

**AUTOMATIC VOLUME CONTROL FOR BEGINNERS** (See Page 263)

# Popular Wireless

Every Wednesday  
PRICE  
**3d.**

No. 570. Vol. XXIII.

May 6th, 1933.

## HEAR ALL CONTINENTS ON



# The H.A.C. SHORT-WAVER

**ALSO THIS WEEK**

## HOW TO MAKE THE DOUBLE D.T. POWER PACK

AND TELEVISION PROGRESS  
□ □  
WONDERS OF B.B.C. RESEARCH  
□ □  
ECKERSLEY EXPLAINS  
etc., etc.

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# 37/6

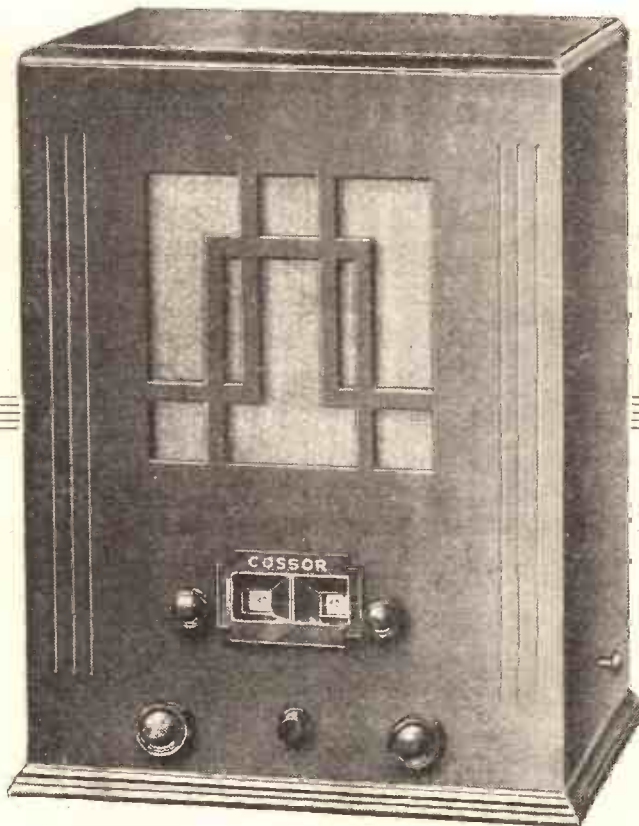
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Name ..... My usual Retailer is .....

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Models 336 and 338 are available for use on A.C. Mains only, 200 to 250 volts (adjustable), 40-100 cycles.

# POPULAR WIRELESS

**THE FIRST AND FOREMOST RADIO WEEKLY**  
 Scientific Adviser: **SIR OLIVER LODGE, F.R.S.** Chief Radio Consultant: **P. P. ECKERSLEY, M.I.E.E.**  
 Editor: **N. F. EDWARDS.**  
 Technical Editor: **G. V. DOWDING, Associate I.E.E.**  
 Assistant Editors: **P. R. BIRD and A. JOHNSON-RANDALL.**  
 Chief of Research Department: **K. D. ROGERS.**

*The Paper that Made Wireless Popular*

EUROPE'S GIANT  
 YOU AND ME  
 AMERICAN NEWS  
 MY CONFIDANT

## RADIO NOTES & NEWS

XMAS ISLAND  
 NEW SOCIETY  
 LET'S WRITE  
 TALKING OF BIRDS

**A Notable P.-M.-G.**

IT is no mere *cliche* to say that by the death last month of the Rt. Hon. F. G. Kellaway, P.C., radio has sustained a great loss—radio both commercial and "broadcast." For this man had the gift of vision beyond the ordinary and obvious.

On being approached by the leading radio manufacturers he at once threw open the ether to a broadcasting service as we knew it in 1922, and abolished the farce of Writtle's fifteen minutes a week. No doubt the permanent officials fainted, but the essential radio services are still working without let or hindrance by the B.B.C.

The public owes him a debt of gratitude which I do not think is recognised.

**Europe's New Giant.**

THE attack of the sponsoring forces which began on the south, in France, is to be duplicated on the west by the Athlone station, to which end very business-like arrangements including a London office, are going forward.

Then there is the question of the Luxemburg giant of 200 kw., which cannot pay for itself unless it sells its transmission time. One can only hope that our broadcasting authorities will remain firm and not permit even the thin end of the wedge to find an entrance—at least, that is how I myself feel about the matter.

**S.-T. Prefers Push-Push.**

JOHN SCOTT-TAGGART in the May "Wireless Constructor" describes with his customary vigour a new set on the Q.P.P. system, which he insists on calling the "Push-Push Five."

His reasons for this new nomenclature you will find interesting and stimulating. A propos of this, the same issue contains a complete review of Push-Push parts by our own Mr. Rogers. S.-T.'s special feature, "From My Armchair," is rapidly becoming an institution, and in this month's number maintains its high level of excellence.

**Something to Strive After.**

GREAT as is the influence of "P.W.," and great as is the confidence which writing for such a paper inspires in my inferiority-complexed bosom, I have still far to travel in the direction of supreme self-complacence before I can reproduce the spirit of the following gem which appeared last month over the name of a certain "radio critic."

"I asked for Sir Hamilton Harty the other day, and here he is to-night conducting

tunes and some of the new rhythmic compositions; he is interested in science but wants it stated in plain English; in economics, but demands an expositor who is nearer practice than theory.

He needs relaxation from the cares of modern life, work and tax-paying, but he is not inclined to be browbeaten or spoofed by professors in soft jobs. He will listen to human beings. And he is no fool.

**American News.**

THE Radio Corporation of America has bought the assets of the De Forest Radio Company for 500,000 dollars. The De Forest Co., besides owning many patents, has a controlling interest in the Jenkins Television Corporation. (By the way, in my notes for April 22nd, Mr. Owen D. Young's christian name was erroneously printed "Oliver.")

It is claimed for Miss Anna A. Nevins of the U.S.A., that she was the first woman wireless operator. This lady entered the service of the De Forest Co. in 1906

**Death of Radio Engineer.**

HERR WALTER SCHAEFFER, Chief Engineer of the Reichs Rundfunk-Gesellschaft (the German B.B.C.), who was formerly the head of the Telefunken Co.'s transmitter laboratory, had to leave his job last month because of his Jewish origin. A few days later he and his wife took their lives. I have no printable comment to make about this.

**My New Confidant.**

THE spiritual successor of my friend The Man of the Iron Bodstead has appeared. He is of Ashford (Kent), and I take his name to be Fubbs, Tubbs, or Jubbo, according to the way you read the signature.

Mr. Jubbo appears to be obsessed by a grievance against a piano-tuner who left Ashford and went to Canterbury in 1916, but his letter has several heated references to a howling dog, a loudspeaker and a tool-

*(Continued on next page.)*

### SERVICE!

**SIR OLIVER LODGE—the Inventor of Tuning—is the Scientific Adviser of "Popular Wireless."**

**P. P. ECKERSLEY—Originator of Regional Broadcasting—is "P.W.'s" Chief Radio Consultant.**

¶ In the last few issues "P.W." has given constructors the first details for making a "Class B" set, a Cold Valve set and the first Automatic Radiogram for constructors.

¶ "P.W." also presented the First Portable to use "Class B" amplification, and the first set to use (a) Multi-mu Pentodes, and (b) the new Double Diode Triode Valve.

¶ The first Ordinary-Valve "Class B" set was also described in this journal recently.

### "P.W." ALWAYS LEADS.

the London Symphony Orchestra at 8.15!" I expect the D. G.'s afraid!

**You and Me and Most of Us.**

ANOTHER very public radio critic says that there is no satisfactory answer to the question, "What exactly is meant by the term 'average listener?'" I don't admire his pluck. Here goes, for better or for worse.

The Average Listener is a person of intelligence who works hard; he likes the old

# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

bag. No doubt radio will gradually creep into his letters when he gets over his first indignation.

Tool-bag, indeed! Dog! Piano-tuner! I don't blame him, but what can "P.W." do?"

## Christmas Island.

**E**IGHT HUNDRED MILES south of Singapore and a thousand miles north-west of Australia lies Christmas Island, with its small British settlement.

(Just fancy where some British babies have to be born!) The "Christmas Island Phosphate Company" has maintained a tiny radio station there, but it is now to be extended and modernised by Marconi's for short-wave working with Singapore and ships.

I wonder whether the islanders are able to hear Big Ben and the Empire programmes. It might help to induce phosphate-forgetfulness.

## Television.

**T**HE 1932 Report of the Radio Corporation of America, in referring to television, adheres to the conviction that transmission of a kind that will permit entertainment and broadcasting on a national scale still presents unsolved problems.

The R.C.A. is pressing forward television research on ultra-short waves. "The Electrician," referring to this year's exhibition of the Television Society, says "... there is still a long way to travel before television can be said to have emerged from the experimental stage."

## New Amateur Society.

**S**OME West Country enthusiasts, feeling that the best way to put television on its feet is to get the amateur on its track, are in process of forming the "Western England Television and Scientific Society," whose object will be to encourage amateur research in television, talking films, etc. We heartily wish the new venture a big membership and a fruitful existence. Hon. Sec., Mr. H. Montague Smith, Eden House, Eden Grove, Filton, Bristol, 7.

## Radio Thrills.

**I**N case Edgar Wallace's play, "The Ringer," did not provide your jaded sensations with sufficient "kick," the B.B.C. arranged, at enormous expense,



to broadcast on April 25th, "Egg Packing and Grading at Cheltenham," with illustrative noises. Making a noise like a cooking egg. Ha! The same week they followed this with "Toy-making at Gloucester" and "The Making of Carpets and Reversible Rugs." How fright-making!

## Broadcasting and "Juice."

**A**N unusual but interesting investigation has been made in Italy into the effect of the use of wireless receivers on central electric station load. The result shows that in a town of 120,000 population 347 consumers owning radio sets increased their consumption of power by an average of 24 per cent.

Dividing these 347 consumers into large and small consumers, it was found that the large consumers increased their consumption by from 4.4 to 11.2 per cent, and the small consumers by about 30 per cent.

## Five Lustrums. Ago.

**A** QUARTER of a century ago, or as I said, five lustrums, Dr. J. Erskine Murray gave a public demonstration of wireless telephony during a lecture at University College, Nottingham.

The detector which he used was a crystal rectifier with a local battery.

## SHORT WAVES.

A lady has written to the newspapers complaining that nowadays most men seem to prefer listening to the wireless rather than spend the evening chatting to their wives. Yes. They know that every broadcasting station must close down sooner or later.

## A PHANTASY OF THE B.B.C.

At the hour of the News and the Weather  
(Or so it appeared to me),  
The announcers sang together,  
And they sang right merrily;  
And their voices, all uplifted  
In clear, sweet carolling,  
Came round me as soon as I shifted  
The button that works the thing.

"Ho, ho! for the current crisis  
In the Polish Corridor;  
Ho, ho! for the Fat Stock Prices!"  
They sang to me once more;  
"There's a deep and a trough-shaped hollow  
In the atmosphere to-day,  
And the General News will follow  
After a short delay.

It was thus the announcers lifted  
Their clear, sweet carolling,  
As soon as I went and shifted  
The button that starts the thing.  
"Punch."

Speech was transmitted over 50 yards, with obstacles such as pipes and iron girders. Was this the first public demonstration in England of radiotelephony?

## My Superhet.

**A**FTER further trial my superhet has turned fractious and developed the most awful anti-programme crackle-cum-snarl. My family revile me. I am a radio outcast.

"Transformer," you say. Maybe. Maybe no. The crackle is set up when we switch on the kitchen electric light; but it will not stop when the aforesaid light has been off for hours. Nay, it will even begin before the light is switched on.

