr. Ferranti was in the chair, and amongst the speakers was Capt. Eckersley, who advocated that licence fees should be spent in improving broadcasting. "There is practically no limit to the money that can

be spent effectively on broadcasting," said the Chief Engineer, adding naively: "There is still the question of my salary, for instance!"

### Sideways Wound Coils.

REFERRING to the article on "Sideways wound Coils," that appeared in "P.W." No. 229 (page 414), Mr. Uriah Beaton, of 45, Chalk Farm Road, N.W.1, informs me that this method of winding is covered by a patent granted to Mr. C. B. Kersting and himself.

### TECHNICAL TERMS ILLUSTRATED.

#### The Crystal Detector.

THERE was a young fellow named Hector,

Who asked his new girl to select a

Nice jewel, or confection,

To prove his affection.

She proved a good 

#### A World's Record.

ONE of the Australian Commonwealth liners, the "Jervis Bay," recently put up a very fine radio record on her voyage from Australia. When she arrived at Plymouth her wireless operators could boast that the vessel had kept in daily radio touch with Perth (W. Australia) from the time she left until she arrived in Plymouth Sound!

### SHORT WAVES.

From a musical paper: Mr. Miller Craig, of the B.B.C., spoke on: "How the British Broadcasting Company can co-operate with the festivals." An organised cork-drawing competition, perhaps?

"Just imagine the poor comedian who makes all his best jokes in dead silence. It would send most of our leading stage comedians to an early grave." ("The Northern Whig.") This is certainly a very good suggestion!

Wireless pirates are to be hunted up again, we understand. We hope it will be "fine" for them! ("Popular Radio Weekly.")

"Why the dickens doesn't the Postmaster-General buy a wireless set?" said the motorist whose car had hit a telegraph pole and pitched him into the ditch. ("Sunday Pictorial.")

An explorer recently returned from the South Sea Islands says that there paper decays, leather is spotted with mildew, and metals tarnish and rust. Were some of our bright young radio playwrights brought up in the South Sea Islands?

That "Beaming" boy—Senatore Marconi.

Sir J. Vijayaraghavachari recently arrived in London. We can imagine the fervent prayers of the B.B.C. announcers that it wouldn't be necessary to mention his name in the News Bulletin. ("Humorist.")

A lady correspondent says that her father simply raves about the reproduction of her four-valve set which she built in accordance with instructions given in "Popular Wireless." A friend who saw this letter said he could quite sympathise with her, as he had heard him several times when he missed the sixteenth hole!

"One thing that will be secured by this new wireless scheme is that only ministers with wireless voices will conduct services through the microphone." ("Glasgow News.")

And only people with listening-in faces will be allowed to hear them.

The power used on the "Jervis Bay" is only 250 watts, but signals were clear all the way except for one awful night, near Gibraltar, when the record nearly went west. But they got through before 24 hours, and next day Perth could hear as well as ever again.

### Armistice Day in Canada.

THE Ottawa and Montreal stations are broadcasting a special Armistice Day programme this (Thursday) evening on a joint wave-length of 434 metres. Amongst the items will be—"It's a long, long way to Tipperary" and "The long, long trail."

### New Stations Coming.

THE announcement that a new broadcasting station has been opened at Seville, Spain (E A J 17), reminds me that others will be sprouting up like mushrooms before long. The Austrians will shortly be testing out the new Klagenfurt station, whilst Yugo-Slavia opens up a Belgrade station next month, to be followed soon afterwards by another at Spalato. The Germans are getting busy with a station at Hoch-Mayer, another at Dengerloch, and a new 10-kilowatt at Königsberg!

Dozens more are "on paper," waiting their turn to edge into the ether!

### Short-Wave Telephony.

THAT short-waver I mentioned a fortnight ago, who has been vociferating telephony just below Königswusterhausen recently, turns out to have been Mount Valerian, Paris. There is a "Buffalo" wandering about down on these waves, too. I understand that, when he is at home, this denizen of the prairie lives in an R.A.F. portable transmitter.

### Maidstone Radio Week.

ENTRIES for the free competition in connection with Maidstone Radio Week will close to-morrow (November 12th), the forms of application being obtainable from the hon. sec., 44, Postley Road, Maidstone. The Maidstone Wireless Exhibition will be held in the Corn Exchange from November 16th to 20th, inclusive.

### The Crystal Telephone.

READERS who were intrigued by the "Crystal Telephone," referred to in the Correspondence columns of "P.W." No. 229 (October 23rd issue), will like to know that the inventor—Mr. Leslie Miller, A.M.I.E.E.—tells me that the instrument has aroused great interest. He adds that his patent on the Crystal Telephone (Thermophone) became void on October 8th, so that other experimenters are now free to try to develop this type of receiver.

### "Pay as You Listen."

SEVERAL correspondents have asked my opinion of the advisability of buying wireless sets on the deferred payment system—(commonly known as the Kathleen Mavouneen system: "It may be for years, or it may be for ever!") There seems to be a lingering prejudice against the method, but personally I think it has a lot to commend it, especially if handled by a reputable firm. There's a lot to be said for "a pound down" and an aerial up!

# Can Wireless Help the Farmers?



THE radio world has been amused recently by the reports which are to hand concerning the alleged increase of growth of certain plants and vegetables under the influence of radio waves. I use the word "amused" here because, all things considered, the attitude of radio men has been really one of amusement rather than one of interest. We have been treated to all sorts of predictions in the daily press concerning the state of affairs

\* \* \* \* \*

**RADIO-CULTURE AS A PRACTICAL POSSIBILITY.**

By J. F. CORRIGAN, M.Sc., A.I.C.

\* \* \* \* \*

recall the fact that the same sort of thing happened when Edison first announced his invention of the phonograph, when Graham Bell brought out his telephone, when Professor Röntgen hit upon the idea of the X rays. And even a certain young man, Guglielmo Marconi, by name, was not exempt from such a torrent of witticisms when he first came to England, his mind full of great ideas concerning the possibility of signalling over considerable distances without the aid of connecting wires. There used, in fact, to be a popular song, the burden of which related the things which would happen when "Mr. Marconi first signals to Mars."

**Recent Experiments.**

To come back to our main subject, however, a certain Nottingham market gardener is reported to have discovered that his cucumbers, tomatoes and other vegetables were obtaining energy from his wireless aerial, and that, under these conditions, their active growth was very much increased. Accordingly, therefore, he conducted a few interesting experiments. He constructed a number of cage and spiral aerials, which were suspended in greenhouses over the growing plants. The result is stated to be a 25 to 30 per cent. increase in the vegetable produce obtained, and also an increase in the actual rate of growth of the plants. Further experiments are proceeding.

A Belfast horticulturist bears out the above claims also. Using an aerial arranged a few feet from the ground in the form of a trellis, he trained a number of peas and runner-beans up the structure. The results showed a great increase in the productivity of the growths. In this direction, also, more experiments are being carried out.

Now, it is not my business to attempt to prove or disprove the above briefly stated reports. They can be regarded in any manner the reader pleases. Nevertheless, I propose in this article to bring together a number of facts, all of which go to prove

that vegetable and plant growths are undoubtedly influenced by electric currents, and especially by those of a high-frequency nature.

In the first place, if we go back in history to the end of the eighteenth century, we shall find Galvani, one of electricity's most brilliant pioneers, experimenting with the fixed impression in his mind that he could influence the germination and growth of seeds by means of electricity. Galvani's experiments were failures, however.

About a hundred years later, to wit, in the nineties of the last century, somebody or other conceived the idea of growing seedlings in a box which had a carbon and a

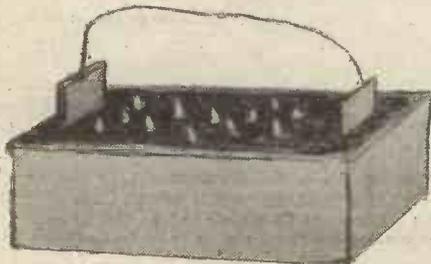


Fig. 1. An early experiment to test the effect of galvanic currents upon seedlings.

which will be set up when the world's agricultural and vegetable produce is grown by the power of radio. And all because someone has come along with the germ of a new idea, an idea which, if it could be applied to practical ends, would, in a fair measure, revolutionise the economic basis of many of the world's commercial markets.

**New Ideas.**

People don't like new ideas. They object to being made to depart from preconceived notions. Hence the quantity of pleasant ridicule which has been poured out upon this latest sign of the extension of the sphere of wireless.

In this connection, it is interesting to

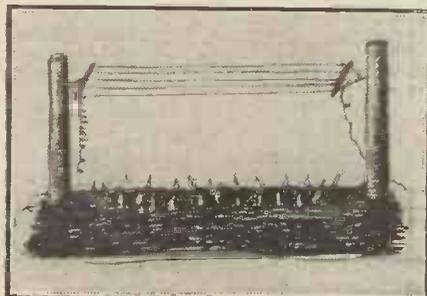


Fig. 2. Using an aerial at high potential.

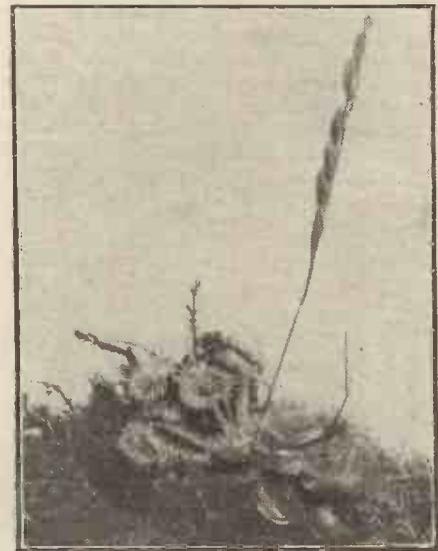


Fig. 3. A typical example of the "Sundew" plant.

zinc plate placed in the soil at opposite ends, similar to the sketch shown at Fig. 1. It was considered that under the influence of the water contained in the soil and of the inorganic soil salts, a minute current would be generated and that this current would favourable influence the germination and subsequent growth of the seeds. A few successes were reported here and there with this method, but interest in it soon waned and further attempts were given up.

(Continued on next page.)

## CAN WIRELESS HELP THE FARMERS?

(Continued from previous page.)

At a later date a number of other experimenters, among whom were Sir Oliver Lodge, took up the investigation of this new science of "electro-culture." In general, they arranged wire network aeri-als over the growing plants. These aeri-als were charged up to a potential of something like 15,000 to 20,000 volts, the current being allowed to flow into the wires for a

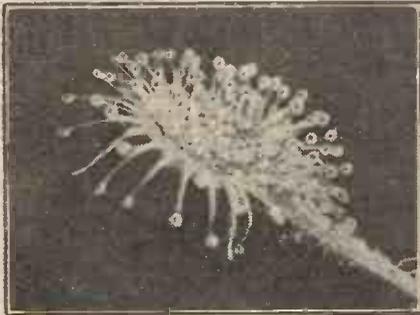


Fig. 4.—An enlarged photo of one of the petals.

period of a few hours daily. Good results were reported by this method, which is illustrated diagrammatically at Fig. 2.

### Practical Possibility.

From time to time during the later periods, various agriculturists and scientific farmers have taken up the question of influencing crop growth by electrical means, and it is now a tolerably well-known fact that the presence of high potentials in the neighbourhood of plants are a direct incentive to their favourable and ready growth.

It is, therefore, quite within the bounds of practical possibility that radio waves may help along the growth of plants in the manner stated in the recent reports. But the question will naturally arise in

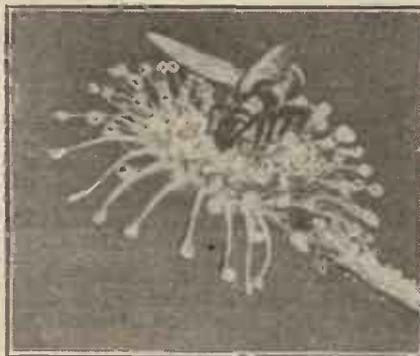


Fig. 5.—A fly trying to release itself from the tentacles of the Sundew.

the mind of the reader as to why all the vegetation lying in the path of the radio waves broadcast from the various transmitting stations throughout the length and breadth of the world does not increase in its rate of growth and productivity. The answer may probably be this. A wireless set does not receive actual ether

waves. It receives minute impulses of electrical current which have been generated in the aerial wires under the influence of the ether waves flowing past. Therefore, a train of ether waves, as such, would have no effect on plant growth. They must be converted into electrical currents by means of a metallic conductor before this influence can arise.

On the other hand, as long ago as 1904, Major G. O. Squier, of the United States Signal Corps, showed that trees and other large masses of vegetation actually absorb ether waves and that they can be used as receiving aeri-als. In such cases the trees must be acting as semi-conductors, but, nevertheless, the currents set up in them under the influence of radio waves must be too minute to have any appreciable influence on their rate of growth.

Some experiments of my own, conducted a short time ago, tend to show that electro-magnetic waves set up in the ether can be "sensed" by plants. A brief description of these experiments may be of interest to the reader.

There grows wild in many parts of England and Wales a little plant which is most remarkable for its sensitive properties. This plant is commonly known as the "Sundew." It is quite a small, lowly-growing affair, as will be evident from a glance at the photograph, Fig. 3. The Sundew has bright red fleshy petals, and a number of these plants growing together is sufficient to give a brilliant red tinge to the ground in the locality.

Now, the most interesting thing about the Sundew plant is that it possesses carnivorous habits. It is a fly-catching plant. The illustrations (Figs. 4, 5, and 6) will depict this remarkable property of the plant. Fig. 4 is an enlarged photograph of one of the petals of the plant. It will be noticed that the petal is furnished with a number of filament-like tentacles, each one of which terminates in a sucker device. Now, if a fly or other unfortunate winged insect happens to alight upon the plant, a sticky substance is immediately exuded from the petals, and the fly is unable to release itself from the plant. The tentacles then begin to bend over the fly until eventually they completely imprison the insect.

### A Peculiar Effect.

The suckers of the plant finally fasten themselves on the body of the insect and extract the juices from it. Thus the Sundew plant actually eats the fly. Fig. 5 is an actual photograph showing the fly attempting to release itself from the flower of the plant, whilst Fig. 6 depicts the flower of the plant in a closed-up condition with the insect prisoner within it.

All the above may have very little interest to the wireless enthusiast, but the interesting fact derived from my experiments is that, apart from being acted upon by chemical means, the filaments of the Sundew can be made to respond to electro-magnetic waves. In one series of experiments, a growing Sundew plant was placed about two and a half inches from the discharge knobs of a one-pint Leyden jar. The charged Leyden jar was then discharged in the usual manner. After the spark had passed, the filaments of the plant slowly closed up, just as if they were holding a fly in the midst of them.

Subsequently, a thin sheet of ebonite was placed between the Leyden jar and the

plant. On repeating the experiment, the same result took place, and similar results were also afforded when sheets of coloured glass were interposed between the plant



Fig. 6.—The final stage: the fly is completely imprisoned by the plant.

and the Leyden jar. Thin sheets of metal, however, prevented the discharge of the jar from influencing the plant.

### Another Interesting Test.

Another experiment which tends to show that certain currents can influence plant growth is one which can easily be carried out by the amateur. Procure a glass trough in which is suspended a fine mesh gauze. On the surface of the gauze scatter a few mustard and cress seeds. Place at each end of the trough two carbon rods to act as electrodes, and then very carefully fill up the trough with clean water until the level of the water just reaches the underside of the gauze.

Now connect the carbon electrodes to the 'phone terminals of an ordinary crystal set which is itself connected to the aerial and earth in the usual way. Carbon electrodes must be employed in the above cell owing to the fact that if ordinary metallic ones were used, contamination of the water would result.

Within thirty-six hours the seeds will begin to germinate, and the rootlets will

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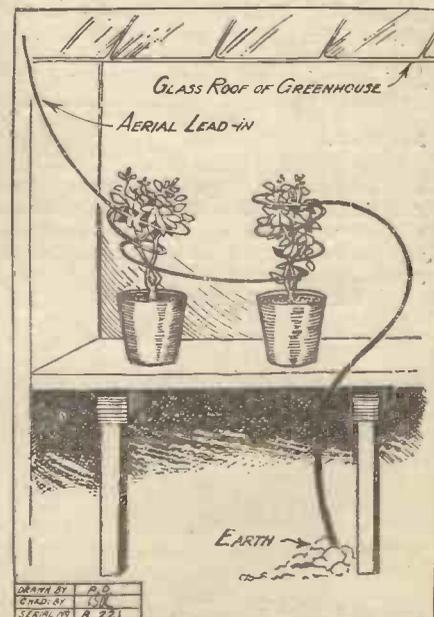


Fig. 7.—Testing the effect of radio impulses on growing plants.

# TWO USEFUL HINTS.

FROM A CORRESPONDENT.

## Battery Leads.

IN a multi-valve set designed to give maximum results, it is usual to provide a separate H.T. positive terminal for each valve, and a separate grid battery negative terminal for each L.F. valve. This means that the number of wires hanging down from the back of a four-valve set may become quite appalling; there may be no less than five H.T. leads and three grid battery leads, besides the accumulator flex.

A large number of leads of this kind may be convenient on occasions, but they are untidy and not at all necessary for ordinary work. Two connections to H.T. positive are generally quite sufficient, one applying about 50 or 60 volts, and the other 100 to 150 volts for the power valve and for any valve that is resistance coupled. If the battery terminals on the set are readily

negative end of the accumulator. If the batteries are linked together in the circuit diagram as shown in Fig. 2, grid bias may be obtained from the H.T. battery by plugging the H.T. negative lead in at +3 or +4½ volts on the H.T. battery, and using the negative end of that battery for the grid battery negative lead.

By adopting these devices the number of leads from the set to the batteries may be reduced to about half their former number, and if these are neatly bound together by means of a strand of silk, there will be no loss of efficiency and the general appearance of the wireless corner of the drawing-room or lounge will be much improved.

## Occasional Distortion.

When the loud-speaker unexpectedly begins to distort, and keeps it up, the cause out of four is either that the high-tension battery is run down, or that the low-tension supply needs renewal. These should be looked to first, and the writer would go so far as to suggest that if they are all right, it would be worth while tuning in a second station (if two stations are available at loud-speaker strength) before searching farther. The trouble may be in the transmission, particularly if the programme is being simultaneously broadcast and the local station is a provincial one.

However, there are many factors that may account for occasional distortion, and sometimes the most obvious is the last to be thought of: incorrect adjustment of the loud-speaker magnets, for example, or a faulty connection to the grid-battery, or excessive reaction. But sometimes the cause is unusual, and not at all obvious. On two recent occasions, for instance, the writer has found distortion to have been caused by a length of flex which had become worn so that only one thin copper strand held the spade-tag to the rest of the wire. In one case the wire was the lead-in from the aerial to the set, and though it is not quite clear why distortion should have been the indication of this fault, such was the fact. In the other case the wire in question was the loud-speaker extension, and the substitution of new flex effected a cure.

A much more persistent case of distortion, in a set which incorporated a filter circuit (choke across the loud-speaker and 1 mfd. condenser in series) was discovered, after many tests, to be caused by faulty insulation in the 1 mfd. condenser. In this case there was less of signal strength as well as distortion. The condenser was returned to the makers, who replaced it without question.

# CAN WIRELESS HELP THE FARMERS?

(Continued from previous page.)

descend into the water. Now, if the electrodes have been continually connected up to the crystal set it will be found that all the rootlets are turned towards the positive electrode.

Naturally, this effect is not due to actual radio currents, but to rectified currents which pass from the set into the cell, and which (if an ordinary crystal set is used) will be of the order of between 35 and 80 micro amps.

Experiments on the influence of radio currents upon plant growth may also readily be carried out. All one really requires is a greenhouse, or, in lieu of that convenient structure, a window ledge, on which are placed a few growing plants. A helix of insulated copper wire is placed around each plant, in the manner indicated in the diagram, Fig. 7. The helices are connected together in series with an ordinary aerial lead-in and the usual type of earth connection.

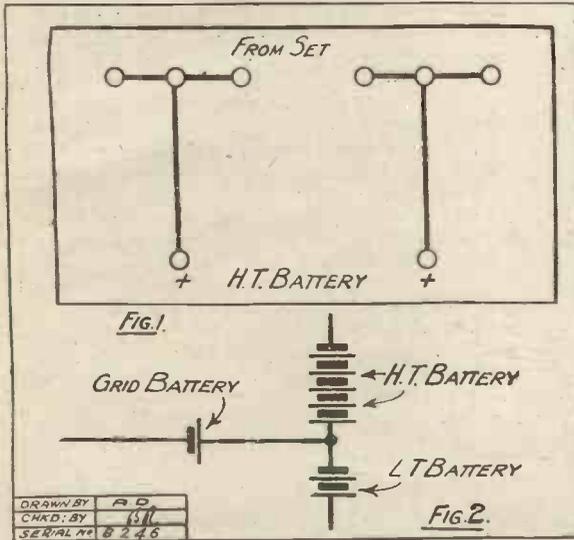
If this arrangement is fitted up, the growing plants will continually be exposed to the influence of incoming currents from the aerial, and it is very probable that interesting results will be observed.

## Future Possibilities.

Here space compels me to leave this interesting and novel subject. Without a doubt it is a well-established fact that ordinary steady and high-frequency alternating currents have a beneficial effect on the growth of plants of all kinds. Whether radio currents have this effect is a question which is not yet settled. But, nevertheless, it is a question which could easily be settled with the aid of a little patient experiment on the part of some interested amateur.

If the possible influence of radio energy upon vegetative growths is finally shown to be a constant and a beneficial one, there is no gainsaying the fact that another application of radio's aid to modern civilisation will quickly be put into practice. Looked at in its correct perspective, the above possibility is one of tremendous future importance. Owing to the world's rapidly increasing population, many economists have predicted a future time at which the production of grain, cereals, and other indispensable articles of food will not come up to the demand. Despite the fact that these gloomy predictions have vigorously been disputed, they are ones which compel consideration by every thoughtful man. If, however, future research within the next few decades shows that radio is capable of coming to the rescue, and of helping the farmer and agriculturist to increase the productiveness of his land, the fear of any lasting food shortage within the next few centuries can definitely be put aside.

Personally, I think such a state of affairs will come about before the world is very much older. And to any sceptical reader who chances to read these lines I would point out the fact that there are very many good folk living to-day who, ten years ago, would have scoffed at the mere idea of broadcasting.



accessible, therefore, it will usually be possible to reduce the number of H.T. positive battery leads to two by linking terminals together. If this is not convenient it is worth while to construct a small panel, as indicated in Fig. 1, which may be hidden behind the set. This will enable either of the selected voltages to be applied to any of the valves at will, and two wires only will hang down to the H.T. battery instead of four.

## Grid Bias.

The H.T. minus lead from the set may be eliminated by the simple plan of connecting the negative end of the H.T. battery direct to the negative terminal of the accumulator—or to the positive, as the case may be.

The grid battery, which is usually small and compact, is often housed inside the set, or under the baseboard, but if this cannot be done, the grid battery positive lead, at any rate, may be abolished by connecting the positive end of that battery to the

THE question of the relation of the loud speaker to the last valve of the receiving set, or to be more exact, the relation of the impedances of the loud speaker and the last valve respectively, is a very important one which often does not receive the attention it deserves.

It is taken as a fairly general rule that the conditions are best fulfilled when the impedance in the valve is equal to that external to the valve, that is, in this case in the loud speaker. I should remark, however, that this rule is very much disputed by some authorities.

So important is it, at any rate, that the loud speaker and the last valve of the set should be matched, that some manufacturers, both in this country and in the States, are supplying special valves with their loud speakers, or are recommending particular specifications of valves to be used with them. In more than one case the loud speaker is sold completely equipped with its own low-frequency power amplifying unit.

These actions on the part of manufacturers represent an attempt to ensure that their instruments shall be used in the proper way so as to yield the best results. It is evident that a loud speaker cannot be expected to give its best results when used in conjunction with other accessories or components with which it is, so to speak, entirely out of sympathy.

In the early days of broadcast reception, so long as the programme could be definitely received and recognised, quality was of small account. But to-day things are different, and quality is all-important. It is for this reason that the refinements indicated above have gradually been introduced.

#### Loud Speaker Resistances.

This brings up a question, which is representative of many which I receive, as to the employment of a transformer between the last valve and the speaker.

The question whether a transformer should be used depends upon a number of considerations, of which, perhaps, the two principal ones are, firstly, the impedance, or the "resistance," as it is wrongly called, of the loud speaker, and, secondly, the desirability of avoiding a steady current through the loud-speaker windings.

If the loud speaker has a very low "resistance," say 100 or 200 ohms, it will be necessary to employ a step-down transformer, as this value will differ very greatly from the impedance of even a low-impedance power valve. But if the impedance of the speaker is, say, 1,000 ohms or more, it will not be necessary—although it may be desirable—to use a step-down transformer, if a power valve of medium or low impedance be used in the last stage. It must be borne in mind that many of the present-day power-valves have a very low impedance.

If, however, an ordinary valve of comparatively high impedance be employed in the last stage, it will certainly be desirable to use a step-down transformer, even with a speaker of 2,000 ohms resistance.

Of course, the foregoing remarks do not take any account of the second consideration mentioned above, namely, the steady current through the loud speaker. This steady current may be obviated by the use of a transformer, as already mentioned, and if the impedance values of the valve and the speaker are correctly matched, a 1 to

## TECHNICAL NOTES.

A Weekly Feature  
Conducted by

Dr. J. H. T. ROBERTS, F.Inst.P.  
(Staff Consultant.)

1 ratio transformer may still be used: this will prevent the steady current without upsetting the impedance ratio.

Before leaving this point, I should mention that a choke filter circuit may be employed, but I will deal with that more fully later on.

If a transformer be not used, and the steady plate current be allowed to pass through the loud-speaker windings, it is important to see that the current passes in the proper direction, that is, in the direction to strengthen and not to weaken the magnetism of the speaker magnets.

#### New Valve Amplifier System.

The suggestion to employ valve amplifiers for the amplification of the sounds reproduced from a gramophone is by no means new; indeed, several practical systems have been developed in which this is done. A recent apparatus, and one which has a

number of novel features, is the Panatrop, by the British Brunswick, Ltd. This is a gramophone in which the mechanical vibrations produced by the record are caused to produce electrical variations (by means of a special device which is, of course, the equivalent of a microphone), and these electrical variations are amplified by means of an L.F. amplifying system, after which they are conveyed to a special loud speaker.

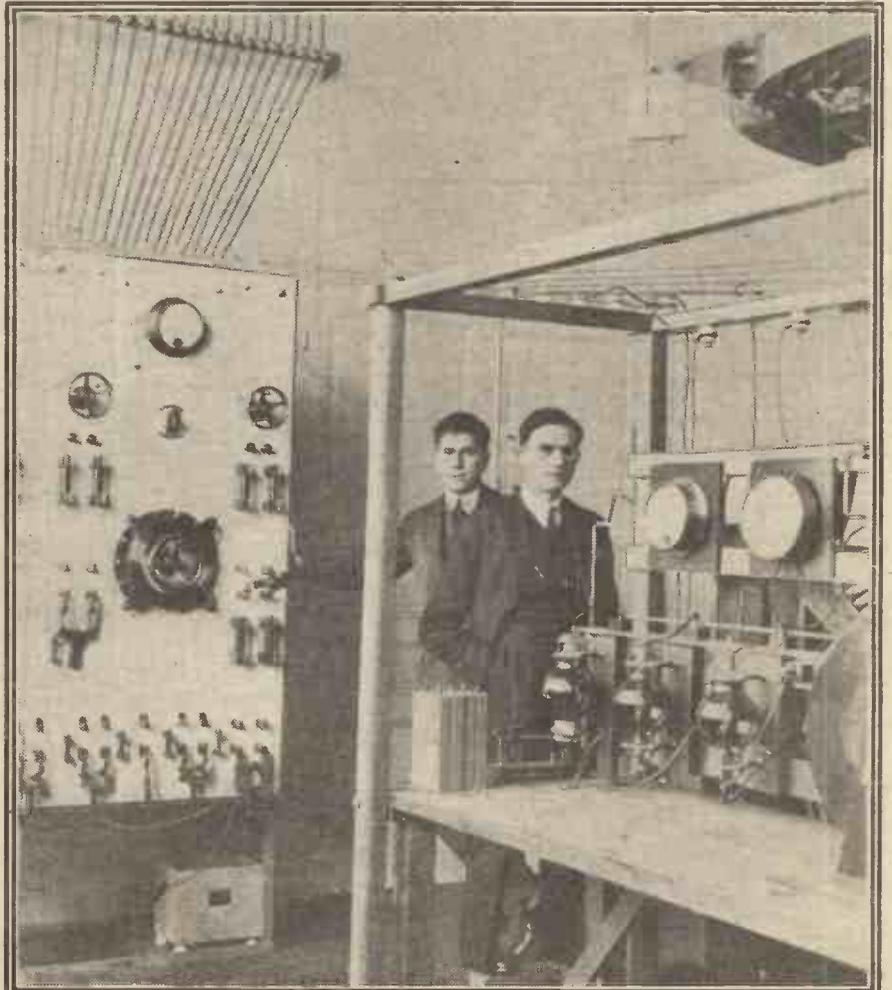
As mentioned above, there is nothing new in the general system, but by the use of a number of special features and refinements, a reproduction is obtained in this instrument which is claimed to be much superior to that obtained from similar apparatus which has been hitherto used.

#### H.T. Battery Life.

What is the life that may reasonably be expected from an H.T. dry battery? This question, though so frequently asked by amateurs, is just as impossible to answer off-hand as the corresponding question amongst motor-car owners, "How long should a set of tyres last?" The answer is that it all depends upon quality, treatment, and use.

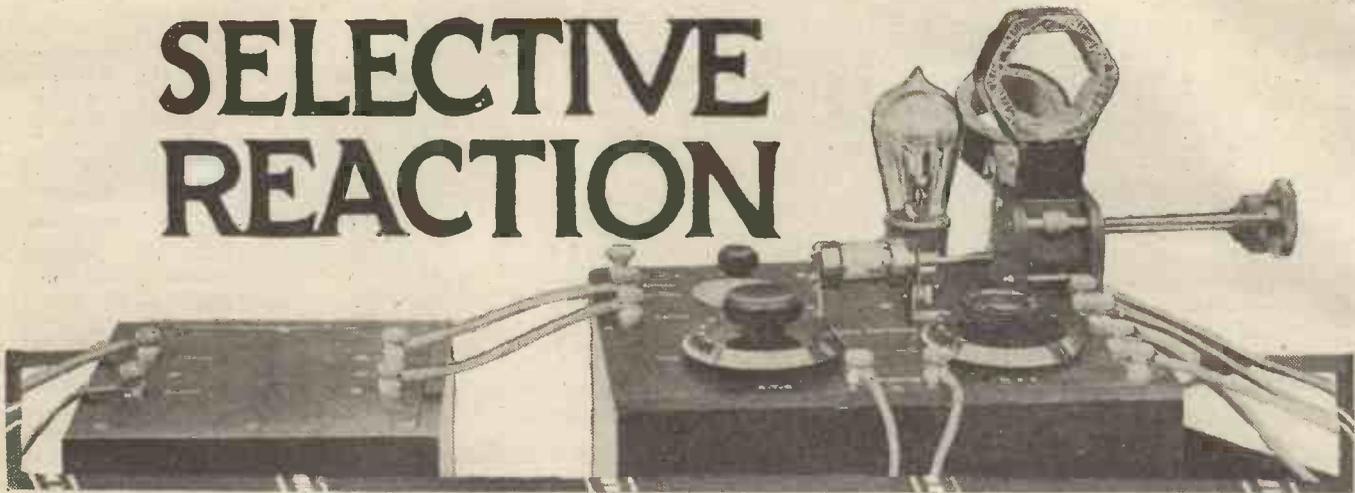
It is obvious that a cheap battery, especially of certain of the cheap German types that have made their appearance largely in the last year or so for wireless purposes, cannot be expected to give the same performance as a battery of a reliable make. Secondly, if the battery is kept in a warm

(Continued on page 656.)



Henri Fenal, nephew of Edouard Belin, the famous inventor, has been appointed head of the radio department of the Malmaison laboratories.

# SELECTIVE REACTION



**D**URING recent experiments the writer hit upon a novel circuit arrangement whereby both magnetic and capacity reaction, applied in a two-valve reflex receiver, were found to introduce super selectivity. The reasons which appear to underlie the effect of this combination of well-known reaction effects have been carefully thought out, but it does not necessarily follow that the attempted explanation given hereafter is correct.

Sailors and longshoremen alike will tell you that the man has not yet been born

\*-----\*  
 A Novel Theory of Magnetic and Capacity Reaction Combined as an Aid to Selectivity.  
 By NORMAN R. ROLPH.  
 \*-----\*

choke and condenser to a detector valve with leaky grid condenser rectification.

The receiver was first set up as shown, except for the absence of the capacity reaction condenser shown in dotted lines.

Here  $L_1 C_1$  comprise the aerial circuit and the grid tuning arrangement of the H.F. stage.  $L_2 C_2$  enable the grid of the detector to be tuned,  $L_3$  is the reaction coil which is shown coupled to the grid coil of the detector, and  $L_4$  is an air-cored H.F. choke of high inductance and relatively low distributed self-capacity.

Its action is to choke back the amplified H.F. impulses flowing in the anode circuit so that they may be by-passed through the condenser  $C_3$  to the detector-grid via the grid condenser,  $C_4$ .

It will be noted that the electrical position of  $C_3$  in the circuit is across the high-tension supply, so the insulation must be perfect, for should the high-tension negative be connected to L.T. positive the filaments would be endangered by a condenser of faulty construction. This arrangement gives us an aperiodic stage between two tuned circuits, and thus the stability of the H.F. stage is assured, there being no two tuned circuits in juxtaposition.

At the same time it was felt that something might be done to improve the selectivity of the receiver, and also to increase its sensitivity. Accordingly a capacity-reaction condenser as shown, was introduced, various capacities up to .0003 mfd. being experimented with.

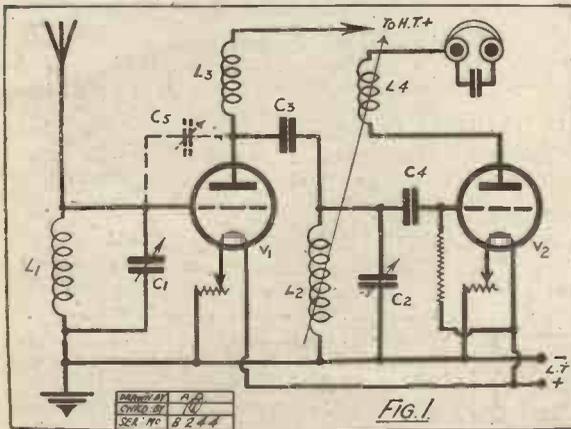
### Sharpening Tuning.

It was, of course, realised that judicious reaction applied to the H.F. grid would sharpen tuning considerably, and might even be used as a vernier to tune between interfering stations. It was not expected that the receiver would now become not only selective between stations on adjacent frequencies, but controllable throughout 80 to 100 metres by this one condenser, combined, of course, with synchronised adjustment of the magnetic reaction applied to the grid of the second valve. Yet this was the case, and having tuned the two grid circuits to resonance (with  $C_5$  at its minimum) it was possible to pick up stations round the dial of this condenser until at wave-lengths of 80 to 100 metres longer, the signal strength seemed to suffer. Thus the Liverpool relay station coming in strongly at the minimum, by increasing the capacity to the full nominal .0003 mfd., and at the same time tightening the coupling of the coils, the receiver was found to tune easily and controllably to 390 metres or thereabouts.