What deepens the mystery is the fact that switching on my "study" light seems to reduce the crackle.

## British Radio Institution.

**I**F you are a serious student and practitioner of radio you really should join the British Radio Institution, whose aims and constitution are set out in a

pamphlet which is obtainable from the Hon. Sec., Mr. J. D. Fox, 25, Kingswood Drive, King's Park, Glasgow. This is a serious institution; you cannot join it in battalions. Its Annual is a publication for scientific radio amateurs.

Membership of this Institution connotes a scientific understanding of radio, but is not beyond the reach of "P.W." readers by a long chalk.

## Let's Write.

**I**T seems quite the fashion now, for man, woman or curate, that he, she or 'other shall say, "Lo, I will even now indite a goodly matter unto an organist." As a choir-boy, I loathed organists; as an adult, I have admired the nippy footwork of the itinerant variety. (Are they organists?) But the thought of writing to even a great organist is one that would rarely occur to me.

Nevertheless—oh, *wot* a world it is!—Edward O'Henry's fan mail has averaged 6,000 letters a week. He has been Tussaud's organist for several years, and has now been translated to the Capitol Theatre, Manchester.

## A Short-Wave Club.

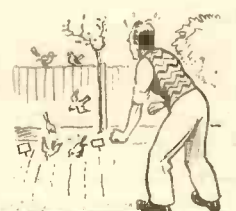
**A** FEW weeks ago I "lifted" an item of interest from the monthly magazine of the International Short-Wave Club and in publishing it I expressed the hope that the Club would not consider that I had infringed its copyright.

Mr. A. E. Bear, the Club's European Representative has now set my mind at rest on that score. The Club has thousands of members in eighty-nine countries and membership fee of six shillings per annum includes the magazine which is full of authentic S.W. news, including lists of S.W. stations. Mr. Bear's address is, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

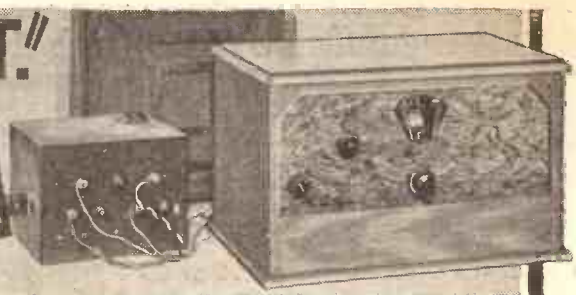
## Talking of Birds.

**A**S I am perforce something of an unwilling, spasmodic gardener, I do not take very kindly to the bird noise artists or to gentlemen like H. Henry, of Birmingham, who recently spoke on the felicity and fascination of bird-watching.

I like watching Christmas turkeys a-roasting, but I find it a poignant experience to watch live birds at work and/or play in my garden after I have spent a back-breaking afternoon laying seeds in the soil. The watching of birds by humans is child's play compared with the watching of us wretched gardeners by birds!



# THE "DOUBLE D.T." POWER PACK



Full constructional details of the A.C. mains unit for THE FIRST MULTI-MU H.F. PENTODE and DOUBLE-DIODE TRIODE RECEIVER, described in last week's issue of "P.W."

By K. D. ROGERS, Chief of Research Department.

WE have dealt with the construction and main operation of our latest radio-receiver design, using the two H.F. pentodes and the double-diode triode, whose description was published in the last two issues of "P.W." It now remains to cover two comparatively minor points—the fitting of the "local-distance" switch on the set, and the construction of the mains power-pack.

The former device is useful in cases where the set is to be used within 20–25 miles of a local high-power station, and as it is only required in such instances it has been left out of the general design of the set.

The "local-distance" control consists

for the set as it is felt that many will like to build their own type of container. It can be quite simple in conception, as the photographs show.

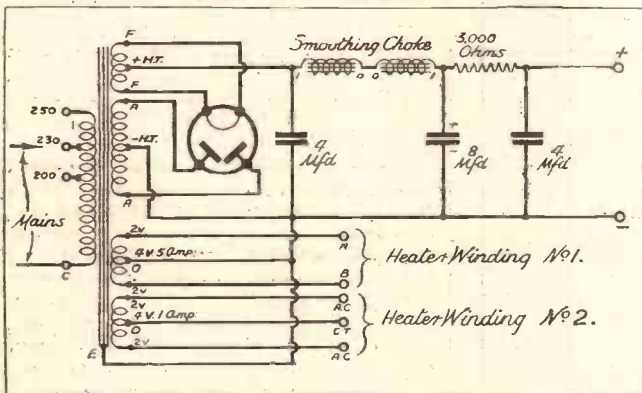
### Circuit Simplicity.

And now for the power-pack. This is preferably built in a compact form, as shown, and enclosed in a metal box, the metal being earthed by means of a terminal screwed into its side and connected to the earth terminal of the receiver, or to H.T.—

The circuit comprises a valve rectifier, fed by a mains transformer, which provides not only power for this valve but two lots of A.C. L.T. for the heaters of the valves in the set.

The last valve in the set is of the *directly* heated type, and requires a separate filament winding on the power transformer. Thus we have on the transformer output side the H.T. winding, rectifier filament winding, and two further L.T. supplies for the receiver itself.

### SILENT AND UNVARYING OUTPUT



As will be seen from the above circuit the "Power Pack" embodies full-wave rectification on the high-tension side, and two separate heater windings. One of these (marked A B) is for the heaters of the two H.F. pentodes and the double-diode triode, while the other winding goes to the heater of the output valve. The compact arrangement of the unit is clearly shown in the photograph, from which it will be noted that the electrolytic condenser terminals pass through the baseboard to facilitate wiring.

merely of a push-pull switch in series with a 100-ohms resistance, the whole being connected across aerial and earth. With the switch pulled "out" the resistance is connected between aerial and earth, and the set is ready for "local" reception. Push the switch knob "in" and the resistance is disconnected and the set is ready for long-distance work.

### Cabinet Suggestion.

There is plenty of room for the control on the back of the baseboard, close to the aerial and earth terminals, and the connections have been shown "dotted" in the theoretical circuit diagram; though the switch has been omitted from the wiring chart. The parts required were given in the list of components last week.

No cabinet design has been described.



### PARTS YOU WILL REQUIRE

Component.	Make used by Designer.	Alternative Makes of Suitable Specification Recommended by Designer.
1 Panel, 8 in. x 6 in.	Peto-Scott	Goltone, Permcol, Becol, Lissen.
1 Baseboard, 8 in. x 7 in. x 1/2 in.	—	—
2 Pieces of 3/4 in. wood, 3 in. x 7 in.	—	—
1 Power transformer	Ferranti S.V.84	—
1 Rectifier valve	Ferranti R.4	Marconi or Osram U.12.
1 Smoothing choke	Igranic OH2	R.I. D.Y.22.
1 4-mfd. fixed condenser	Ferranti C.6	—
1 4-mfd. do.	T.C.C.	Dubilier L.E.C.
1 8-mfd. electrolytic do.	Hellesen type 80 435.	Dubilier "Dry" type, T.C.C. type 802.
1 4-pin valve holder	W.B.	Ferranti, Lotus, Benjamin, Lissen, Telsen
1 3,000-ohms resistance	Colvern Strip	—
7 Terminals	Goltone	Belling - Lee, Igranic, Bulgoin, Clix
Small piece of copper foil for connection under electrolytic condenser	—	—
1 Mains connector	Goltone MC/9 and LS/31	—
Adaptor for mains connection	Goltone E.80/90	—
2 yds. sleeving and 3 yds. 18-gauge tinned copper wire	Goltone	Wearite
Flex, screws, etc.	—	—

The Ferranti transformer model SV 84 was chosen as being suitable for the pack, and with it has been used a rectifying valve "to match"—the Ferranti R 4.

Owing to the design of the transformer, somewhat more than the required amount of power-output can be obtained. So it is necessary to break down the voltage supply to the set. This is done by the 3,000 ohms strip resistance fixed under the baseboard of the power-pack.

Incidentally, the resistance and its associated 4-mfd. condenser assist in the general smoothing of the supply, and in the decoupling.

(Continued on next page.)

# THE "DOUBLE D.T." POWER PACK

(Continued from previous page.)

As arranged, with a Ferranti LP4 (or Osram PX4) in the output of the set, a supply of 250 volts or just under is provided for the receiver H.T. This is O.K. for the last valve, and no further breakdown resistance is required there.

For the other valves of the set 250 volts would be too much, so, as will have been seen, further breakdown and decoupling resistances have been used in the receiver itself, with the result that on the anodes of the two pentodes we get 200 volts, on the double-diode triode we have some 120 or more, and on the screen-grids of the pentodes there is 100 volts, or slightly less.

The connections inside the power-pack are too clear to need any explanation, with the exception of those to the electrolytic condenser.

This has to be mounted vertically, and a

hole in the baseboard has to be made for it. The case is the negative side, and great care must be taken that the correct polarity of connections is attained.

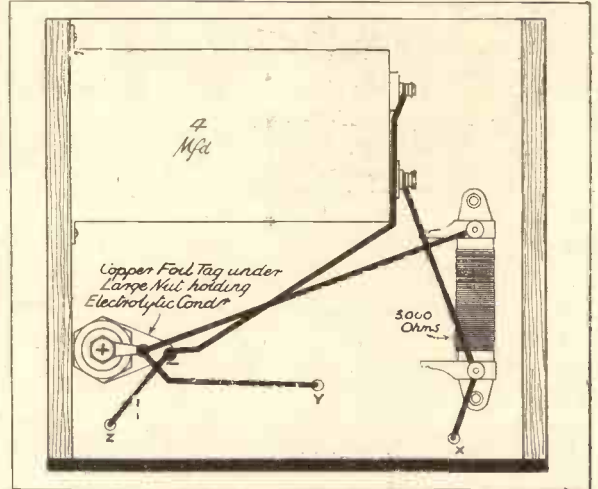
The connection to the positive pole—the centre electrode—is very easy as a tag is provided for the purpose, but that to the case is at first sight not so simple.

Electrolytic condensers are primarily designed for use in metal chassis layouts, and in such the connection of the condenser case to H.T.—(which will be the chassis) is automatic with the mounting of the component.

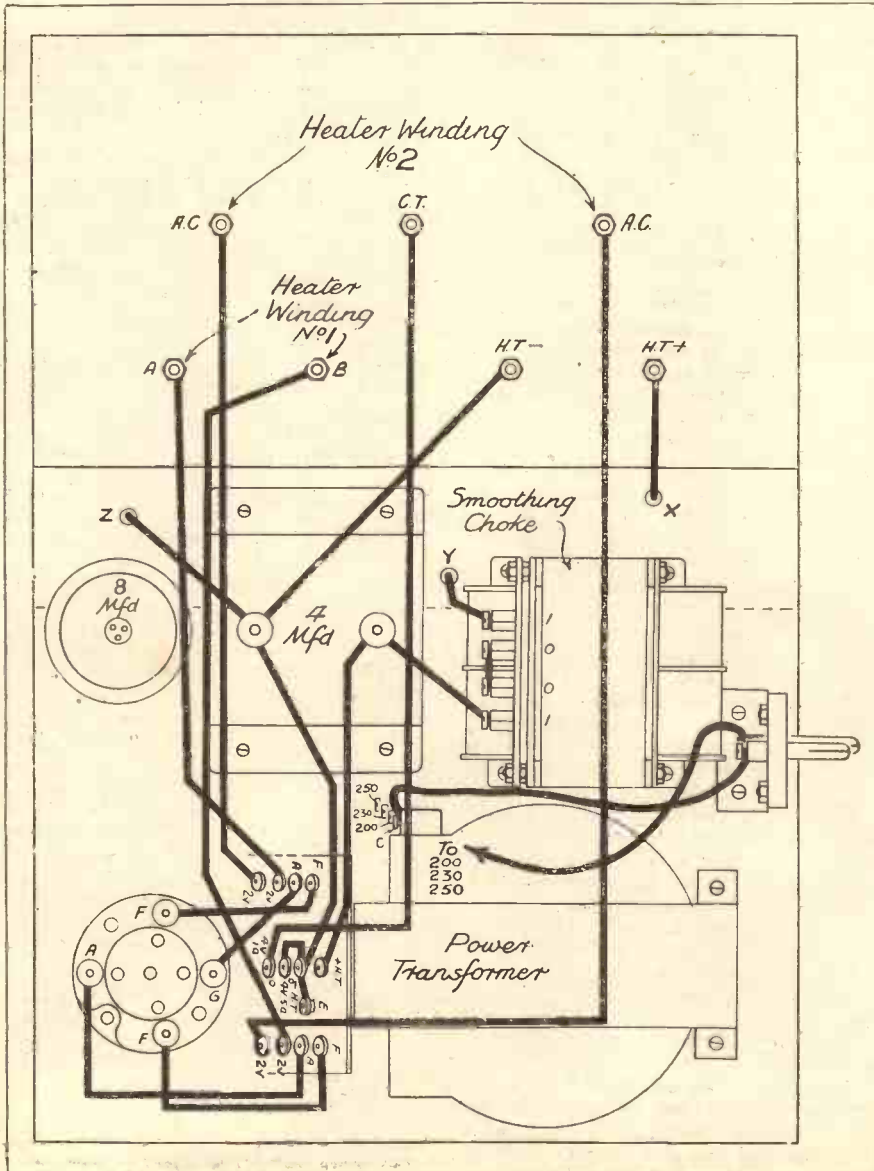
In the "D.D.T." power-pack the difficulty is overcome by slipping a small piece of copper-foil between the large fixing-nut and the baseboard. This makes contact with the large nut—which is "negative"—and to the foil "tag" is taken the negative connection of the wiring.

It will be noted that one of the centre taps on the L.T. side of the transformer is connected to H.T.—. This is the tap on the "5 amp." winding, the outsides of which go to the two terminals on the panel marked A. B.

## UNDERNEATH THE BASEBOARD



## HOW THE WIRING IS ARRANGED



The wiring is quite straightforward and should present no difficulties whatever. The connection to the negative side of the electrolytic condenser is made by means of a small piece of copper foil clamped between the condenser securing nut and baseboard. The two flexible leads join the transformer mains input terminals to the mains plug which is located to the right of the smoothing choke.

The 1-amp. winding and its centre tap, for the output valve of the receiver, is connected to the top three terminals on the eliminator panel. This is taken to the heater wiring No. 2 (See diagrams last week).

The connections from the set to the power-pack and the mains are these. From the household mains plug adapter one wire goes to the switch on the panel of the set. The other wire goes direct to one side of the mains plug on the power-pack.

From the other side of the panel switch a lead goes to the remaining pole of the power-pack plug. Thus the receiver switch is made to control the power supply, the leads from it being taken either through a hole in the baseboard below the switch, and along underneath to the back, then out to the power-pack and mains, or else from the switch direct along the upper surface of the baseboard.

In either case, care should be taken that the two wires running from the switch are in the form of tightly twisted flex.

### Cooling the Rectifier.

From the power-pack we have H.T.—going to the 1-mfd. condenser which connects to the earth terminal via the foil. H.T.+ goes direct to the 25,000-ohm resistance, and then to the feed-points of the set. The two heater windings are connected as shown in the diagrams.

In making the metal cover for the power-pack it will be noticed that the rectifying valve comes up "proud" of the top of the power-pack panel. Thus a hole in the top of the metal cover has to be made to allow the top of this valve to project slightly. This ensures adequate cooling of the valve—a most important feature of the design.

Details for drilling the panel are given in the Radiotorial columns of this issue.



# TELEVISION PROGRESS (CATHODE RAY SYSTEMS)



RECENT developments in television, particularly in America and Germany, show a distinct swing of the pendulum in favour of using cathode rays as a substitute for rotating discs. The cost of a cathode-ray receiver, for instance, need be no higher than that of a set using a motor-driven scanning disc, whilst it has the definite advantage of producing a picture which is automatically "framed" on the viewing screen and is noticeably free from "flicker."

### The Method Employed.

In the Zworykin tube shown in Fig. 1 electrons emitted from an oxide-coated filament F are accelerated by the positive voltage on the anode A into a fast-moving stream, which is reduced to a fine "pencil" by being passed in succession through two small apertures T, T<sub>1</sub>. In this form it is

Fascinating facts about a Television method that is quite independent of revolving discs.  
By J. C. JEVONS.

seen in greenish light-and-shade on the end wall of the receiving tube.

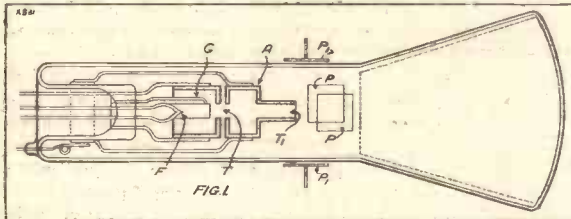
Synchronisation involves no mechanically moving parts. A wave of the required frequency, superimposed on the radiated picture signals, is applied to a pair of plates P arranged inside the tube so as to swing the electron pencil rapidly to and fro across the fluorescent screen. A lower frequency is applied to another pair of plates P<sub>1</sub>, in order the deflect the pencil gradually downwards from top to bottom of the screen. This second frequency is

electrons, and therefore the force of their impact upon the viewing screen. It will be noticed that this is done without in any way interfering with the scanning movement applied by the synchronising plates P, P<sub>1</sub>.

### A "Space Charge" Effect.

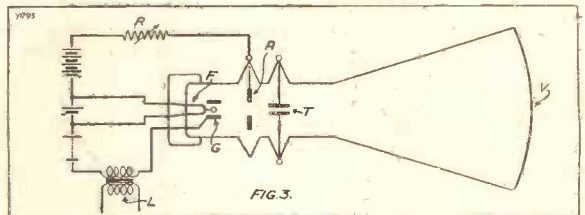
A third method, illustrated in Fig. 3, is to apply the incoming signals from an input L to a negatively-biased cylindrical electrode G, which surrounds the filament F. The resulting field from the cylinder varies the "space charge," or cloud of electrons normally formed near the cathode, and in so doing alters the density of the electron emission. This, in turn, produces corresponding light and shade effects on the viewing screen V.

In order to prevent the signal voltages from simultaneously affecting the speed of the electrons—as well as their number—



### INSIDE THE TUBE

The method of controlling the electron stream by the grids which it passes will be evident from these diagrams.



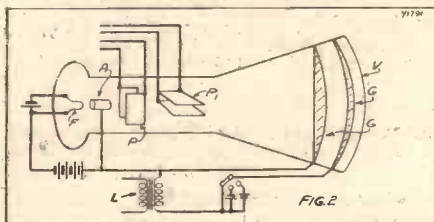
swept to and fro over a fluorescent coating on the enlarged end of the tube.

At each point of impact the pencil produces a visible spot of light, the intensity of which depends upon the density of the stream or the number of electrons which strike any particular point on the screen. This, in turn, is controlled by the incoming picture signals which are applied to a control grid G, so as to divert more or less of the electrons away from the apertures T, T<sub>1</sub>.

### No Moving Parts.

Provided that the to-and-fro movement of the electron pencil over the fluorescent screen is properly synchronised with the transmitter, the original picture will be

### REGULATING SPEED



The pull of the control grids (G) regulates the degree of light or shade.

derived locally from a condenser which has a definite period of discharge.

### Controlling the Electron Speed.

The result of the combined movements is to cause the electron pencil to traverse every point on the viewing screen from twelve to fourteen times a second. In other words, the complete picture is repeated at this rate, and the persistence of vision does the rest in giving the effect of motion.

As previously explained, the incoming picture signals are applied to increase or diminish the number of the electrons falling on the viewing screen, thereby varying the light and shade effects.

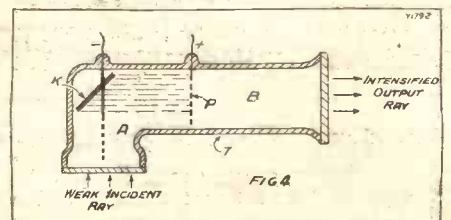
It is also possible to secure the necessary variations in light and shade by regulating the velocity of impact of the electrons on the fluorescent screen. The higher the speed at which an electron strikes against the fluorescent coating, the greater the intensity of light it will produce, and vice versa.

For instance, in the arrangement shown in Fig. 2 the control grid G, to which the incoming signals are applied from the input L, is located near the far end of the bulb, i.e. close to the actual viewing screen V. In this way the grid voltages serve to increase or diminish the speed of the

the voltage applied to the anode A is varied at the same time as, but in opposite phase to, the signal voltages by inserting a resistance R in the external anode circuit. When the incoming picture signals correspond to a point of high light intensity (i.e. to a positive grid voltage) the resulting potential drop along the resistance R simultaneously reduces the anode voltage, so that the total accelerating force on the electron stream is kept constant. When a dark spot comes through on to the grid, i.e. when the voltage swing is negative, the anode potential is at its maximum. In this way an approximately steady electron velocity is maintained at all times.

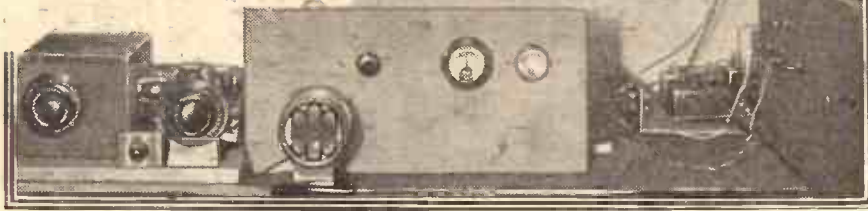
(Continued on page 284.)

### AMPLIFIED LIGHT



This arrangement can be applied at either the sending or receiving end.

# Short-Wave Notes *By W.L.S.*



AS I write these notes there appears to be no sign of any great improvement in short-wave conditions, which are keeping to a monotonous level of mediocrity. (In other words, "Fair; further outlook, unsettled.")

Anyone with a short-wave set of quite average efficiency can be reasonably sure, nowadays, of having quite an enjoyable time between 8 p.m. and midnight. In the early evening various "stray" stations are to be found—Nairobi, Johannesburg and the 31-metre Americans on a good night. Slightly faintly one can count on the 19-metre group of stations, unless conditions are rank bad.

## Don't Blame The Set.

By the arrival of 11 p.m., the 49-metre ether is waking up, and four or five of the "big Yanks" are usually very clearly audible. Logs I receive from readers seem to indicate that they find no difficulty with the 49-metre band, but find the others somewhat irregular.

The important thing to remember, especially if you are fairly "raw" at short-wave work, is that conditions do vary from day to day, and probably always will. Don't get all hot and bothered with your receiver if it won't repeat its performance from day to day; the poor thing can't help it! I mention this because I have actually met many cases of "suspect" receivers which were really above reproach.

Until you have experienced it for yourself, you can hardly believe how completely "dead" a receiver will sound when one of these sudden patches of bad conditions arrives. Twenty-four hours back the dial was fairly crammed with distant stations; now there is just a faint mushy noise thinly spread over the entire tuning range!

## Penetrating "P.W."

"V. I. E." (Liverpool), although he can't claim a world record for hearing all Continents, sends in a log indicating that he heard five Continents in three minutes! Australasia was the only missing one. Need I add that this was with a single-valver?