### A Peculiar Effect.

The operation became similar to a single valve detector, and when the grid tuning condensers had been advanced in harmony with each other a further 80 metres or so could be comfortably explored on a sort of vernier jaunt. This effect was perplexing, and the following is an attempt to solve the puzzle.

(Continued on next page 648.)

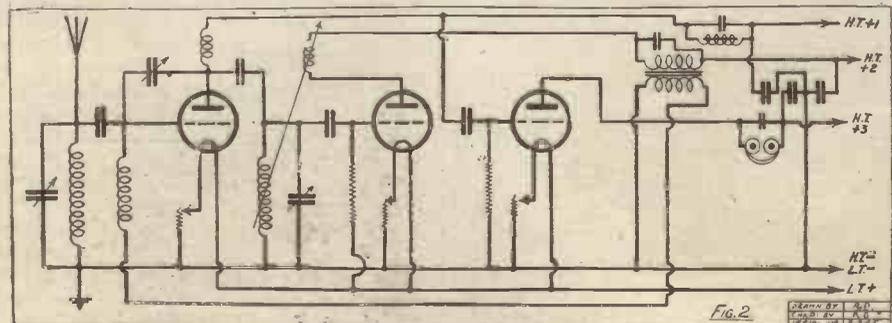


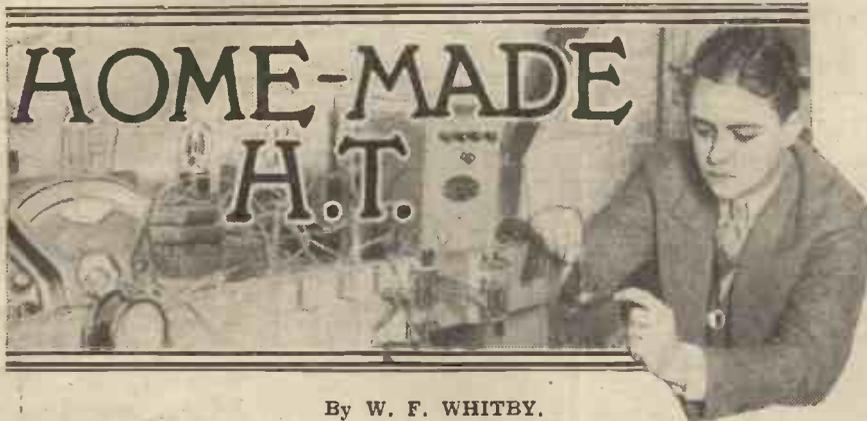
who can understand the action of the tides or accurately forecast the direction that may be taken by coastal currents.

The same thing is true of high-frequency currents. The reason why so many experimenters fail to get the maximum amplification out of H.F. stages is because it is like trying to imprison a flash of lightning in a basket. There are leakages all round. Every component used and every lead in a receiver utilising H.F. amplification provides a means of escape whereby the impulses are by-passed to adjacent parts, and thence to earth.

### Faulty H.F. Stages.

And thus with the vast majority of three-valve circuits (1-v-1) you can switch off the H.F. stage and continue to receive without much inconvenience. It was in an attempt to get a little more out of a high-frequency stage that the writer turned his attention to the aperiodic type of coupling shown in Fig. 1. This is an instance of an H.F. valve coupled by means of a high-frequency

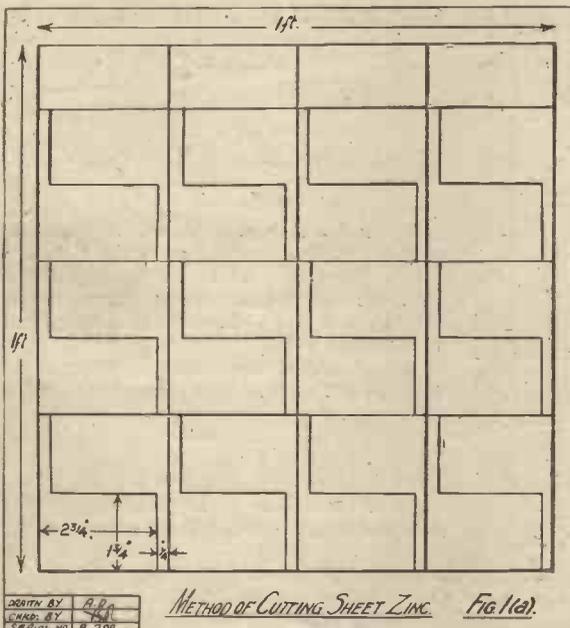




By W. F. WHITBY.

**M**OST wireless "fans" at some time or another have occasion to think hard things about their H.T. batteries

to prevent the electrolyte from creeping. The zincs should be cut as already described, and bent as in Fig. 1b so as to fit inside the jars.



The carbons must be dug out of the old batteries intact, with the brass cap and manganese dioxide packing complete—these then will resemble Fig. 2. Before soldering the zincs to the brass caps on the carbons, make sure that these caps are a tight fit and are not cracked. Should you find any that are damaged or loose—scrap them, and use in their places spacing washers such as are used for spacing the fixed vanes of a variable condenser. In order to use these the carbon must be filed slightly smaller till the washer just fits on; then, if the carbon is pushed home immediately after soldering the washer to the zinc, it will be found that on cooling the washer will grip the carbon tightly, thus making a good, sound electrical connection.

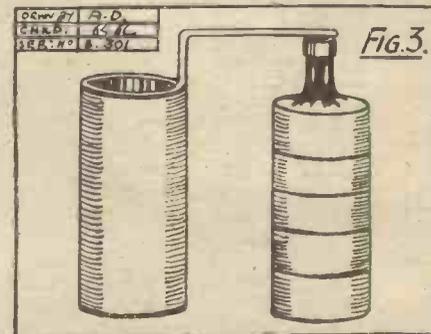


jar, and the zinc (negative) into the second jar, and so on to the end. The last jar is completed by placing a carbon only with soldering tag inside the zinc; this is the positive pole. Next fill the jars with ammonium chloride (sal ammoniac)—six ounces to one pint of water—and the battery is ready for use.

**Economical Battery.**

With an occasional run-over to see that the jars are filled with sal ammoniac, this battery will run for quite a considerable time without further attention.

It will be found that "push-on" paper clips are a very convenient method of taking tappings, and the battery has the additional



advantage of being very elastic, as tappings can be taken from each cell by simply pushing the clip on to the connecting tag.

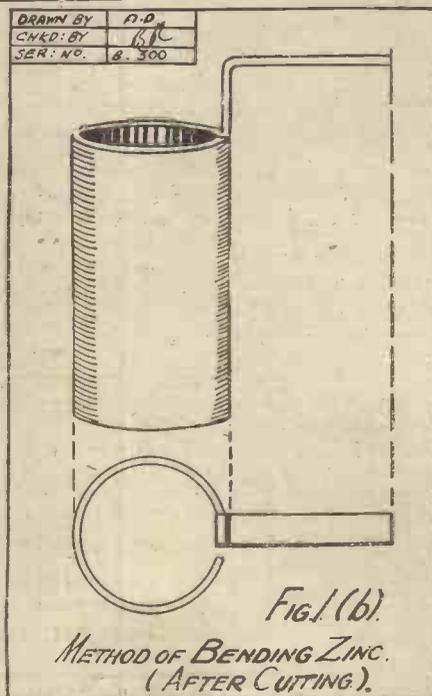
It should be remembered, however, that after the construction of the battery and the filling of the jars with solution have been carried out, the whole thing shall be left for about twelve hours before any attempt is made to put the battery into service.

and, on the score of expense alone, a wet H.T. battery is a worth-while proposition. A 60 cell (approximately 90 volts) wet battery can be made up for about seven shillings, and with a little attention periodically will serve its purpose faithfully for quite a considerable period, possibly for years.

**The Necessary Parts.**

First, let us take the materials required for making such a battery: (a) 60 small glass jars (these can be purchased at 1d. each—see "P.W." small ads.); (b) Zincs (negative pole). These also can be purchased at 1d. each, but if the constructor does not object to a little work a cheaper, and possibly better, way is to purchase about three square feet of No. 14 gauge sheet zinc and to cut it as in Fig. 1a. This can be purchased for 8d. per square foot, each square foot being sufficient for about twenty-four zincs; (c) Carbons (positive pole). These are the cheapest of all, for they cost nothing to one who has a discharged H.T. battery—or flash-lamp cells.

Having all the materials the next step is the preparation for assembly. The tops of the jars should each be dipped about a quarter of an inch in paraffin wax in order



# YOUR LAST CHANCE!

## £200 IN PRIZES FOR READERS

 Closing Date, November 16th. 

### WHAT YOU HAVE TO DO—

The Editor of POPULAR WIRELESS is offering 5 prizes of £25 each and 5 of £15 each to readers of POPULAR WIRELESS who enter the "P.W." Constructors' Competition by filling up the coupon on this page. There is no entrance fee.

The prizes will be awarded under the following categories:

- A. A prize of £25 for the best home-made L.F. amplifier unit. Second Prize £15.
- B. A prize of £25 for the best home-made Variable Condenser, approx. capacity .001 mfd. Second Prize £15.
- C. A prize of £25 for the best original wireless receiving set component. Second Prize £15.
- D. A prize of £25 for the best home-made Variometer for B.B.C. wave-lengths. Second Prize £15.
- E. Special prize for readers under 16 years of age. A One Valve B.B.C. wave-length (not 5XX) receiver, size limit for panel 10 in. by 7 in. First Prize £25. Second Prize £15.

#### READ THESE RULES CAREFULLY.

The First Prize of £25 in each class will be awarded by the Editor of POPULAR WIRELESS for what he considers the best constructive effort within the terms laid down for the respective classes. In all cases workmanship and design and the amount of actual "home made" apparatus will be primarily considered in the judging. The second prizes will follow according to merit.

The Editor may divide any of the prizes, at his discretion. The Editor's decision will be absolutely final and binding in all respects.

Any number of entries may be sent, but each entry must be separate and distinct in itself and must be accompanied by a separate signed coupon (as given here). Thus, if you want to enter two of the classes, just buy another copy of "P.W." which will give you the necessary coupon.

All apparatus must be addressed to:

"Amateurs' Radio" Competition,  
The POPULAR WIRELESS,  
7/9, Pilgrim Street, Ludgate Hill,  
London, E.C.4 (Comp.)

and it must reach that address not later than TUESDAY, November 16th. Nothing arriving thereafter will be admitted for adjudication. When packing your apparatus, pack carefully and make sure that you enclose stamps to cover the cost of its being sent back to you; otherwise its return cannot be guaranteed. And when sending up your apparatus it will help us if you use on the parcel a label (according to the class you are entering), as given in the 16th Oct. issue of "P.W." Every care will be taken of entries, but no responsibility can be undertaken in this respect. This contest is only open to *bona fide* wireless amateurs.

Any apparatus of professional make (other than the smaller component parts and accessories) will be disqualified.

No one connected in any way with POPULAR WIRELESS is eligible to compete.

Apparatus will be returned as soon as possible after the adjudication.

#### ENTRANCE FORM.

I (Signature).....

of (Address).....

.....  
an amateur in wireless construction, wish to enter the "P.W." Constructors' Competition Class. . . . (write "A," "B," "C," "D" or "E," as the case may be) and hereby agree to abide by the Editor's decision. I declare that the entry herewith submitted, is of my own construction. (If under 16 years, please state age.)

To the Editor ("Amateurs' Radio" Competition Dept.), POPULAR WIRELESS, 7/9, Pilgrim St., Ludgate Hill, London, E.C.4 (Comp.)

# BROADCAST NOTES

BY OUR BROADCASTING CORRESPONDENTS.

The P.M.G. Weakens—The Royal Charter—De Groot—Programme Criticism—Cutting the Cackle—The Menace of Education—Is Mr. Reith in the Charter?

## The P.M.G. Weakens.

THE announcement that, after all, the House of Commons will have a chance to discuss Broadcasting before the end of the year shows that listeners have been exercising some of their political influence. It is now an open secret that the Whips were astounded to receive so many danger signals from private members who had been pestered by constituents about the Broadcasting legislation. But there is no sign as yet of a change of financial policy. While weakening on procedure, the P.M.G. reiterated that, in his opinion, the £620,000 allotted to the B.B.C. for the current financial year was quite adequate. Naturally, he did not go out of his way to explain that of this £620,000 only £495,000 was available for programmes, engineering and administration; the balance was for capital and liquidation. The essence of the problem is that for the period in question programmes alone should receive just twice the amount set aside for programmes, engineering and administration. But as long as a Civil Servant, or for that matter a Minister of the Crown, is to decide on the standard of programme to be given to broadcast subscribers, absurdity will be perpetuated.

## The Royal Charter.

The future constitution of British Broadcasting is still undisclosed. Authoritative political circles agree that there has been prolonged discussion in the Cabinet on whether or not to give more than the merest perfunctory lip service to the Report of the Crawford Committee. The chief bone of contention has been the maintenance of Post Office supremacy. The Crawford Committee was for limiting this to the technical side, but the Post Office has been conducting an intensive campaign to retain ascendancy on the programme side as well. The alarming thing now is that so far as the Government are concerned the Post Office appears to have scored a notable success. It remains for Parliament to let the light of publicity illumine many of these dark corners.

## "My Programme."

This series is running well, and attracts widespread interest. Viscountess Astor will probably make number six, due for November 29th. George Crossmith will take the eighth. Father Ronald Knox, the Bishop of Truro, and Mr. J. L. Garvin are other probabilities.

## De Groot.

In every competition on the comparative popularity of programme items De Groot has figured in the first three, and usually has been first. It is a great pity, therefore, that his broadcasting is now a matter of history. But the B.B.C. have got to retrench constantly while licence revenue accumulates at the Post Office. At the present rate, there will be other notable economies before long. If the financial policy remains the same, the

Savoy Bands, the London Radio Dance Band, the various Radio Revue companies, and most of the special features will be washed out. There will be a revival of gramophone music on the ether.

## Programme Criticism.

The system of regular outside critics which the B.B.C. instituted last year is being abandoned. The idea of this was that a few listeners taken from different walks of life should send in regular reports on the programmes. This attempt to get a cross-section of public opinion proved helpful at first, but each critic tended to get into a groove, and ultimately nearly every point

## The Progress of "P.W."

We offer a sixty-eight page "P.W." to our readers this week—seventy-two pages, including the cover—for the usual price of 3d.

If you refer to other magazines sold at 3d. you will find few offer such exceptional value at such a low price.

Thanks to the confidence of our readers and advertisers, we, however, are able to give our readers of the best—and plenty of it!

There are thirty-nine pages of advertisements in this issue—a sure sign that "P.W." is the "Advertisers Favourite"—and that "P.W." has the largest circulation of any British Wireless Journal.

made was cancelled out. Moreover there was very little constructive criticism forthcoming.

## Evansong from Temple Church.

There is a strong probability that, beginning shortly, evansong will be broadcast from Temple Church on certain Sundays.

## Soft-Pedalling Speeches.

It is good news that the B.B.C. is ruthlessly rejecting proposals for the broadcasting of speeches at public dinners. There is always a keen demand for this sort of thing from interested quarters. Pressure, both social and political, is brought to bear at Savoy Hill. Among dinners recently rejected are several connected with the Imperial Conference, the British Olympic Association Dinner, and a Dinner to Lord D'Aberton. Listeners will be relieved to know of the new policy at Savoy Hill. The sonorous platitudes of the great are no substitute for decent music. When there

are alternative wave-lengths, then perhaps a few of these dreadful functions can be broadcast. For those actually present an abundance of good food and wine is some compensation.

## Peggy in "Paddy."

Arrangements are in hand for a special radio production of "Paddy the Next Best Thing," starring Peggy O'Neil. This should be broadcast in the last week of November.

## "We and Others."

By permission of Sir Oswald Stoll, this popular item will be broadcast late in November or early in December. It had been hoped to include it in the National Wireless Week programmes, but there was a good deal of delay in granting the permission.

## The B.R.D.A.

The British Radio Development Association, formed last spring at the initiative of the B.B.C., is being revived. The success attending the effort to co-operate for the purpose of National Wireless Week has brought the larger issue to the front once more. It is likely that the new Radio Manufacturers Association will take an active interest in the B.R.D.A.

## Cutting the Cackle.

Routine bulletins and talks are to be limited to five minutes in future. This is a welcome decision. It is also stated that the 9.30-9.45 period is in future to be filled according to programme values. Thus if the talk available is not of definite entertainment interest, then music will be substituted.

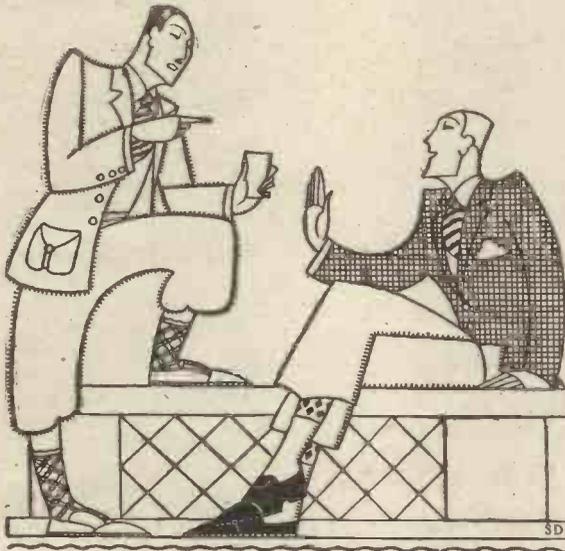
## The Menace of Education.

The confident assertions about the Radio University, and the already frequent meetings of educational pundits, have naturally given rise to some apprehension in the minds of discerning listeners. Is the new régime to see an orgy of uplift and high-browism in its most offensive and patronising forms? The continued delays in the high power plans put the régime of alternative programmes farther and farther away. Except for the purpose of publicity and post-prandial eloquence, there is no possibility of really effective alternative programmes until 1928. It becomes all the more necessary therefore that the depredations of the high-brows on programme time shall be resisted to the utmost now. What listeners want is, roughly, the balance they have had under the Broadcasting Company's régime. If this is upset, then there is no doubt whatever that licences will fall off. Already the rumours of the effect of the change-over has reduced the rate of increase in licences to an almost "level" curve. The point of decline is not remote.

## Is Mr. Reith in the Charter?

POPULAR WIRELESS was the first to call attention to what might be the crowning scandal of the change over in Broadcasting control. To leave Mr. Reith off the new Board of Governors was deplorable but understandable. To leave his name out of the Charter would be an outrage. There is no indication yet as to what is to be done in this matter; but if Mr. Reith's name is not in the Charter, then there is to be a big fuss in Parliament.

EXPERTS IN RADIO ACOUSTICS SINCE 1908



'Not on your life, old man!

**I**T'S not an atom of use getting on your hind legs to tell me of the thrills of an eight valve "super-het." Nice little row of fairy lights—what! That's all they mean to me.

Besides, I want peace in life. I get just as much fun out of two or three valves and much less trouble and expense.

I want ease of operation, marvellous compactness, ingenious design and guaranteed efficiency, and I'll bet a Brandes means all that.'

# Brandes

From any reputable Dealer.



54



### THE BRANDESET II.

The new Brandes 2-valve set features simplicity of control and ingenious compactness. Condenser dial, filament rheostat, reaction dial and "throw-over" switch for long or short wave tuning complete the panel controls. Straight line frequency condenser tuning and grid-bias is employed. The standard coil is suitable for Daventry and no "plug-in" coils need be purchased. The L.T., H.T., and grid-bias leads are plaited into one cable from rear of set.

£6 - 10 - 0

(Exclusive of Marconi Royalty and Accessories.)



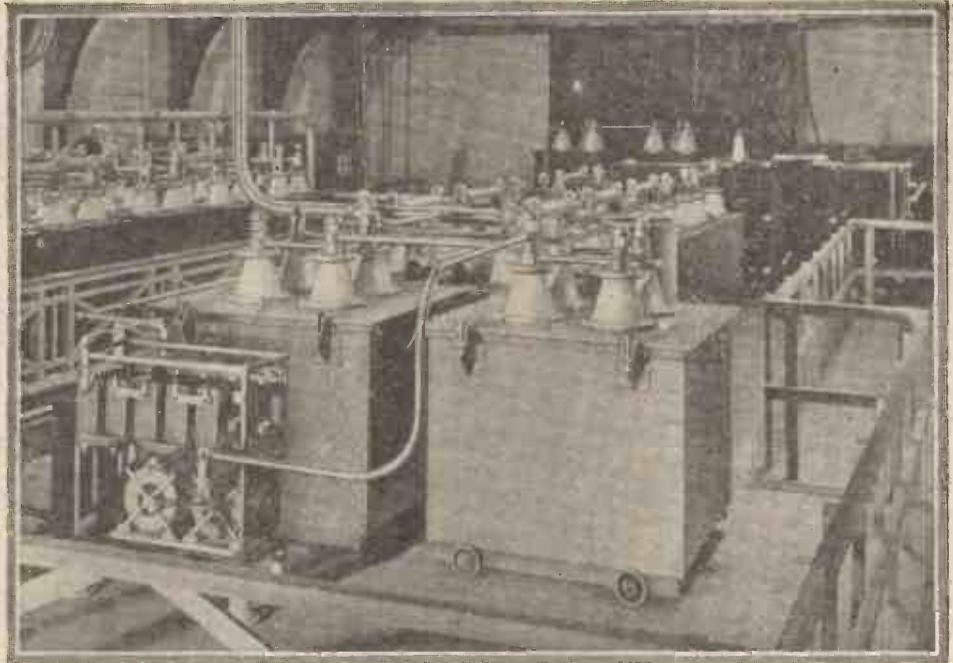
### THE BRANDESET III.

The new Brandes 3-valve receiver employs the same ingenious characteristics as the Brandeset II, except that an extra stage of Audio Frequency is employed. It has straight line frequency condenser tuning, grid-bias and is adapted to long and short wave tuning. Both receivers give most excellent loudspeaker reproduction on a number of stations, and are specially designed for this purpose.

£8 - 10 - 0

(Exclusive of Marconi Royalty and Accessories.)





## Specify Dubilier!

Sixteen years ago we commenced manufacturing wireless condensers.

In those days, electrical condensers certainly existed but they were totally unsuitable for wireless purposes. Accordingly we made a minute study of the subject and, as a result of careful observations over long periods, we were enabled to design condensers in which hysteresis losses, insulation leakage and numerous other factors opposed to condenser efficiency were either reduced to the minimum or eliminated completely. The small, hermetically sealed groups of mica and metal plates which form the essential units of the familiar 600 Type condensers are the direct outcome of these observations.

They represent the very high standard of electrical efficiency to which modern science has brought the condenser, and it is interesting to note that these identical units, grouped in their tens of thousands, make up the Condenser Banks of the world's principal wireless stations.

In the Condenser equipment of the Government Radio Station at Rugby, of which we show a view above, there

are in each of the large "tanks" over half a million of such mica and metal plates grouped into hundreds of condenser units.

Each of the many millions of plates was individually selected and tested before being collected into groups, and each group was again subjected to frequent and stringent tests during the successive stages of assembly.

This ritual of tests, tests, and more tests is observed in the case of every single product bearing the Dubilier name. Our long experience has taught us that if we are to make condensers which will be satisfactory in service, whether they are designed for High Power Stations or for Broadcast Receivers, we must take precautions to eliminate every possible cause of failure. As Condenser Specialists we know these precautions to be not only desirable but essential. Governments and Manufacturers of Broadcast Receivers all over the world, agreeing with us in this matter, specify Dubilier.

Are there Dubilier Condensers in your set?



Specify—



ADVERT. OF THE DUBILIER CONDENSER CO. (1925) LTD.,  
 DUCON WORKS, VICTORIA ROAD, NORTH ACTON, W.S.  
 TELEPHONE: CHISWICK 2241-2-3.



**WHAT IS A "PSYCHIC-GALVANIC REFLEX" ?**

This interesting article will tell you—and other less-known facts about the application of Radio to Human Progress.

"WHAT a piece of work is a man!" exclaims the ever-famous Hamlet. And doubtless he would have had more to say on the same subject if he had been familiar with some of the curious electrical properties of the human body which science in the last quarter of a century has brought to light.

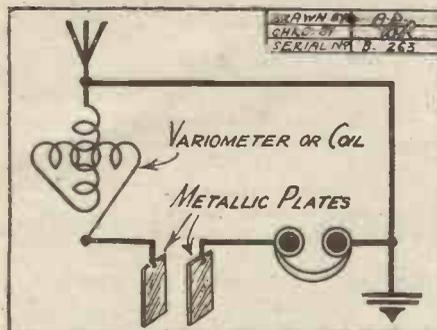
well known, and which, in view of the many different experiments which may be carried out upon the subject, will be of especial interest to crystal-set owners, and experimenters in crystal and other types of radio rectification.

It is the subject of rectification by means of the human body, a subject which forms, incidentally, still another of the many interesting electrical properties of the human body. Many crystal experimenters have, no doubt, noticed that, occasionally, faint signals are heard in the 'phones even when the point of the cat's-whisker is not resting on the crystal surface, but is a short distance above it. People have tried on occasions to explain this phenomenon by ascribing it to some sort of capacity effect set up by the detector and its surroundings. It is difficult, however, to appreciate the truth of such assertions, for close examination of the details of the experiment will elicit the fact that in every case the gap between the crystal and the cat's-whisker has been bridged over in some way, directly or indirectly, by the semi-conducting path of the human body.

Of course, in such a complicated and obscure electrical path, loose contacts must exist, and loose contacts, as the reader will well know, are notorious for the peculiar electrical effects which they give rise to. It is pretty certain, however, that in cases of the above nature, the body itself must be acting as a rectifier, and the following experiments are simple ones which the radio man, interested in the subject, may carry out for himself, and very possibly discover further important facts in so doing.

**Preparations for an Experiment.**

A very simple experiment in human rectification is as follows: Remove the cat's-whisker from the crystal surface, and grasp the crystal cup between the fingers of the left hand, and the cat's whisker holder between the fingers of the other hand. The grasp on both sides of the detector should be very firm at first. Now listen carefully, and endeavour to determine if any faint sounds are present in the 'phones. If they are



The human body possesses in varying degrees electrical properties very peculiar to itself. One of these of which a great deal of use has been made within recent times is the property which the body possesses of automatically varying its electrical resistance under the stress of conscious or sub-conscious emotion. An instrument working on this principle, and called the "psycho-galvanic reflex," is now quite a perfected affair, and it has been used for many purposes. As an instance of its usefulness, let us suppose that, after many months of patient restraint, you go out and murder the persistent and incurable oscillator next door. Naturally, your crime is found out. You are arrested. And, when subsequently you plead "Not guilty," you are invited to submit yourself to a test on this new instrument of electro-physiological science. Fitted up to this instrument, you cannot tell a lie, and your untruthful plea of "Not guilty" is immediately detected by the instrument.

**A Mystery Solved.**

Sometime I hope to write a few notes on the subject of the psycho-galvanic reflex apparatus, and its possible applications to radio science, for the benefit of readers who may be interested in the subject, but at the present time, however, I propose to confine myself to a matter which is quite

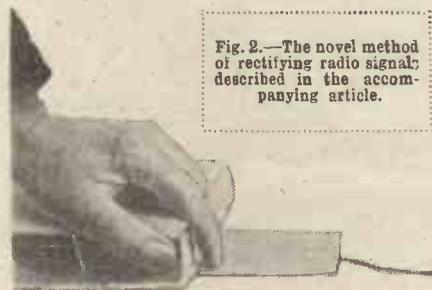


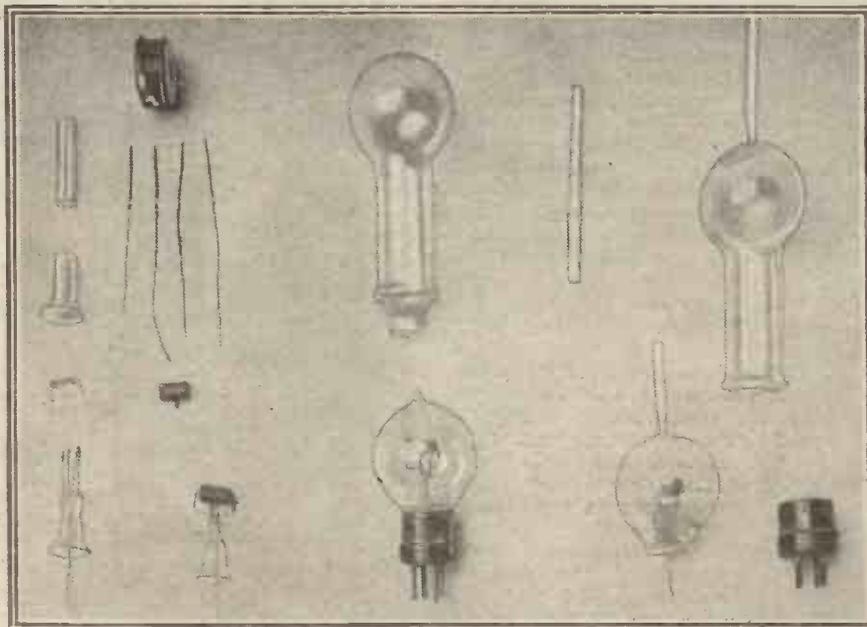
Fig. 2.—The novel method of rectifying radio signal; described in the accompanying article.

absent, considerably relax the grasp of the fingers on one of the sides of the detector, keeping the grasp on the remaining side quite firm. Then lighten the grasp on the remaining side of the detector. In many cases rectification will be evident under one or other of these conditions.

A better experiment, however, is the following:

Obtain two perfectly flat copper, zinc, or lead plates and solder a wire lead to each.

(Continued on next page.)



Stages in the construction of receiving valves made by senior students of the Milan radio university.

## NOVEL RECTIFICATION.

(Continued from previous page.)

The ends of the wire leads are connected to the opposite poles of the crystal detector, so that the whole arrangement in reality possesses a circuit similar to that indicated at Fig. 1.

Now thoroughly wash the hands, using hot water and plenty of soap, and subsequently well rinsing the hands in plenty of hot water. After this process the hands must be thoroughly dried by rubbing them vigorously in front of a fire.

Assuming that the set is tuned in to its maximum extent, and that, under ordinary conditions, the signals which it receives are strong in intensity, we may now carry on with the experiment.

### An Unique "Cat'swhisker."

Place the palm of one hand flat upon the surface of one of the metal plates. The fingers should be loosely separated, and the whole hand should press heavily down upon the plate. Next, with one of the fingers of the other hand, make very light contact with the other plate. In very many cases, rectification will be evident, and faint but perfectly clear signals will be heard in the 'phones.

As many individuals are unable to exert very light degrees of pressure by means of a single finger, it may be a good plan for the experimenter to adopt the means of attaining this end which are illustrated in Fig. 2. Rest the palm of the hand upon a book, the fingers being comfortably curved, and the whole hand at ease. Now point one of the fingers downwards so that it just comes in contact with the metal plate placed underneath. Under these conditions quite a considerable amount of control on the finger pressure may be exerted, and this control may be maintained over relatively long periods.

### Some Interesting Questions.

Still better rectification by this method may be obtained by using a very lightly copper-plated carbon plate for making the light finger contact upon. A suitable carbon plate may be procured by breaking up the porous pot of an old Leclanché cell. It is copper plated by immersing it in a dilute bath of copper sulphate, together with a strip of metallic copper, and by connecting the carbon plate and the copper strip in circuit with a single dry cell. Only a very light copper plating is required, and the surface of the carbon plate should still retain its black appearance when the plating process has been completed. An immersion for twenty or thirty seconds in the copper sulphate bath is usually sufficient to effect this degree of copper deposition on the surface of the carbon plate, although, of course, the precise length of time is determined by the current strength and the strength of the solution.

Such, in brief, are the experiments which may be made successfully on rectification by means of the human body. I say "successfully" made, but nevertheless there do seem to exist a number of individuals who are devoid of this interesting property. If, after repeated trials, the experiments

fail, you may be one of these individuals, but you are certain to find one or other of your acquaintances who will react favourably to the experiments.

There is really a tremendous amount of original research which the average experimenter may carry out. For instance, what is the effect of various bodily states upon this peculiar property of rectification? Does it increase when we are ill? Is the effect the same when we are hungry as it is after we have just completed an eight-course

dinner? Do mental states influence the effect? If we are madly in love can we effect better rectification with our bodies than we can if we are sullen, morose misogynists?

There are hundreds of questions similar to these which are worthy of investigation. It is all a matter of time and patience, and, for the interested amateur, especially in view of the approach of the longer evenings, the subject makes an excellent one for original investigation.

Naturally enough, the question in the mind of the reader at this point will be "How is the effect produced?" To be truthful, however, no fully proved explanation is forthcoming. It has been shown that solutions of various metallic salts of definite strengths possess the property of rectification when very delicate metallic contact is made with them under special conditions. And this is quite possibly what happens under the conditions of human body rectification. The body, as we well know, is fairly well full of metallic salts in various states of solution and it is very reasonable to suppose that their presence governs the rectification effect set up by the body. If this theory is true it supports the conventional electrolytic hypothesis of rectification, a theory which many present-day authorities have discarded in favour of molecular and electronic explanations of the phenomena of rectification.



A disc type loud speaker made by an Australian reader. It is stated to give very good results.

## YOUR AERIAL AND HIGH WINDS.

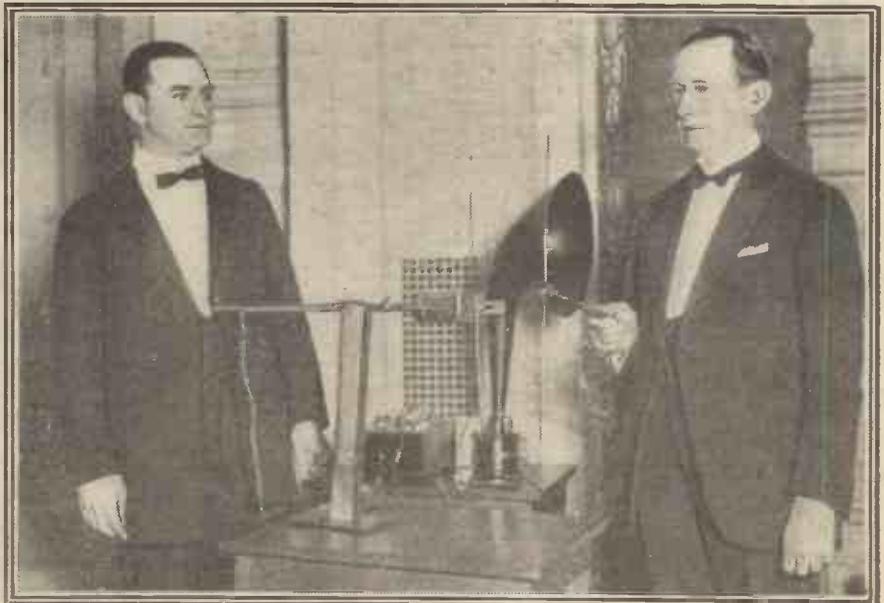
AT this time of the year many aerials break as a result of the strain created by high winds. If, instead of attaching the aerial permanently to the mast, you run it through a pulley and attach the lower end to a weight, the weight will normally keep the aerial taut, but will pull up a little when the wire is strained, thus preventing a break.

This idea, of course, is old, and many

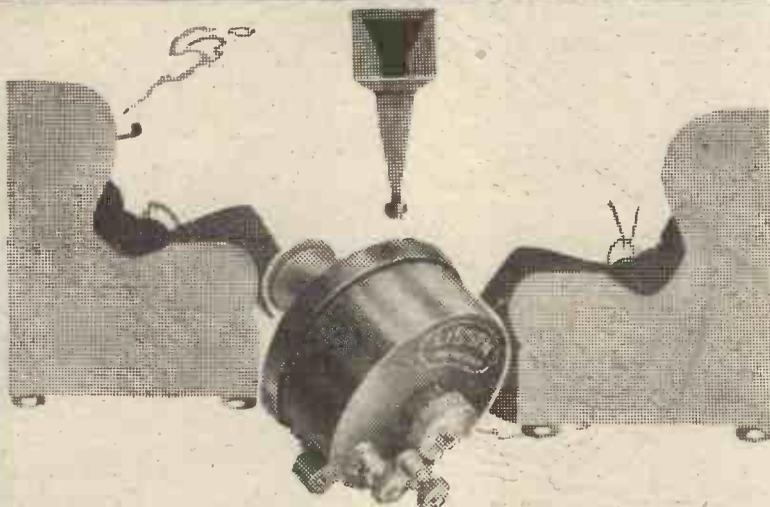
aerials are already fitted in this way, but the problem of the weight itself frequently presents difficulty. The ordinary standard two-gallon petrol can makes an extremely convenient adjustable weight, as it can be filled with water to any level, giving just the weight required.

Two gallons of water weighs approximately 20 lb., so that with the weight of the can you will probably have all you need for quite a long aerial.

Arrangements should be made that the can does not sway against the mast when it begins to blow, for if it does an annoying chatter will result. The improvised weight can, however, very easily be held away by means of a cord fastened to a peg in the ground.



A photograph of Senatore Marconi, inventor of the beam system, taken during his tour of the United States.



## Build your own loud speaker for the week-end

Do you know you can build yourself a loud speaker for less than the price of a pair of telephones, which will yet be equal to any expensive loud speaker you can buy at any price?

Tens of thousands of people have done this—and what they have done you can also do.

### 7 DAYS' TEST AT HOME.

Your dealer will demonstrate, but better than all take a LISSENOLA home—put it on your set—put it on your friend's set—try it with the horn of his expensive speaker fitted to it—then if you are not satisfied, or do not find it at least equal to any expensive loud speaker you have heard, take it back to your dealer's or send it back to us.

You can build a big horn for the LISSENOLA yourself for a few pence—easily—from the full-size diagrams and clear instructions given with each unit, thus providing yourself with a complete instrument equal to any loud speaker, and saving you many pounds.

If any difficulty in obtaining send direct to factory. No postage charged, but please mention dealer's name and address. Or can be sent C.O.D.



The "Lissenola" instantly converts any gramophone into a radio loud speaker.



A cone diaphragm loud speaker can easily be constructed. The illustration shows one method of mounting to the "Lissenola."



Price **13/6** each



Complete directions and full-sized pattern for making this horn are given with every "Lissenola."



The "Lissenola" Reed Attachment (patent pending) for use with cone diaphragm loud speakers. Price 1/-.

### SMALL ENERGY-CONSERVING CONDENSERS—

Fit LISSEN—these small condensers deliver all their stored-up energy. The following capacities are made in mica (LISSEN also make the Mansbridge type in larger capacities). Leaky condensers waste energy—fit LISSEN and save it.

Capacities '0001 to '001 1/- each (much reduced).

'002 to '006 1/6 each (much reduced).



Note the new case which enables the condenser to be fitted upright or used flat. At present the new case is available in the capacities most used, but will quickly become standard for all capacities.

### ADD 10% MORE LIFE TO YOUR H.T. BATTERY

—merely by using a LISSEN 2 mfd. or 1 mfd. (Mansbridge type) condenser across your H.T. battery. It cuts out all the noise from your H.T. battery when the battery is old, and keeps the energy flow steady and quiet in the meantime. One LISSEN condenser will outlast many batteries, and the lengthened life you get out of your battery will pay for the cost of the LISSEN condenser over and over again. Your dealer will tell you how you can easily connect the condenser when buying it. Use either 2 mfd. or 1 mfd. capacity—the larger condenser is more effective.

LISSEN (Mansbridge type) condenser :  
2 mfd. 4/8 1 mfd. 3/10

Other capacities made are :

.01	2/4	.25	3/-
.025	2/4	.5	3/4
.05	2/4	1.0	3/10
1	2/6	2.0	4/8

Instead of a tin case, the LISSEN Condenser, unlike all other condensers of the Mansbridge type, has a specially moulded case which IN ITSELF IS A SOLID INSULATOR. That is why it is impossible for the LISSEN condenser to short circuit on to its case, an important protection for the user when the condensers are being used in a circuit connected straight on to the electric light mains. And due to our new direct to dealer policy of distribution THESE LISSEN CONDENSERS COST YOU NO MORE THAN THE ORDINARY KIND.

### LISSEN GRID LEAKS THAT DEFIED BOTH RAIN & SUN—



During the summer of 1925 a case of LISSEN Fixed Grid Leaks was left on our factory roof—soaked by rain and baked by sun, yet the resistance in each grid leak never altered. All capacities one price, previously 1/8, NOW 1/-.

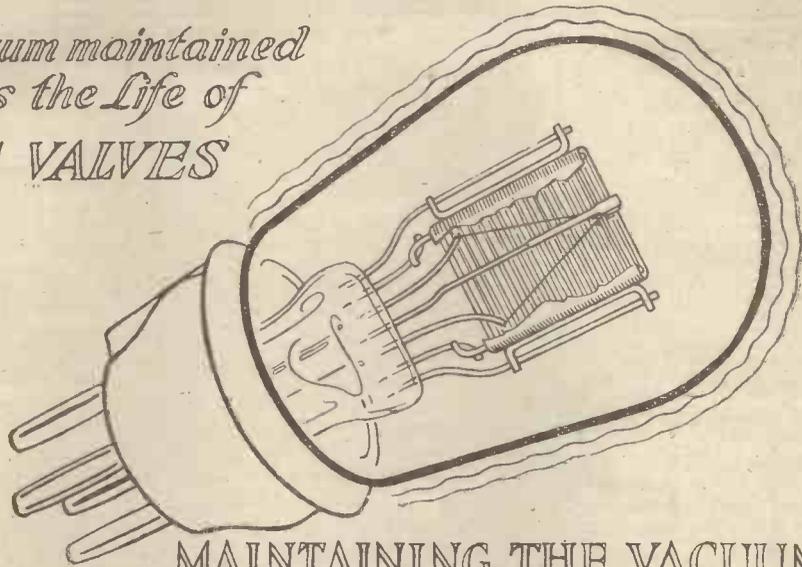
# The LISSENOLA

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OSRAM VALVES*



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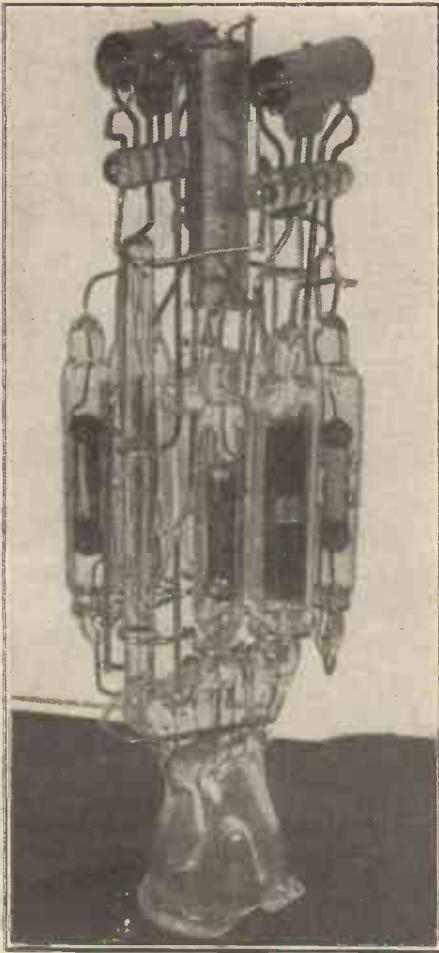
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# THE MULTIPLEX VALVE.

A Brief Description of a very Interesting German Invention.



(Above). A "close-up" of the Loewe triple valve partially assembled.

(Below). A Loewe receiver which incorporates the elements of a three-valve receiver, although using only the one special valve.

A RECENT German invention claims to have made obsolete multi-valve sets, especially in cases where several stages of L.F. amplification are required. Dr. Sigmund Loewe has brought out a valve containing all the elements necessary for the operation of a three-valve resistance-capacity coupled amplifier within the glass bulb of the valve itself.

### Extremely Compact.

Everything is contained inside three plates, three grids, and three filaments, the resistances and condensers neatly packed away in a bulb only a little larger than that of an ordinary receiving valve.

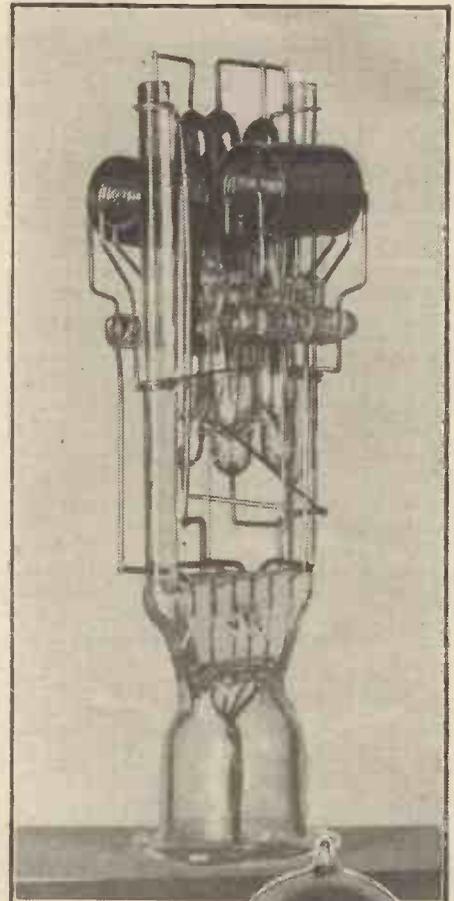
Thus a loud speaker set taking up surprisingly little space can be constructed, the detector being followed by one of the Loewe triple valves, whereby an amplification of about 3,000 is claimed. Lack of distortion is another point claimed by the inventor, so that the constructor has not to worry over lay-out or anything like that. He merely connects up the six tags from the valve socket, and his amplifier is ready as soon as he has plugged in the valve.

### Very Economical.

The triplex valves take about .7 amp., at 4 volts, so that they are very economical to run. The H.T. consumption works out at about 5 milliamps., a very low figure considering the amplification obtained.

Another valve, the duplex, has also been constructed by Dr. Loewe for H.F. amplification purposes, and this valve promises to become equally as popular as the triplex.

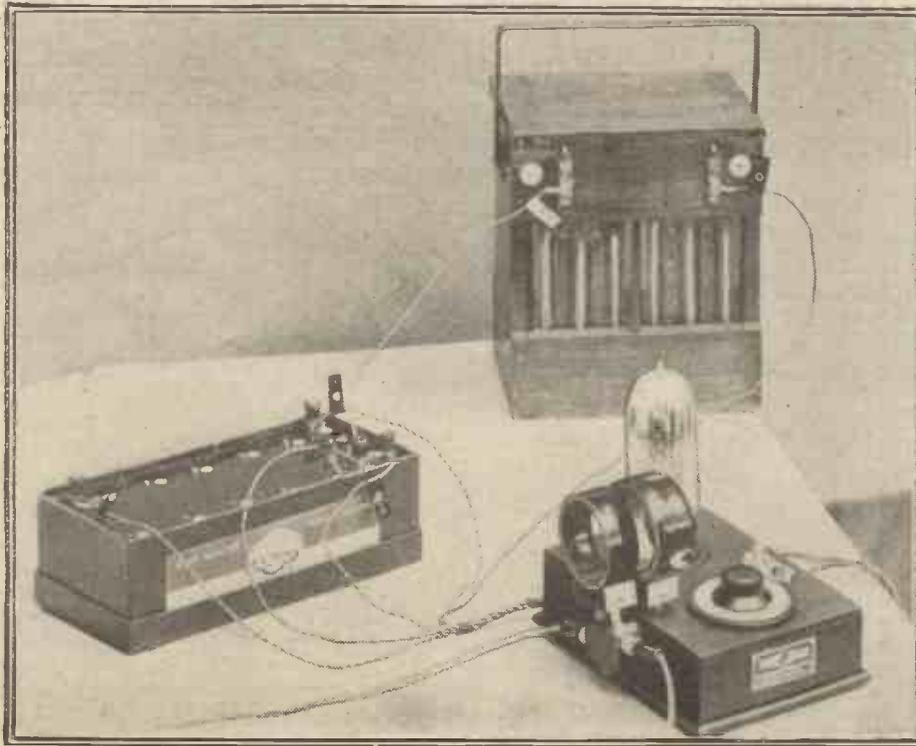
The cost of a Multiplex valve, in Germany, works out



at the equivalent of about 27s. 6d., and the cost of repairing one burnt out filament at about 8s.

(Above). Another Loewe multiplex valve of a slightly different nature, partially assembled.

(Right). The Loewe valve fits into a base which is rather reminiscent of American practice.



The above valve is shown again in operation in the photograph on the left. The coils and the H.T. battery are of average sizes and it will be noted that the size of the latter exceeds that of the set itself.

## AN INTERVIEW WITH M. YSAYE.

### A FAMOUS VIOLINIST ON BROADCASTING.

By "ARIEL."

WHEN on the Continent recently for a short holiday I was lucky enough to run into the celebrated Belgian violinist, Monsieur Eugene Ysaye. Of course I couldn't expect him to think it lucky, but, after apologising and being properly introduced, I reminded him that about eighteen months or two years ago I had heard him broadcasting some violin solos during a concert at 2 LO organised by the Editor of that popular journal "Answers."

There was a twinkle in his eyes as if he suspected that I wanted to interview him; this gave me courage to ask him whether he had broadcast at all since the "Answers" concert, and if so, where. He sighed and shook his head, saying: "No, I'm afraid I haven't."

Monsieur Ysaye making no attempt to escape, we walked a little way together, chatting about this and that, until presently I found to my delight that he was getting reminiscent. I wondered whether the lack of an audience affected an artiste's playing and whether he was able to give his best when broadcasting, and when I put this proposition to him he said, after carefully weighing the question: "The artiste, if well disposed, can play just as well without an audience as he can with one."

"Tell me frankly," I said; "do you dislike broadcasting?" He raised those expressive eyebrows as he said: "Well, I have nothing against it."

#### Personality Counts.

To my surprise he confessed that he seldom listened in to any of the broadcasting programmes. "Not lack of interest," he explained; "merely lack of—opportunity." I suggested that, nevertheless, his opinion would be interesting as to whether violin music comes over well when a solo is broadcast, and he said he thought that while the sonority was good, perfection was still to be obtained.

I tried to get Monsieur Ysaye's opinion as to the merits of a good broadcast receiving set compared with the best gramophone ever made, but the famous violinist smilingly refused to give a definite opinion. "I must confess I really haven't sufficient experience," he said.

His modesty was charming, but embarrassing to one who was so anxious to get information on this subject. But I was not downcast, and I told him so. He said I might go ahead, but reminded me that to expect him to talk wisely about wireless was almost as cruel as to suggest he should play a sonata on his beloved instrument without strings. "Well, you can tell me this," I said; "do you think broadcasting is adversely affecting the concert industry? I'll tell you why I ask this pointed question—because Mr. William Boosey is reported to have said that broadcasting is very injurious to the concert industry and that it's keeping people at home when they might be going to various concerts.

"Of course, the B.B.C. deny this," I

assured him, "and say that the broadcasting of music has made thousands of people in this country more interested in music than heretofore, and that, if anything, the effect on the concert industry has been to the good. Do you agree to this or not?"

Monsieur Ysaye stopped suddenly in his



A characteristic portrait of M. Ysaye, the famous violinist.

walk and faced me. "My dear sir, nothing can suppress the interest of a personality; personality counts for so much in music and drama, even in business; therefore concerts will always continue. If they don't—" He shrugged his shoulders and made a delightful grimace.

I asked him what he thought broadcast best; whether, as many other people suggest, it was, in his opinion, either the

violin or violoncello. He tried to look severe, told me I was asking too many questions and, I suppose hoping to "dry me up," said: "I don't know!"

This was certainly not very encouraging, but: "One more question," I pleaded, "Would you be prepared to broadcast another series of concerts from the London station. Yes or no?"

"Of course I won't say no—certainly I would."

Before I could say another word, Monsieur Ysaye reminded me my last question had been asked: "Now it's my turn to interview you," he smiled. "What do you think of violinists?"

Ingenuously I told him I thought there was only one!

## CALCULATING FILAMENT RESISTANCE VALUES.

A TYPICAL case is when a 4-volt accumulator is used in conjunction with the popular 2.8 volt, .06 amp. dull emitter valve. Supposing only one valve is to be used, then the correct resistance for the filament rheostat is arrived at as follows:

By Ohm's law,

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amps.}}$$

Now, in this instance, the voltage which we require to drop is 4 volts (that of the accumulator) minus 2.8 volts (that required by the filament of the valve), which equals 1.2 volts. We know the current to be taken by the filament (.06 amp.), and so, by the above formula,

$$\frac{1.2 \text{ volts}}{.06 \text{ amp.}} = \text{resistance in ohms} = 20 \text{ ohms.}$$

In practice, however, it is advisable to use a resistance of a somewhat higher value than the theoretical, in order to provide control over the valves, and a variable resistance of 30 ohms maximum is suitable here.

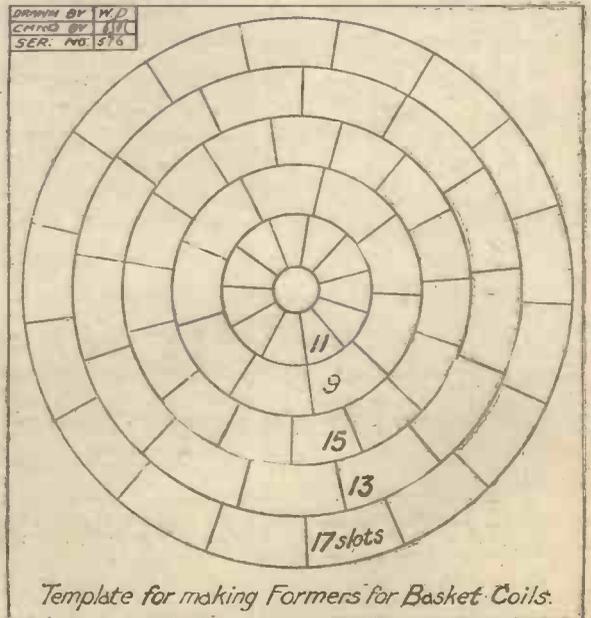
When more than one valve of the same type is used, the filament resistance is easily found by dividing that required for one valve by the number of valves.

## A USEFUL TEMPLATE.

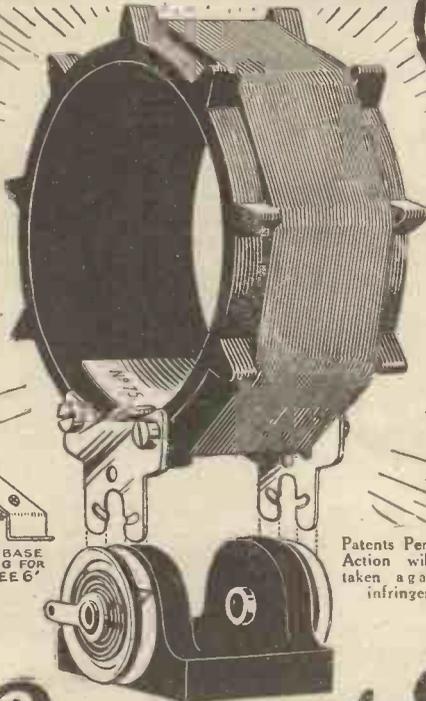
THOSE who wind their own coils and make their own formers will find the accompanying template very useful, as it will enable them to make formers with from 9 to 17 slots.

A piece of tracing paper at the back of this page may be laid upon the cardboard or fibre from which the former is to be cut, and a blunt-pointed stylus, such as the end of a bone knitting needle, or a sharpened match, used to mark off the points at which the slots are to be cut.

DRAWN BY W.D.  
ENGRD BY J.W.C.  
SER. NO. 576



Template for making Formers for Basket Coils.



SPECIAL BASE MOUNTING FOR ELSTREE G

Patents Pending. Action will be taken against infringers.



# Rout your Enemy — H·F RESISTANCE!

High Frequency Resistance, the dreaded enemy which crept into your Receiver during its construction, rendering it unselective and generally defeating your efforts to tune in distant broadcasting, can now be easily circumvented.

There is no secret—one glance at the

## MH UNIMIC COIL

will tell you all.

The base is of special interest. As will be seen from the illustration, the connecting plates on the coil are firmly gripped between the spring connecting jaws on base, ensuring a tight contact, at the same time enabling the coil to be moved through an angle of 90°

It is robust in construction, yet it is by far the most efficient coil of its type, and is capable of numberless applications, among which are—

1. Variable Coupling between two tuned circuits.
2. Variable reaction coupling.
3. Aperiodic aerial coupling to tuned circuit.

In fact, it can be used in practically every H.F. circuit.

Price - - 5/-

Base 2/6 extra.

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### THE MH 'DIMIC' COIL

places in your hands the essentials of good reception, i.e.,  
High Selectivity.  
Wide Adaptability.

The Highest Efficiency.

Taken at the Middle frequency the MH Dimic Coil No. 1 has a resistance of 5.25 ohms at a frequency corresponding to 400 m., i.e., .026 ohms per  $\mu$ H. In all ranges of wavelength from 150 to 10,000 metres, and the S.W. Dimics from 20 to 150 metres.

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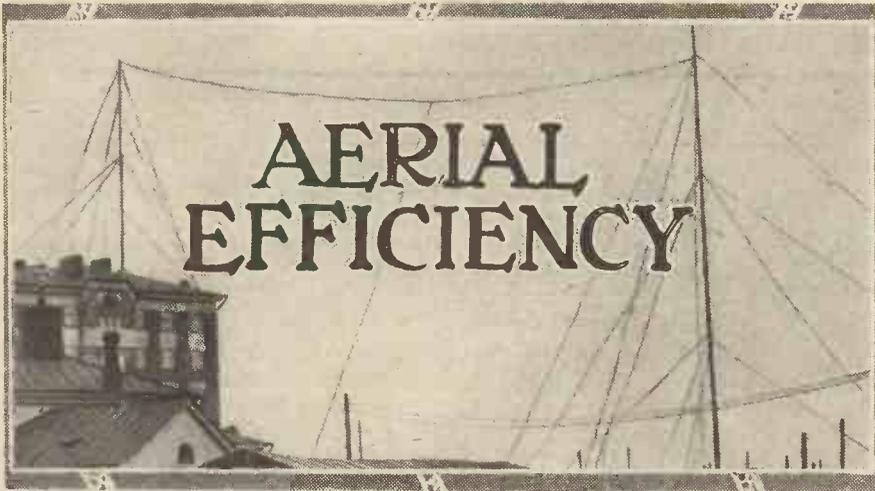
10 for 6d. 20 for 11½d.

50 for 2/5 100 for 4/8



P.1392.

PERFECTLY MADE FROM CHOICE OLD VIRGINIA TOBACCO.



FROM A CORRESPONDENT.

IT is a commonplace in wireless science that, to a very great extent, the efficiency of a receiving aerial, or of a transmitting one, for that matter, is dependent upon the degree of thoroughness of its insulation. An efficient aerial must, of necessity, be a well-insulated one, and the large numbers of aerial insulators, of different types and patterns, which are to be seen on the market nowadays, testify in no mean manner to the essential truth of this dictum.

When an aerial is first erected, the degree of insulation which is obtained by the use of a single well-made insulator placed at each end of the aerial is, for all practical intents and purposes, quite as effective as the insulation obtained by the use of two or three insulators at each end of the aerial. And, of course, an aerial so constructed has the undoubted advantage of possessing a minimum weight, and of putting less strain upon its holdings.

But is this equality of insulation maintained? The answer, I am afraid, is in the negative, as they like to say in official circles. In the first place, the impure and smoke-laden atmospheres of our modern industrial cities are sworn enemies of effective and prolonged aerial insulation. In the course of time, soot and other atmospheric impurities are deposited on the surface of the aerial insulators, with the result that the aerial currents begin to leak away to earth via the dirty insulators.

**Leaks.**

Again, the rain which falls in the neighbourhood of manufacturing towns is generally highly charged with dissolved gases, such as carbonic acid gas. Thus the insulators form a conducting path for the current in wet weather.

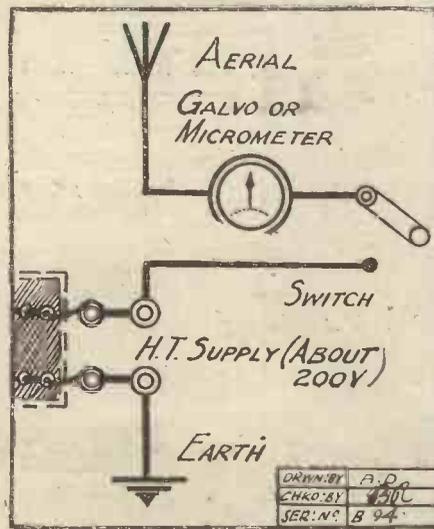
Country aerials, however, are to a very large extent exempt from these troubles. For one thing, much less dirt collects on the insulators, and, added to this, we have the fact that the rain-water of country districts is considerably purer than that of the towns, and thus the aerial current is not so liable to leak away over the wet surfaces of the insulators.

However, it is the purpose of this article not so much to discuss the relative advantages and disadvantages of different aerial insulating systems, but to give an indication of a useful method of measuring the resistance of an aerial's insulation to high-tension

currents. Whilst, of course, the method to be described does not give the actual resistance of the aerial to oscillatory currents, it is nevertheless sufficiently reliable to afford a good indication of the aerial's efficiency in this respect.

**Testing the Resistance.**

Many a wireless enthusiast has been perplexed by the apparently inexplicable falling off in efficiency of his favourite receiving circuit, despite the fact that the receiver itself is known to be in good order. And perhaps it may not be very far from the truth to state that the majority of these amateurs seldom, if ever, suspect the



gradual loss in the aerial's insulation efficiency due to the sooting up of the insulators to be the prime cause of the mysterious trouble.

The method of testing the insulation strength of the aerial which is detailed below will, however, do much to trace troubles of this nature.

The diagram shown at Fig. 1 will make clear the circuit which is employed in the method of estimating direct current aerial resistance. A sensitive and calibrated galvanometer, or, better still, a microammeter, is placed in series with the downlead of the aerial. The terminals of a high-tension direct current supply are also con-

nected in series with the aerial downlead and the earth-wire of the receiving set. A pressure of about 150-200, or sometimes even more volts, is required and, for the sake of convenience, a switch should be inserted in the circuit in the position indicated in the diagram. For the direct current supply, it will be found the most convenient to make use of a series of ordinary H.T. batteries, the employment of the batteries for this purpose resulting in no harm being done.

As an example let us suppose that on connecting up the various parts of the test circuit as shown in Fig. 1, and operating the switch, the microammeter reading corresponds to a current of 1 microampere, the voltage of the H.T. batteries being 200.

Now, applying the well-known Ohm's law equation:

$$\frac{E}{C} = R$$

in which E equals the applied voltage, C the current in amperes, and R the required resistance, we can calculate from this reading the aerial insulation resistance.

Thus,

$$\frac{200}{1/1,000,000 \text{ amp.}} = 200,000,000 \text{ ohms, or } 200 \text{ megohms. (1 megohm = } 1,000,000 \text{ ohms.)}$$

In this way, the direct current resistance of an aerial insulating system may be determined with a reasonable degree of accuracy, and from it a good estimation of the aerial's insulation resistance to H.F. oscillatory currents may be inferred.

Still, however, I can imagine the reader drawing back from the practical application of this method, and on one account only. Accurately calibrated microammeters are expensive instruments, and very likely the amateur may not possess one.

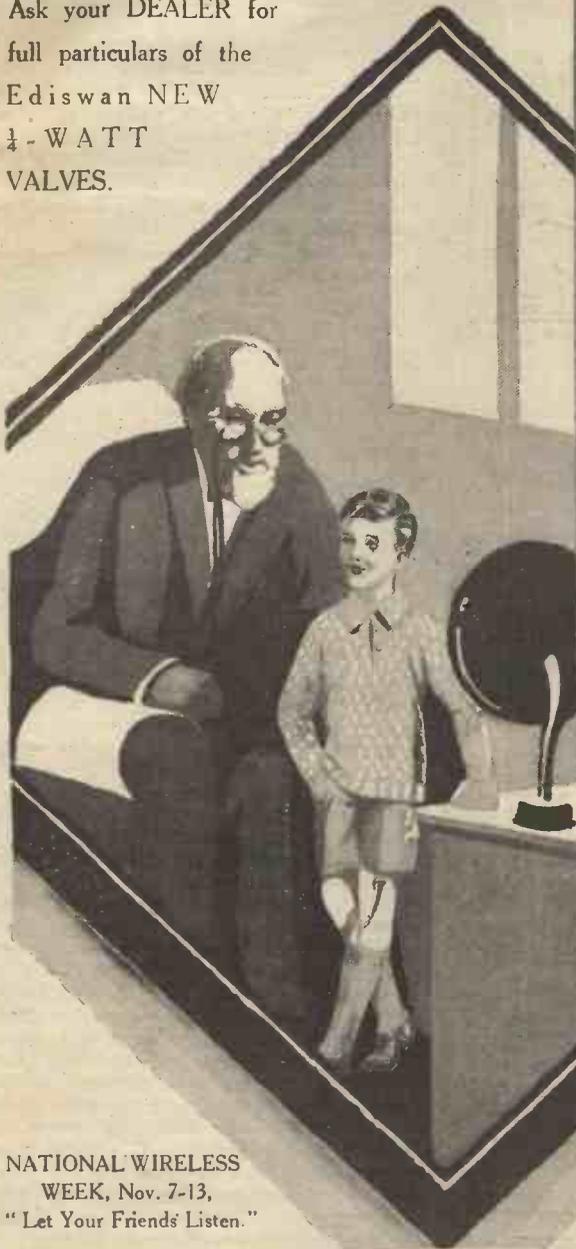
**Comparative Tests.**

However, if such an instrument is not available, there is still another method of determining the aerial insulation resistance. In this case, it is only the relative resistance which is estimated. In place of the calibrated microammeter, employ simply an ordinary sensitive galvanometer of the moving coil or similar type. Then, on operating the switch and allowing the current to flow into the aerial, any small insulation leakage will give rise to a small deflection of the galvanometer needle, and by comparing the amount of needle deflection with that obtained from a test on an aerial of proved efficiency, a fairly good estimate of the relative insulation strength of the aerial under test may be made without any calculation.

Many interesting experiments on the variation of aerial insulation resistance may be carried out by these simple means. The insulation resistance of the aerial circuit will usually be found to vary from day to day, according to the amount of moisture present in the atmosphere, and for various other reasons.

Before conducting experiments by the above methods, however, care should be taken to ascertain that the aerial downlead is well insulated at the place where it enters the room, and also that the entire length of the earthing wire is in a similar well-insulated condition.

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Resistance Coupling			
		*R.C. 2	P.V.6 (1- Watt)

\* The anode resistance used should not be less than 1-5 megohms.

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# The RADIO CONSTRUCTOR

Edited by PERCY W. HARRIS, M.I.R.E.



This valuable eight-page supplement, devoted to the interests of amateur wireless constructors, appears every week in "Popular Wireless." Tell your friends about it, for it is only in "P.W." that they will find radio articles by the leading constructor's expert, Mr. Percy W. Harris.

than that of many five-valve sets, while the full round volume of the audio-frequency side will yield all that two good transformers can give. The method of rectification is also novel (grid leak and condenser defects have been avoided as neither of these components are used).

## A WEEKLY CHAT BY THE EDITOR.

I WONDER whether most of us are not being spoilt by the growing efficiency of modern wireless apparatus? The better and more efficient the apparatus becomes, the easier can we get good results without troubling about getting real efficiency. This and similar thoughts occurred to me the other day when passing down a long thoroughfare of suburban houses.

An end view along the neat little gardens revealed a forest of sticks, poles and masts, showing aerials of every conceivable height, size and degree of tidiness. One aerial was so hopelessly inefficient that I doubt whether the listener would note much difference if the whole structure fell down, yet I feel sure that everyone in the road was getting passable results, and probably a great number were fully satisfied.

### Is He Careless?

Now, quite apart from the unpleasing appearance of a badly erected aerial, one cannot help coming to the conclusion that the man who is so careless as to allow this kind of structure to serve as his receiving wire, is unlikely to pay attention to many other points of equal importance. Sets designed by writers who specialise in home construction, and factory built receivers of the most efficient type, are frequently blamed for defects which can be traced to sources other than the instrument itself. Many people are getting two-valve results on four or five valve sets, thus using twice the filament and H.T. current they really need. Why allow any such wastes to occur?

### False Economies.

When experimenters were confined to crystal receivers and when the signals were able to obtain were of the weakest nature, we only succeeded in obtaining good results by paying very careful attention to our aerial and earth systems. Again, why use an elaborate multi-valve set purely for local reception? A few miles from a broadcasting station the results from that station given by, say, a five-valve set with two stages of H.F., a detector and two audio-frequency stages, compare quite unfavourably with those obtainable from a detector and two audio stages alone. In nine cases out of ten a set without radio-frequency will give at least equal quality

and volume, while the two-valve Hale receiver described in this issue will probably beat both types.

There is far too great a tendency to make one set serve all purposes. In the majority of cases it *can* do so, but where local reception is mainly required, I always advocate the use by the home constructor of a simple and local receiver. Such an instrument is inexpensive to build, and as it always remains tuned to the one station, its operation is simply the matter of an on-and-off switch. Its running, too, is very economical. The long-distance set can then be reserved for its real purpose.

### "The King of the Air."

Last week I mentioned my new receiver "The King of the Air," which is now passing from the experimental bench into the practical stage. While I cannot yet give you details of the design I can, at least, indicate a few leading points and novelties.

To begin with, it is a four-valve receiver, of very compact design with a new style of lay-out and a new type of cabinet. The efficiency of the H.F. side is far greater

rectification!" you say.

No, you are wrong, for it is something quite different. You will be interested to hear that the set is a reflex, but really foolproof, there is no crystal, it is non-radiating, and there are but two simple tuning controls. There is not a single component of an expensive nature, there are no double or treble condensers, and the H.T. and L.T. current demands are of an extremely moderate character.