"P.W." certainly does penetrate to every corner of the world. I have just received a letter from a reader in China. "L. E. H.," away in Canton, sits in front of his "S.G. Four" dreaming of the day when it will be replaced by an "Empire Super." As he says, he can't "pop round the corner" and buy the parts, and a customs regulation prevents him from getting them into China at all.

But "L. E. H." obviously possesses the

right stuff. He has workshop facilities and is prepared to go ahead and make the whole thing himself with the exception of the L.F. transformers! Try some large plug-in coils tuning to, roughly, 3,000

Notes on the best times of reception and a timely word on variable conditions are given by our short-wave expert this week. He also discusses the important question of the aerial and deals with some interesting queries raised in reader's letters about various aspects of short-wave reception.

metres, "L. E. H." and tune them roughly with compression condensers, and all will be well.

If "L. E. H.'s" mains are a sample of the Chinese brand of A.C., I should think there must be some eliminators going

In cases like this, two or three wires across the room, underneath the carpet, make quite an effective counterpoise, and one generally succeeds in stopping the trouble.

## A Good Spot.

"W. W." (Exeter) is among those who find conditions still quite good. But, then, Exeter is a good spot—even "W. W." says so! He says that when he hears a tale of a man who lives in a "bad spot" he goes round and generally finds said "bad spot" is the gear used. In a week he logged ten American broadcasters, YV1BC (Venezuela), Sydney, Melbourne, Nairobi, and "the usual locals."

Funny how we speak of "locals" on short waves, when we mean Moscow, Zeesen, Rome, and the others who would be almost "DX" for the broadcast bands.

Here are two more "general interest" queries, this time from "H. E. G." (Tottenham). First he wants to know how "hams" measure their output wattage. As far as I know, "H. E. G." the formula

is this: Input wattage minus X equals output wattage. X is an unknown quantity dependent upon the gear, but most of all upon the imagination. The fact of the matter is that there is no way of obtaining an accurate measurement of output within

the reach of the average "ham." For a good outfit an efficiency of between 50 and 60 per cent might be assumed. Very rarely does one come across a higher figure. I was once able to measure my own and found it to be about 48 per cent; I believe it is a little higher now.

## Short Wave Coils.

Secondly, "H. E. G." wants to know how to measure, roughly, the inductance of a coil. The best way is to refer to one of the published data charts. There are rough formulae given, but in the case of short-wave coils the variations in diameter, gauge of wire, and spacing are so tremendous that it isn't possible to devise a simple formula that is watertight.

Instead of worrying about inductance, it is possible to give a

rough idea of the tuning range with a given condenser. Assuming a diameter of three inches, with a .00015 condenser, a coil of No. 14, spaced about one diameter, with nine turns, will cover roughly 36 to 60 metres. A six-turn coil will give roughly a range of 30 to 50 metres, and a four-turn from 18 to 32 metres. With a larger tuning condenser the wavelength ranges will, of course, be increased above those mentioned; but a larger condenser will mean that tuning will be somewhat more critical.

## POLICE PATROLS



A radio-equipped motor-cycle combination to aid in the war on smash-and-grabbers. Inset shows the special Marconi transmitter to work at police headquarters, in conjunction with the mobile receiver. Notice the latter's rod aerial.

cheap in his neighbourhood. Sixty to 110 volts within a few minutes—

"J. W. H." (Stoke-on-Trent) sends me a newsy letter containing an abridged version of his radio history since the days of W-r-r-rattle. Strange how much alike we all were in those days! He finds the National programme "breaking in" over a fairly small patch on the dial of his short-waver. Try an indoor aerial, "J. W. H." If that doesn't cure it, remove the earth and erect a small counterpoise.



# RADIO SIMPLIFIED

# A PRACTICAL OUTLINE FOR BEGINNERS

**T**HE history of the development of "automatic volume control" is long and involved; moreover, it is largely unimportant when viewed through present-day glasses. We are concerned with A.V.C. (as it is abbreviated) only in as far as it affects our present-day listening, and as to how it may be applied to modern sets.

There are many variations of A.V.C. available, and there are special valves being produced in order to make the carrying out of it easier and more effective. These we will not consider in this section: rather let us see exactly what A.V.C. is, and how it is applied in principle, in its simplest form.

### Special H.F. Valve.

Ordinary volume control consists of two kinds; that applied to the H.F. end, and that used in the L.F. section of a set. The latter is the more generally used, but with the introduction of the variable-mu valve (a special screened-grid valve recently developed) the practice of using volume control on the H.F. side has rapidly spread.

### BASED ON THIS

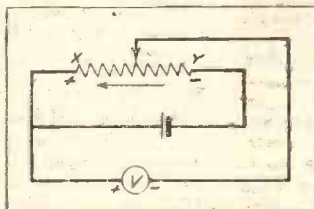


Fig. 1.—Tapping off voltage across a potential dropping resistance—the fundamental basis of automatic volume control.

This, as you may know, is carried out by altering the amount of negative bias voltage applied to the grid of the variable-mu valve. This alters the valve's mutual conductance (or "mu"), and changes the amplification obtained from the valve. As the bias is increased amplification is decreased, and vice-versa.

### Self-Compensating.

Such control is normally carried out by means of a potentiometer with panel control. It is manual and not automatic.

But, obviously, if such control could be made self-regulating—that is, if it were to be regulated by the actual broadcast reception, it could be put to very

good use. For instance, if adjusted so that the strength of a received programme (carrier strength, not loudness of music) could be made to control the bias, things could be arranged so that as the strength tended to increase the bias could be increased and amplification decreased, and vice versa.

### First Principles.

Thus, within the limits of the amplifying powers of the set, a constant strength of reception



could be maintained, any alteration in aerial pick-up being compensated by the degree of H.F. amplification carried out by the variable-mu valve.

This would be true A.V.C., and in fact it has been accomplished like this. Look at Fig. 1. Here we have a simple battery-resistance circuit. Current flows through the resistance in the direction of the arrow.

Across the resistance is a voltmeter, so arranged that it can be tapped "up" and "down" the resistance. Obviously with the tap at "X," the voltmeter will show the full voltage across the resistance—i.e. that of the battery.

As the tap is moved towards "Y" the reading on the meter will decrease, until at "Y" no potential difference across the two ends of the voltmeter will exist, and we shall get no reading. All this will be clear to those who have read the recent articles on Ohm's Law in this section.

### Voltage Sources.

Thus we can supply voltage to the voltmeter by connecting it across the resistance, and the amount of voltage depends on the position of the tap on the resistance.

Suppose we changed the circuit so that instead of a battery supplying the power, we had an A.C. mains unit with a dry rectifier. It would be just the same, wouldn't it?

And so it would if the rectifier

were of the H.F. variety—i.e. a valve, rectifying the incoming broadcast energy. The only difference would be in the exact circuit and the amount of voltage applied.

### Descriptive Circuit.

So we can transfer to Fig. 2. This shows a variable-mu S.G. stage followed by a diode rectifier—that is, a plain rectifying valve with no reaction or amplifying powers. It just rectifies the H.F. impulses into uni-

Thus, were we to put a suitable voltmeter across X and Y we should get a reading, and this would vary with the strength of reception.

Obviously then, we should be able to "tap off" this voltage, and make it operate volume control in conjunction with the variable-mu valve.

This can be done like this. To commence with, the variable-mu valve is biased in the usual way, by the resistance "B" in its cathode lead. This gives it a minimum bias necessary for its normal operation.

If this were all the bias applied the valve would always operate in its most sensitive condition, and we should get the fullest amplification from it. That is how we want it for "distant" reception.

### Varying Bias.

But by taking a lead from "Y" (negative end of resistance) we can apply to the grid of the variable-mu valve any voltage developed across "A." Thus, when strong "signals" are received a strong negative bias is applied, reducing the

directional voltages. (As A.V.C. is usually applied to mains sets, we have shown mains valves in the diagram).

### No Frills.

The H.F. is applied to the plate and cathode (or filament in a battery valve) and the result is a unidirectional voltage across the external circuit between these two points. We have left out all "frills" in the way of H.F. chokes, condensers and so on, to show the "bare bones" of the scheme.

The external circuit we will consider consists of the resistance "A." H.F. is applied to the valve "D" from the tuning coil and condenser circuit, and "out" of the valve comes a single direction voltage which is developed across "A." (In practice there is a blocking condenser between the coil and the anode to prevent shorting of the valve in the D.C. sense, but this is not required for our explanation.)

The "strength" of the voltage across "A" depends upon, and is proportional to, the strength of the H.F. impulses supplied to "D." These in turn depend on the amount of the aerial input to the S.G. valve, and on that valve's amplification.

### How It Works.

Now there is obviously current flowing through "A," and this occurs in the direction of the arrow, "X" becomes the positive and "Y" the negative ends of the resistance.

### A SIMPLE METHOD

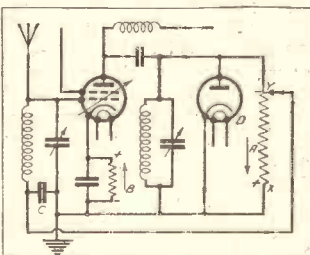


Fig. 2.—A simple A.V.C. circuit. The biasing voltage for the automatic control is tapped across the resistance "A."

amplification of the variable-mu valve, and when weak "signals" arrive very little voltage is thus applied, and strong amplification is obtained.

### Practical Developments.

In practice all sorts of delayed action and so forth can be applied to this scheme, and by "tapping down" "A" we can control the amount of the automatic volume control, but it will be seen from the foregoing that the variable-mu valve takes the place of our voltmeter across "A," and receives a negative bias in accordance with the strength of the "signal" passed on to "D."

## Special Beginners' Supplement—Page 2.

IT is only on the wavelengths below 100 metres that some of the most interesting aspects of wireless reception become evident.

The ordinary receiver will tune up to about 2,000 metres on its longest long-wave setting, and down towards 200 metres at the very bottom of the medium-wave tuning. But far below this there lies the most fascinating waveband of all, with properties and peculiarities quite different from those encountered during ordinary reception.

## USING AN S.G.



There are several advantages in using an S.G. amplifier on short waves, including ease of reaction control and increased amplification.

Below 100 metres are to be found about one hundred different broadcasting stations, and various interesting transmissions such as trans-ocean telephony, beam services and so forth. These offer an incomparable field for the experimentally minded set-owner. For not only are the stations themselves different ones, but they behave quite differently, apparently disregarding or contradicting many of the recognised rules of ordinary reception.

For example, the short-wave stations are not necessarily best received after dark, as is the case on ordinary wavelengths. Many of the most remarkable reception feats below 100 metres, such as the picking up of Australian broadcasting direct, occur in the broad daylight hours when ordinary long-distance reception is out of the question.

Even more remarkable is the distance-spanning range of the short-wave receiver. Instead of being confined to Euro-

# RECEPTION ON THE SHORT WAVES

pean programmes, it picks up transmissions from all over the world and covers thousands of miles instead of mere hundreds like the ordinary set.

Moreover, the simple one-, two- or three-valvers are often more successful in such really long-distance reception than the multi-valve arrangements which have been evolved—another example of the topsy-turviness of short-wave reception.

In the main the apparatus employed for short waves is the same as for ordinary broadcasting. The valves, batteries, and the whole of the low-frequency apparatus following the detector are suitable as they stand for short-wave work. But naturally the tuning apparatus is different.

Instead of coils with perhaps fifty, one hundred or two hundred turns on them, we need coils of only two, three, or four turns. And instead of the usual '0005-mfd. tuning condenser, a short-wave set has a much smaller tuning capacity, perhaps '0002 mfd. or '0001 mfd.