Tuning, I need scarcely say, is razor-sharp, and my friends who have seen the set in the initial stages, say it is at least six months ahead of anything yet published.

In pursuance of my policy of endeavouring to help every home constructor to get the best he can with what apparatus he has, I have arranged the set to use many parts of the kind the average home constructor already possesses. At the same time, those who wish to start afresh with everything new, will find a full list of suitable components in the article, which will appear in "The Radio Constructor" very shortly.

### Decorated Panels.

Do you like the idea of decorative panels? My American correspondents tell me that, having tired of the monotony of the jet black or imitation mahogany panels which have reigned for so long, the United States radio enthusiasts are turning to something far more ornate. Some of this season's receivers have panels with most elaborate designs in gold, resembling, in many ways, the gold painted ebony screens which we import from China and Japan.

Other sets have a crystalline finish like the crystallised lacquer we see on some cameras and scientific instruments, while still others disport themselves with panels of engraved metal. So far as the cabinets are concerned, radio sets now hide themselves in Jacobean, Chinese chippendale, Sheraton, and every other kind of "period" furniture, while loud speakers in passing from the "horn" to the "cone" shape are now disguised as fire screens, lampshades, and even pictures. As to the panels of our sets, I am rather in favour of a little more variety. What do you think? Write and tell me.



Testing valves for the article "The Assault on Your Battery."

*Percy W. Harris*



# The GUARANTEED REFLEX

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

In this set, the Hale Circuit is worked out for two valves, so that you can use your existing parts to best advantage, or convert another reflex to the "Hale" if desired.

THE two-valve receiver I am describing this week will offer, I think, a double interest to most listeners. It is, first of all, a very simply controlled set which will give tremendous volume together with quality far above the average from the local station, while possessing that useful reserve of power which enables it to be used fifteen or twenty miles away from a station with only a small indoor aerial.

Thus it will have a particular appeal to the flat dweller and those who, for æsthetic or other reasons, do not wish to erect an outside aerial. The more advanced experimenter, too, will be intrigued by its "distance-getting" qualities, although, as in the case of the one-valve Hale receiver described a fortnight ago in these pages, it is not particularly recommended for general long-distance reception. Such work should be reserved for a set which has, at least, one stage of high-frequency magnification (preferably neutralised to prevent interference with one's neighbours).

Incidentally, much can be done in the prevention of interference and oscillation if receivers with an adequate power reserve are used, for if, as is the case with the receiver to be described, there is sufficient reserve of power good volume is easily obtained without "pushing" the set. I would venture the opinion that most oscillation trouble is caused by people using inefficient sets which require to be worked on the limit of reaction-amplification in order to give the volume they desire.

#### Use Your Old Parts !

You may perhaps wonder why, in this receiver, I have adopted what some people may call "old-fashioned ideas" by using the conventional two-coil holder and plug-in coils outside the box. This, however, is only part of the story. Look into this set and you will find that there are no special parts of any kind. There are no double condensers, special coils, or, in fact, any components which are not generally available.

The whole object of making the set

#### Parts required to build this set:

- One ebonite panel, 10 x 7 x  $\frac{1}{2}$  in.
- Suitable cabinet and baseboard.
- One two-coil holder.
- Two good L.F. transformers.
- Two anti-vibratory valve sockets.
- One .0005 mfd. variable condenser with vernier.
- Small strip of ebonite carrying two terminals for "Aerial" and "Earth."
- One fixed condenser, Mansbridge type, of any value from .25 mfd. upwards.
- One fixed condenser, .0001 mfd.
- Ditto .0003 mfd.
- Ditto .002 mfd.
- One dual filament resistance.
- One crystal detector.
- Stiff wire for wiring up, quantity of flexible wire, and suitable plug-in coils for wave-length range required.

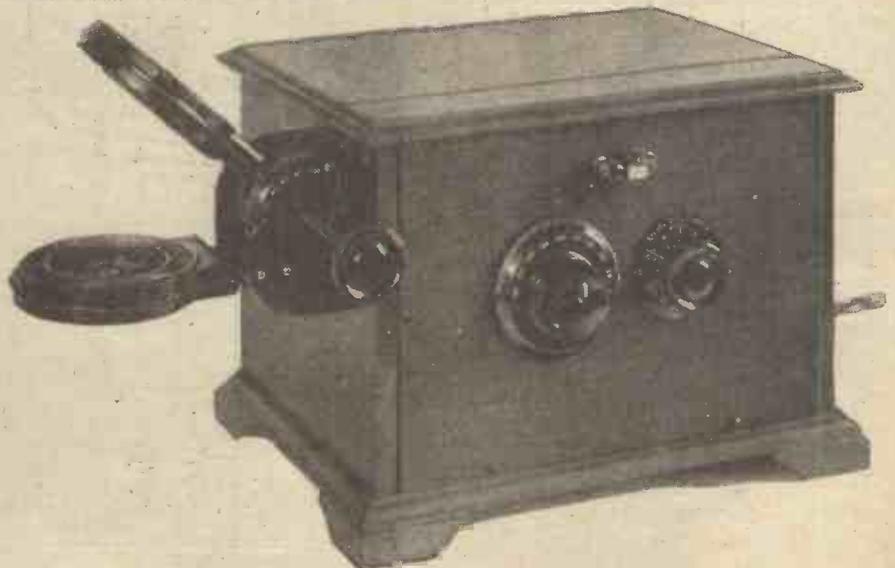
in the manner described is to enable experimenters to use their present gear, and, indeed, to convert any existing two-valve and crystal reflex into the new circuit. It is quite likely that you may have a two-valve-and-crystal reflex receiver which has never given you the results you desire to obtain. From the parts of such a receiver you can build this two-valve Hale set, and still be left with several useful parts over!

#### Not Critical.

Remember that several of the older reflex circuits have proved exceedingly critical in the matter of transformers, valves, and crystals. This circuit does not possess such disadvantages, so that if you have an older reflex in which the transformers have proved a source of trouble, you can rely on their working satisfactorily in the Hale receiver.

The fact that the coils are carried on a holder outside the box enables me to make this design more compact than would otherwise have been the case, with a result that I have been able to use a panel measuring 10 by 7 by  $\frac{1}{2}$  in. and a baseboard  $7\frac{1}{2}$  in. deep.

(Continued on next page.)



Extreme simplicity and compactness is a feature of this receiver



## THE GUARANTEED REFLEX

(Continued from previous page.)

### POINT-TO-POINT WIRING.

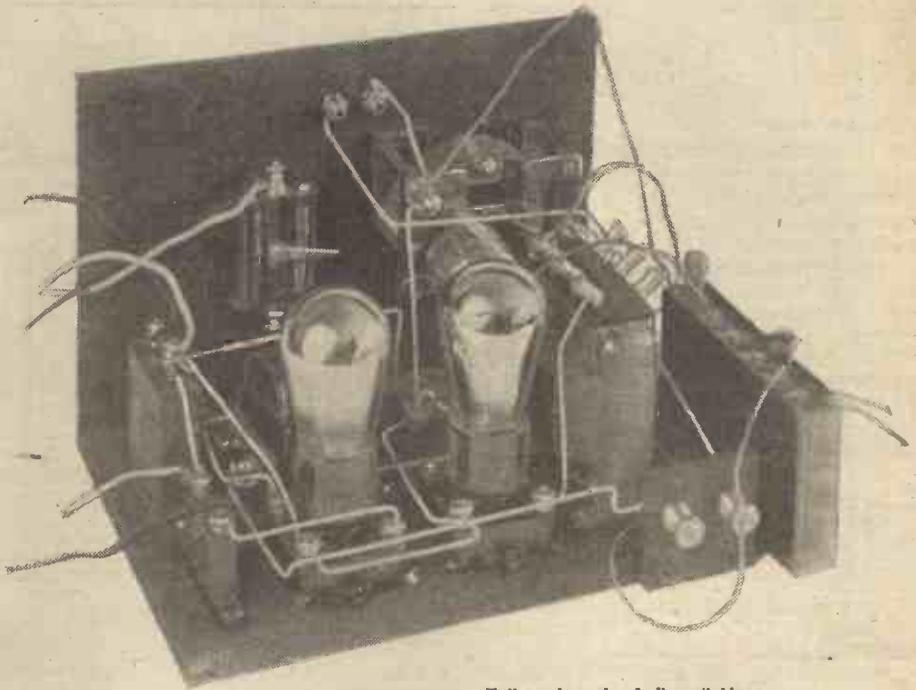
Aerial terminal to fixed vanes of condenser, to .0001 fixed condenser, and to S.O. and P1 of R.I. transformer. Attach flexible lead to S.O.

Earth terminal to moving plates of condenser, crystal, and flexible lead for coil holder; also flexible lead for G.B. negative and stiff wire to I.S. of second transformer.

S2 to grid of first valve. Join one filament terminal of both valve sockets to bottom of filament rheostat. Join other filament terminal of both sockets to one terminal of Mansbridge condenser and to one terminal of .0003 fixed condenser. Join flexible lead for G.B. + to this last point.

Join flexible leads of L.T. +, H.T. - to top terminal of filament rheostat. Take flexible leads for coil holder from anode of first valve and from terminal of .0003 fixed condenser. Join same terminal to I.P. of second transformer. Join O.P. to Mansbridge terminal. Join crystal to P2 of first transformer and to .0001 fixed condenser.

H.T. positive flexible lead to Mansbridge, L.T. negative flexible lead to other Mansbridge terminal. Join .002 fixed condenser to Mansbridge. Other terminal of .002 condenser to anode of second valve holder. Grid of second holder to O.S. of second transformer. Flexible leads for loud speaker taken from terminals of .002 condenser. Thread coil holder leads through holes in side of cabinet.



Full use is made of all available space.

inclusion of a .0001 mfd. condenser across the primary winding of the transformer. With the R.I. tapped transformer the addition of this condenser is a distinct improvement, but in many transformers this condenser will make no difference whatever. I would suggest, in any case, that you try the effect with and without it.

### No Soldered Connections.

By using the parts shown it is possible to wire up this set without a single soldered connection, a point which, I am sure, will appeal to many home constructors who have not yet "got the hang" of the

soldering iron. So many modern components are provided with good-sized terminals that if the wires are carefully bared, bent round the terminals shanks, and screwed up tightly, a thoroughly satisfactory connection can be made. Indeed, a sound connection of this sort is infinitely preferable to a poorly made soldered connection.

To enable the panel and baseboard to be withdrawn from the cabinet, it is necessary to use flexible leads for the two-coil holder. These leads should be taken as follows: One lead from the transformer at the point where secondary and primary are joined. You will observe that this point is connected to the aerial terminal. A second lead from the point of variable condenser which is connected to earth, a third lead from anode terminal of first valve holder, and a fourth lead from the terminal of the fixed condenser across the primary of the second transformer. The first two of these flexible leads go to the aerial (fixed) socket of the coil holder, and the other two to the moving or reaction socket of the coil holder.

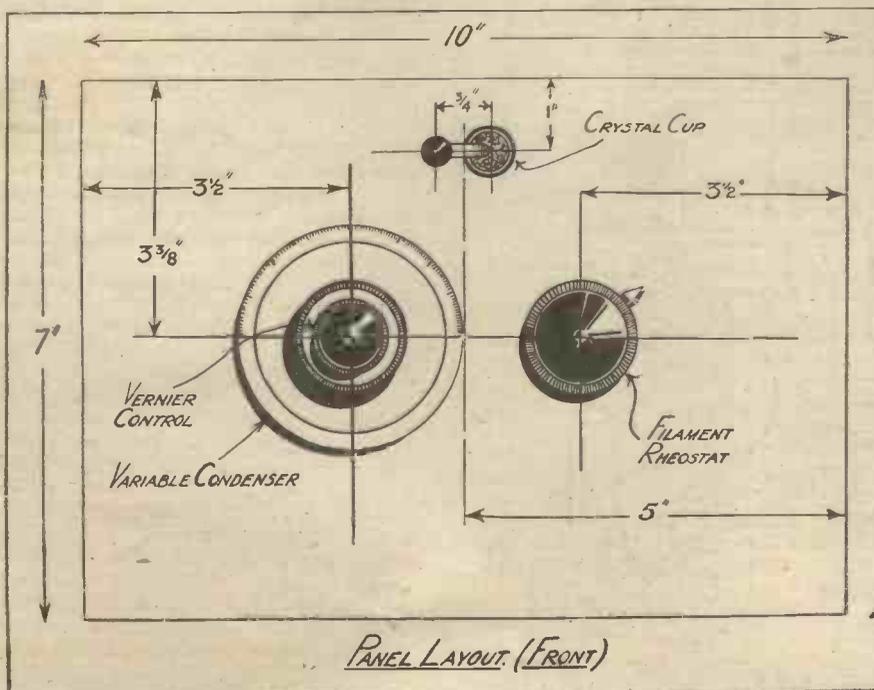
The two flexible leads for the loud speaker are taken from the two terminals of the .002 mfd. condenser shunted across the loud-speaker connections. High-tension positive goes to one terminal of the Mansbridge condenser, and high-tension negative goes to one terminal of the filament resistance.

### Use of One Terminal.

This same terminal has connected to it the low-tension positive lead, while the low-tension negative lead goes to the second Mansbridge terminal, which you will find is connected to the negative filament. You can finish off these flexible leads with spade terminals, or in any other way you desire, and when the panel and baseboard are slid into the case the flexible leads can be taken to the batteries in an unobtrusive fashion.

There is no "on-and-off" switch, but

(Continued on next page.)



MANY home constructors waste a lot of time by using old and blunt drills for their panels. Such drills are not expensive, and should be replaced when they get really blunt, for a blunt drill is not only slow and difficult to use, but often breaks a way the ebonite on the other side of the panel as the point passes through.

The cheapest drills are by no means the most economical, as they blunt rapidly and are generally unsatisfactory. The best, although the most expensive, are known as "high-speed steel" drills, and are probably the most economical in the long run, as they keep their edge almost indefinitely.

**Tool Outfits.**

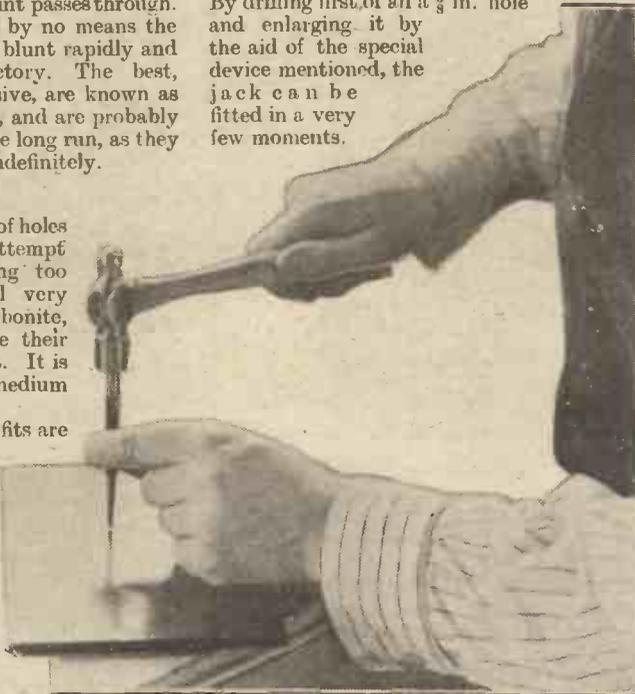
When drilling a number of holes in a panel do not attempt to save time by working too quickly. The drills will very easily heat up in the ebonite, and when very hot lose their temper and become blunt. It is really quicker to drill at medium speed, for this reason.

Excellent radio tool outfits are sold by the "Yankee" tool people, and also by C.A.V. Small Tools. In both of the outfits you will find a special tool for widening holes in ebonite panels, and this proves very useful. For instance, many of the jacks sold for panel mounting require a hole larger than  $\frac{3}{8}$  in. (the largest drill the average home constructor uses).

# DRILLING HINTS.

By P. W. H.

By drilling first of all a  $\frac{3}{8}$  in. hole and enlarging it by the aid of the special device mentioned, the jack can be fitted in a very few moments.



Always use a centre-punch to give a depression for the point of the drill. This saves drill wandering and inaccuracy.

In mounting large instruments, such as voltmeters, many home constructors outline the hole size on the panel, drill a number of holes round the edge until the centre drops out, and then finish off the aperture with a round-faced file. I prefer to use a fret-saw.

## THE GUARANTEED REFLEX.

(Continued from previous page.)

you will see that one filament resistance controls both valves, so that this itself can be used as the on-and-off switch, care being taken not to burn the valves too brightly. The Efesca, and many other filament rheostats, have a dial on which you can note the best reading for the valves you are using, and you can then arrange, when you turn on the set, not to advance the pointer beyond the reading which gives you the best results with your particular valves.

**Aerial Coil.**

Your aerial coil size will, of course, depend upon your aerial and the wavelength range you wish to receive. This set does not differ from others using plug-in coils, and you can use the coils to which you are accustomed. For example, a 35 will probably suit you for wave-lengths below 400 metres, and a 50 for the shorter wave-lengths above this. For my reaction coil I generally find a 50 or 60 very suitable on the outdoor aerial, while on the small indoor aerial a 30 is generally big enough.

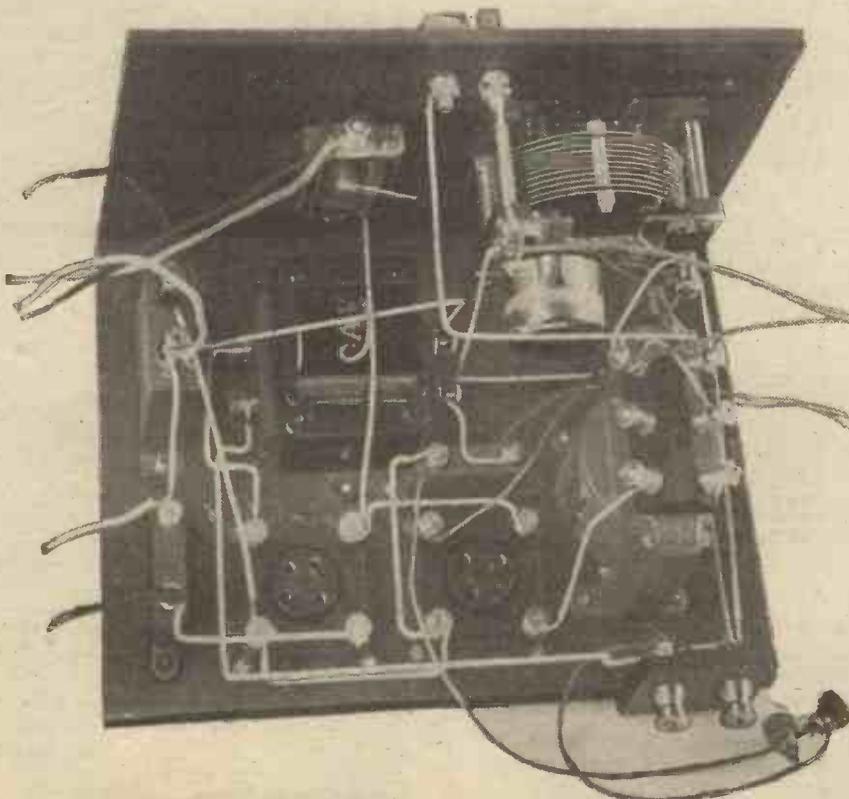
This set works excellently with any type of valve, although, as mentioned in the previous article, better results are obtained with low-frequency valves of the small power type. For the local station this set possesses such a reserve of power that at Wimbledon, seven miles from 2 L.O., full loud-speaker strength is obtainable on the earth lead alone.

**The Set for Listeners.**

A large number of stations other than the local are audible in the telephones using an outside aerial, with the set well below the oscillation point, and on the first evenings of trial (most of the broadcasting stations had shut down at the time) I was able to receive Radio-Catalana, Barcelona, at adequate loud-speaker strength for a small room. The Madrid stations (Union-Radio and Radio-Iberica) are frequently audible in the later hours of the evening on the loud speaker with this receiver.

Grid bias is adjusted to suit the valves used, which should both be of the same type.

In order to test the reliability of this circuit, using widely different components, I have rung up several friends on the telephone and described the theoretical circuit to them, whereupon they have built it up with their own parts, and with no further advice from me. In every case complete satisfaction has been obtained at the first trial, so that I can unhesitatingly recommend the circuit to all listeners who want a really powerful and economical set for local work.

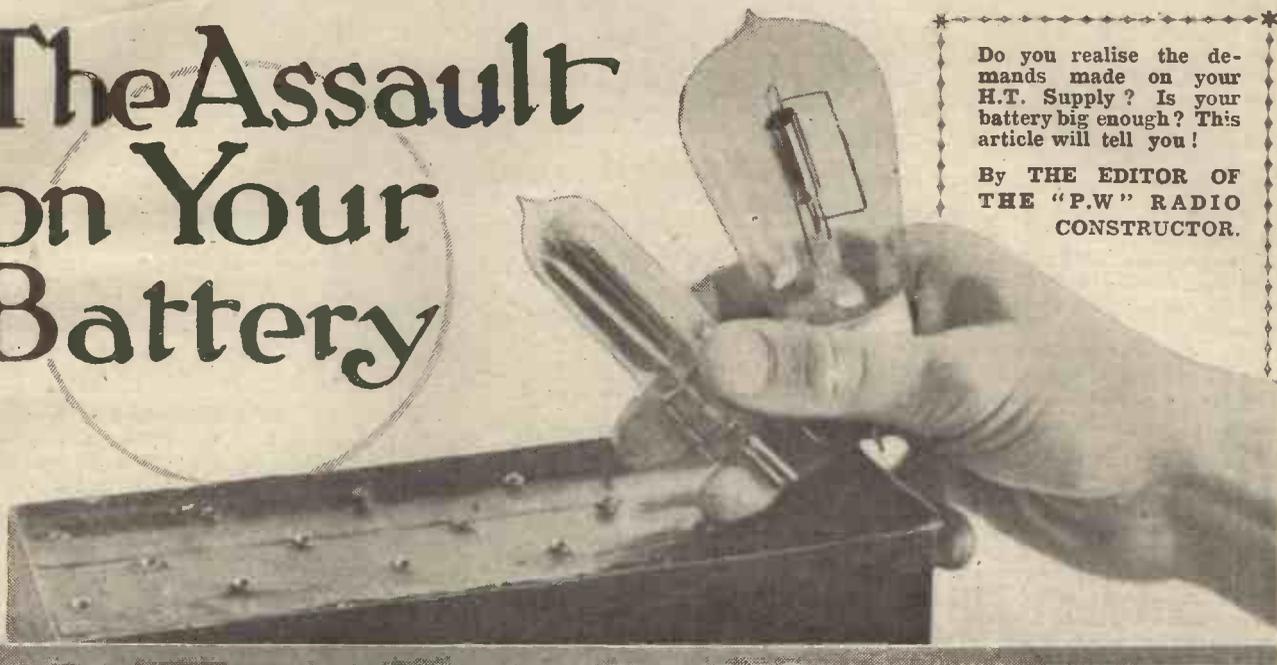


By a careful arrangement of parts, room is found for the inclusion of any size and type of low-frequency transformer, condenser and valve holder.

# The Assault on Your Battery

Do you realise the demands made on your H.T. Supply? Is your battery big enough? This article will tell you!

By THE EDITOR OF  
THE "P.W" RADIO  
CONSTRUCTOR.



YOU will find it pays to understand your high-tension battery, whether it be of the dry-cell type or the increasingly popular high-tension accumulator. By this I do not mean that you should make a life-long study of its chemical actions, its actual structural formation, and other such matters. Rather, I wish to impress upon you that half an hour's study of a few essential facts may save you pounds in the course of a year or two.

The H.T. supply in your set stands in the same relation to the incoming signal as the gunpowder in a cartridge to the pull on the trigger. The amount of energy necessary to release the spring and thus fire the cartridge in a sporting gun, is far less than that required to impel the shot through the air and bring down the bird. I am told you can buy all kinds of cart-

ridges at all kinds of prices and that such a selection will guarantee you all kinds of results. This is also the case with the H.T. battery.

Far too many people ask for a "60-volt H.T. battery" or a "100-volt H.T. battery" without paying any regard to the maker of the battery, his reputation, or their own previous experience with the same make.

## Volts and Power.

Possibly, owing to a rather loose way of using the word "volts" in the newspapers many people look upon the voltage as the only essential factor when purchasing an H.T. battery. To see how one may be misled in this way, let us consider what you actually want to buy when you purchase a battery.

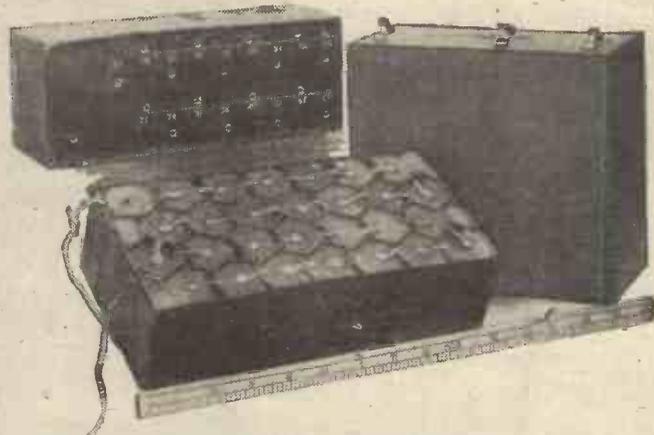
An H.T. battery, as you know, is connected to the plate or anode of the valve,

and causes a current to flow across the intervening space between the plate and the filament of the valve. The action of the signals on the grid of the valve sets up a current variation in this supply, and it is these variations which give you the signals in the telephones or loud speaker. So, when your set is working, current drawn entirely from the H.T. battery will be flowing continuously across the vacuum space in the valve, through the various windings and through the telephones or loud speaker. According to the kind of valves you are using and the way in which you are using them, a certain pressure will be needed. This pressure is measured in volts.

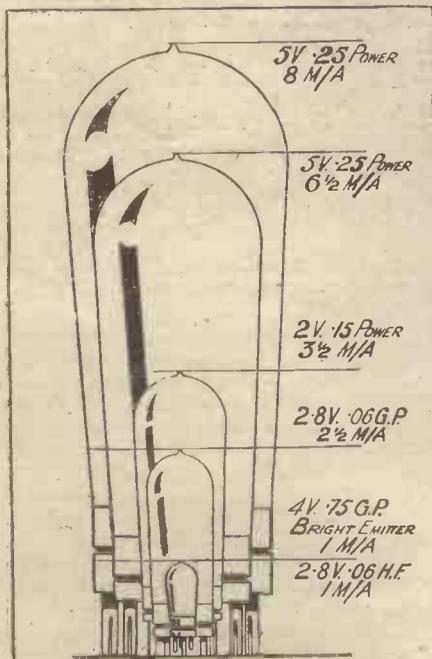
In some circuits it may not be necessary to have more than 30 or 40 volts, while others using, say, a power amplifying valve

in the last stage, may require 120 or 150 volts.

Whatever voltage you need, you must also have current, and it is the H.T. battery which supplies this current. I have in my laboratory here a large number of accumulators, both high and low tension. There stands in front of me, as I write, a



This illustration shows how the sizes of H.T. batteries differ. The smallest in size has the highest voltage.



A pictorial comparison of the H.T. demands of various valves.

large glass jar with sides 6 in. wide and 8 in. deep.

This is a two-volt battery. Alongside of it, reminding one of the famous picture, "Dignity and Impudence," stands a tiny celluloid box, also possessing two terminals. This is a two-volt battery! What, then, is the difference between them? Simply this—the large jar will deliver current at two volts in far greater quantity or for a much longer time than will the small battery. We say the *capacity* of the large accumulator is greater than that of the small accumulator.

We speak of the capacity in "ampere-hours," that is to say, a battery which has a capacity of 40 ampere hours will give 40 hours' supply of current at one ampere

(Continued on next page.)

## THE ASSAULT ON YOUR BATTERY.

(Continued from previous page.)

before it needs recharging, or 20 hours' supply at two amperes, and so on.

Because the current supply taken from any H.T. battery is relatively small, experimenters have been liable to overlook the fact that a definite current is really taken, and with modern power valves this may be very appreciable. A milliampere, as you know, is a thousandth part of an ampere, and some of the dull emitters now used, consume for filament current only 60 milliamperes. You will know, if you have used these valves on a small accumulator, that in spite of their small current output, the accumulators still require re-charging.

What you may not know is, that some of the multi-valve sets now used take as much as 30 milliamperes total plate current from the H.T. battery. Expressed in another way, the H.T. battery may be required to give a current half as great as that taken from some L.T. accumulators!

Now H.T. dry-cell batteries, although they appear to you as oblong boxes with little sockets into which you push your "wander plugs" are really made up of a number of small cells joined in series. Each of these cells contain a carbon and a zinc electrode, the carbon being the positive and the zinc the negative, together with certain chemicals. The constitution of the cell is such that when the carbon is joined to the zinc through an electrical circuit chemical action takes place in the cell and current is generated. This is the current we use for supplying the plate circuit of our valves.

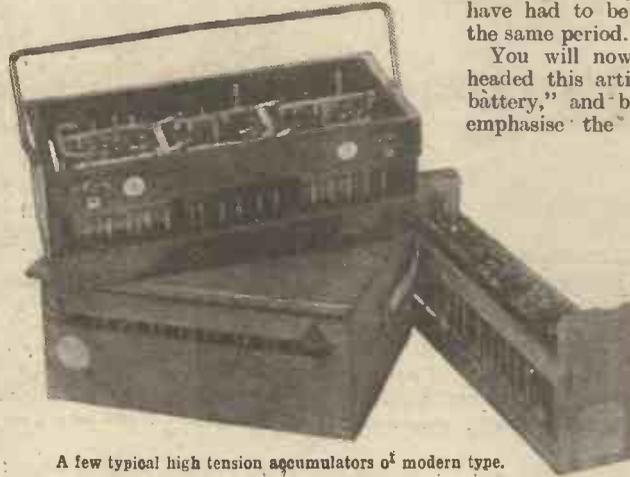
What I wish you to bear in mind in considering the problem of the H.T. battery is that each particular-size of cell (each cell, by the way, gives approximately one and a half volts) has a definite limit to the current which can safely be drawn from it. A new H.T. battery can be made to give a very strong current, even enough to light the filament of the valve, but the effect on

takes eight milliamperes regularly, and is used by the family for many hours each day, frequently until midnight. It is running with three 45-volt H.T. batteries in series, is occasionally left on (by accident) all night, yet the batteries at the end of about eight months' service have dropped only 20 volts. The voltage is now about 115 instead of its original 135. The small-size H.T. battery if used on this set would have had to be renewed several times in the same period.

You will now understand why I have headed this article "The assault on your battery," and before closing it I want to emphasise the importance of grid bias, not so much for improving quality (although with loud signals you will notice a marked improvement by using it), but on the life of your H.T. battery. Let me give you some actual figures which I have just taken on my valve-testing set with a well-known type of valve, very popular for loud speaker use.

With 90 volts on the plate and without grid bias the current taken from the H.T. battery is  $9\frac{1}{2}$  milliamps. With this valve the grid bias recommended by the makers brings down the current to  $3\frac{1}{2}$  milliamps. or just about a third of that consumed without grid bias. You will thus see, particularly on a multi-valve set, that the correct adjustment of grid bias will quite conceivably make your H.T. batteries last at least twice as long.

My own practice, and one I can strongly recommend for economical reasons, is to



A few typical high tension accumulators of modern type.

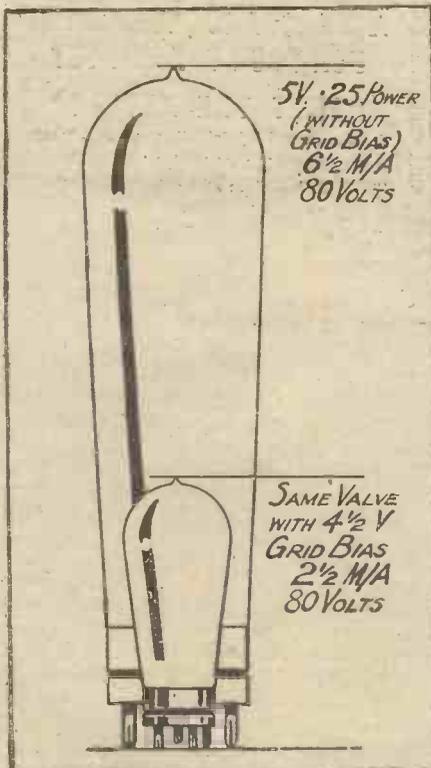
such a battery is deadly. The faster you take current from any H.T. dry battery (over a certain stated figure) the more rapidly does the cell deteriorate, far out of proportion to the demand made upon it.

For example, you may have a particular H.T. battery which can be relied upon to have a good life if you do not take more than six milliamperes, and you might imagine that if you take 18 milliamperes you will obtain a third of the life. In point of fact, taking 18 milliamperes from such a battery may bring the life down to as low as a tenth, so you see how very wasteful it is to take too high a discharge from your H.T. battery.

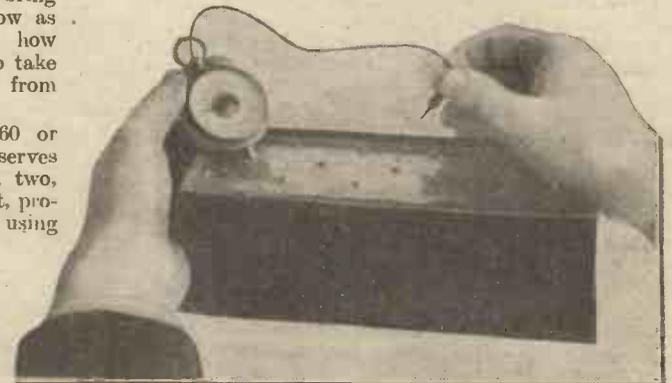
The average size 60 or 72-volt H.T. battery serves excellently for a one, two, or even three-valve set, provided you are not using power valves. For multi-valve sets where small power valves are being used, you should buy the larger size H.T. battery. For example, a super heterodyne will work for a short time on small H.T. batteries, but almost from the first night there will be a drop in voltage, and before long you will have to discard your batteries as quite useless.

If you buy the larger sizes, which may cost three or four times as much, you will not only get infinitely better signals after the first night or two, but your H.T. battery bill for the year will be considerably lower than by buying a number of the cheaper and smaller batteries and replacing them more frequently.

Although I have a number of H.T. accumulators in my laboratory, I also make good use of the very large size dry cells, and I have a set at the moment which



A pictorial lesson in the value of grid bias



Do not test your H.T. battery with a low resistance voltmeter. This will injure it.

adjust your grid bias as negative as possible without sacrificing signal quality. Very often it is possible to use more negative bias than that recommended by the makers before a noticeable distortion is produced, with the result that you reduce the drain on your H.T. battery even more.

Finally I would like to draw your attention to the pictorial diagrams accompanying this article. Valves are drawn in such a way as to indicate by their comparative heights the comparative drain on the high tension battery. In the figure on the previous page a few typical valves were tested at zero grid volts. On this page the value of grid bias is very clearly proved.