## Short Wave Adaptors.

The fact that a great part of an ordinary set is suitable, as it stands, for short-wave reception, led to the introduction of the short-wave adaptor. This embodies, in one compact unit, all the essentials of short-wave tuning. It can be plugged into almost any set, and instantly converts it into a short-waver!

Hundreds of thousands of these instruments are now in use in various parts of the world. The idea of such an adaptor was first put forward in the pages of POPULAR WIRELESS, and the original constructional details given in this journal, although widely copied, have been altered only in detail for even the latest types, which are thus the direct outcome of a "P.W." idea.

Despite the undoubted efficiency of an adaptor, the very keen short-wave experimenter generally uses a special short-wave set in which every part is specially selected and "hotted up" to get the last ounce of long-distance service.

## Inexhaustible Scope.

In this way a special technique has grown up around the short-wave receiver, because it offers inexhaustible scope for experiment with different circuits, reaction control, etc. (Everyone interested in this most intriguing aspect of radio should regularly read the Short-Wave Notes in "P.W.," where the latest news of new stations, and practical points in reception, are dealt with week by week.)

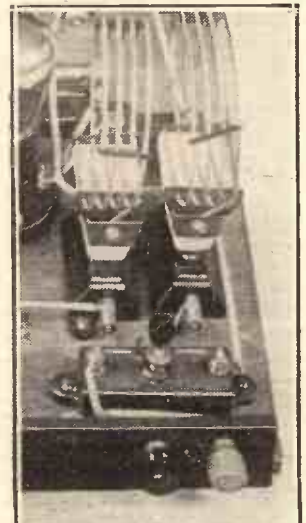
In articles written specially for short-wave enthusiasts it is seldom necessary to mention some of the most interesting facts about short-wave working because these are already known to such readers; but a few facts are set out below for the benefit of those only just taking

an interest in this class of reception.

The reason that short-wave programmes are received at a phenomenal distance is that most of the radiation from a short-wave station does not take place horizontally, but is directed "skywards." Instead of travelling along the ground, as it were, and thus serving the neighbouring aerials strongly like the local B.B.C. station serves its listeners, the short-wave station has a very limited effect locally, and directs its energy upwards into the sky.

Special aerials are often used for this purpose, but in any case

## AERIAL COUPLING



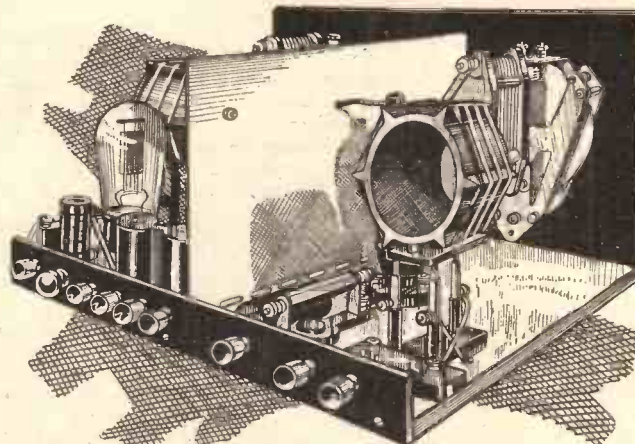
One good arrangement is to insert a pre-set between aerial terminal and coil, as illustrated. The smaller the capacity the weaker is the aerial coupling.

the shortness of the wavelength favours the sky route, at the expense of the "ground ray."

Most of the waves travel upwards and outwards until they strike an electrically conductive layer which surrounds the world in outer space, and by this they are reflected back to earth again. But they are reflected at an angle, so that they come down hundreds or thousands of miles away from their starting-point.

Between the point of reception and the point of origin there is an area where the station cannot be heard at all—the "skip-distance effect" is the apt name given to this phenomenon. The daylight-range of short-wave stations is also due to this reflecting-layer effect, and so are the very curious fading effects often experienced—in fact, short waves are so radically different from those employed for ordinary reception that their entertainment value is often in danger of being overlooked, because of their appeal to the experimenter.

## MAKES YOUR SET A SUPER-HET.



This ingenious adaptor converts any set with an H.F. stage into a super-het short-waver. Constructional details were in "P.W." dated March 4th, 1933.

## NEXT WEEK:

## RADIO CALCULATIONS AND USING A PICK-UP

# ECKERSLEY EXPLAINS-



**H**AVE I sometimes remarked that I think good quality reproduction is the thing? I suppose one might do anything in the way of polishing up other parts of the circuit, but to leave one part unpolished dulls the whole effect. Chain—weakest link, and all that.

If the B.B.C. sends out poor stuff, what good the best receiver? And vice versa, what good in Mr. Kirke and all his minions if the receiver spoils all their painstaking work?

So when someone writes about detectors, the principles thereof and the whys and the wherefores, I always think of  $y = x$ , and hope that this relationship is maintained as between signal (H.F.) in and signal (L.F.) out.

### Detector Bias.

Here's "A. B. N." (Brighton) though, puzzled as to why we don't use negative on the grid in a grid-leak detector. Answer, because the signal itself puts negative on the grid of the detector valve in proportion to itself. Signal A puts one volt negative on the grid, let us say, but a signal two times A puts 2 volts negative on the grid.

If you put a milliammeter in series with the anode circuit of your grid-leak detector you will notice that, as you tune in the signal, the current in that circuit will fall, because the signal puts negative on the grid. When the transmitter currents rise and fall with modulation so the signal rises and falls with modulation, and so the negative on the grid of the grid-leak detector rises and falls and so the current in the anode circuit falls and rises—antipodean, upside-down, inverse and all that!

**QUESTIONS OF QUALITY**  
are dealt with by our Chief Radio Consultant this week. He has much of interest to say about grid-leak detection, and also gives "P.W." readers some valuable hints on volume control.

It happens like this because, in a grid-leak detector, there's a condenser to let the high-frequency currents on to the grid and a resistance to stop electric charges on the grid from getting back to the filament with any ease or celerity. The signal bumps on to the grid positive for a few swings (perhaps it takes 3 or 3-millionths of a second doing this), but each time the grid goes positive it collects electrons out of the filament.

These electrons want to get back—to leak back to the filament—but someone has stuck a great big (grid leak) resistance in the way so they can't get back—they accumulate on the grid and they are negative—so they put negative on the grid. I told you they did when I started on all this, and now you know why they do.

### Grid Current and Volts.

It's very clever because as the signal gets stronger it collects more electrons, and they cannot leak away and so, as the signal gets stronger, the more the negative of the grid and the less the anode current.

But who cares if the current is more or less as the signal is more? With bottom-bend rectification (very easy) the anode current gets greater as the signal is greater.

The whole point is to get a proportionate relationship between signal and anode current.

Of course, all this stuff goes, I mean all this theory does not apply when you use a detector as the first valve of a gramophone amplifier—the gramophone does not produce a high-frequency signal which must be rectified, a gramophone gives off pure low frequency. I mean pure. Of course I mean pure.

### Better than Anode Bend.

My own impression—no! it's more than an impression, I have proved the fact, is that leaky-grid detection is superior to anode-bend detection. This answers "G.R.," of New Cross, too. But get lots of volts on the anode of the leaky-grid detector, otherwise alas!—not so good. We used leaky-grid detectors with only 50 or 60 volts a few years ago.

That drove us to the use of the bottom-bend detector, which is superior when you've only 60 volts or so high tension to play with. So I use a leaky-grid detector and see that at least 150 volts get on the ANODE of the valve. If you have only a few volts available, get it rigged up as a bottom-bend detector.

## "P.P.E." ON METHODS OF VOLUME CONTROL

**B. G. R. (Bromley).**—"I am fitting a volume control to the L.F. amplifier of my receiver, and have decided that the most convenient method is by connecting a variable resistance across the primary terminals of an L.F. inter-valve transformer.

"I know the effect of connecting a resistance in parallel with the secondary winding, but have never been able to find out how the quality is affected when a variable resistance is connected across the primary.

"I should be pleased if you would explain this fully for me."

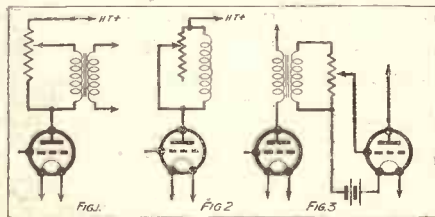
I do not quite understand what you mean by connecting a variable resistance across the primary. What I think you ought to mean is to connect a potential divider across

the primary as I have shown it (1). If you do this, obviously moving the slider downwards, according to the diagram I have shown, will put less and less volts into the primary of the transformer.

What you have to be careful of is to maintain the same or substantially the same effective anode impedance, and to ensure that this anode impedance at any frequency and any setting of the potential divider has a value greater than or equal to the optimum impedance of the valve. This requires making the resistance of a sufficiently high value but you will realise, with the diagram I have shown, that you will not maintain the anode potential the same with different settings of the potential divider slider if the potential divider has a high resistance.

If you do it according to Fig. 2, obviously the volume will not change because the volts across the primary remain the same, except in so far as the effective anode impedance is slightly altered.

I don't think either of these methods is much good and I should certainly advise the



**WHAT'S THE EFFECT—**  
of the resistance on quality? These diagrams help to explain.

ordinary method as shown in Fig. 3. All that this requires is that the total value of the potential divider resistance shall be so high as not seriously to overload the secondary of the transformer. There may be a certain amount of top cut if the total resistance of the potential divider is too small, but I think, provided you choose 250,000 ohms, that this top cut will not be serious. Or try a small condenser in the transformer secondary to resonate and bring up "top." **P.P.E.**

THE MIRROR OF THE B.B.C.

By O.H.M.

## EMPIRE PROGRAMMES

The New "5 G B"—Paying for O.B.s  
—The Bottle Imp—Covent Garden Operas.

**C**ECIL GRAVES, the Empire Service Director, is now getting into his real stride. For the first few months, he was naturally reluctant to squander his best programme resources. So he wisely waited until the engineers reported reasonably good conditions of reception throughout most of the Empire Overseas.

Now that he has the "all-clear," he is going straight ahead, and I prophesy a marked subsidence of the complaints that have been coming in since Christmas.

### The New Midland Regional.

Preliminary work in connection with the building of the new Midland Regional transmitter has started on the site recently acquired at Wychbold, near Droitwich, and a contract for the building of the station has just been placed with Messrs. Higgs and Hill, Ltd.

### Paying for O.B.s.

Since the B.B.C. took the unusual step of paying for the rental of a site from which to broadcast the Grand National, a number of organisations have considered demanding payment from the B.B.C.

It was only by the merest chance that the Derby relay was obtained without payment, for the racecourse authorities did not hear of the financial arrangement at Aintree until after they had granted the B.B.C. permission to broadcast a running commentary from Epsom Downs. No doubt they will demand a stiff fee next year, and Mr. Gerald Cock, the B.B.C.'s tactful "O.B." Director, is getting anxious lest the principle of payment for outside broadcasts should obtain too firm a hold.

After all, the question of payment has always cropped up in negotiations with the Football Association when relaying the Cup Final and the B.B.C. has insisted that the match should be broadcast for nothing. I wonder whether the F.A. know the financial arrangements of the Grand National relay.

### Dance Memories.

Memories of famous dance bands will be recalled by Robert Tredinnick's gramophone recital for Midland Regional listeners on Saturday, May 13th. Earlier the same evening the McGowan Quartet from Coventry will be heard in part-songs and Henry Bentley of Tipton will play cello solos during a concert by the Midland Studio Orchestra.

### Japanese Plays.

Japanese literature contains many hundreds of traditional plays, dating from the fifteenth and sixteenth centuries, which are known as the No plays. Three of them have been translated by Arthur Waley, and they will be included in the broadcast programmes of Thursday and Saturday, May 4th and 6th, respectively.

It will perhaps be much better that we should say very little in advance about these plays, because their production and

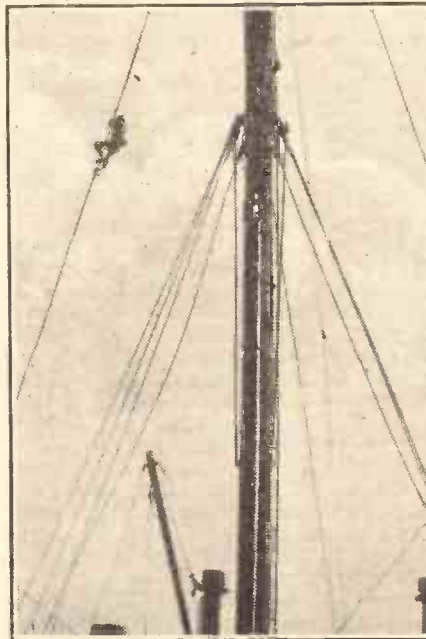
acting in Japan are very intricate. Six hours is the usual time required for the performance of a No play, and it has to be accompanied by a shrill kind of flute music and sounds from a drum beaten or tapped by the hand. The broadcast versions will, of course, be much shorter.

### "The Bottle Imp."

During the following week there is to be a broadcast of "The Bottle Imp," which has been adapted from Robert Louis Stevenson's famous story. Numerous voice trials have been given to artists in order to get a suitable cast for this tale of the South Seas, particularly as the producer wishes to have non-European voices for some of the smaller parts.

He is hoping to get the results he requires from a cast consisting of three Englishmen, two Japanese, an American, a Frenchman, an Indian, two Negroes, and a couple of genuine South Sea Islanders.

### USEFUL FOR AERIALS



This Lascar seaman is climbing the wire stay of a passenger liner by means of hands and toes, to inspect one of the insulators at the mast-head.

The Production Department at Broadcasting House has recently shown considerable activity by announcing new plays. Another will be added to the list in the near future now that the B.B.C. has acquired the broadcasting rights of "June Moon," the comedy by Ring Lardner and George F. Kaufman, which had a long run in New York about two years ago.

### New Operetta.

Friedrich Hollaender, who with his German wife is settling in England owing to the anti-Jewish feeling in Berlin, has agreed to write a radio operetta for the B.B.C. in time for the autumn programmes. Hollaender was born in London, but has spent most of his life in Berlin, where he won fame as a composer of dance music and as director of a cabaret theatre.

### Covent Garden Operas.

Some details, including the relay for National listeners of the third act of "Der  
(Continued on page 285.)

## THE LISTENER'S NOTEBOOK

A critical review of recent broadcasting topics from the ordinary listener's point of view.

**E**SCAPE, "Chu Chin Chow," and "The Ringer" are a trio of plays that made the listener's Easter, 1933, memorable. Of the three, I preferred "Escape." In fact, in "Escape" I thought the Plays Department set itself a standard of excellence that it will find difficult to pass.

Of course, this play of Galsworthy's as a stage play is unique in construction. Its series of episodes make it fine material for broadcasting, so much so that it is surprising that a repetition of it has been so long in coming.

I thought "Chu Chin Chow" was as successful as it could be. A play that is essentially spectacular can't expect a perfect representation via a medium that does not call for the use of the eyes. However, "Chu Chin Chow" brought back memories, and its music, so popular with small orchestras, can still fascinate.

I listened to "The Ringer" in a dark room. This wasn't intentional, for the play started in daylight. The fact is I suddenly found myself in a darkness which had stolen on me unawares.

I mention this by way of tribute to "The Ringer." The play gripped me from start to finish. Its brisk movement offered a welcome contrast to those irritating pauses that we find so frequently in broadcast drama. There was no wasted "business" in "The Ringer."

On the whole, the scenes were easily visualised, and an irate Divisional Det.-Inspector plus a much-used telephone created all the atmosphere that was needed. The honours were shared by the cast; it would be invidious to single out even one character for special praise when the whole cast was so uniformly good.

### Size of the Cast.

There were also one or two extremely good lines to relieve the gloom that is natural to this type of play. But there were moments when the situation wasn't clear. This was particularly so at the end of the play.

A large cast must always be a problem for the producer, and it is abundantly clear now that the success or failure of a broadcast play depends largely on the size of the cast. Another noticeable weakness of "The Ringer" was the unpleasant noises that occurred in the shrieking scenes.

I wonder how many of you listened to that impressive ceremony at the Menu Gate, prepared by the Ypres town council, and at which several hundred British children were present? Eleven a.m. is an unfortunate time for most listeners, but whoever heard the broadcast will long remember the stirring words of M. Lippens, the Belgian Minister of Public Instruction.

"Nowhere abroad," he said, "will you find more sympathy for your country than in this country of mine."

Broadcasting showed on this occasion how personal and intimate it can be. Wasn't there something uniquely sensible in the announcer's assurance to the mothers of the British children present that their children were all quite well?

Of course, all the British mothers would hear this with satisfaction, for aren't they naturally anxious on this score? Was it the inspiration of the woman announcer to add this? Mothers will say it was; it would never have occurred to a man!—I wonder!

### Industrial Relations.

Mr. John Hilton is certain of success with his four talks on "Industrial Relations." Those of you who heard his introductory talk must have been struck by his very attractive manner—a manner we don't usually associate with talks of this sort. Will others please copy!

And here's that other live noise—Mr. Cecil Lewis, with a fondness for "dunnies and devils," talking interesting stuff about film-making. His first talk was also full of good meat.

If you missed it, make a point of hearing some of those to come. He is giving six talks in all. You cannot but enjoy what he says, and as for how he says it—well, listen for yourselves.

Wireless talks have improved by leaps and bounds. Mr. C. H. Middleton is perhaps representative of the older school, but his style is ideal for his subject. He always appears to be right on top of his job, whether it be gardening or broadcasting. There's never a hitch in his twenty-minute talk.

The Moscow trial, while it lasted, seemed to put a bit of life into the News Bulletins. Naturally, we were all interested in the proceedings and wanted every bit of news.

The B.B.C. served us well, particularly in the final stages, when we expected the verdict. That last night was exciting, and listeners determined to know the verdict before going to bed had to sit up late for it. It came through almost on the stroke of twelve.

And now for a suggestion. Wouldn't it add to  
(Continued on page 288.)



**R**EADERS of my "Short-Wave Notes" in POPULAR WIRELESS are constantly coming across the mystic letters "H.A.C." Some of them know that they mean "Heard All Continents"; some fondly imagine that they mean "Heard All Countries"; and quite a few think that there is some reference to a certain famous regiment.

**Free from Complications.**

As a matter of fact, the initials are rapidly losing any indication of short-wave prowess at all. A few years back it was quite a distinction to have "Heard All Continents"; but nowadays anyone with a reasonably good receiver can do it, provided that he chooses the right time for listening.

This "H.A.C." Three-Valver is the result of certain confabs. between myself and the Research Department of "P.W.," and it represents just the type of "snag-proof" short-waver of which I approve very

**HOW TO BUILD**

a super-efficient short-wave receiver with S.G. amplification. The total absence of "dead spots," "hand-capacity" and "threshold" effects are among the features which place this guaranteed "P.W." design in the forefront of its class.

This "H.A.C." Three-Valver contains the bare minimum of components, and if you make an accurate copy of it, right down to the smallest detail, you are as nearly as possible guaranteed against them.

As I deal with the theoretical circuit and the practical points of the layout, you will see how each possible source of trouble has been taken care of.

Let us analyse the theoretical circuit diagram first. We start off with a perfectly conventional screened-grid stage of H.F. amplification. This is of the fully-tuned variety—"untuned" S.G. stages nowadays are a delusion and a snare—and the aerial is variably coupled to the grid circuit by a neutralising condenser.

This stage is parallel-fed, and is coupled across to the detector stage by means of another neutralising condenser. This variable coupling is of the greatest importance, as you will see when we come to the operating details.

The detector itself is parallel-fed. This may seem inconsistent with my remarks in the series of "Short-Wave Hookups" published a little while ago, but there is a reason for it in this case.

A 10:1 "Coupling Unit" forms the link between the detector and the L.F. stage, which is perfectly "straight" except for the provision of an H.F. choke between its anode and the 'phones or L.S. This takes the place of choke-filter output, which I generally specify, but which is not always absolutely necessary.

**Comprehensive Screening.**

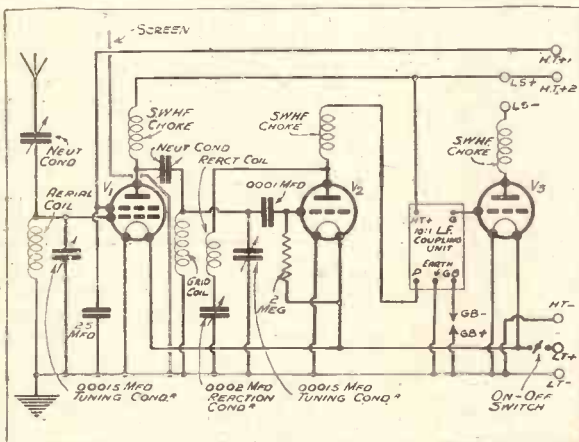
Reference to the photographs and wiring diagrams will show that the set is not unduly large, although ample "breathing space" has been given to all components, especially the short-wave coils. Note that the S.G. grid coil and the other two have been mounted with their axes at right-angles, although there is an aluminium screen between them.

This set, as a matter of fact, is as near to a "chassis" set as one can get without going the whole hog! The panel is of metal; a metal screen separates the H.F. stage from the detector; and the base-board is covered with foil. There are still many readers who fight shy of chassis receivers, and labour under the delusion that they are difficult to construct. We are pandering to them sufficiently, in this case, to give them a "quasi-chassis" set that falls in with their own ideas of simple construction.

A word about this S.G. stage. Strangely enough, the finest preventive against

*(Continued on next page.)*

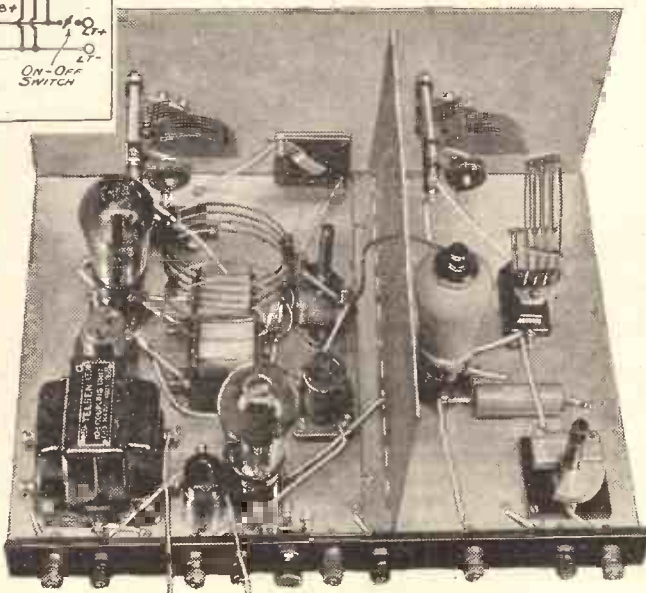
**SIMPLE AND STRAIGHTFORWARD**



heartily. It is not the simplest short-wave set that one could possibly build, but it is notably free from all the complications of the more unnecessary kind that one sometimes finds in short-wave sets.

**Analysing the Circuit.**

Before we get on to practical politics, a word about this complication business is very desirable. A man who has had enough experience of the funny little troubles that sometimes beset the short-waver can often build a really simple set that works perfectly. On the other hand, a man with less experience may build what he fondly imagines to be a similar set, and he will have a bad time with it. Little troubles will crop up, and it is only by introducing complications that he will be able to get rid of them.