*Note.*—In this section Mr. Harris will discuss each week interesting points from the large correspondence he regularly receives. Readers are invited to write to him on matters of interest, and extracts from their letters, together with Mr. Harris' comments, will be published from time to time. It must be pointed out, however, that general and technical queries cannot be answered in this section, but should be addressed to the Technical Query Department, complying with the conditions laid down under the heading, "Technical Queries" in each week's issue of POPULAR WIRELESS.

**P**ERSISTENT and uncontrollable oscillation in a neutrodyne or other neutralised circuit, about which one of my correspondents is worried, can be due to such a variety of causes that it is impossible to put one's finger on the trouble without careful examination of the set. Many troubles arise on the constructional side, so that a few notes here may be of use to this correspondent and other readers.

In the face of a certain amount of early opposition to my views, I have preached for years the importance of considering the actual physical lay-out of components and wiring in a wireless receiver. Every experienced home constructor is aware that the same theoretical circuit is capable of working in a number of different ways if made up with different arrangements of parts. In neutralised sets the actual disposition of parts is of paramount importance.

#### Two Objects.

In such a receiver we have to consider the two main objects to be achieved. First of all we must allow for an efficient transfer of energy from one stage to another and, secondly, we must counteract undesirable feed-back of energy from one stage to another. This feed-back of energy can take several paths, one being the feed-back due to the capacity between the electrodes of the valve, another the capacity between adjacent wires (a very important path), and, still further, a leakage of magnetic fields between circuits.

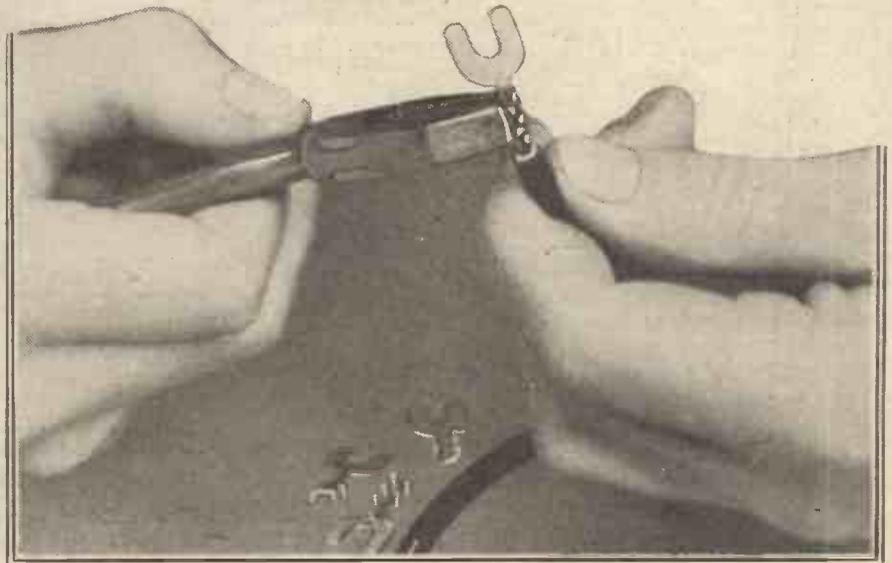
In the Hazeltine neutrodyne arrangement, so largely used in the United States, the H.F. transformers are placed at a certain angular relation to one another, so that the interaction between the fields shall be at a minimum. Whatever other balancing arrangements are made in the circuit if we alter the angular relation of these fields to one another, the set will burst into persistent oscillation, and none of the methods provided in the receiver for neutralising will be effective. Possibly this is one of the faults my correspondent has met.

Again, if you were to take a carefully

designed factory built neutrodyne receiver, leaving the components exactly in the position as manufactured, but altering the lay-out of the wiring, you would probably find that uncontrollable oscillation would again appear. Even in neutralised sets, using screened or astatic coils, an alteration in wiring lay-out may make a tremendous difference.

#### A Warning.

If you are copying an already worked out design, remember that the disposition of wiring and components is vitally important. If you are endeavouring to design a receiver for yourself from a theoretical circuit (not such an easy task as it appears), remember that numerous experiments may be necessary to find the best position for the various wires. Last year a well-known American manufacturer of a neutralised set told me that it took many weeks of experiment in their laboratories to determine the best position of one of the grid-return wires!



Pinch-on tags for your battery leads will save much trouble and ensure good contact.

A correspondent in Manchester asks me a number of questions regarding screening and screened coils which could only be answered by a lengthy article and the result of practical experiments rather than theoretical assumptions, which are often so very misleading. Generally speaking, however, I am inclined to the view that the best effects of screening can only be obtained by screening the whole apparatus, as well as each H.F. stage separately.

While the screening of coils has produced marked improvement, very similar results are obtainable with "astatic," "binocular," or, as they are often called, "fieldless" coils. It must be remembered that shielding is designed to avoid both interaction between stages and direct pickup of signals through undesired channels. For example, it is very annoying if your aerial circuit and the correct path through the stages are arranged to be very sharply tuned, giving high selectivity, while signals are picked up directly on the wiring and detector stage.

#### An Analogy.

It is very similar to police supervision at the gates of a football match to prevent people entering without paying, while, simultaneously, thousands of people slip through unguarded gaps in the fence! It must be remembered that not only will coils pick up signals; with highly sensitive apparatus, the connection wires between stages and even the valves themselves, can be quite efficient collectors of energy.

The Western Electric Company in America have long shielded their apparatus most carefully, both as a whole and between stages. This season's American receivers show many examples of complete screening.

Special Features in Next Week's  
"Radio Constructor"—

### A RESISTANCE AMPLIFIER FOR YOUR PRESENT SET

"MEET THE METER!"

A valuable and helpful talk on measurements  
in your receiver.



**A new and better transformer is sweeping the country.**

The heart of your amplifier is your transformer. Now LISSEN gives you a transformer which surpasses anything ever before available—users everywhere are learning that it is no longer necessary to pay a high price to get a high-grade transformer. This new LISSEN is being tried and tested under all conceivable conditions everywhere—it is being enthusiastically and largely bought by the trade for their own made-up sets. Throughout the whole range of audible frequencies this new LISSEN amplifies fully every note, every harmonic, every overtone. That means realistic reproduction. In the purity and power of its volume the results are remarkable. You will appreciate at once the clearer tones and greater volume.

Expensively made in all its details, traders at this year's National Exhibition at Olympia, asked to name the price at which they could sell it, invariably named a price close to £1. Many said 25/-, and many even more than that.

**TEST IT FOR 7 DAYS AT HOME.**

If it fails to satisfy you after 7 days' test, take it back to your dealer's or send it back to us. Do this, too, if you are not convinced it is equal to any high-priced transformer you try it against.

**8/6**

**GUARANTEED FOR 12 MONTHS. 7 DAYS' TEST.**

Turns ratio 3 to 1.  
Resistance ratio 4 to 1.

*Suitable for every set and every valve you will want to use.*  
Use it for 1, 2, or 3 stages L.F.

Compare it against any for tone purity and power. You can get it at your dealer's, but if any difficulty send direct to factory. No postage charged, but please mention dealer's name and address. Or can be sent C.O.D.

*N.B. So good is this new LISSEN that we have unhesitatingly withdrawn all our previous high-priced transformers.*

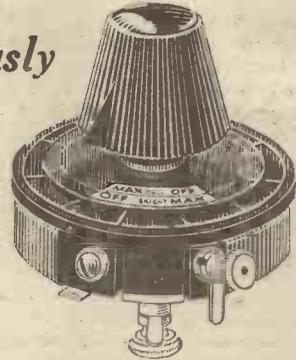
**QUALITY RHEOSTATS**

previously

4/-

**NOW**

**2/6**



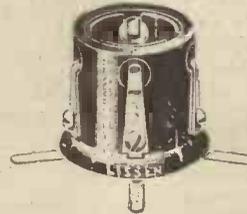
LISSEN quality—look how they are made—the wires cannot move and short circuit—the contact brush rides firmly yet smoothly—the heat-resisting former cannot soften—there are accessible terminals—and the combined knob and pointer will fit flush with the neat photo-engraved dial when mounted. Lastly, note the irresistible appeal of the price, made possible by our big production programme backed by our new direct-to-dealer distribution policy which cuts out all wholesale profits.

	Previously	NOW
LISSEN 7 ohms rheostat, patented	4/-	2/6
" 35 " " "	4/-	2/6
" Dual " "	6/-	4/6
" Potentiometer, 400 ohms	4/8	2/8

**EVERY ONE LISSEN ONE-HOLE FIXING, OF COURSE.**

Baseboard mounting type same prices as above.

**A VALVE HOLDER FOR CLEARER, BETTER SIGNALS.**



Because of its low loss and low capacity qualities, the LISSEN Valve Holder plays its part in getting clearer, louder signals. Sent out ready for baseboard mounting, as shown, it can also be used for panel mounting by bending the springs straight.

**LISSEN VALVE HOLDER,**

patented, previously 1/8

**NOW 1/- each**

**IMPORTANT TO THE TRADE.**—Retailers who have not already been notified of our new direct-to-dealer policy of distribution should, in their own interests, communicate with us without delay. All orders must now be sent to us at Richmond, and not to usual wholesale factor.

**LISSEN LTD., 8-16, FRIARS LANE, RICHMOND, SURREY.**

Managing Director: Thomas N. Cole.

**BUILD WITH THE BEST PARTS.**

L. 101

# CURRENT TOPICS.

BY THE EDITOR.

Square Pegs in Round Holes—The New Commission—That £4,000 a Year—A Question of Nationality—The 14-Valve Set—Not a Stunt—2 L O's New Announcer.

BRITISH Governments seem to have an unhappy knack of fitting square pegs into round holes. A glance at the new Broadcasting Corporation which we discussed in these columns last week will support this contention. The "Daily News" has pointed out that the members of this new commission, to say the least of it, are middle-aged. Only one of the "Big Five" is under forty and the average age of the others is round about sixty. And curiously enough, only the youngest of them, Mr. J. C. W. Reith, who is thirty-nine years of age, knows anything about the technique of running a broadcasting service.

It is really amazing that when selecting members for the new commission which is to control broadcasting in the future, the Government did not show a little more imagination and a little more sympathy with the needs of the public. They have appointed people to this commission who are undoubtedly in their own sphere of life very distinguished, and in many cases very brilliant, but a more unsuitable list to appoint in connection with running a broadcasting service it would be hard to imagine.

## A Young Man's Job.

It would have been a much happier selection if the Government had chosen one or even more members of the commission of a younger age. Broadcasting, it has been pointed out, is a triumph for post-war ideas and post-war inspiration, and it is undoubtedly a young man's job. For four years young men have made it the best broadcasting service in the world, and it seems more than unfair to scatter well-paid jobs to others of another generation. The chairman of this new commission is to get £4,000 a year. At this rate of pay, Mr. Reith is worth at least £10,000 a year, but we don't suppose the Government will pay him that.

There has been a good deal of criticism regarding the nationality of the members of the commission. It has been suggested that a Scotsman and a Welshman should have been included in the list. Scotland, it is true, is taking a pioneer part in the linking of radio with social and religious problems, and perhaps in the future the Government will be kind enough to allow Scotland to participate in the control of broadcasting. Wales, too, must not be feeling particularly happy at the omission of a Welshman from the Board.

But politics, as Emerson has pointed out, is a deleterious profession like some poisonous handicrafts, and politicians have their own ways of appointing commissions and filling nice comfortable jobs with their own particular protégés.

But the Government has blundered and upset thousands and thousands of listeners by the appointment of the new commission, and this cannot be gainsaid. We only hope that readers of POPULAR WIRELESS

will make a point of writing to their respective Members of Parliament and urging them to demand a discussion of the matter in the House before a commission takes over the control of broadcasting at the New Year.

Our readers must have noticed a good deal of publicity in connection with our fourteen-valve set and Mars in the newspapers during the last few days. It is indeed amazing that the Press should have devoted so much space to this topic of the reception of signals from Mars. We must confess that we are a little to blame for this excessive publicity in connection with Mars and wireless.

Some time ago, Mr. Dowding, the Technical Editor of POPULAR WIRELESS, worked out a fourteen-valve set for the purpose of reception, his aim being to control the set efficiently on thirty metres as well as on



The Tefag "Neutroflex" a popular German five valve receiver.

thirty thousand metres. And then, as time progressed, we saw in the newspapers statements that Mars was again in a favourable position for observation.

Now, publicity is very essential these days, and when we sent out invitations to the Press to inspect this fourteen-valve set it was inevitable that some reference should be made to the possibility of this set detecting signals from a great distance, possibly from Mars.

## "Picking up" Australia.

But the main idea of this set has not been a stunt one in connection with Mars. We would impress upon readers that this set has been designed for something much more important and much more serious, viz., the reception of broadcasting from Australia.

On preliminary trial, the set has given such extraordinarily satisfactory results that we are now planning a series of experiments in an attempt to pick up broadcasting signals from the Antipodes, and should these experiments prove successful,

we intend approaching the B.B.C. in the matter and asking them whether they would care to try it out at Keston with a possible view to broadcasting, via the British stations, concerts, etc., picked up from Australia.

But the Mars stunt seems to have filled the public eye to such a great extent that we are rather afraid the main object of this fourteen-valve set will have been missed, and the fact that Dr. Mansfield Robinson sent out a special message from Rugby to Mars created such hilarious interest that we think we ought to make it quite clear in this editorial that we did not associate ourselves in any way whatsoever with the attempts made by Dr. Mansfield Robinson to communicate with Mars.

However, our readers will appreciate the joke, and we feel sure they will not lose sight of the main object of this fourteen-valve set. Further details of the experiments we are conducting with the receiver will be published in due course in this journal.

## A New Announcer.

The new announcer at 2 L O, the Honourable David Tennant, brother of Lord Glenconner and nephew of the Countess of Oxford and Asquith, cannot be said to be a great success. We cannot help wondering why the Hon. David Tennant has been chosen for this new position. It is true that he is twenty-four years of age and an accomplished musician, and that he is keenly interested in broadcasting; but honesty compels us to say that his voice is not at all suitable for the rôle of announcer. There must be many other young men in less envious positions than the Hon. David Tennant who would welcome the opportunity of proving their worth as an announcer for the London station.

We have listened to the Hon. David Tennant broadcasting announcements several times, and it seems that he has still a very great deal to learn about the art of elocution. It is surely not necessary to read out a weather report in a declamatory way reminiscent of Sir Johnston Forbes Robertson reciting "To be, or not to be."

But still, there it is, and we can only hope that the Hon. David Tennant will, in due course, pick up a few tips from his less fortunate brethren at 2 L O, and that he will in time become worthy of the very important rôle which he has to play in the conducting of 2 L O.

## "FURTHER EXPERIMENTS WITH THE 'P.W.' 14 VALVER,"

Is the title of an article by Mr. Dowding which will appear exclusively in an early issue. Some very important data in connection with this set will interest every valve user.

**WONDERFUL NEW  
CIRCUIT.**

**NEW PRINCIPLE MAKES  
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**NEW AND IMPROVED CIRCUITS.**

**SOME WONDERS AT THE WIRELESS  
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FROM U.S.A. STATIONS  
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# THE INTERPLEX.

By J. ENGLISH.

## PART II (Continued).

UNIT No. 2 is the smallest of the units, all components being mounted on a panel 6 in. by 2 in., but the size of the unit is no measure of its usefulness, as it is applicable to all experimental work with contact detectors.

Fig. 4 is the composite drilling and wiring diagram, the disposition of the two detectors, terminals, and jack being shown in the photograph. Before assembling com-

is wired to a terminal behind the panel. If the panel mounting type of P.M. detector, as illustrated, is used, then the terminal nut at the end serves to secure the spade terminal. From terminal 9 the circuit is completed through the detector, and the output terminals 11 and 12, to input terminals 13 and 14, to input terminal 10.

The 'phones, or the input of an audio-frequency circuit can be connected either to the output terminals 11 and 12 or to a plug which, when placed in the jack (D.P.S.T.), cuts out the connection to these terminals. Regarding input connections, when this unit is used in conjunction with Unit No. 1 to form a simple crystal set, the aerial end of the coil is connected to 9 and the earth end to 10.

We now come to the construction of a very useful class of unit, No. 3. This comprises a variable condenser panel, three units being used in the complete system, but, apart from the capacities of the condensers, all three are identical in design and construction.

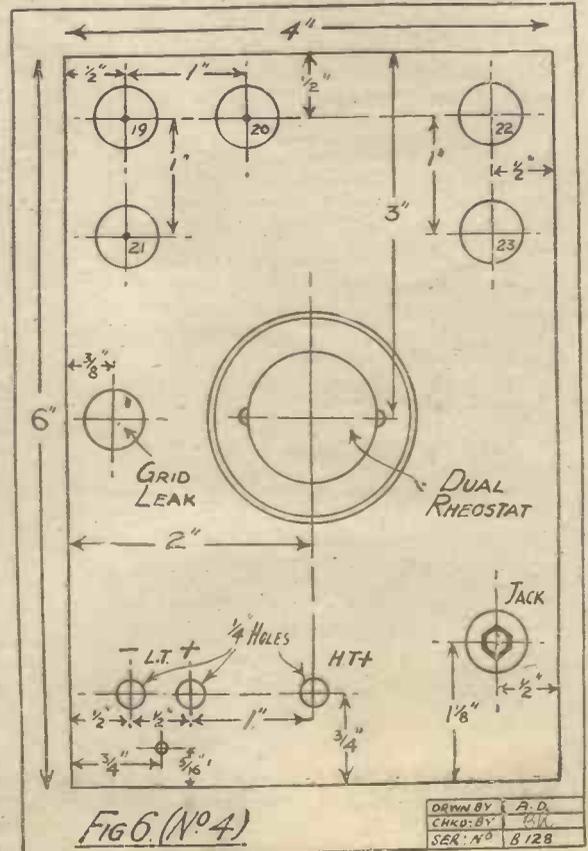
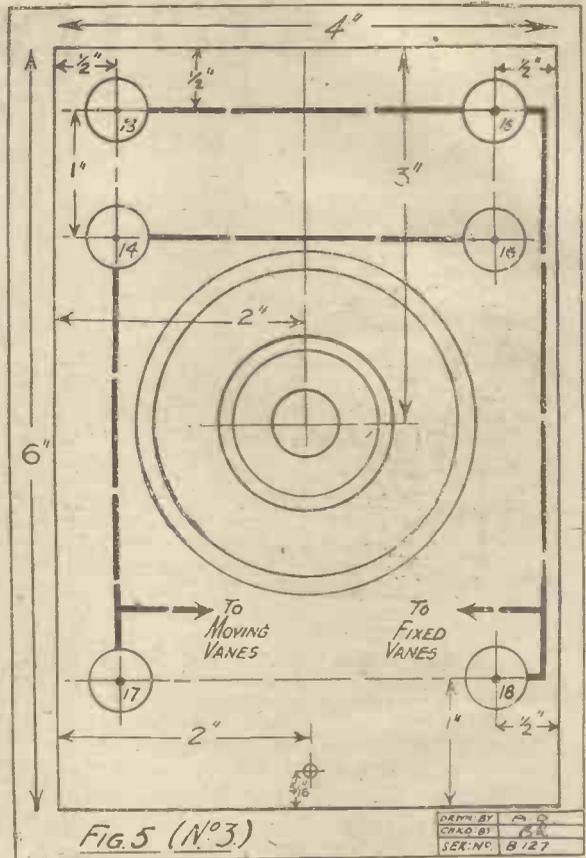
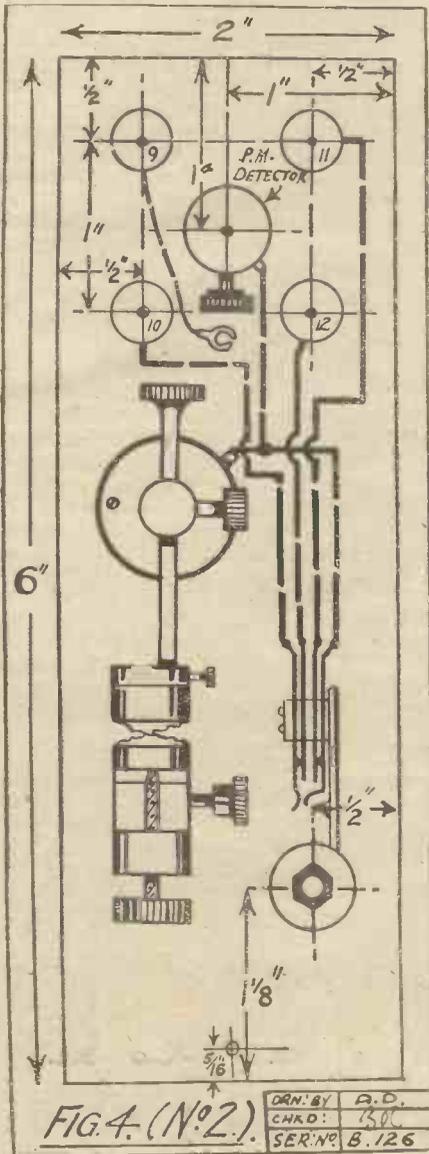
The constructional work for this unit is very simple, a panel 6 by 4 inches being drilled as indicated in Fig. 5 and the condenser mounted in the exact centre of the panel. Six terminals and one locking device are required, and when these have been mounted, the unit is wired as indicated in Fig. 5. Connections should be as short as possible consistent with proper spacing, as crowded, untidy wiring will increase the minimum capacity of the condenser.

### Condenser Capacities.

As indicated in Fig. 5 there are three terminals connected to each side of the condenser. Terminals 14, 16, and 17, which are wired to the moving vanes, will generally be connected to points of low or earth potential, and, as the high potential terminals 13, 15, and 18 are connected to the fixed vanes, no undue difficulty is experienced from hand capacity effects when using the unit in sensitive circuits. Full details of the uses of this class of unit will be dealt with later.

Regarding the condenser capacities, constructors can use such condensers as they may have at hand, but for general work, two .0005 mfd. and one

.0003 mfd. will be quite suitable. The addition of some slow motion device such as a vernier dial is a valuable addition to the unit. (Continued on page 635.)



ponents, a locking device should be constructed and fitted as described for No. 1.

The high potential terminal No. 9 of Fig. 4 has soldered to it a length of flex terminating in a spade terminal which can be connected to either detector. For this purpose, one side of each of the detectors

# Why Your Set

## (1). *The Name behind them.*

They bear the imprint of John Scott-Taggart and all that this name has come to mean in the valve world.

## (2). *Possess the right Dynamic curves.*

They are designed and tested on the basis of Dynamic characteristic curves. The common method is to have regard only to the static or ordinary curve. The ordinary curve, while valuable for some purposes, ignores working conditions, since it is taken with a fixed anode voltage. Every valve in a wireless receiver has, however, a constantly fluctuating anode voltage, which, when the grid is made more positive, becomes less than the H.T. voltage, while when the grid is more negative, the anode voltage rises to a value higher than that of the H.T. battery. This is due to the variation in current through the impedance always in the anode circuit of the valve. This impedance may, for example, be an H.F. or L.F. transformer, a choke, a resistance or a loudspeaker.

This phenomenon is generally overlooked by both manufacturers and many valve users. Every type of S.T. valve, however, is designed to give the right Dynamic curve which represents the conditions with the impedance in circuit. The valve, moreover, is tested dynamically, *i.e.*, under operating conditions.

## (3). *It is their curves that count.*

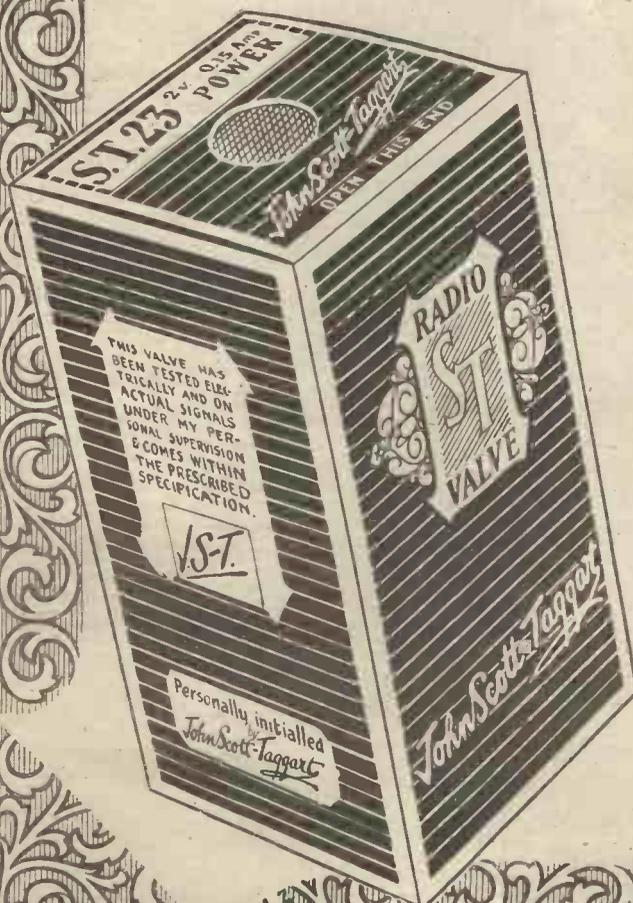
All the operating merits of a valve, whatever the type may be, are reflected in the characteristic curves of the valve—provided, of course, that the right curves are taken. The effect of electron emission, the shape, sizes and spacing of electrodes, for example, all produce an effect on efficiency which is noticeable in the characteristic curves of the valve. That is why S.T. Ltd. lay so much store by the curves of their valves. Anyone can claim perfection and this or that merit, but in the end the curves show defects or merits. The Dynamic curve of a valve cannot lie. It's the curve that counts!

## (4). *Like the Pyramids, they last.*

However well a valve may work and however good a curve it may have, this is no consolation if the valve only lasts a few days or a few weeks. This brings us to what many people regard as the most important factor—the life of the valve. About 50 per cent. of the valves sold use thoria in their filaments and often the power of emitting electrons seriously falls off. The valve remains alight, but the emission falls below the safe limit and signals become—to many—unaccountably weak, and distortion also arises. The S.T. valve has a *torodium* filament and has a very long and useful life. If you buy your valves on the basis of the length of service they give, you will always choose S.T.'s. for they are built like the Pyramids—to last.

## (5). *The Torodium filament.*

The secret of the long life of the S.T. valve lies first in the filament and secondly in the vacuum. The filament is made of torodium, a recently invented alloy of precious metals which gives off, when heated, a copious stream of electrons. This power of emitting a generous supply of electrons remains throughout the life of the valve, and, moreover, breakages through the brittleness of the filament are unknown, as even after being used for a long period it retains a strength



2 VOLT.		4 VOLT.		6 VOLT.	
S.T.21 (H.F.) 0.1	amp. - - - 14/-	S.T.41 (H.F.) 0.1	amp. - - - 14/-	S.T.61 (H.F.) 0.1	amp. - - - 18/6
S.T.22 (L.F.) 0.1	amp. - - - 14/-	S.T.42 (Power)	0.1 amp. - - 18/6	S.T.62 (Power)	0.1 amp. - - 18/6
S.T.23 (Power)	0.15 amp. - - 18/6	S.T.43 (Super Power)	0.25 amp. - - 22/6	S.T.63 (Super Power)	0.25 amp. - - 22/6

# Clamours for Them

and pliability comparable to that of a steel cable. The life is also largely attributable to the fact that the torodium filament operates at so very low a temperature that it gives no visible glow.

(6). *Extremely high vacuum due to the Baret process.*

The vacuum in a valve is a feature which greatly influences not merely the initial operation of the valve, but also its life. After a time, there is a tendency for gases absorbed or "occluded" by the metal electrodes in the valve to leak out into the space in the bulb and partially spoil the vacuum. It has been proved beyond question that the slightest traces of oxygen, water vapour and other gases greatly affect the electron emission and the life of the filament. In the case of S.T. valves, the electrodes are heated to a very high temperature to drive out every particle of gas. These gases are then withdrawn from the bulb by the Baret process of evacuation, which produces the highest vacuum known to science. This high vacuum is retained, and is a potent factor in giving the S.T. valve a long and efficient useful life.

(7). *Economical, as they take very little current.*

Economy in upkeep is a vital factor in the choice of a valve. Hence the great popularity of dull-emitter valves. Many so-called dull-emitters are, however, very extravagant in current consumption in comparison with the S.T. valves, which only take 0.1 ampere in most cases and 0.15 ampere in the case of one of the power valves. Work out how much this saves you in the cost of accumulator charging and the fatigue of carrying accumulators to be charged. The smallest increase above these figures means greater cost and trouble.

(8). *Not critical to work.*

One of the most delightful features of the S.T. valve is the fact that it is not critical to work. You can, in fact, be careless. For example, the torodium filament will work efficiently with or without a rheostat or resistor. Many valves are very critical on filament voltage but the 6 volt S.T., for example, will work off any voltage between about 4.5 and 6 volts. Some valves only work at their best when the accumulator is absolutely fully charged and sig-

nals "go off" after a time. The S.T. valve, however, will continue to work until the accumulator runs down.

(9). *Non-microphonic and robust.*

The S.T. valve is non-microphonic. You can tap it with impunity. It is very strongly made. Built like a chronometer for accuracy and uniformity, it is yet robust. Each electrode is supported in several places to give strength.

(10). *Every valve certified O.K. by John Scott-Taggart.*

Every valve is tested under Mr. Scott-Taggart's supervision and every carton is personally initialed by him to certify the satisfactory characteristic of the valve. The valves are uniform and every one is a "picked" valve. Any valve not coming up to the required standard is destroyed.



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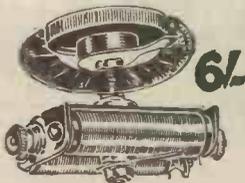
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·005 ..	-	1/9
·006 ..	-	1/9
·0001/·0005 MFD.	-	1/3



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# THE INTERPLEX.

(Continued from page 631.)

The Universal Valve Unit No. 4 is one of the most important of the units, being in fact the keystone of the system. Although it is small in size and of simple construction, its relative importance from an experimental point of view will be realised when we come to consider its many applications in association with other units.

This unit comprises a panel 6 by 4 inches, screwed to a baseboard, 5½ by 3¼ inches,

clip being mounted on a piece of ebonite screwed to the baseboard, while the other clip is joined by a flexible lead to terminal 19. This provides a connection to the grid through a condenser of any desired capacity. Terminal 20 is connected straight to the grid and 21 to L.T. negative, these three terminals, 19, 20, and 21 being the input terminals.

The grid is also wired to the end of the grid leak furthest removed from the panel, the other end being connected to a flexible lead terminating in a wander plug which can be put into the back of either L.T. socket so that the leak may be to negative or positive. Terminal 22 goes to the anode and 23 through the jack to the H.T. positive socket. These two output terminals are provided preferably for connections to any circuit or component comprising the radio frequency portion of the anode circuit, and any audio frequency circuit or component is introduced into the anode circuit by means of the plug and jack.

Withdrawal of the plug does not break the anode circuit, but terminals 22 and 23 must be shortened if no coils, etc., are connected.

When wiring up, connections should be made as short as possible consistent with good spacing so that interaction between various leads may be reduced to a minimum. If wires to the valve-holders are soldered to the tags thereon the terminals also provided may be reserved for any further experimental connections, but the terminal connections on the panel have proved quite sufficient for all purposes no matter how the unit is used.

### For Unique Circuits.

It should be noted that the rather peculiar mounting of the grid condenser is the one position in which unwanted capacity effects are minimised, and the constructor should not alter this position unless absolutely necessary. The method of connecting and using this unit will be dealt with more fully later. In passing it may be mentioned that this unit can be adapted to four-electrode valves by providing an extra terminal for a free connection to the second grid. Such an addition will be necessary when experimenting with Unidyne circuits.

The construction of Unit No. 5, the audio-frequency coupler, presents no difficulty, its design being quite straightforward, and the disposition of components is clearly shown in the photographs.

The body of the unit comprises a panel, 6 by 3¼ in., drilled as indicated in Fig. 8, and screwed to the baseboard, 8½ by 3¼ in., underneath which the locking device is fitted as described for Unit No. 4. The transformer is screwed down in the centre of the baseboard with a fixed condenser-holder on each side. Between the transformer and the panel is the holder for



A photograph of the frame with only one condenser unit in position.

the anode resistance, which may be a variable type if desired.

Fig. 9 is the wiring plan, and it should be noted that connections to the transformer from terminals 24, 26, and 28 are flexible leads terminating in spade terminals, thus enabling connections to primary and secondary to be readily changed. Also, the leads from terminal 29 and from one terminal of the secondary going to the grid bias battery are also flexible, and terminate in wander plugs which are so connected that

(Continued on next page.)

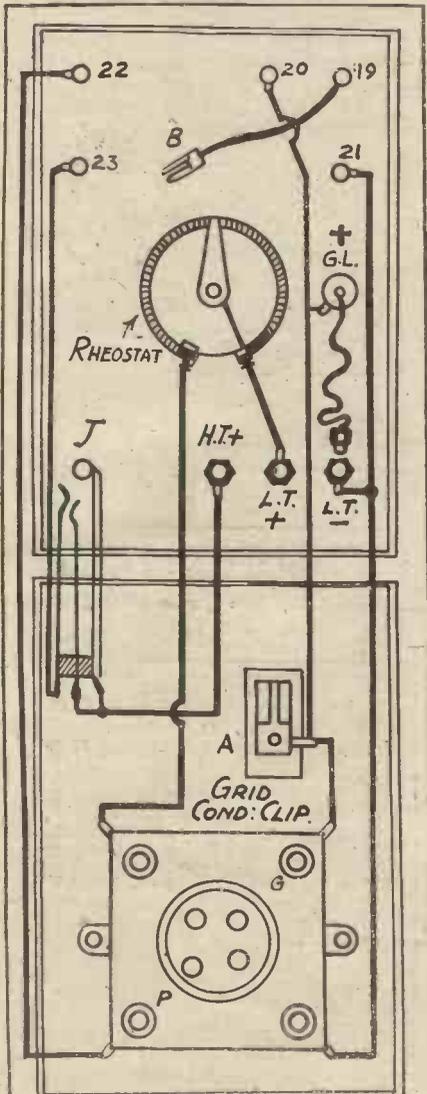


FIG. 7.

DRWN:BY A.D.  
CHKD:BY B.R.  
SER: NO. B. 129

the piece of ebonite forming the locking device being fitted as indicated previously. Fig. 6 is the drilling plan of the panel and Fig. 7 the wiring plan. On the panel are mounted five terminals, three sockets, and a jack (single circuit closed), while in the centre is the dual rheostat, with a variable grid leak on the left. The baseboard carries at the rear an "Antipong" valve-holder and a grid condenser. Interchangeable types of the latter are used here, one

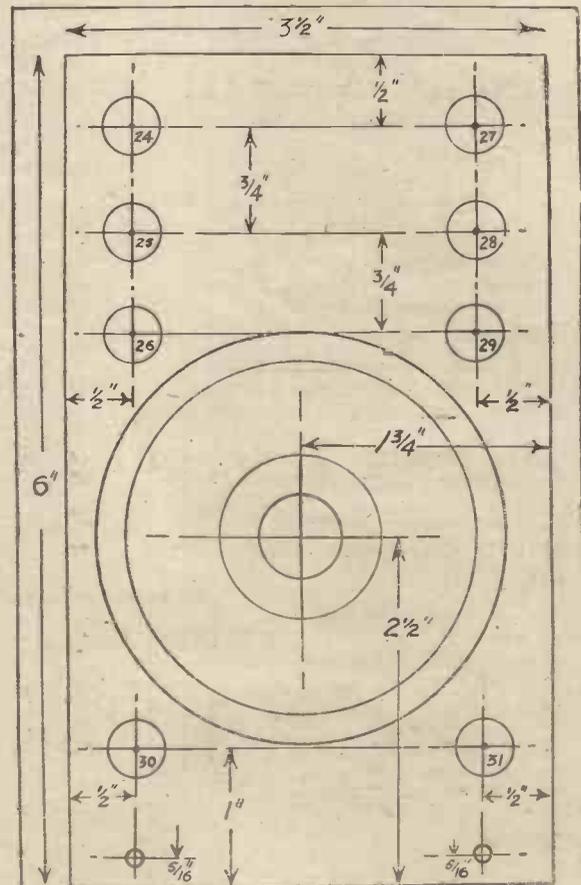


FIG. 8. (No. 5.)