**A CLEAN LAYOUT**

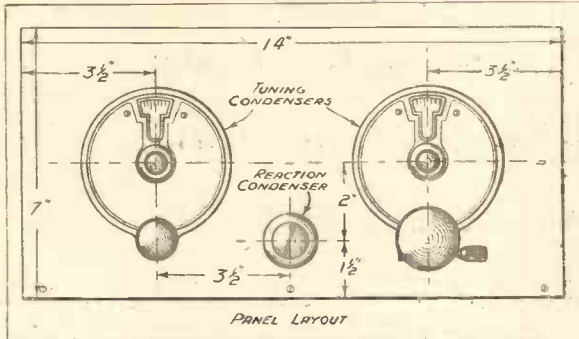
One of the features of the "H.A.C." short-waver is its straightforward circuit arrangement. A fully tuned parallel-fed S.G. stage is employed, and the L.F. stage incorporates a high-ratio coupling unit, thus ensuring excellent amplification. As the photograph shows, the tuning coils are of the plug-in type and have been arranged so that their axes are at right angles in order to eliminate undesirable interaction effects.

## THE "H.A.C." SHORT-WAVER

(Continued from previous page.)

threshold-howl and hand-capacity effects in short-wavers that I have yet discovered is

### DESIGNED FOR EFFICIENCY



A metal panel is used so as to eliminate hand-capacity effects, and the tuning is further simplified by the provision of slow-motion controls on the aerial and detector tuning condensers.

a stage of S.G.! So by all means let us use it. Other "preventives" effect a very doubtful cure, and don't do anything but clutter up the baseboard. The S.G. stage is a practically certain preventive, and it gives us something else as well, in the shape of a considerable amount of amplification (and, of course, the right to crow over the man next door who has only two valves).

But it does still more, in that it cures two troubles for which there is no other cure—"dead spots" from the aerial, and wobbly signals from a swinging aerial. This S.G. stage is, in fact, the perfect "decoupler" of the aerial from the set. Signals come through it, but undesirable effects don't.

#### Effective Coupling Device.

And it also comes in the category of the little things that I mentioned earlier on. A real expert can make a short-waver without an S.G. stage do wonderful things; but an ordinary man like you or me is better advised to use one, and will probably find it less trouble in the long run.

The screen volts are supplied from a tapping on the battery, and a special terminal is provided, next to the aerial and earth terminals. With a voltage of 100 or 120 on the anode, probably 60 will be found sufficient for the screen.

So much for the first valve: Now let us examine the detector circuit. The neutralising condenser coupling through from the top of the detector grid coil. Its damping effect is just about similar to that of a small aerial capacity-coupled in the same way, so that the tuning range is not unduly reduced. Quite a small amount of capacity is required to give an effective degree of coupling.

Note that the leads from the grid coil to the condenser that tunes it are reasonably short, and, above all things, direct. The bottom end of the coil is taken down to

L.T. negative and earth, while the grid-lead goes from the grid to L.T. positive. Potentiometers across the L.T. for the grid-return are not necessary nowadays, especially if two-volt valves of the H.L. type are used as detectors.

The H.T. is fed to the detector anode through the 10:1 coupling unit and an H.F. choke of the short-wave variety, and the reaction coil and reaction condenser are taken from the plate to earth, with the condenser at the "earth" end. There is not the slightest excuse for reaction condensers "up in the air," as hand-capacity troubles are every bit as serious when they appear on the dial of the reaction control as when they are on the tuning control only.

When you set your reaction carefully, so that you are listening to a telephony transmission with the set just below the point of oscillation, you want to feel sure that it will stay there.

## RECOMMENDED ACCESSORIES

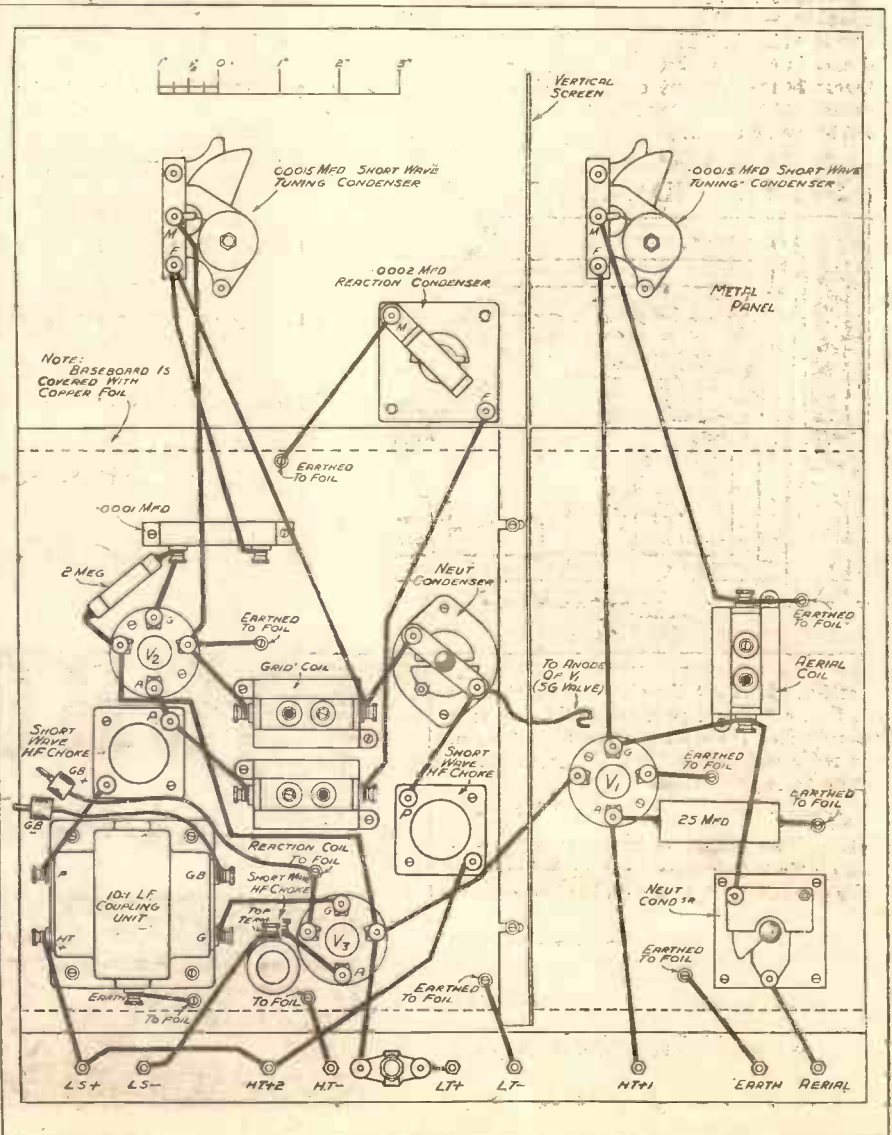
- LOUDSPEAKER.**—R & A, Celestion, B.T.H., Atlas, Marconiphone, H.M.V., Blue Spot, Ormond, G.E.C.
- PHONES.**—Ericsson.
- BATTERIES.**—H.T. 120 volts. Ediswan, Siemens, Ever Ready, Pertrix, Drydex, Silver Knight, Lissen, Magnet. G.B.—4½ volts. Siemens, Pertrix, Ever Ready, Drydex, Lissen, Ediswan, Magnet, L.T.—2 volts. Exide, Ever Ready, Ediswan, G.E.C., Pertrix, Lissen.
- AERIAL AND EARTH EQUIPMENT.**—Electron "Superial," Goltone "Akrite," Graham Farish "Filt" earthing device.

In this year of grace, 1933, we don't want to have to sit in our chairs like dummies, afraid to release our grip on a knob for fear of losing our station.

There is nothing to say about the L.F. stage, except that the simple expedient of using a short-wave choke in the plate lead looks after "head-capacity" so well that the operator doesn't have to emulate one of Mr. Epstein's creations and sit with immovable features when he is wearing the phones.

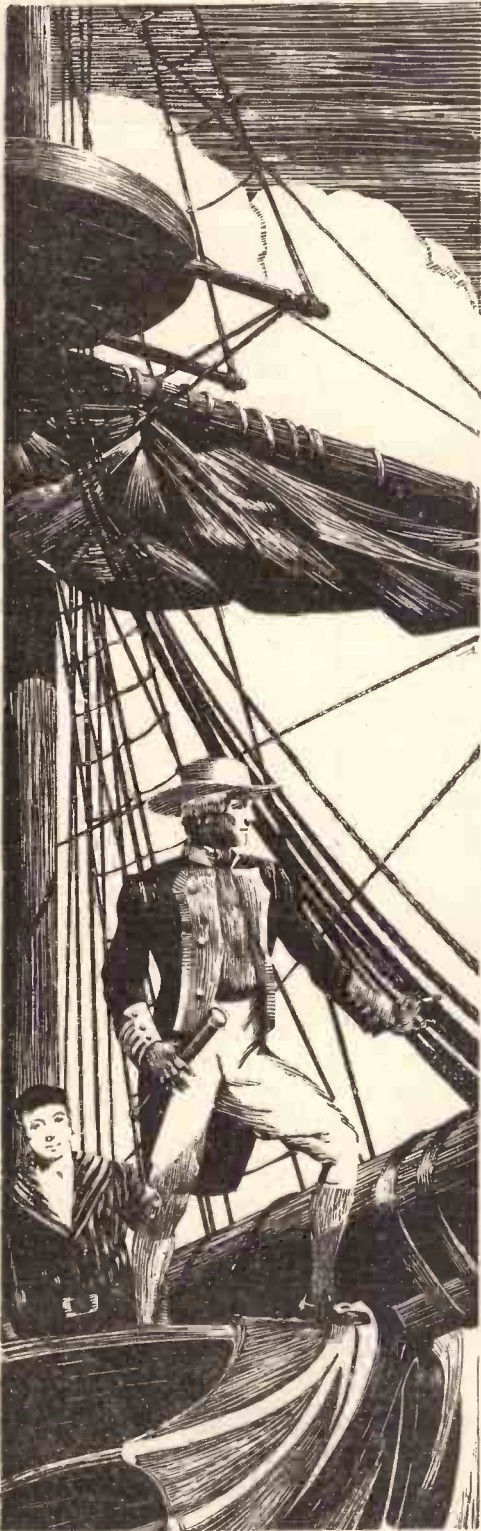
(Continued on page 271.)

## CAREFUL COMPONENT PLACING—DIRECT WIRING



The simple, direct wiring is clearly shown in this diagram. It will be noticed that a considerable amount of wire has been saved by covering the baseboard with copper foil and taking "earth returns" to the nearest convenient point.

Parallels of History No. 4



## CAPTAIN JAMES COOK

hero of many triumphs; author of many adventures; discoverer of New Zealand and many of the Oceanic islands. His name has been famous for over 150 years, and because of his determination and fearlessness, he has earned the respect of the whole world. It is this same spirit of determination to accomplish an ideal that has enabled Dubilier to bring their products to the high standard of efficiency that they enjoy, an efficiency that is the climax of 21 years successful trading.

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\* \* \*
- ★ Mark Hambourg on  
**MY THOUGHTS ABOUT BROADCASTING**

## "BETTER RADIO"

A practical and entertaining feature which will help you to a better understanding of your receiver, better results from your listening and a better enjoyment of radio in general. More and more listeners are reading and benefiting from "Better Radio" every month.



## THE "H.A.C." SHORT-WAVER

(Continued from page 268.)