DRWN:BY A.D.  
CHKD:BY B.R.  
SER: NO. B. 130

**THE INTERPLEX.**

(Continued from previous page.)

they may be plugged together when no grid bias is needed. The grid bias battery is held in position by clips screwed to the baseboard behind the transformer.

When using the unit as a simple transformer coupler between two A.F. valves, one Unit No. 4 is placed on each side, and the output terminals 22 and 23 of the first valve unit joined to terminals 24 and 26 respectively. Output terminals 28 and 29 are then connected to 20 and 21 of the second valve unit, and the grid bias plugs of unit 5 adjusted as required. If the grid leak of the second valve unit is left in, it acts as a high resistance across the secondary of the transformer, as sometimes required in amplifiers. When used as a choke-capacity coupler, input connections are made to terminals 24 and 26, and a lead taken from 27 to 19 of the following valve unit, the grid condenser of which is

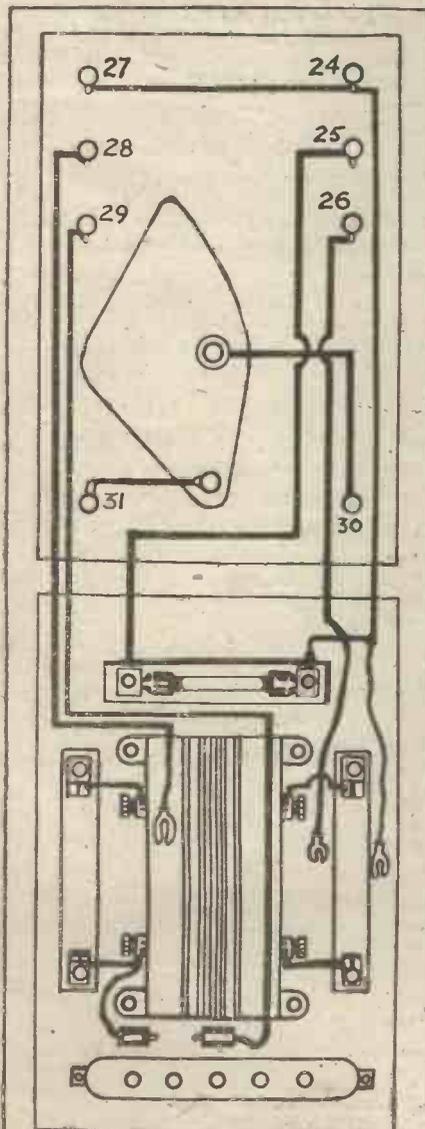


Fig. 9.

DRWN. BY A.B.  
CHKD. BY W.C.  
SER. NO. B. 131

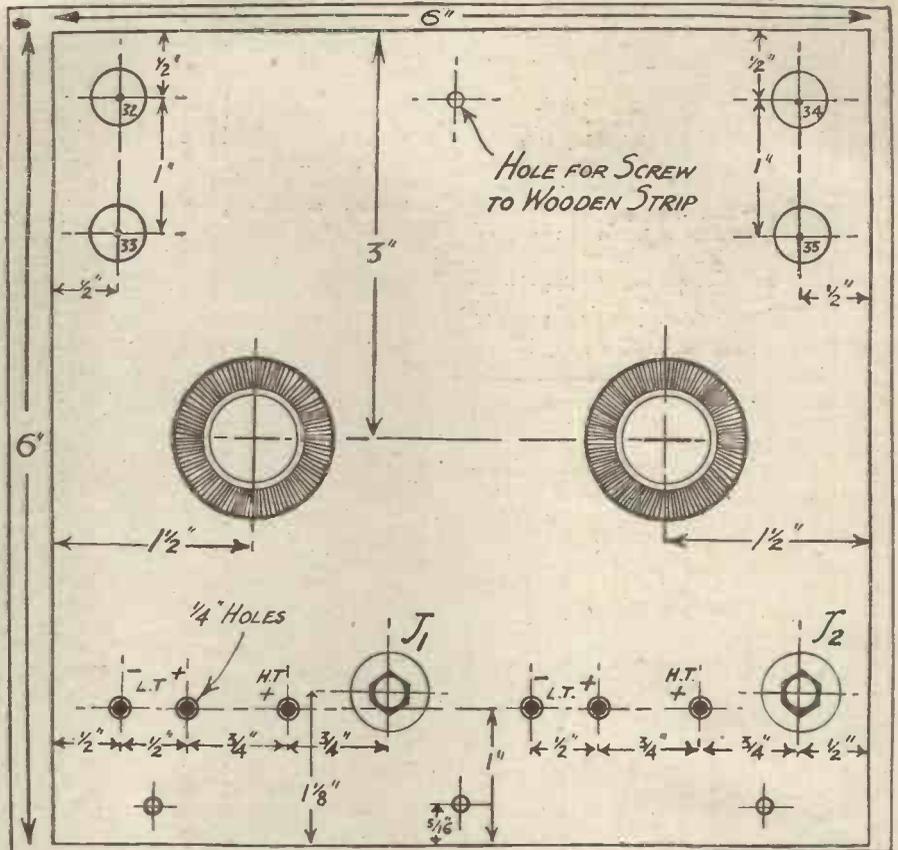


FIG. 10. (N<sup>o</sup> 6.)

DRWN. BY A.B.  
CHKD. BY W.C.  
SER. NO. B. 132

changed for one of suitable value, while the grid leak plug is placed in the negative L.T. socket. To change from choke to resistance-capacity coupling, all that need be done is to remove the input connection to 26 and place it in 25.

This unit also provides terminal connections to a choke, one or two fixed condensers, a high resistance or a variable grid bias battery, and the necessary arrangement of connections can be easily worked out from Fig. 9. The .0001 mfd. variable condenser is really included to fill up panel space, but is of use where a small variable-coupling condenser is required, the terminals for which are 30 and 31.

**The Two-Valve Amplifier.**

The last of the units to be constructed is No. 6, the two-valve amplifier which is quite a compact little unit for its size, and although components may appear to be rather crowded together, it certainly works admirably. The dimensions of this unit were intentionally reduced to the lowest limits, so that ample cabinet space would be available for the other units. Hence a little extra care will be necessary here when mounting and wiring up the components.

The frame of the unit consists of a panel, 6 by 6 in., and a baseboard, 5 1/2 by 8 1/2 in., underneath which is fitted the locking device. A strip of wood is screwed to both panel and baseboard as shown in the photograph, and this prevents the baseboard from sagging beneath the considerable weight of components mounted on it. Also, the addition of this strip makes the unit as a whole quite rigid, and it can be lifted in and out of the cabinet without fear of straining anything.

On the panel, which is drilled as indicated in Fig. 10, are mounted four terminals, two rheostats, two jacks (D.P.S.T.) and

(Continued on page 651.)

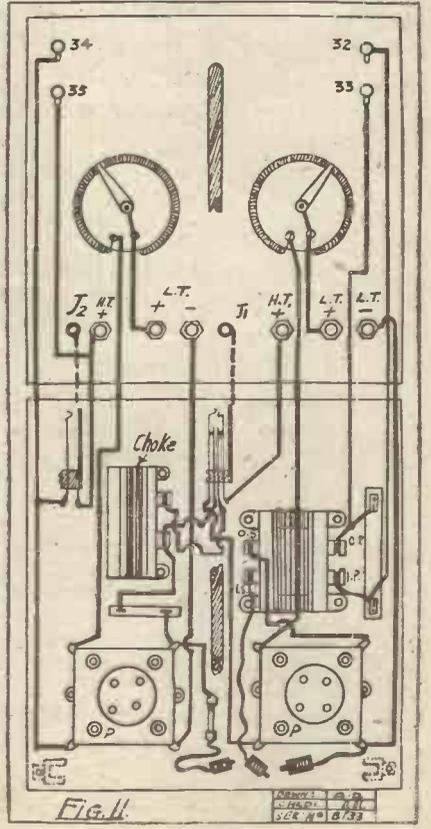
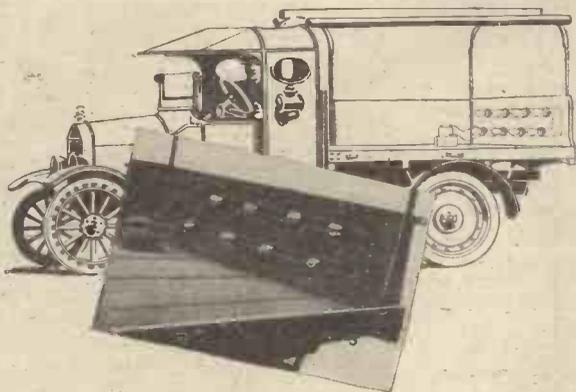


Fig. 11.

DRWN. BY A.B.  
CHKD. BY W.C.  
SER. NO. B. 133



Here's Proof that  
the 'LOTUS' Survives  
Shock and is  
anti-microphonic !

**E**IGHT Lotus Valve Holders fitted with large power valves and fixed to tailboard of a Ford motor lorry, driven over rough roads for 30 miles survived the test.

At the finish each spring was as it started—perfect. No damage or looseness at the connection of leg socket and spring—no valve became loose from the holder. Both were electrically perfect all the way.

That is why we guarantee the security of Lotus Valve Holders against shocks and vibration.

Fit the Lotus to *your* set and protect your valves

From all Radio Dealers



Pat. No. 260833.

Made from best bakelite moulding with springs of nickel silver and phosphor bronze valve sockets.

GARNETT, WHITELEY & CO., LTD.,  
Lotus Works, Broadgreen Rd., Liverpool.  
Makers of the famous "Lotus" Vernier Coil Holder.

Prices :

Combination  
GRID LEAK  
and VALVE  
HOLDER

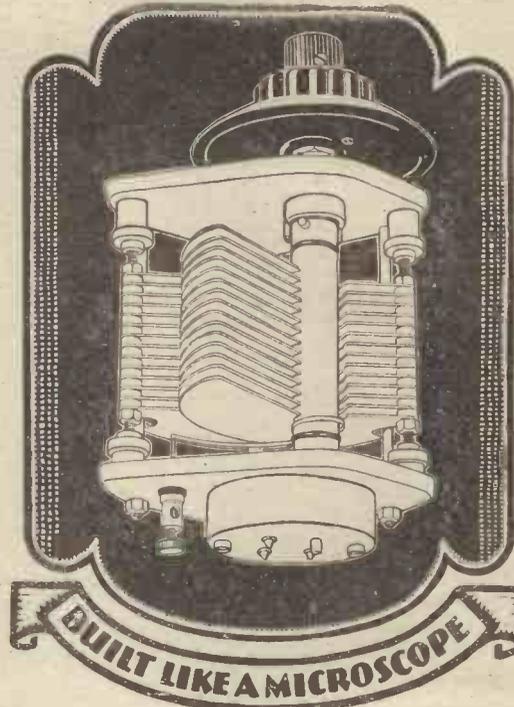
3/9

VALVE  
HOLDER  
With  
Terminals

2/6

VALVE  
HOLDER  
Without  
Terminals

2/3



HERE IS the last word in Variable Condensers. Geared movement combined with low-loss design—made by a famous firm of scientific and radio instrument makers, built with the precision and finesse that only makers of scientific instruments know how to impart.

A TYPICAL FEATURE is the unique smoothness of the 200-1 ratio geared vernier control that enables the minutest adjustment to be made. There is not the slightest trace of backlash. The condenser is solidly built of brass with porcelain insulation. A dust-proof case is provided for the gear mechanism, and the stout stamped endplates are entirely insulated from the rotor vanes by ebonite and from the fixed vanes by porcelain, making hand capacity negligible. Connection to the rotor vanes, which are of decrement shape, is made by a soldered pig-tail to the spindle. Definite stops are provided. Fixing is by the one-hole method.

CAPACITIES.	.0001 m f d.	.0003 m f d.	} £1 2s. 6d.
	.0002 "	.0005 "	
	.00075 "		

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W. G. PYE & CO., GRANTA WORKS,  
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Manufacturers of Scientific Instruments and Radio Apparatus





Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

#### PHILIP'S H.T. UNIT.

IF the Board of Trade laid down rules and regulations regarding the use of H.T. and L.T. units on house lighting mains, we wonder how many of those on the market would obtain a certificate. As a matter of fact, it is, in our opinion, high time some central authority did undertake the responsibility of framing such "safety first" laws and of seeing that they were adhered to. Anyway, wireless amateurs and listeners would be well advised to obtain their main units only from trustworthy manufacturers—manufacturers whose very names are an indication of reliable apparatus. There is no doubt but that the Philip's H.T. supply unit would fulfil the "safety" requirements of the most critical authority. As is usual Philip's practice, the unit is enclosed in a fireproof metal case, and is designed on true "safety-first" lines.

The unit embodies a half-wave rectifier

and, using a dull emitter valve of special design, it is very economical. A feature that appeals to us is the neat little metal plate which, fixed permanently to the case, gives detailed instruction as to the use of the unit.

Two H.T. plus tapings are provided, and a considerable variation of voltages is obtainable by a filament adjustment. An earthing terminal is provided, and proves very effective and greatly assists in stabilising the unit and in cutting out "hum."

On test, this Philip's unit gave excellent results, and, as previously indicated, current consumption proved to be practically negligible. Sufficient H.T. current was available to operate a receiver employing two L.F. power valves and reception was practically as silent as with batteries, and decidedly was the supply of H.T. more constant and reliable than with some batteries.

The first cost of such a unit is heavy—in this case it runs to £7 10s., but running costs are so light that the far-seeing amateur will see that in the long run this method of obtaining H.T. is an economical one all through. Certainly it is a trouble-free method, and one no more likely to let a listener down than the very supply mains from which it derives its current.

#### DX PLUG-IN COILS.

Mr. John T. Nichols recently sent us some of his DX coils wound to the "Spider" specification. They gave excellent results—results just as good as those given by our original coils.

The special aerial coil, which is provided with a tapping terminal nicely placed on the top of the coil, is priced at 4s., at which figure we consider it good value for money, considering the special nature of its windings. It deviates slightly from our specification in that the two windings are wound multi-layer fashion one above the other, but this does not appear to cause the trouble that might have been expected. It will be remembered that Mr. Nichols wound all the coils used in our special fourteen-valve receiver.

#### ANOTHER MULLARD VALVE.

Every valve in a multi-valve receiver is a very important item, but none is so vital as that last one, the one that precedes the loud speaker. It is in the last L.F. stage that really fearful distortion can occur, more especially if the valve used is unsuitable for the task imposed upon it. An inefficient H.F. valve will probably cause a great loss in sensitivity, but an inefficient

(Continued on page 640.)



## The First Essential to Perfect Reception

**B**ROADCASTING brings into your home all that is best in music, drama, and education. But to enjoy these to the full, you must use "HART" Batteries on your set for both Low and High Tension Supply.

"HART" Batteries alone provide that steady power to your valves which enables them to reproduce with maximum power and purity.

That is why eminent musicians like De Groot and many others personally use and recommend them.

# HART

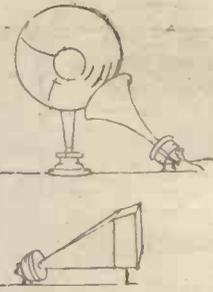
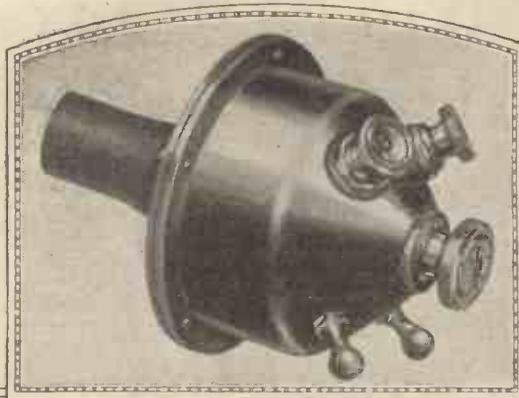
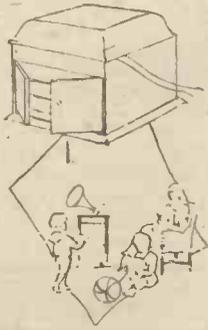
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20-VOLT 14/8; 30-VOLT, 22/-.

"ENDURO" LOW TENSION ACCUMULATOR, 2-VOLT  
10 AMPERE-HOUR ACTUAL, 6/-

Write Dept. P.W. 5 for full particulars of all "HART" Models.

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## HEAR THIS GRAMO-SPEAKER

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to your nursery or domestic quarters by means of this wonderful instrument. Try one with your large loud-speaker for stereoscopic tone experiments. You will be delighted with the reliability, performance and tone of the Gramo-Speaker. It has no equal because like all T.M.C. Radio Products, the Gramo-Speaker is the best of its kind, yet its price is only 13/6

Ask for the new T.M.C. Catalogue at your local wireless shop or we will send a copy free on request. Please mention the name of your usual dealer.

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**HEADPHONES:** No. 3 (Lightweight) in cardboard box, 17s. 6d.; No. 2a Heavier Model, 15s. 0d. (Plush lined cases 2s. 6d. extra, nett.)

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 No. 2, 6 Pt., 2 position, 6 0  
 No. 3, 24 Pt., 3 position, 15 6  
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7/6	12 Months' Guarantee. 12 Months' Guarantee	7/6
7/6	<p>Why buy an imported Transformer of unpedigreed stock when you can buy a guaranteed British Transformer for 7/6?</p> <p>The EMPIRE doesn't need a shroud. There is no bad workmanship to cover.</p> <p>75% of total weight is iron core and copper wire. Open to inspection.</p> <p><b>PURITY WITH GOOD AMPLIFICATION</b>                  Equal to a high-priced British Transformer in performance at the price of a cheap foreigner.</p> <p>If your dealer cannot supply SEND TO US.</p> <p><b>EMPIRE TRANSFORMER</b>                  THE H.T.C. ELECTRICAL CO., LTD.,                  4, Boundaries Road, Balham, London, S.W.12.                  Phone: Battersca 0374.</p>	7/6
7/6		7/6
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FLUXITE, Ltd. (Dept. 324), Rotherhithe, S.E.16.

# FLUXITE

**APPARATUS TESTED.**

(Continued from page 638.)

last stage power valve may not mean only a mere difference between strong and very strong signals, but the difference between harsh, grating reproduction and pure, mellow speech and music.

Of course, a good valve used incorrectly may give as bad results as a bad valve with every refinement in the way of ample H.T. and grid bias. But one must start right, and that brings us to the real point of this discourse—the Mullard D.P. 425, a power valve with which we have obtained excellent results.

Rated at 3.8 volts, .25 amps., and requiring from 75 to 150 volts H.T. with from 5 to 22 volts grid bias, this Mullard valve is suitable for use with large loud speakers. It has an impedance of some 3,500 ohms and can handle very large inputs without causing distortion.

It operates at an extremely low temperature, and there is practically no glow at all from its filament. For the power that it can deal with it is an extraordinarily economical valve, and in view of its very "dull" nature it must have a very long life. We can thoroughly recommend this Mullard D.P. 425 power amplifying valve as a "last stager" that will pass all tests.

**DUBILIER UNIVANE VARIABLE CONDENSER.**

The Dubilier "Univane" Variable Condenser is an extraordinarily ingenious component. The vanes are more or less

conventional in shape, and number twenty-six in all. The thirteen moving ones operate in sequence. For instance, supposing all the vanes are "in" (maximum capacity). One revolution of the dial causes the first vane to move; on the commencement of the second revolution of the dial the second vane is picked up and moved from a minimum to a maximum setting, and so on. Reversing the direction of the dial rotation the same thing happens in a reverse direction. Thus the dial must be turned thirteen times in order to cover the min.-max. range. Throughout the whole of this the control is never on more than one plate, so that when any one is in gear it can be carried to its max. or min. position independently of all the others.

An indicator at the edge of the dial plainly shows which vane is in use and thus exactly at what point the variable is being operated.

Despite the novel results the mechanism is very simple and cannot jam or get into trouble.

The movement is a true "vernier," and as it can be so accurately calibrated, experimenters will appreciate its value.

The "Univane" is beautifully constructed and well up to Dubilier standard in general design and finish. It is not the sort of variable we should use on a broadcast receiver for it takes so long to get from the max. to min. settings, but doubtless it will appeal strongly to the "precisionist." The price is 25/- and the rated capacity, .0005 mfd.

The American Radio Corporation, Ltd., Bond Street, London, inform us that they handle the Cone speaker and other Radio Foundation, Inc., products in this country.



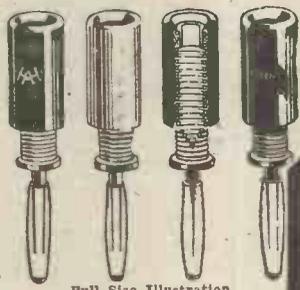
A demonstration of the process of manufacturing Mullard valves given recently at Selfridge's.

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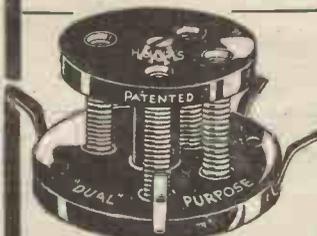


Fig. 975. Code Word



Full Size Illustration.

**JUST PLUG THEM IN!** Per 1/6 Set of 4 (3 black, 1 red)



Full Size Illustration.

Fig. 976. Code **"DUAL"** Word. **PURPOSE**

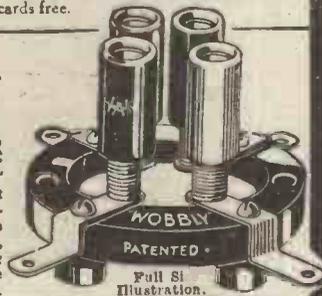
DOUBLE ENDED. Price 1/9 each. **THE FOOL-PROOF HOLDER FOR BASE OR PANEL FITTING OR IN ANY OTHER POSITION.**

The smallest and neatest combined holder on the market. No joints because the soldering tag is the same piece of wire as the spring. Show cards and display cards free.

Fig. 974. Code **"WOBBLY"** Word. PRICE . 2/3 each.

**THE IDEAL EXPERIMENTER'S HOLDER TOO SIMPLE TO IMPROVE**

For the genuine experimenter who must have a holder without capacity, and perfectly sprung, Hunt's "WOBBLY" is ideal. It is impossible to have fewer parts, or to better insulate, separate or spring them. Separately sprung legs are far more effective than a closed-in solid spring top.



Full Size Illustration.

Made under Patent 242057/24, Prov. Pat. 30670/26 and 40/26, by:— **A. H. HUNT, Ltd. (Dept. 12), Croydon, Surrey.**

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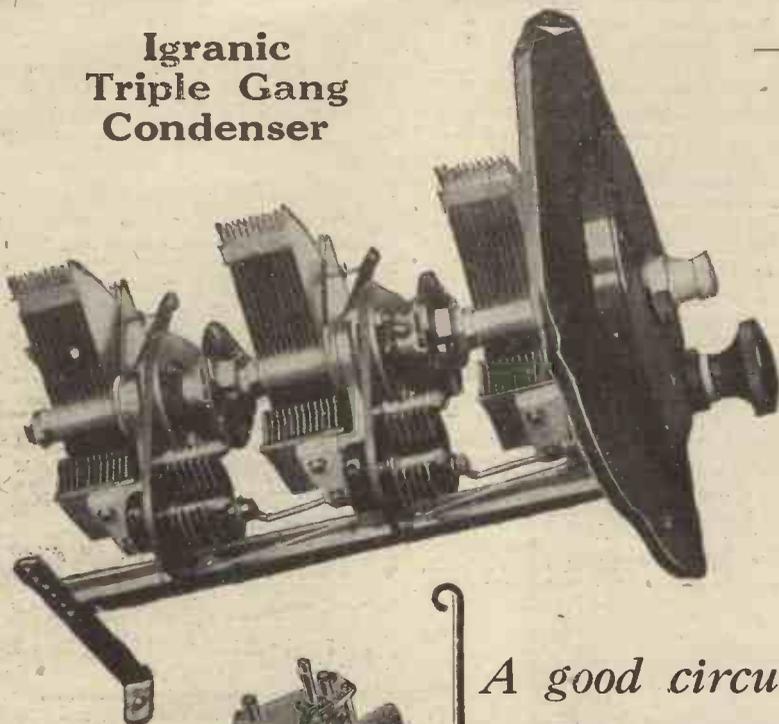
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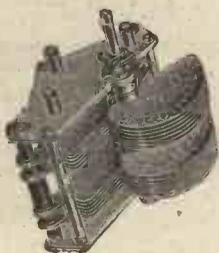
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**IGRANIC DUAL VARIABLE CONDENSERS** are particularly rigid, so that there is no risk of the plates getting out of alignment or of the accuracy of tuning being affected.

.0003 mfd. (Dual) .. .. 22/6  
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Write for the  
new **IGRANIC**  
CATALOGUE  
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### — and now the IGRANIC "Twin"

**IGRANIC GANG CONDENSERS** successfully solve the problem of single knob control.

Small compensating condensers connected in parallel with the main condensers enable each section to be exactly equalised without the necessity of altering the relative settings of the main condensers.

The Igranic method is simple and practical and preserves the accurate square law tuning of the condensers as a whole.

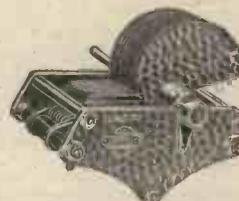
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*A good circuit  
deserves the  
best components*

**ALWAYS USE**



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VARIABLE  
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**IGRANIC VARIABLE CONDENSERS** have earned the reputation of being the "choice of experts — and amateurs." Ask your dealer to show you one.

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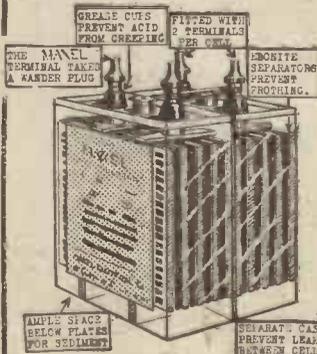
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A LEADING valve manufacturer reports that "exceptionally good loud speaker results" were obtained with the Watmel Auto-Choke. "Speech was clear and sharp and music free from distortion." Get full particulars of Watmel Auto-Choke, Grid Leak, and Combined Fixed Grid Leak and Fixed Condenser from your dealer, or write direct to manufacturers.

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CARR. PAID to your door in 24 hours. 2-v. 1/4, 4-v. 1/6, 6-v. 2/1.

DO YOU KNOW, we can rebuild your L.T. Battery under 6 months' guarantee, at a low cost. If beyond repair, scrap allowance off price of Maxel Battery. Delivery 3 days.

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

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.

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked "Patent Advice."

## TECHNICAL QUERIES.

Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

BLUE PRINTS. A series of 20 Blue Prints can be obtained from the Query Dept. price 6d. per Blue Print.

Only a limited number of circuits are covered in this series, and full details of the circuit arrangement, available in Blue-Print form are published fortnightly in the advertisement columns of this journal.

All other back-of-panel diagrams are specially drawn up to suit the requirements of individual readers at the following rates: Crystal Sets, 6d.; One-Valve Sets, 6d.; One-Valve and Crystal (Reflex), 1s.; Two-Valve and Crystal (Reflex), 1s.; Two-Valve Sets, 1s.; Three-Valve Sets, 1s.; Three-Valve and Crystal (Reflex), 1s. 6d.; Four-Valve Sets, 1s. 6d.; Multi-Valve Sets (straight circuit), 1s. 6d. Except SUPER-HETERODYNE DIAGRAMS, all of which, irrespective of number of Valves used, are 2s. 6d.

If a panel lay-out or list of point-to-point connections is required an additional fee of 1s. must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

## Questions and Answers

### Panel and Baseboard Lay-out.

"2-VALVER" (Hanwell, Middlesex).—I am going to build a 2-valve receiver to receive London on a small loud speaker and distant stations (Continental and B.B.C.) on the telephones. The circuit that I wish to use is on the lines of that given by the pictorial blue print, No 11, but instead of building a flat panel set, like that illustrated on the blue print, I wish to make a receiver with an upright panel,

(Continued on page 644.)

Every 'air Cna on sed.



## "Phone-Joy"

Only truly experienced when listening-in on Bowerman's Phones. There is a charm, comfort and clarity about these instruments that is beyond praise and beyond rival. Get a pair to-day—they will amaze and delight you and reveal undreamt-of powers in your sets. Obtainable from Harrods, Selfridges, and all leading wireless dealers or direct under guarantee. P.O. 12/6.

**Bowerman's**  
SUPER  
POWER  
HEAD PHONES

For  
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Bowerman's Phones, 10-12, Ludgate Hill, London, Eng.

## BECOL

Registered Trade Mark.



Ebonite Rods Tubes and Sheets. Panels guaranteed free from surface leakage.

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Makers of the  
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As used in sets that took the first four prizes at the 1926 "Manchester Evening Chronicle" Wireless Exhibition and the set that won the Gold Medal at the 1926 Amsterdam Exhibition.

Size: 3 inches diameter to outside of wings. Prices:  
6 inch lengths 3/- (Postage 6d.)  
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Write for List "C."

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Having decided to make up the latest circuit, why not get in touch with us?

This will save both time and trouble, as our stocks are always new and right up to the minute. See the latest in Screened and tapped Coils. Illuminated Tuning Dials and everything you cannot get elsewhere.

OUR INTERNATIONAL RADIO CATALOGUE (3rd Edition) will be sent to all enthusiasts sending 6d. to cover cost of postage and packing.

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# ALL THE LATEST "P.W." SETS

Supplied as finished instruments or in parts for home construction.

NOW is your opportunity to acquire a really good set at a very reasonable price. Under the famous PILOT service, you can obtain from us all the parts for any set published in the various wireless papers, and you may rely upon receiving free advice and help from our Technical and Service Department. On the other hand, if you prefer to have your set ready built, we can supply it at a small extra cost. In either case, you are assured of first-class results.



A Typical "Pilot" Receiver.

*This Week's Attraction:*

## The "HALE" 2-Valve Set

(Described in this issue)

☐ *This Receiver follows upon the "Hale" 1-Valve set, which has proved one of the most outstanding Receivers of recent months. Here are the prices:*

FINISHED INSTRUMENT, approved by Mr. P. W. HARRIS as being equal to the original model in every respect.

Highest quality components throughout, including Marconi Ideal Transformers, etc., Aerial Tested	10	10	0
Hale and Marconi Royalties Paid			
PILOT kit of components (to make the Set as described in this issue)	4	7	6
Polished Ebonite Panel, 10" by 7" by 1/2", drilled		6	0
Polished Mahogany Cabinet and Base		17	6

☐ When a complete Kit of Components is ordered, a Marconi Royalty of 12/6 per Valve Holder is payable and should be remitted with order.

☐ *Every finished set we sell is tested under the supervision of CAPT. TINGEY, A.M.I.R.E. (Late of Radio Press Laboratories)*

### "P.W." SPIDER SET.

A phenomenal demand has arisen for this popular Set. Are you building it the safe PILOT way?

Finished Instrument (Aerial tested and guaranteed, less coils and valves)	12	0	0
Marconi Royalties	1	17	6
Complete PILOT Kit of parts	6	16	9
'Red Triangle' Ebonite Panel 15" x 8" (matted and drilled)	12	0	
Polished Mahogany Cabinet and Base-board	1	19	6

### LET YOUR FRIENDS LISTEN!

The PILOT MANUAL contains illustrated details of a number of up-to-date sets which we thoroughly recommend. Much useful information on soldering, assembling, testing, etc., is also included. Post free ... 3d.



### THE PILOT MANUAL

## PETO-SCOTT CO., LTD.

Head Office & Works: 77, City Rd., LONDON, E.C.1

Branches: 62, High Holborn, London, W.C.1. WALTHAMSTOW—230, Wood Street. PLYMOUTH—Bank of England Place. LIVERPOOL—4, Manchester Street.

# SIEMENS

## H.T. DRY BATTERIES.

FOR  
STEADY  
PERSISTENT  
SERVICE.



SEE THAT  
THEY BEAR  
THIS  
TRADE MARK!

REG. TRADE MARK

### TALK No. 2

#### The Use of Negative Grid Bias

The heaviest drain on the H.T. battery is almost invariably due to valves functioning as low frequency amplifiers, and where a high anode voltage is used it is very necessary to employ a negative grid bias battery, not only to ensure purity in reproduction, but also to reduce the drain on the H.T. battery. The higher the value of negative grid bias the smaller will be the amount of current drawn from the H.T. battery, and therefore as high a value of negative grid bias should be used as is consistent with obtaining a satisfactory volume of reproduction. Should there be any doubt as to the correct amount of negative grid bias to use, reference should be made to the valve manufacturers' data for the particular valves in use. As a general rule, the grid bias battery should be renewed whenever a new H.T. battery is installed, but a test with a suitable voltmeter will determine whether this is necessary or not.

#### Allowance for Voltage Drop in H.T. Battery

A point which is not perhaps appreciated sufficiently is the fact that the voltage of a high-tension dry battery steadily falls during its life, and therefore it is desirable to allow for this fall by installing a battery of higher voltage than is normally required by the receiving apparatus. Not only does this ensure the maximum results from the set, but it also effects considerable economy, as the useful life of the battery is thereby extended. Users of multi-valve sets taking a considerable current from the H.T. battery should particularly bear this in mind, as the fall in voltage in their case will probably be relatively greater.

The above is an extract from my new Catalogue No. 650, "Siemens Radio Batteries," which will assist you in the selection of the correct size of battery to be used for any radio purposes. It also contains a large amount of practical information on the CARE and MAINTENANCE of Radio Batteries.

A copy will be sent post free on application to

SIEMENS BROTHERS & CO., LTD., WOOLWICH, S.E.18

# Simple Soldering at Last!

Soldering is now something that every novice can do, for "Flusolda" has come to the aid of expert and novice alike.

With a tin of "Flusolda" at your side, a perfect clean joint becomes merely a matter of applying a clean fluid and heating it.

## Put on a little - FLUSOLDA - and Heat it - That's All

No flux or tinning required.

One of the outstanding successes of the Manchester Wireless Exhibition, where large sales were made.

In tins at 1/3 from Wireless Dealers and Ironmongers.

Trade enquiries to - **THE TRANSPORT SUPPLY CO., LTD., WARRINGTON.**

London Office - 82, VICTORIA ST., WESTMINSTER, S.W.1. Telephone: Victoria 7834.

## RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 642.)

so that the valves and coils are enclosed in the case, out of harm's way. What is the best method of arranging the components on the baseboard and panel?

The accompanying photograph shows a good arrangement for a set of this type. It will be seen that the coil holder is placed behind the variable condenser and the L.F. transformer is fixed alongside it in such a position that the moving coil is "all out," there is room for it to lie down on the baseboard without fouling the transformer. The numbered components represent (1). Tele. phone condenser (the use of this is optional). (2). The switch for one or two valves. (3). Variable condenser. (4). The reaction coil (moving). (5). Aerial coil. (6). Detector valve. (7). L.F. amplifying valve. (8). L.F. transformer, and (9). Fixed condenser across the primary terminals of the L.F. transformer (if used).

### AM I OSCILLATING?

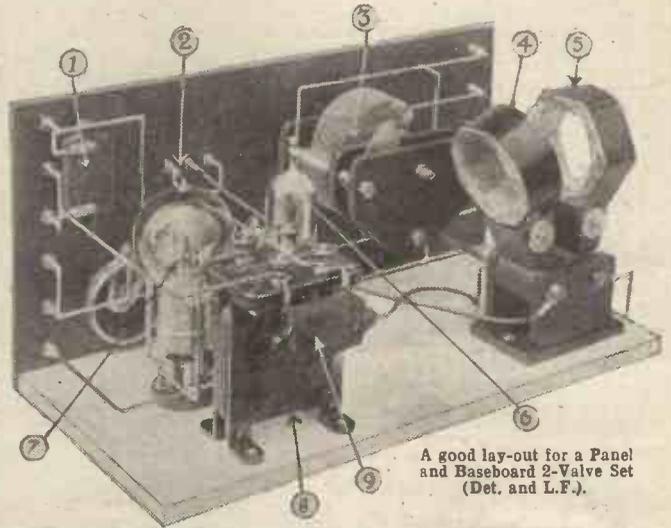
J. S. (London).—Being a beginner as regards valve sets, I should be pleased if you can give me any information with regard to reaction and oscillation. My set, I am informed, has a reaction coil fitted, and I do not wish to cause any interference to my neighbours' sets. How can I tell when I am oscillating? And if so, how is it cured?

We cannot do better than to quote the following paragraph taken from a circular letter addressed to listeners in Canada by the radio branch of the Department of Marine and Fisheries of the Canadian Government and published in "The Times" of recent date:

The principle of regeneration, as used in radio receiving sets, is that part of the output of the detector valve feeds back into its own input, and thus greatly increases the volume of the signal. The electric waves reaching the receiving set from the transmitting station travel down the aerial wire, through the primary coil in the set, and so to earth down the earth wire. The weak electric current resulting from this influences the valve in such a way as to set it functioning.

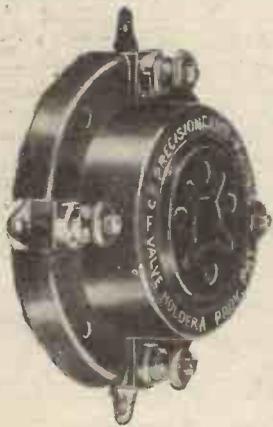
The resulting output from the plate circuit of this valve is fed back in such a manner as to set up a "field" or influence in the part of the circuit connected to the input (the grid) of the valve. This field induces in the input circuit a current of electricity

(Continued on page 646.)



A good lay-out for a Panel and Baseboard 2-Valve Set (Det. and L.F.).

**REPAIRS** SETS, PHONES, TRANSFORMERS  
 Officially Approved by Radio Association.  
 ALL WORK GUARANTEED LOWEST RATES 24 HOUR SERVICE  
 Cash on Delivery if Desired.  
**JOHN W. MILLER, 68, Farringdon St., E.C.4.**  
 Phone: Central 1950.



OUR latest production, the C.E. PRECISION FLOATING VALVE HOLDER, shows great improvements upon others. By its use, the distortion due to vibrations transmitted to valve filaments is entirely eliminated and a receiver fitted with it acquires a perfectly clear background which facilitates the reception of distant stations. Of very low capacity and entirely non-microphonic, the C.E. PRECISION FLOATING VALVE HOLDER is ideal for its purpose. Made from Bakelite and fitted with soldering tags and terminals.

2/3 each.

C.E. PRECISION RHEOSTATS AND POTENTIOMETERS have so frequently been specified by the Wireless Press that they need little description. The special care taken in their production ensures a perfectly smooth and silent action. Bakelite formers; silvered dials; fitted with soldering tags and terminals.

7 and 15 ohms - 2/9 each  
 30 and 50 ohms - 3/- each  
 Dual Rheostats & Potentiometers - 3/9 each

FOR UTMOST  
**C.E. PRECISION**  
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**C. EDE & CO., LTD., BYFLEET, SURREY**  
 Telephone: Byfleet 226. Telegrams: "Ceprecise, Byfleet."

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### SCRAP DRY BATTERIES!

By obtaining H.T. Current from Electric Supply Mains (D.C. & A.C.) by just attaching adaptor to Electric Light Lampholder.



Size 12" x 6" x 7"



SIZE 6" X 6" X 3"

**SAFE!**  
**SILENT!**  
**SOUND!**

Model	Voltage Tappings	D.C.	Price	A.C.	
1A	One	..	£2 2 6	—	TRADE ENQUIRIES INVITED
2A	Two	..	£2 15 0	£8 10 0	
3	Three	..	£3 7 8	£7 5 0	
CATALOGUE	V2A	1 Variable, 1 Fixed	£4 5 0	£7 15 0	
	V3	2 Variable, 1 Fixed	£5 10 0	£9 0 0	
FREE	V3A	3 Variable	£6 2 6	—	
	3A	Special "Marconi Straight 8" Model	£8 6 0	£9 10 0	

### READ WHAT THEY ALL SAY! THE PRESS.

"AMATEUR WIRELESS." 9/10/26.  
 "We have tested this Unit. No trace of 'hum' could be heard."  
 "BRITISH TRADE JOURNAL." 1/10/26  
 "We have tested the 'EKCO' H.T. Unit and found the instrument efficient in every way. It is one of the few exceptions that has reached the commercial stage."  
 "WIRELESS WORLD" 11/8/26.  
 "No 'hum' was discernible—the unit is a good practical proposition and can be relied upon."

S.B., DONCASTER.—"The reception was first class."  
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 H.J., NEWCASTLE.—"H.T. worries are over for everyone who possesses an 'EKCO' H.T. Unit."

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# A Constant High Tension Supply for a Lifetime

## "Goltone" (REGD.)

### HIGH TENSION BATTERY ELIMINATORS

First cost saved in a short time. Gives increased volume and purity of tone. Simply plug in to any convenient lampholder. Complete with Lampholder Adaptor and Flexible Cord, ready for use.

#### DIRECT CURRENT MODELS.

Type "D.J." Approx. tappings, 45 and 100 Volts. Price 32/6

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#### ALTERNATING CURRENT MODEL.

Approx. Tappings, 30, 60, 90 and 130 Volts. Dual tappings are taken from each voltage thus providing 8 separate tappings. Price £5 : 10, including valve.

Please state voltage and frequency of Lighting Mains when ordering.

See List for full details of "Constructional Kits."

#### USERS WRITE!

E. J. G., Hilsdale, Moulcombe, Brighton:—"I find it very satisfactory, and have recommended it to several friends."  
L. A. D., Colinton Road, Edinburgh:—"The Eliminator is working in a highly satisfactory manner."  
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Mr. H., Market Street, Kirby Stephen:—"We have had several which have given every satisfaction."  
Mr. B., Littleborough:—"Have installed the 'Goltone' A. C. H. T. Battery Eliminator, and must say it has ex-

ceeded expectations. It has not the slightest suggestion of hum or distortion of any kind, and is very satisfactory."

Mr. W. F. G., Longsight:—"I was delighted with the result—a beautiful tone, perfectly clear and no harshness, and at the same time, I may as well tell you, it is a great saving of expense."

G. J. & Co., Church Road, Acton, London:—"The H.T. Eliminator is giving great satisfaction. It is being used within a short distance of an Electricity Station, and the Set is perfectly silent, there being not the slightest suspicion of hum. It is the best we have seen."



Large fully illustrated 48-page Catalogue, No. R/116, on request. Dealers should enclose Business Card for Trade Terms. Goltone Products are stocked by the Leading Stores.

Refuse Substitutes.

#### HIGH TENSION WANDER PLUGS



### EASIFIX

"COURT" RADIO ASSEMBLIES.

Size over all, 33 ins.

Eliminates ugly loose wires and minimises the risk of burning out valves. Each Conductor is distinctively coloured and the whole enclosed within a strong outer braiding. Fitted with Spade Terminals and Wander Plugs.

4 ways, 2/- 5 ways, 2/3  
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Refuse Substitutes.

TO HIGH & LOW TENSION PANEL TERMINALS.

#### ACCUMULATOR CHARGING SETS for Home Service



NO TECHNICAL KNOWLEDGE or ATTENTION REQUIRED.

Simple, reliable and convenient. Simply connect to any adjacent lampholder.

Complete with Adaptor, Connecting Cord and full instructions.

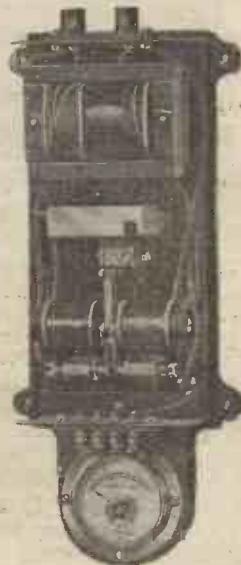
"INDISPENSO." (Direct Current.) Charges the High Tension Accumulator at no extra cost when light is in use. Price 6/-

"ALTERNO." (Alternating Current.) Charges the High Tension Accumulator at negligible cost. Price 21/-

Goltone "PENDELTON." Patent App. (Alternating Current.) Charges the Low Tension 2, 4 or 6 volt Accumulator economically and effectively. Charging rate approx. 2 amps. Price £2 : 12 : 6

Fitted with Ammeter, as illustrated, £3 : 7 : 6

Please state Voltage and Frequency of Lighting Mains when ordering.



"PENDELTON" CHARGER with Cover removed.



## JOIN A Wireless "Mustard Club"

In other words spend 2/6 and enjoy a year of radio success. HALF-A-CROWN BRINGS TO YOU:—

- (1) RADIO PLAN No. 1. THE GENUINE ORIGINAL BOOKLET DIAGRAM OF THE FAMOUS P.P.V2 CIRCUIT. THE SIMPLEST, LOUDEST TWO-VALVE SET A NOVICE CAN BUILD. WORKS LOUD SPEAKER UP TO 60 MILES AT LEAST.
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- (4) AS MUCH FREE ADVICE, ASSISTANCE AND PRACTICAL HELP YOU CARE TO WRITE FOR. ALL YOUR WIRELESS TROUBLES SOLVED FREE OF CHARGE FOR ONE YEAR

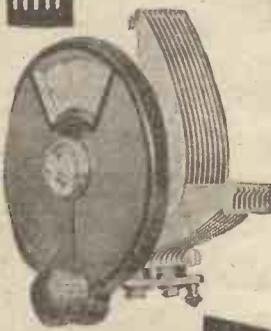
All you have to do is to remit 2/6 with your name and address mentioning "P.W." to:—  
PRESS EXCLUSIVES, Wireless Publishers, 2, Wine Office Court, Fleet Street, London, E.C.4



### ULTRA LOW-LOSS Straight Line Frequency Condenser

Cone Bearings Braced Vanes. Positive Collector. A real precision job.  
Condenser only, .0003uF., .0005uF. . . 9/-  
Condenser with plain Dial, Standard 2" dial shaft . . . . . 10/6  
New Vernier Dial . . . . . 6/-  
Reduction Ratio 16-1, No Backlash.

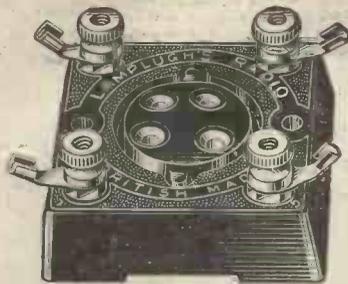
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Manchester: Mr. J. B. Levee,  
23, Hartley St., Levenshulme  
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Britain's Best **RADIO** in Radio.

**LAMPLUGH**

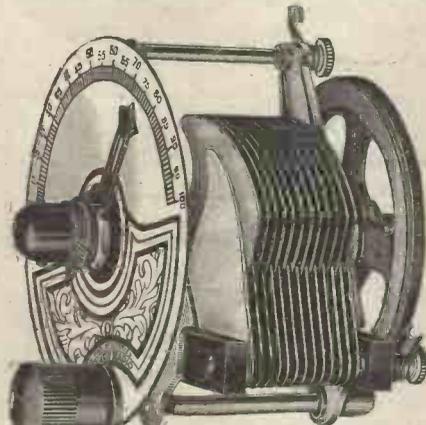
PRODUCTS



**SILENT VALVE HOLDER**

Anti-microphonic

Fitted with Heavy Terminals & Grip Tags. PRICE 2/6



**S-L-T  
STRAIGHT LINE TUNING  
CONDENSERS**

separate stations on all wave-lengths. Lowest minimum capacity and the most positive slow-motion control.

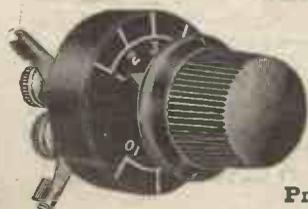
Prices: .0005 13/-; .0003 12/6; .0002 12/-  
Gang of 3 .0005 50/-



**VARO-FIX  
FILAMENT RHEOSTAT**

Interchangeable elements and each one adjustable. More positive than automatic devices.

6 ohm, 2/3; 15 ohm, 2/6; 30 ohm, 2/9



**GRID  
LEAK**

5 to 15  
MEG OHMS  
ONE HOLE  
FIXING

Price 4/- each.

**S. A. LAMPLUGH LTD.**

King's Road, Tyseley,  
BIRMINGHAM.

Sole Distributors for London and Southern Counties:  
The Empire Electric Co., 303, Euston Road,  
London, N.W.

Scottish Depot: 38, Montrose Street, Glasgow.  
Obtainable from all leading Wireless Dealers.

SEND FOR LISTS.

**RADIOTORIAL  
QUESTIONS AND ANSWERS.**

(Continued from page 644.)

of the same frequency as that of the received electric waves. The energy therefore, which comes down the antenna wire is automatically strengthened by an impulse from the output of the detector valve. Unless controlled, this action will continue until the saturation point or climax is reached, the valve being then said to be in a state of oscillation. When a receiving set is in oscillation, it causes howling and squealing, both in itself and in neighbouring receiving sets. Regeneration should therefore never be allowed to proceed to this point, as it then constitutes a public nuisance.

(1) It causes whistles in radio receiving sets of all types which are tuned to the same station. This interference may be heard up to a distance of several miles.

(2) It distorts the quality of the music.

(3) It uses more H.T., and therefore the life of the H.T. battery is reduced.

(4) It tends to reduce the life of the detector valve.

When a radio receiving set in a state of oscillation is exactly tuned to a broadcast station, it is said to be in the state of "zero beat." This distorts the broadcast reception, and also interferes with neighbouring receiving sets which are tuned to the same station. In a word, regeneration carried to oscillation causes great annoyance to neighbours, poor reception and expense to the owner of the set, and has no advantages whatever.

*For the Constructor*

**No. 8.—WORKING EBONITE.**

(a) Don't use pencil to mark a panel. Unless thoroughly cleaned off with a slightly oily cloth, there is a tendency for leaks to occur along the pencil-marks.

(b) When the marking has been done, a light tap with a centre-punch will ensure that the drill starts properly.

(c) Ebonite can be cut perfectly square if a tenon saw is employed.

(d) If a hacksaw or (for big panels) a rip-saw is used, the "cut" should not be along the line marked, but just outside it. Otherwise the panel will be too small.

(e) Use a coarse file to trim panel edges. Fine files become choked.

(f) "Metal-working" drills should be chosen, and only a light pressure employed.

(g) Keep the bench clear whilst working, or the panel will be disfigured by scratches.

(h) When "breaking through" with the drill, relax the pressure, or the panel surface may chip.

(i) When withdrawing the drill, do not reverse, but continue turning slowly.

(j) Ebonite melts under heat, so terminals will need tightening after they have been soldered.

The interfering whistle which is heard in a receiving set may originate in the set itself, or it may be interference caused by a neighbour. In order to determine this point, the following test may be made:

Leave the regeneration control (reaction handle) in a fixed position, slowly rotate the tuning dial, and note particularly the change in sound of the whistle. If the whistle rises and lowers in pitch sympathetically with the movement of your tuning dial, it indicates that your receiving set is in a state of oscillation, and probably causing interference to other sets. On the other hand, if the whistle does not change in pitch corresponding to each movement of your tuning dial, but simply varies in volume, the whistle is not caused by your receiving set, but is interference produced by some other oscillating receiving set in the neighbourhood.

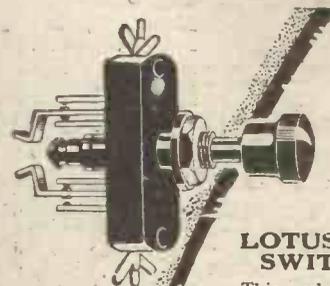
**WHAT SET SHALL I NEED?**

A. E. G. (The Hyde, London, N.W.9).—I am wanting a circuit for a 2-valve set for use with loud speaker in Bromley (Kent). The essential feature must be simplicity in circuit and panel surface. This you will readily understand on learning that the set is intended for a blind man. Perhaps something with a variometer would be most useful?

As the distance would be about twelve miles, you really need more than two valves for good loud-speaker work. If the set must be a 2-valver, and as simple as possible, we should use a straight detector and L.F. amplifier. One or both of the valves should be of the "power-valve" type, and plenty of H.T. would be required, unless the set is used in conjunction with a very good outdoor aerial. A circuit of the type named (straight Det. and L.F.) is given on the "P.W." 6d. Blue Print, No. 11.

(Continued on page 648.)

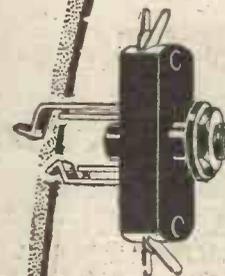
*The latest in  
Jacks & Plugs*



**LOTUS JACK SWITCHES**

This push-pull switch is designed to occupy the minimum space, being only 1 1/2 in. deep. Of the finest Bakelite, it has nickel-silver springs and contacts of pure silver. Soldering contacts can be made to suit any wiring.

PRICES:  
No. 9, as illustrated .. 4/-  
Others from .. 2/9



**LOTUS JACK**

Designed to take up the least space, the depth back of panel being 1 1/2 in. Made from best Bakelite mouldings with nickel silver springs and pure silver contacts. One-hole fixing. Soldering contacts can be brought into any position.

PRICES:  
No. 3, as illustrated .. 2/6  
Others from 2/- to 3/-



**LOTUS JACK PLUGS**

Designed for use with Lotus Jacks. Made from best Bakelite mouldings and nickel-plated brass. To fix, the wires are placed in slots and gripped in position by a turn of the screw cams.

PRICE 2/-

**LOTUS  
JACKS·SWITCHES·PLUGS**

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LOTUS Works, Broadgreen Road, Liverpool.



# BUILD YOUR NEXT SET with CERTAIN SUCCESS!



SEND 1½ IN STAMPS FOR THE BOWYER-LOWE RADIO NEWS - IT TELLS YOU MORE ABOUT TESTED & GUARANTEED COMPONENTS

ARE you sure that you will get perfect results from the set you are building—that every component will function perfectly?

To be certain of success each individual component must not have a deteriorating effect on the remaining parts of the set—this success can only be achieved by having tested and guaranteed components—Bowyer-Lowe Components.

They fulfil these qualifications, and the Guarantee protects you against damage after leaving the factory, since every article bought from Bowyer-Lowe, if found faulty within twelve months of purchase, will be replaced free of charge.

We are distributing the Radio News which is exceedingly useful to the experimenter—and it will put you right on perfect reception. Send 1½d. stamp for it to-day.



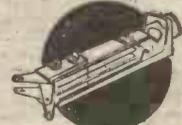
### POPULAR Condenser

Electrically and mechanically sound in design, this condenser ensures perfect results.



### Antipong Valve Holder

The only valve holder with such a low capacity combined with the cushioning for preventing microphonic noises in your valves.



### JACKS

Bowyer-Lowe Jacks mark a great advance in design, while the workmanship is typical of Bowyer-Lowe Quality.

ANNOUNCEMENT BY THE BOWYER-LOWE CO LTD LETCHWORTH HERTS

## Banish 'Ringing' noises



At last you can run your receiving set without the intrusion of those "ringing" noises, caused by shocks and vibration, which spoil perfect reception; and which are increased by the use of dull emitter valves.

fit the NEW

Fit the new NELSON-NON-PHONIC Single Filament VALVE, made so that the greatest shocks or vibrations do not reach the delicate internal construction; the efficiency of the valve being in no way impaired.

Perfect reception is assured by the "floating" of the glass envelope on a rubber cushion; a method far superior to the combination of valve and so-called anti-microphonic valve-holder.

## NELSON NON-PHONIC SINGLE FILAMENT VALVE

THREE TYPES NOW AVAILABLE:—

For 2 Volt Accumulators

For 3-4½ Volt Dry Cells

For 4 Volt Accumulators

TYPE G220.

TYPE Q306.

TYPE G410.

2 Volts, 72 amps.  
Impedance 20,000 ohms.  
Amplification Factor 7.  
11/-

3 Volts, 06 amps.  
Impedance 25,000 ohms.  
Amplification Factor 7.  
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The Bretwood S.L.F. Condenser

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Prices: 0005 17/6. 0003 14/9.

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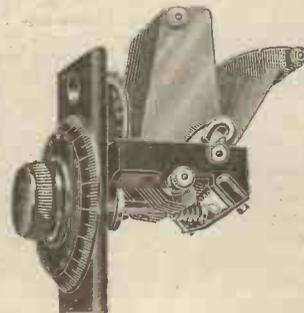
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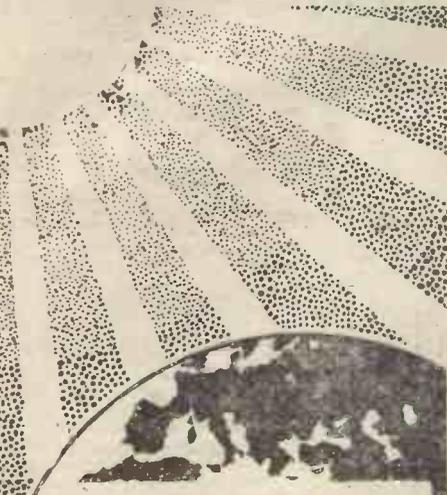
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We have received the following testimonial:—

"I do not know whether you know that this particular valve is the finest in the world for use in a reflex set, it easily gives double the volume of any other I have ever used.

This is due of course to the remarkably low impedance, which is the lowest I think of any valve made."

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"I had some wonderful results on a new single valve reflex unit yesterday, using one of these valves, tuning in, in daylight, stations from six different European countries, as well as a number of British stations and 22 amateur transmitters.

It is one of those cases where one would not believe unless heard, as the use of this valve in any reflex set will at once double the volume. I may add that I am just over three miles from 2 Z.Y. and I have to detune to bring the volume reasonable on a large Brown H.Q. and Amplion Radiolux Speakers."

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S.P. 18 RED 14/ Fil. Volts 1.6 Amps .3  
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## BENJAMIN SHORTPATH VALVES

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Erantwood Works, Tottenham, London, N.17.

## RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 646.)

### 2-VALVE UNIDYNE.

J. B. (Dublin).—In which number of "P.W." was the 2-valve Unidyne set described (Det. and L.F.) that appears on the "P.W." Blue Print No. 12?

The particular set in question was not described in a how-to-make article in "P.W.," though several similar sets have been described constructionally. The numbers of "P.W." containing these articles are now, without exception, out of print.

### THE SIMPLIFIED P.W. COMBINATION SET.

E. R. (Brixton Hill, S.W.).—I have recently taken to pieces an old 1-valve "P.W." Combination set which had given excellent loud-speaker results, but which I wish to rewire into a simpler and smaller set. As it was generally switched over to the "dual" position, can I do without the switches and build it on a flat panel, 1 valve and crystal for loud-speaker results? Has such a set been described in a back number of "P.W."?

The full constructional description of a similar set appeared in the free supplement given with "P.W." No. 229 (October 23rd issue). The details of a set of this kind are available also in "P.W." Blue Print form; the required Blue Print being No. 7. (See Blue Print announcements in this issue.)

### SELECTIVE REACTION.

(Continued from page 603.)

The magnified H.F. impulses in the anode circuit of  $V_1$ , being impeded by the choke  $L_3$ , are by-passed to the grid circuit of  $V_2$ . On this brief journey, however, they are greatly intensified by the magnetic feed back from the reaction coil, which is also the path of the rectified L.F. currents. As reaction is increased a point is reached where the detector valve becomes saturated, and a howl is set up.

If  $C_5$  is now increased the H.F. load delivered to  $V_2$  is reduced in the first instance by the amount of the H.F. energy fed back to the aerial circuit. This stimulates or energises  $V_2$  to deliver a stronger anode current, and approaching the pre-oscillation stage becomes more sensitive. It appears that some of the energy fed back from the anode of  $V_2$  finds its way back through  $C_2$  and  $C_3$  to the aerial circuit. Thus the effect of the two reactions would appear to be that the H.F. flow automatically balances itself between  $V_1$  and  $V_2$ , so that both valves are held as it were on the brink of the stage of saturation or pre-oscillation.

#### Wide Reaction Range.

It is well known that the grid circuit of a detector valve requires re-tuning after each variation of the reaction coupling or other feed back. In this receiver the reaction coil may be moved through 45 degrees without apparently affecting grid-tuning, provided the capacity reaction is simultaneously adjusted. The fact that this independent adjustment of magnetic reaction is possible must be responsible for the wide wave-band over which changes of reaction make it possible to tune. The actual receiver in question incorporates a feed back of L.F. impulses to the H.F. valve which is reflexed, the feed to the grid being via iron-core transformer and H.F. choke, whilst a third valve is used as a choke coupled low-frequency amplifier.

It is one of the most satisfactory circuits experimented with over a matter of some four or five years. The final arrangement is shown in Fig. II.

## ELECTRADIX BARGAINS No. 104

R.A.F. 2-VALVE No. 33 RECEIVERS.—All range Type in encls. mahogany case, D.E. Valves. Ready for use. L.T. and H.T. Batteries, 5/7/6. Post 2/6.

3-VALVE R.A.F. ENCL.—All range Type No. 138A, in encls. portable case, 3 D.E. Valves. Ready for use. L.T. and H.T. Batteries and Phones, £4 15s.

4-VALVE RADIO C.—Polar Receiver, in Vert., encls. pol. mahog. Cabinet with all B.B.C. and Daventry coils. All aerial tested and ready for use, £6.

5-VALVE R.A.F. PORTABLE RECEIVER.—Encls. B.B.C. type with H.T. and L.T. Battery and Loud Speaker, £6.

AMPLIFIERS. Marconi 3-valve L.F. Transformer, coupled, Selector for one, two, or three valves. Tested and guaranteed, £2 10s. Cost £18. Res. Cap. coupled with switch, £3.

POLISHED CABINETS. New Teak fitted ebonite panels, 13 1/2 in. by 11 1/2 in. by 5 in. For experimental panels, 9/- Marconi Slope type ditto, 12 in. by 12 in. by 8 in. base, 17/6. Portable 1 in. mahogany cases, 7 in. by 8 in. by 5 1/2 in., two hinges and lock, 5/6.

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Mfd.	Plain.	With Vernier.	Square Law.	With Vernier.
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.0005	4/-	5/3	5/-	7/3
.0003	3/-	5/-	4/6	6/6

TINY TOWNSEND BUZZERS. Highest note and small size. For sharp tuning, 3/6 each; cheaper model, 2/- Small Power Buzzers, 4/6. W.D. Tuners. Loose Couplers for fine tuning. 10-way tapping switches on Primary and Secondary. Rack ebonite mounted, 200/900 meters, 25/- Shunt Boxes, 45/-

600 POTENTIOMETERS. 350 ohms under panel type, 2/6. bargain. 600 ohms new, 4/9 each. 1,000 ohms 9/6. 3,500 ohms 12/6.

CONDENSERS. Mansbridge 2 mfd., 2/6; 1 mfd., 1/6; 1/36, 6d. 1 Jar Glass Dielectric, 20,000 volt, 2/6, post 1/3. Naval Laboratory Condensers, Mica Dielectric, 2,000 volt, 3 1/2 mfd. with all plugs in, 35/- each. Variable Condensers, .0015, Oil Dielectric, 2,000 volt, 20/- each. Post 1/3.

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V/47	20	10/12	2,000	£5 0 0	Mackie
129	30	15	3,000	£6 10 0	Vaucas
118	70	20	1,800	£10 0 0	L. and W.
140	80	11	2,500	£8 10 0	Mawdsley
17	100	18	1,300	£12 0 0	Vickers
62	110	26	1,300	£14 0 0	
139	100	36	450	£16 0 0	Verity
34	110	50	1,430	£17 0 0	G.E.C.
26	210	25	1,400	£24 0 0	Crompton

H.T. FROM THE MAINS. D.C. UNITS, EVER-READY SIZE for 200/220 volt supply, 3 taps, any ranges 50 to 120 volt, contain special filter, 35/-

A.C. PARTS FOR MAINS UNITS. Six-tap Rectifying Transformer, 25/- Condensers, 4 mfd., 6/6; 10 mfd., 15/- Power Chokes, 1,000, 1,400, 3,000 ohms, 4/6; 2 Electrode Rectif. Valves 15 m.a., 7/6; 30 m.a., 10/6. Complete Kit, £3 10s. Od.

DISTANT CONTROL FOR FILAMENT. Navy type Auto switch, positive on and off, any distance. Small, finely made, quite new, 12/6. In pol. mahog. case, 15/-

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2-VALVE RECEIVERS.—All Range Type as above, complete, ready for use, tested on aerial, B.B.C. with D.E. Valves, H.T. and L.T. Batteries, 55/- Post 2/6.

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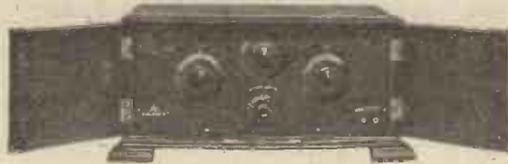
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30, 2/9; 40, 2/9; 50, 2/9; 60, 3/1; 75, 3/3; 100, 3/6; 150, 3/9; 200, 4/-; 250, 4/6; 300, 4/9; 400, 5/6; 500, 7/-; 750, 9/6; 1,250, 14/-; 1,500, 9/- ALL PARTS STOCKED.

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This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.  
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0003 4/11  
VERNIER 1/- each extra

Lightning Arresters, 1/- Wave-length Permanent Det., 6d. Red Diamond Ferrite, Detector, 2/-; Liberty, 3/6; Brownie, 3/-; R.L. 6/- Crystals: Shaw's Genuine Hertzite, sealed, 8d; Neutron Wray, 1/6; Dazite, 2/6. Spindled enclosed Crystal Detectors, on base, 1/-, 1/3, 1/6. Micrometer, 1/9; Service do. 2/9 (with crystal) P. Switches, 1/- Non-microphonous V.H. 1/3. Solid Rod Eb. 1/- Baseboard, 8d. 2-way Geared Coil Holders, 2/11. 3/11. Penton, Lotus, Polar, Newey stocked. Back of panel, W.L.L., 4/11; Kay Ray, 3/11. 20-v. H.T. Accumulator Unit—the top and all plates are removable, can be replaced or cleaned. The world's greatest bargain per 20 volts, 8/6. 4 drills for 1 h. fixing, 1/3. Phone Cords, 1/-, 1/3. L.S. do. 1/6, 1/9. H.T. & L.F. Leads, 4/- way, 1/11. Our old friends, Crown "Polo" H.T. Batteries, 60-volt (not one in a 1,000 has to be returned) will change our fans' Price 6/11. Adco. Error-ready, Siemens, Hellesens, 60-v. & 100-v., all 15 Batteries here (Columbia always stocked). Roll up in your thousands!

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**BARGAIN DEPT.**  
Huge quantities of window-rolled and goods which have been taken in exchange for sale at ridiculous prices. Bargains not sent by post.

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*Hundreds of readers of this Journal have expressed their satisfaction with workmanship and price of our cabinets*

*Specialist makers of Wireless Cabinets  
Caxton Wood Turnery Co.  
Market Harborough*

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Rotax High Tension Accumulators greatly improve Loud Speaker reception, eliminating the annoying noises caused by partly run down dry batteries and may be hired ready for use.

Our Low Tension Hire Service effects a considerable saving if you add the depreciation in value to the cost of having your own accumulator unskillfully recharged.

Here's a way of improving reception, saving money, time, and trouble for all valve set users who live within 12 miles of Charing Cross. Write now for particulars of the unique service. **RADIO SERVICE COMPANY, 105, Torrion Avenue, N.W. 5.** \*Phone North 0623, (3 lines).

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Back of Daly's Theatre  
Nearest Tube, Leicester Square.  
'Phone: Gerrard 4637.

## THE INTERPLEX.

(Continued from page 636.)

single circuit open), and filament and H.T. sockets for each valve. The general arrangement of components on the baseboard can be seen from the various photographs. It will be observed that a second transformer, a spare telephone step-down transformer, has been used here as the iron-cored choke, for which any reputable make may be used, provided its inductance is about 40 to 50 henries. The "Antipong" valve holders are mounted behind the transformer and choke, the space left at the rear of the baseboard being for the grid bias battery, which is held in position by two clips. A fixed condenser holder is provided across the primary of the input transformer, while a fixed grid leak of .5 M.O., mounted on its own connecting wires, will be seen between the valve holders.

### Operating the Amplifier.

If Fig. 11 is followed carefully, wiring-up should not present any difficulty, due care being taken with the spacing of wires carrying high and low tension currents. The input terminals 32 and 33 are connected to the transformer primary, and terminals 34 and 35, which are wired in parallel with the second jack, constitute an alternative output connection.

Regarding the grid bias connections, three flexible leads terminating in plugs are needed, one being soldered to filament negative lead, a second to IS of the input transformer, and a third to the free end of the grid leak.

As this unit is complete in itself, it will be more advantageous to consider here a few points regarding operation. The type of valve used will depend, of course, upon the voltage input at each stage and the degree of amplification required. Generally a power valve will be needed for the second stage, with suitable grid bias tapped off the bias battery at the back of the baseboard, this battery being common to both valves. If the slab type of battery, tapped every 1½ volts, is used, there is sufficient room for one having a maximum voltage of 18, which is ample for power valves dealing with quite large input voltages.

### Always Useful.

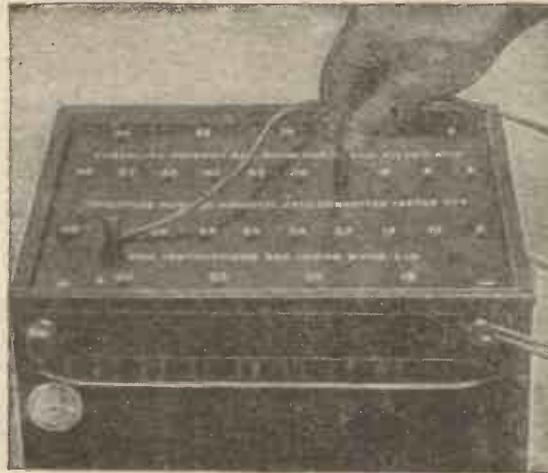
The control of filament and anode voltages is separate and distinct for each valve, and this, in conjunction with other features described above, constitutes a reasonably distortionless and powerful amplifier which, moreover, needs little attention. Once having made and noted the necessary adjustments of filament, anode, and grid bias voltages, all that need be done to bring the amplifier into operation is to connect up the input terminals, place the output plug in jacks 1 or 2, and turn on the required rheostats.

Although this unit is more or less fixed in design, a considerable amount of experimental work on A.F. amplification can still be undertaken with it, and, as a whole, it is quite a useful unit. In fact, the advantages of having such an amplifier always ready at hand are so great that the system could not be considered complete without it.

## TUNGSTONE 60 VOLT 3 A.H. HIGH TENSION FOR WIRELESS

NO CRACKLING OR PARASITICAL NOISES ON WIRELESS PHONES OR LOUD SPEAKER. NO FROTHING, FOAMING, HEAT and OTHER TROUBLES

Tungstone (Patented) Tapping-Off Cell-Connector. By means of the Wander Plug supplied free, Tappings can be taken off as required at any two-volt cell, or any varying series of cells.



TUNGSTONE  
60 Volt 3 A.H.  
is more efficient  
than a 100 Volt  
Dry Battery.  
Will outlive  
hundreds of  
Dry Batteries.

TUNGSTONE at £5 15s. includes a Free first partial charge and a Polished Teak Box, also Glass Filler—only 1/11 a volt for a 3 a.h. Inclusive weight 23 lbs. only. Carriage Paid in U.K. SAVES BUYING A SELECTOR SWITCH COSTING £1-17-6: SAVES COST OF FIRST CHARGE

COMPETITORS sell at 3/3 per volt, including a first charge; also a Selector Switch necessary costing £1 17s. 6d. making total cost of £9 15s.

TUNGSTONE creates a World's record for lowest price, minimum weight (only 23 lbs.) portability, accessibility, compactness, perfect rubber insulation, long periods between re-charges, no self-discharge nor sudden drop of voltage. Ideal for Hot Climates, and can be sent Overseas with Free first partial charge, without acid.

Under normal working conditions the calculated plate life is at least Four Years, and for a 3 or 4 valve set estimated to require recharging about every three months. First FREE charge lasts one month.

TUNGSTONE High Tension 60 Volt Battery 3 a.h. is sold in the United Kingdom on Monthly payments over extended period. Apply for particulars. Further interesting information on points of this advertisement are to be found on pages 58, 59, and 67 to 73 of the Illustrated Booklet "Photography tells the Story" which will be sent free on application to the—

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MEANS DOUBLE POWER  
For use in both H.T. less and ordinary circuits, B.E., D.E. and '06, 10/6 to 14/-  
Send card for Radio press reports and booklet. This valve can be used in any set without alteration and will give 50% to 150% increase in power.

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By specialists skilled in every form of accurate and intricate coil windings.

Headphones, Loud Speakers & Transformers rewound, remagnetised and reconditioned

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Owing to the rapid growth of business in our REPAIRS Department, we regret that we find it temporarily impossible to maintain our 24-hours' service. Pending extension and re-organisation, a delay of a few days may be unavoidable.

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S.E.18

Proprietors: Oliver Felt Control, Ltd.

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Price in Oak - - - - - £6-6-0  
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Write for full illustrated leaflet 123a giving all particulars.



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Newcastle - on - Tyne: TANGENT House, Blakett Street.

**CORRESPONDENCE.**

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.

**"P.W." "ULTRA" ONE-VALVER.**

The Editor, POPULAR WIRELESS.  
Dear Sir.—Re the "P.W." Ultra Auto Coupler Selective 1-valver, POPULAR WIRELESS, dated September 4th.

I have assembled this set, and I consider the circuit is an ideal one for the all-round listener.

On test Bournemouth and Cardiff came in excellent at 35 and 45 miles respectively, Swansea, Dublin and Newcastle at reasonable strength, and twelve over-sea stations at audible strength. I consider the set, if well-built, will be useful for the occupier of a flat, or in other spots if an aerial cannot be used, more especially if the owner is situated within 5 to 10 miles of the nearest transmitter. I have obtained, at 35 miles, audible results without an aerial or earth. Of course this is mostly due to the Iraucic Auto Coupler Coil (Ultronic). These results, without aerial, were brought in on 24 volts H.T. and 2. I.T. on a Marconi D.E.2 valve.

Yours truly,  
R. J. HANSFORD.

203, Marston Road,  
Sherborne, Dorset.

**CONCERNING DE GROOT.**

The Editor POPULAR WIRELESS.  
Dear Sir,—With the passing of De Groot we poor "low-to-medium-brows" are deprived of one of our only too few sources of wireless enjoyment.

Some of the money which the E.B.C. expends on "stunts" might well be devoted to the retention of the services of one who has given delight to thousands of licence holders. Let us have less of divers-at-the-bottom-of-the-sea, mushy relays of American programmes, and the like, and more of rational music and song which the plain man can appreciate.

To "write to your M.P. about it" would probably produce but meagre, if any, results. We can, however, write to the B.B.C. about it, so please urge your readers to write en masse—at once; a postcard would suffice, and make it clear to Savoy Hill that a large section of us is very fond of what it likes!

We count on the active support of "P.W." to help us through what appears to be the initial stages of an acute crisis in the affairs of those whose only medium of expression is through the columns of "Britain's Favourite Wireless Journal."

Yours faithfully,  
J. WAYMAN.

167, Trinity Road, S.W.17.

**INTERESTING TESTS.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—I was extremely interested to read Mr. Leslie Miller's letter in your recent issue, and as I have had totally different experience with the same class of test, I think it may interest you to have the results thereof.

The apparatus, consisting of a D.E. 5B valve (which, as you know, has an amplification factor of 30) together with, first, a Weston galvanometer and, secondly, a Weston milliammeter registering on full scale deflection 5 milliamps. by tenths, was set up on a glass plate resting on a wooden table on a floor covered by linoleum, so that there can be no question of insulation. The H.T. was taken from an Exide accumulator of 50 volts.

The tests were made with varying lengths of dry wood, ranging from about 2 in. to 3 ft., and in each case there was hardly any deflection of the needle. The effects of static charges were negligible, and I, therefore, suggest that Mr. Miller was using damp wood for his tests, because in my experience dry wood is almost as good an insulator as ebonite. There will be a slight leak, of course, but nothing like that experienced by Mr. Miller, and if the wood is at all damp, the leak will be greater in proportion to the dampness of the wood.

Was Mr. Miller using insulated or bare wire for his tests? If the latter, the deflection of the needle would probably be caused through contact with his body.

Yours faithfully,  
E. H. WOOD.

"Broadway House," Sandown, I.W.

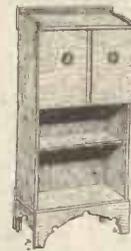
**EFFICIENT INDOOR AERIAL.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—I enclose full particulars and instructions how to make and fit up a novel and very excellent indoor aerial, which I have made and used with excellent results.

I hope that this will be of some use to you, and of interest to some of the readers of your very useful paper.

(Continued on page 654.)

**WIRELESS 'R' CABINETS** will keep your set & all accessories compact

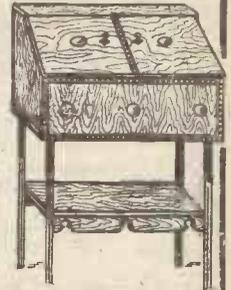


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44 in. high.  
Carriage Paid Great Britain.  
Top inside measure 14 in. high  
x 18 in. wide, 8 in. deep. Under  
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**LARGER SIZES** same height,  
2 1/2 in. wide, **35/-**  
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Inside measure.  
Two doors to bottom, 4/6 extra.

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Hinged top with two  
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high back. Made of  
hard wood, light,  
medium or dark oak  
finish.

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5/-, Re-magnetising only 2/-. All work guaranteed.  
Postage extra. Write for trade terms.—H. B. P. Co.,  
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with spare time who wish to substantially  
increase income required where we are  
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With our Alarm Clock Attachment (price 2/9) you  
can stop and start your set automatically at any  
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H.T. ACCUMULATORS.** Anything Wireless.  
Send a list of the parts you are requiring, and we  
will send you a quotation on monthly payments.  
**H. W. HOLMES, 29, FOLEY STREET,  
Phone: Museum 1414. Qt. Portland St., W.1**

**SAVE YOUR VALVES**

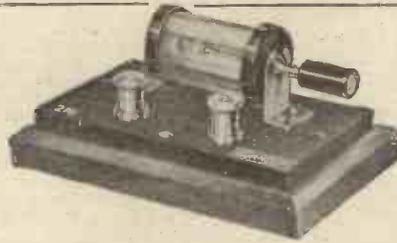
PRICE complete 2/-  
New Bulbs 6d. each



**HUNTS "SAVEIT"**

**SAFETY FUSE COSTS PENCE  
A. H. HUNT, LTD.,**  
**WANDER PLUG SAVES POUNDS  
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**A BURNDEPT  
QUALITY  
COMPONENT  
OF REAL  
INSTRUMENT  
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**T**HIS unusually efficient crystal detector will appeal to all users owing to the ease and certainty with which adjustments are made. Instead of "pushing" and "pulling" to get best signal strength, just rotate the ebonite handle to obtain micrometer screw adjustment of the gold catwhisker. All parts of the crystal can be explored, and the catwhisker stops just where you put it. The crystal is the new BURNDEPT Synthetic and is sensitive all over; all working parts are enclosed in a glass tube and can be assembled (without tools) right or left handed as desired.

No. 215. Crystal Detector Assembly, for mounting on panel, and Burndept Synthetic Crystal in special cup. Price 4/-

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"LET YOUR FRIENDS  
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- TYPE 202  
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PRICE 7/6 5/9
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POWER VALVE  
PRICE 10/ 9/
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6 VOLT D.E.  
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4 VOLT D.E.  
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**YOU can now buy a British made Dull Emitter valve for 5/9, and there is no deterioration in quality. The same high standard of Voltron excellence is being maintained—but increased production and the substitution of machinery for expensive hand labour have lowered costs enormously. You get the benefit.**

W. G., of Burnage, Manchester, writes of Voltron Valves:—"I feel I cannot speak too highly of them. My set has been brought to life with them. I thought my results were good enough before, but it was dead compared with my present results."  
**Close electrode construction, a filament of high emissive value and Voltron special 3 stage pumping ensure absolute uniformity, freedom from micro-phonous noises and a long life of full clear-toned service. The guarantee is exceptionally generous.**

# VOLTRON

"Buy British and be Sure"

Look for the triangular box.



Ask your dealer for Voltron Valves or send your order direct to the manufacturers. Valves sent post free by return. C.O.D. 4d. extra. When ordering state whether H.F. Detector or L.F.  
**VOLTRON COMP ANY.**  
189, City Rd., London, E.C.1

## The New J.B. TRUE TUNING S.L.F.

is the latest development in SLOW MOTION CONDENSER Design.

The Vanes are designed on a new principle—developed to fall in line with the latest method (Geneva Plan) of allotting wavelengths to transmitting stations—a principle which gives the most even spacing of stations possible, obviating any crowding at the upper end of the scale, and marking the new J.B. TRUE TUNING S.L.F. as the Condenser of the future.

This new model is provided with a Double Reduction friction drive, giving a ratio of 60-1. The friction surfaces are all metal, engaging with a vice-like grip, which prevents all possibility of slip. The use of Ball Bearings cuts down friction to an absolute minimum, permitting a wonderfully smooth control, and obviating the disadvantages of "static" friction so usual in the ordinary type of condenser. A noticeable feature is the complete absence of backlash. A coarse and fine movement can be obtained, i.e., the body of the condenser can be moved independently of the friction device, for quick search. One hole fixing, specially designed for rigid mounting, this new model combines all the excellent features of the ordinary J.B., S.L.F.

Retail Prices: '0005 mfd., 16/6; '00035 mfd., 15/6; '00025 mid., 15/-



2" Bakelite Knob for Slow Motion Control Device.

4" Bakelite Dial for coarse tuning.

(Patented)

# JACKSON BROS.

8, POLAND ST- OXFORD ST  
LONDON - W.1  
(First Floor)

Telephone: GERRARD 7414



No. 4730.

## “THEY STILL READ 55—56 VOLTS AFTER 12 MONTHS”

Amateur Experimental Stn.: G6YR  
Nr. Harrogate, Yorks.

Dear Sirs,

Perhaps the following account of the life of some of your batteries may be of interest to you.

In Sept., 1925, I purchased 4 of your 4780 dry batteries, totalling, of course, 240 volts. These were obtained because in my present location I have absolutely no other method of obtaining High Tension for my low power transmitter. I have kept a watchful eye on them and was quite prepared to have another set to buy after about, say, six months, but I have been amazed at their remarkable life, which so far is 12 months. Each battery still reads about 55 to 56 volts.

They have survived two serious shorts, which would have ruined any ordinary battery; and still continue to give service. My DX may be of interest as, obviously, the h.t. supply plays a big part in results. I have been in two-way communication with Finland, France, Belgium, Holland, Italy, Germany, Denmark, Sweden, Ireland, and Brazil, with an input of 2 (two) Watts, except for Brazil, when I added some more batteries and used 4.8 watts (four point eight). I have also been heard in New York when using 3½ watts, and my telephony signals get out reliably to about 300 miles.

The transmitting circuits are normal ones, a wave-length of 45 metres is used and a Hertz radiator, badly screened, serves as antenna.

—a letter received from a  
user of Columbia Batteries

# Columbia Dry Batteries

Ask any good dealer for full particulars or write to us for Columbia literature.

J. R. MORRIS,

15/19, Kingsway, LONDON, W.C.2.

Telegrams: Colcarprod, London. Telephone: Gerrard 3038.

Scottish Representative:

John T. Cartwright, 3, Cadogan St., GLASGOW.

## CORRESPONDENCE.

(Continued from page 652.)

Firstly, I purchased at a garage an old “Ford” ignition coil; this article may be purchased at most garages for about eighteenpence.

The first step is to take it carefully to pieces. Having done this, there will be found a small oblong article embedded in the pitch inside (apart from the coil). This is a condenser which consists of two strips of tin-foil (each piece of foil being between two pieces of waxed paper), rolled up. This is the only material needed, except a few rubber bands and some nuts and bolts and washers.

The condenser must be carefully unwound, care being taken to keep each piece of foil between two pieces of waxed paper. This being done, it will be found that each strip of foil, between the waxed paper is of considerable length, long enough to stretch across a moderate-sized room.

A hole should be made right through the strip. This should be carefully made, to avoid tearing the strip. A screw with a washer next to the screw-head should be inserted in the hole, a nut is screwed on the screw with a washer. These washers are put on to prevent tearing the paper. A rubber band is next fixed to the screw. This is to suspend the strip from the picture-rail or wall.

At the other end of the strip a hole is made, a screw with a large washer at its head is threaded through the top layer of waxed paper, a tight-fitting washer, or, better still, a small piece of brass tapped the same B.A. as the screw is screwed up tight on to the waxed paper. This is to make contact with the foil. The screw is now put through the hole in the foil, and, as before, a piece of brass or washer is screwed up as tightly as possible without tearing the foil; and lastly the screw is put through the waxed paper and a washer and nut put on.

A rubber band and a piece of wire is fixed to the screw; the wire is for the lead-in, and the rubber band to suspend the strip.

The other strip is prepared in the same way, the lead-in is taken in the same manner as from a twin-wire aerial. The finished article will be found most efficient. I get excellent results with this aerial here at Hendon with a one-valver using reaction.

Yours faithfully,

J. S. LONGSTAFF.

“Westoe,”

Brent Green, Hendon,  
London, N.W.4

### A “P.W.” ONE-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was rather interested in your reply to B. P. S. (Warrington), on October 9th, when he says he can only hear 6 V and 2 Z Y on his 1-valve set. Is he living in an unfavourable spot or is the circuit he has used not so good as it might be? Since I made up a 1-valve set, published in “P.W.” No. 193, I have discarded my 2-valve set, for I can plainly hear with four sets of phones connected London, Bournemouth Cardiff, Davenport, Birmingham, Newcastle, Manchester, Glasgow, Aberdeen, Hamburg, Brussels, Radio-Paris, Hilversum, San Sebastian, Madrid, Dublin, Rome, Oslo, and several other foreign stations which I cannot discern!

Yours faithfully,

W. F. WILBEE.

Botley, Hants.

### RESULTS WITH THE “RANGER.”

The Editor, POPULAR WIRELESS.

Dear Sir,—Would you be good enough to allow me a little of your valuable space in which to congratulate you on your production of the “Ranger” 2-valver?

Of all the sets of 2 or 3 valves I have tried, I can honestly say that the “Ranger” beats them all. Here are some of the results obtained on Wednesday night, October 27th: Edinburgh (local), excellent on L.S.; London, good on L.S.; Hamburg, very clear on L.S.; Bournemouth, fairly good, but liable to fade; Glasgow, excellent on L.S.; Frankfurt-on-Main, good and very clear on L.S. Dundee also comes in on L.S., but is jammed by the local station.

I may say I did not have to resort to the use of phones to tune in any of the stations, and all could be heard anywhere in the room, which is roughly 12 ft. square.

Perhaps a few particulars of my set might be of interest:

A.T.C.—Ormond square law, not low loss.

Grid leak.—Dubifier 25 v. is found to be the best for all-round work (DX included).

Choke coil.—2 hank wound coils of 250 turns each, 28 S.W.G. wire, and connected in series.

Valves.—Det. is Ediswan A.R.D.E. L.F. Cossor Power, old type, takes 5 amp.

Also two fixed condensers, one .006 and the other .01, are connected in parallel and are across the loud-speaker terminals.

Wishing “P.W.” every success.

Yours sincerely,

“A RANGERITE.”

Edinburgh.

## EVERY LOUDSPEAKER

# DESERVES MULLARD MASTER VALVES

— Ask for —

Mullard P. M. Power Valves.

## “FROM SCHOOL TO PROFESSION”

via Wireless.

No long expensive apprenticeship, just RADIO MARITIME TRAINING, and your son will be placed in a responsible position. Within twelve months the capital invested is returned in his salary as a Wireless Operator. But it must be the TRAINING WITH THE WIRELESS SERVICE BEHIND IT. Write to Radio Maritime, Ltd., 15, Broadway Chambers, Hammersmith, W.6; or to 26-27, St. Mary Street, Cardiff.

## PICKETTS-CABINETS

For every Constructor.

Estimates to your OWN sizes and LISTS FREE.  
Picketts Cabinet (P.W.) Works, Bexleyheath.

## Valves Repaired

AS GOOD AS NEW!!

**HALF PRICE** (Except Weco, S.P.'s, and low capacity types). Minimum D.E. Current 0.15 amps when repaired.

**ALL BRIGGS & DILL EMITTERS** Listed at less than 10/-.

Minimum charge - 5/-.

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## HEADPHONES REPAIRED

Re-wound & re-magnetised 5/- per pair. Loud Speakers repaired 5/-. Transformers re-wound 5/- each. All work guaranteed and tested before delivery.

Write for Trade Prices. Phone Clerk. 1795.  
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FOR MOUNTING ON WOOD.  
Orders under 1/- send 1/4d. postage.



PERFECT INSULATION  
Two required for each hole.

NUMBER 0 1 2 3 4 5 6  
Hole in Bush .6BA, 4BA, 2BA, 1/4", 5/16", 3/8", 7/16"  
Price each: 1d. 1d. 1d. 1d. 2d. 2d. 2d.

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Waldram Road, Forest Hill, London, S.E.23  
TRADE SUPPLIED

## PRIVATE GREETING CARDS. AGENTS

(either sex; any age) wanted. Largest Manufacturers in Great Britain offer Magnificent FREE SAMPLE BOOK, containing WONDERFUL NOVELTIES—VELVET FIGURES with life-like GLASS EYES, NOTE PAPERS, DAINY CALENDARS FOR PURSE or HANDBAG, BLOTTER, and GREETING CARDS for every taste, and DELIGHTFUL COLLECTION OF CALENDARS. PROFITS AND PRIZES WILL AMAZE you. Write:

**ALL-BRITISH CHRISTMAS CARD CO.**  
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## AERMONIC VALVE HOLDER

Don't pay more. You can't buy more. New design eliminates losses. New springing system gives better results.

**JAMES CHRISTIE & SONS, Ltd.**  
246, West Street, SHEFFIELD.  
London Agents: A. F. BULGIN & CO., 10, Cursitor Street, London, E.C.4.

**REPAIRS** Headphones and Loud Speakers Re-wound and Repaired. Prices from 3/-. Delivery two days. All work tested on crystal and valve set. 12 months' guarantee. Postage paid.

**MIDLAND PHONE REPAIR SERVICE.**  
213, Slade Road, Erdington, Birmingham.

LITTLE WIRELESS GADGETS

# MAP

THE VERNI-NOE, 6d.  
Postage 1/4d. each.

**M.A.P. Co., 246 Gt. Lister St. Birmingham.**

**"NO CRYSTAL SET IS COMPLETE WITHOUT THIS WONDERFUL ATTACHMENT"**

*Extract from an entirely unsolicited testimonial recently received from a customer situated 80 miles from Daventry.*

The WONDERFUL ATTACHMENT referred to is the

**MAGNETIC MICROPHONE BAR AMPLIFIER**

(Patent No. 248581/25.)

Not only will this marvellous device give really good LOUD-SPEAKER RESULTS from CRYSTAL RECEPTION of average strength, but it is also the ONLY means of increasing the strength of weak signals in head-phones other than by using valves.



(Two-thirds actual size.)

NOT a Microphone Button.

**NO** Valves, Accumulators or H.T. Batteries. Fragile parts. Distortion.

Simple as A B C.

Almost as good as a 2-valve amplifier.

**A BOON TO DEAF PERSONS**

**EQUALLY EFFICIENT ON VALVE SETS**

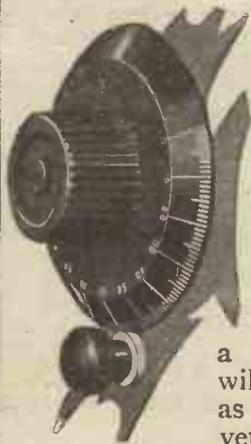
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**ILLUSTRATED LISTS FREE**

**COMPLETE AMPLIFIER**  
as shown PRICE  
post free **38/-**

**DRY BATTERY** lasting over  
three months 4/- extra.

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The Original  
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An inexpensive friction tuning device giving excellent results.

The "Midget" can easily be fitted to all sets in a few moments, and it will work equally as well as many higher priced vernier controls. All metal parts heavily nickel-plated, highly polished Bakelite knob and best quality rubber washer. It is self-adjusting and will add 100% efficiency to your set.

Complete with full instructions for fixing.

**9d.**  
Each.

Full particulars of other Radio Products upon request. "Belden" Battery Cords, plain or fused, 5, 6 or 7-way. Frame aerial wire, enamelled and new braided type. Headphone and Loud Speaker Cords. Terminals, insulator hooks, etc. *Trade enquiries invited.*

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— electric  
light in your  
home—?

**IF** SO WHY NOT  
GET YOUR  
H.T. SUPPLY  
FROM THE MAINS?

You can make sure of a perfect and constant High Tension supply, entirely free from crackling, hum or ripple.

**TUDORADIO  
MAINS UNITS**

can be connected to the nearest lamp socket. Current consumption is negligible, and expensive and troublesome batteries can be done away with once and for all. There are two types: D.C. for direct current and A.C. for alternating currents. There is no risk to your valves or set with either of them. Ask your dealer for details or apply direct to:



**TUDORADIO  
JUNIOR  
D.C.  
MAINS  
UNIT**

Output volts 100  
Price **35/-** complete

**THE TUDORADIO  
COMPANY, LIMITED,**  
Tudor Works, Park Royal,  
London, N.W.10.  
Telephone: Wembley 41.

**OTHER MODELS FOR OTHER SETS**

TECHNICAL NOTES.

(Continued from page 602.)



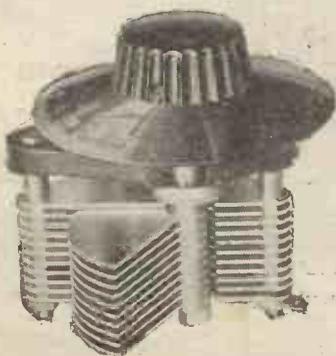
With the "PEERLESS" Resicon Condenser

(Reg. Trade Mark 457357)

you can tune over a greater range with a given inductant than with many condensers having double the stated capacity. The plates of the "PEERLESS" RESICON CONDENSER are shaped to give uniform tuning over the whole scale, in both aerial and anode circuits—the minimum capacity being very low. A precision instrument. Electrical loss exceedingly low. NO side strains. Moving plates revolve freely and without backlash. For Super Heterodyne receivers the "PEERLESS" RESICON CONDENSER is ideal. Operates so finely that vernier is almost unnecessary. One 1/8 inch hole only needed for panel fitting.

Capacity.

- 00025 Complete with Dial . . 15/-
- " (With Dial & Vernier) 17/6
- 0003 Complete with Dial . . 16/6
- " (With Dial & Vernier) 19/-
- 0005 Complete with Dial . . 18/-
- " (With Dial & Vernier) 20/6



From all Dealers or direct from

The Bedford Electrical & Radio Co. Ltd. 22, Campbell Road, Bedford

place (whether it were originally good, bad or indifferent), its life will be considerably shortened, for a "dry" battery is one in which—although it is not strictly "dry"—there is a very limited amount of moisture. As soon as this moisture is all dried out, and the dry battery is really dry, its useful life is at an end. Special precautions are taken by the makers to prevent, or at any rate to retard, the drying out of the moisture in the batteries; these methods include the employment of special chemical ingredients, and the use of particular means for sealing up the cells when completed. The batteries will dry out quite rapidly enough in ordinary use, but if they are kept in a warm place, the drying will naturally be greatly accelerated. Therefore, always keep your dry batteries in a cool—though not in a damp—place.

**Life of H.T. Battery.**  
Of course, the life of the battery will also depend upon the amount of current which is drawn from it. A dry battery, like an accumulator, has a definite "ampere-hour capacity"; this depends to some extent upon the actual discharge rate, and upon the "rest periods" between discharges. But it can only deliver a total quantity of electricity which depends upon the nature and quantity of the chemicals within it. A battery used with a set consuming 12 milliamps. in the plate circuits will not last as long as in one consuming a smaller plate current, other things being equal. In this connection, I would again remark upon the importance of using correct grid bias, which may have the effect of greatly economising H.T. battery current.

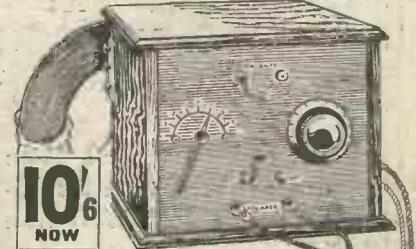
**Concerning Lay-out.**  
In laying out the components of a set, although compactness is greatly to be desired, it is important to remember that this should not be secured at the expense of efficiency. There is a danger, when packing the components close together, of unwanted interaction being encountered, and of loss of efficiency from that and from other causes.

The necessity of arranging coils and transformers at right angles to one another is well known and does not need to be emphasised here.

**Unexpected Losses.**  
The efficiency losses due to the presence of conducting masses in too close proximity to coils are not, however, always so carefully borne in mind by the amateur designer. This is particularly important in the case of the H.F. components, such as the H.F. coils. If any considerable amount of metal is present, either in the construction of the coils or in their immediate vicinity, eddy-currents will be set up in the metal, and these currents will represent loss of energy from the H.F. coil which may make all the difference between efficient and poor working of the set as a whole. It should also be remembered that the metal of other components, for example the shield of an L.F. transformer, will likewise act as a "sink" of energy from the H.F. coils if in too close proximity.

2-VALVE AMPLIFIER, 35/-  
1-Valve Amplifier, 20/-, as now; Valves, D.E. 06 7/-; Headphones, 8/6 pair; new 4-Volt Accumulator, 13/-; new 60-Volt H.T., guaranteed, 7/-; 2-Valve All-Station Set, £4. Approval willingly.  
Write for free bargain list.  
P. Taylor, 57, Studley Rd., Stockwell, London

GRAVES  
2-VALVE  
LOUD SPEAKER BARGAIN.



10/6  
NOW

**This highly efficient 2-Valve Loud-Speaker Set is the finest wireless value ever offered.**  
It gives a volume and quality of tone unattained by any instrument of a similar price and is the essence of simplicity. Fitted with coils covering all the British wave-lengths, including Daventry.  
**THE CABINET** is of beautifully polished Oak, & all components are of the highest quality. Dull Emitter Valves with patent valve holders, &c.; H.T. Battery, 2-volt accumulator and complete Aerial Outfit; **LOUD SPEAKER** of exclusive design with unique magnetic system and 1/2" improved mica diaphragm. Price £7:17:6



**TERMS:** Our Bargain Price is for deferred payments. Send 10/6 now, & complete purchase in 14 monthly payments of 10/6. If you wish to pay cash, 5 per cent discount is allowed. Catalogue Post Free. Up-to-date Crystal & Valve sets at keenest prices.  
J. G. Graves Ltd. Sheffield.

Of proved efficiency  
Fulllest Approval

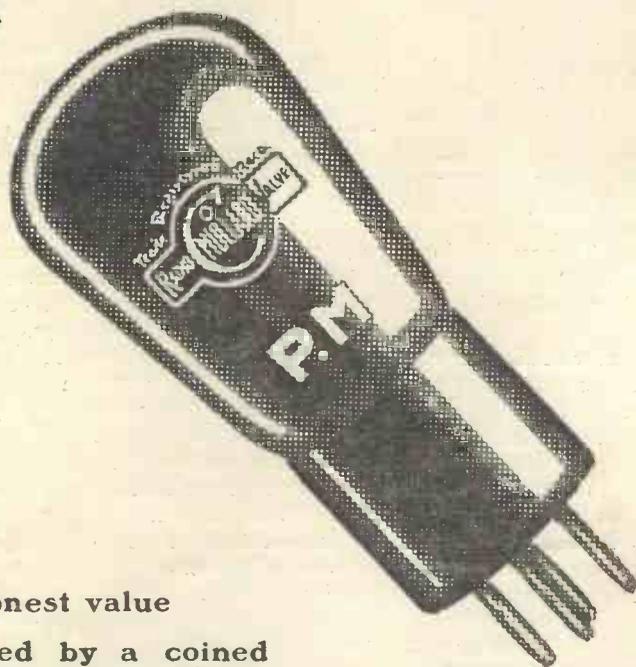
**EBONITE PANELS**  
OR STRIPS, ETC., DESCRIBED IN THIS ISSUE (OR ANY OTHER) CAN BE OBTAINED IMMEDIATELY THROUGH ANY TRADER FROM—  
**TRELLEBORGS EBONITE WORKS, LTD.,**  
AUDREY HOUSE, ELY PLACE, LONDON, E.C.1.

**Wet H.T. Batteries**  
(Leclanché Type)  
Cheapest in long run. Each cell gives 1.4 volts. Full instructions sent with each delivery. Price per dozen cells, complete, 3/9. Alternatively: Zincs, 1/-; Sacs, 1/6; Jars, 1/3 per dozen. Carriage extra. Orders for £1 and over carriage paid. Trade enquiries invited.—Wet H.T. Battery Co., 23, Coldharbour Lane, Camberwell, S.E.5. Phone: Brixton 2539.

**Hale Receiver Cabinets**  
House a good set in a quality cabinet  
That means a Unica Cabinet! For the Hale Receiver, designed by Mr. P. W. Harris, there are two types available—In oak In Mahogany 24/6. (Prices include base-board.) Sent under C.O.D. system.  
**Unica Cabinet Co., 73, Camden St., N.W.1.**  
G.A. 6237

**EASY PAYMENTS** Finest 2-valve amplifier set, including loud speaker, 120 H.T., D.E. valves, £7 10s.; or 18/9 down and 11 instalments of 15/-.  
**CASH BARGAINS.**  
Amplifiers, 17/6 and 21/-; Phones, Telefunken type, 13/-; Fr. T. Houston, 11/-; Good H.T. 60-v., 5/9; or 4-v. (laboratory test), 3/9 doz. Accumulators, with 12 months' guarantee, 2-v. 40 Ignition, 8/3; 4-v. 40, 15/-; 6-v. 60, 29/-; Valves: Radio Micro 06, 5/6; 2-v. 25, 5/6; Power 4-v., 8/9 or 11/9. Wonderful Metal Valves, 2-v. 2, 5/-; 2-v. 06, 6/9; 2-v. 5. Power 8/6. Transformers: Orox, 3/5; Habana, 3/6; Radiolys, 3/9; Fr. T. Houston, 8/3; Brunet, 7/9. Also Ferranti, Eureka Formo, etc. Everything in wireless reliable and cheap. Satisfaction or cash refunded.  
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# WE CALL OURS A FILAMENT



Sheer honest value

Not called by a coined name that means nothing.

The first filament made to consume only one-tenth ampere and still unequalled.

Its great length and strength give you 3 times more for your money. Can only be obtained in Mullard P.M. Valves.

ASK FOR THE VALVES WITH THE WONDERFUL MULLARD P.M. FILAMENT.

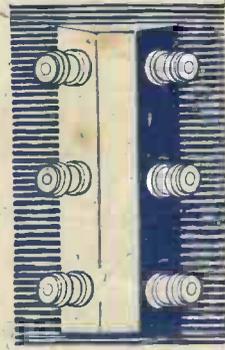
## THE UNBREAKABLE FILAMENT

That defies all but the roughest handling

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**THE · MASTER · VALVE**

ADVT. THE MULLARD WIRELESS SERVICE CO. LTD.,  
MULLARD HOUSE, DENMARK STREET, LONDON, W.C.2



## THE ODDS ON SUCCESS

That gratification of personal vanity which we call "success" depends not only on our individual ability for its attainment, but to an equally effective degree on the materials which we choose as being of the greatest practical assistance to our effort.

When we build our wireless set, however, this mechanical element assumes the superiority, for we follow certain definite constructional lines and find little scope for our own initiative. Therefore, based on the perfection of the various component parts, the odds are greatly on the side of success.

Theoretically this may be sound but in practice we find that it is not the perfection of any single instrument that counts but also its ability to function correctly in relation to the remaining components with which it is to co-operate.

Designed to fulfil these requirements in every way, the R.I. Multi-Ratio Transformer has almost completely reformed present day audio-frequency amplification as far as quality and power of reproduction are concerned.

Apart from its value as an ordinary transformer, it offers all the advantages of a number of different ratios and impedance values — enough to satisfy the demands of any circuit and any valve.

With its use the odds on successful audio-frequency amplification are decidedly heavy, so much so that the question of odds hardly enters into the

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