I should imagine that by now you know quite enough about this set to go ahead and make an intelligent copy of the original layout. One doesn't make mistakes in wiring nowadays, so I will say nothing about checking over the connections and making sure that the voltage across the L.T. terminals is L.T. and not H.T.

Connect up the batteries with 60 or 80 volts on H.T. 1 and 100 or 120 volts on H.T.2; suitable L.T. for your valves on the L.T. terminals; whatever aerial you possess on "A" and whatever earth you possess on "E"; and don't forget the phones or loud-speaker.

For a start I suggest that you insert the coils covering the band roughly between 36 and 60 metres—that is to say, a 9-turn coil for the S.G. grid coil and the detector grid coil, and a 6-turn coil for reaction. Set both tuning condensers somewhere near the middle of the range, and increase the reaction condenser slowly from the zero position. I hope that you will find that the set goes smoothly into oscillation with that nice Rolls-Royce noise—a gentle hiss.

### Finding Programmes.

Turn the detector tuning dial—on the right—slowly until you find a signal of some kind. Probably it will be some loud Morse from a commercial station. Now rotate the S.G. tuning dial and see what happens to the signal.

It will probably do one of two things (a) disappear; (b) come up in strength until it reaches a maximum and begins to die off again.

If "condition (b)" is in force you need make no more adjustments; you will have been lucky. If, on the other hand, "condition (a)" takes charge, you will have to do a few tests with the two neutralising condensers.

Let us assume that the signal disappears. This will only be because the S.G. stage has

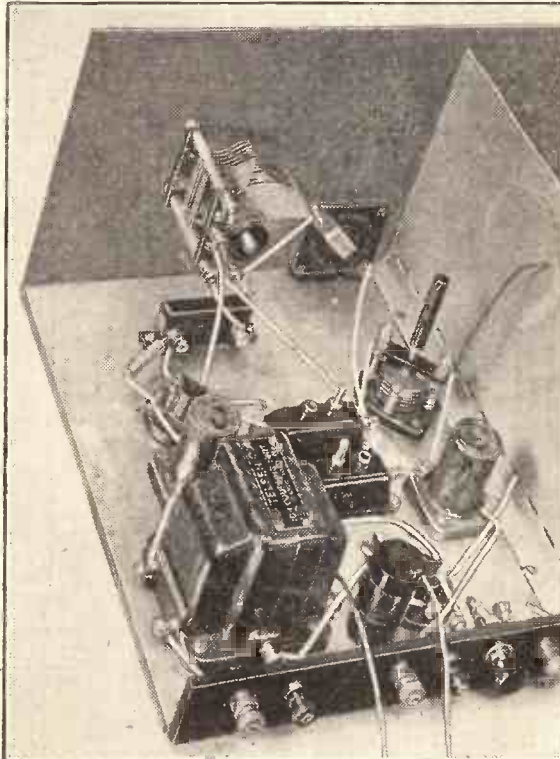
taken charge for the moment. Retune on the detector dial—probably only a degree or so will be necessary, and "follow" the signal as you manipulate the two dials together.

You will be able to tell when the S.G. stage is in tune with the signal, whatever the effect is. It will either come up to a maximum in strength, or the set will oscillate harder over a few degrees. If the signal simply comes up in strength, but shifts about

## THE CORRECT VALVES

Make.	S.G.	Det.	Output.
Mullard	P.M.12A.	P.M.1H.L.	P.M.2A.
Mazda	S.215B.	H.L.2	F.220
Cossor	220S.G.	210H.L.	220F.A.
Osram	S.22	H.L.2	L.F.2
Marconi	S.22	H.L.2	L.F.2
Hivac	S.G.210	H.210	P.220
Eta	B.Y.6	B.Y.1815	B.W.604

## DETECTOR AND L.F. STAGES



This photograph depicts the detector and L.F. stages which are separated from the S.G. stage by the vertical metal screen. The flexible lead passing through the screen goes to the anode of the S.G. valve.

second neut. condenser. If the set seems to oscillate hard when the S.G. is in tune, increase the aerial coupling to the S.G. stage by means of the first neut. condenser, near the aerial terminal. Probably this will need to be nearly "all in," particularly if you are using a smallish aerial.

### Daylight Reception.

It is almost impossible to give any definite rules, but, for your guidance I may as well say that the ideal state is that in which the rotation of the S.G. dial just produces the effect of bringing the signal up to a maximum, not too sharply. You may regard it simply as a volume control. It is always possible to produce this effect, simply by judicious "wangling" of the two neut. condensers. It requires patience, but you will want lots of that, in any case, if you ever hope to get anything out of short-wave work.

The coils that you have in the sockets now will probably tune roughly from 36 to 60 metres. At all events, it is certain that the 49-metre group of broadcast stations will appear somewhere in the middle of the tuning range.

During daylight you should find Moscow and the Vatican City if they are on. In the early evening, if you feel ambitious, you should adjust the headphones properly, find a comfortable chair, and settle down to find Nairobi. He is never really weak, but you mustn't expect it to be as easy as finding Midland Regional. Scrutinise each degree on the dial, listen to everything that you hear, and when you find a telephony station

the detector tuning dial, reduce the coupling between the S.G. stage and the detector by reducing the setting of the

make sure that you are getting the best out of him by really careful adjustment of the  
(Continued on page 285.)

## THE PARTS YOU WILL NEED FOR THE "H.A.C."

Component	Make used by designer.	Alternative makes of suitable specification recommended by designer.	Component	Make used by designer.	Alternative makes of suitable specification recommended by designer.
1 Metal Panel, 14 in. x 7 in.	Magnum	Peto-Scott	1 .25-mfd. fixed condenser	T.C.C. type OF.	Tunewell, Igranic,
1 Baseboard, 14 in. x 10 in. x 3/4 in.	—	—	1 2-meg. grid leak with wire ends	Goltone	Dublier 1 watt.
1 Cabinet to fit above	Camco	Peto-Scott, Pickett	3 Four-pin valve holders	Lissen LN 5069	W.B., Benjamin, Telsen
2 .00015-mfd. tuning condensers	J.B. short-wave type	Ormond, Folar	1 L.F. coupling unit	Telsen 10-1	R.I. "Parafed," Bulgin
1 Indigraph drive for above	Igranic ("Vinil")	—	—	—	"Transcoupler," Benjamin
1 Indigraph drive with micro-meter control	Igranic ("Vinad")	—	1 On-off switch	Lissen LN 376	Benjamin "Transfeeder,"
1 .0002-mfd. reaction condenser	Graham Parish	Te'sen, Folar	9 Indicating terminals	Goltone	Wearite, Telsen, Tunewell
1 Neutralising type condenser	Bulgin	Igranic (Micro).	1 Terminal strip, 14 in. x 2 in.	—	Belling & Lee, Igranic, Clix
1 Micro Condenser (base-board type)	Igranic	Bulgin (Neut type)	1 Vertical screen, 6 in. x 10 in.	Magnum	—
2 Short-wave H.F. Chokes	Telsen	Wearite, Bulgin	3 yds. insulating sleeving	Goltone	Wearite
1 Short-wave H.F. choke	Keystone	Keystone	4 yds. 18-gauge tinned copper wire	Goltone	Wearite
3 Plug-in coil holders	Igranic	Wearite, Telsen, Bulgin	Sheet copper foil, 14 in. x 10 in.	Belling & Lee	Goltone, Bulgin, Clix
1 .0001-mfd. fixed condenser	Lissen LN9	Dublier, T.C.C., Ferranti, Telsen	4 Battery plugs	Atlas	Igranic
—	—	—	1 Set Short-Wave Coils	Belling & Lee	—
—	—	—	1 Wander fuse	Clix	Belling & Lee
—	—	—	2 Accumulator spade terminals	—	—
—	—	—	Flex, screws, etc.	—	—



Microphones have to be put through their paces before they can go into the studios, and the very stringent tests carried out by the B.B.C. engineers are revealed in this "behind-the-scenes" account.

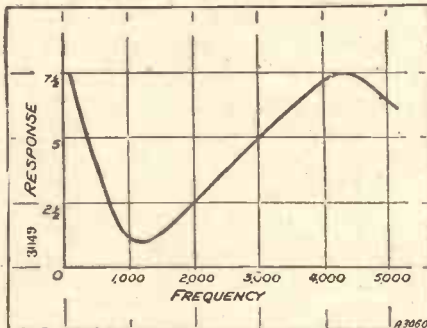
By OUR SPECIAL CORRESPONDENT.

YOU have only to pay one visit to the B.B.C. Research Department at Clapham to realise that broadcasting is not all bread and honey.

Unfortunately the average man cannot get behind the scenes of the research station. It is a close-guarded department from which even the rest of the B.B.C. Staff is excluded and so much light is hidden under many bushels.

Sometimes the light leaks out! For instance, I have just heard about the amazing way in which the new microphones are tested for sensitivity.

### THE SHAPE OF THE CURVE



This curve shows how a carbon microphone responds to the various frequencies. The figures were obtained by the Rayleigh Disc test.

It has been kept a hush-hush process, not only because it is very delicate, but because the testing of "mikes" is not desired by the B.B.C. to be a public matter. There are so many makes of "mike" which the engineers are asked to try out, and they put each through its paces. The results must be kept secret for obvious commercial reasons.

#### New "Mikes" Used.

The B.B.C. in the past, has used ordinary Reisz microphones, and before that a "mike" known as the Marconi-Sykes. Now there are five. It is not generally known that so many are being tried by the B.B.C. But I am not divulging a State secret when I say that in the London and Manchester studios you will find an entirely new kind of Reisz microphone, another carbon microphone by B.T.-H., and condenser microphones by R.C.A. (the film people), Edison Bell, and Western Electric.

These are tried out in the studio and given practical tests during broadcasts, the programme staff being asked to vote in an unofficial way. Artistes, also, have their choice. Henry Hall has definitely refused to use certain microphones, and has chosen one of the five I have mentioned.

At the research lab., however, much more stringent tests are given.

#### Miraculous Measurement.

In their lab., the engineers take the new carbon and condenser "mikes" sent them and put them through tests which show how they respond to bass and the top notes.

It is amazing to watch this being done. The microphone experts use the Rayleigh Disc method for testing "mikes," which is really a miracle of science.

Engineers have tried several methods of testing the microphones, but they all suffer from one defect.

They are, in effect, only a measurement of the pressure which is actually exerted on the sensitive diaphragm by the sound waves.

#### Bomb-Like.

Now you would think that this would be satisfactory, but you must remember that as a "mike" has a definite size, it is capable of reflecting sound waves itself. This introduces a number of curious effects, including a slight change of frequency on the diaphragm. Incidentally, it is one of the reasons for the bomb-like case fitted to some of the new condenser "mikes."

What the B.B.C. engineers want to know is the performance of the microphone relative to the sound-wave pressures in the air itself and to include in that performance any increase in pressure over part of the frequency range which may occur as a result of "reflection" on the "mike's" diaphragm.

In this way the microphone experts can measure the output of a "mike," can tell whether or not it has a silent background and can see what its frequency range is.

The Rayleigh Disc method which the experts use, is a difficult one by which

sound-wave pressures are measured. It works this way.

If a very light disc is suspended in the path of sound waves, going to a microphone, it tends to turn so that it is at right angles to the direction of motion of the sound waves. The force which tries to turn it is dependent upon the pressure of the waves.

The experts use a very light disc which is silvered on one side. They focus a beam of light on it, and by watching the deflection of the beam as the disc turns, they can measure the force and so calculate the sound-wave pressure.

#### Too Sensitive.

This Rayleigh Disc idea is too sensitive to be employed for ordinary microphone testing. It is one of those brilliant ideas which are simple in theory but which need so much tricky apparatus that one microphone test in this way takes a couple of days.

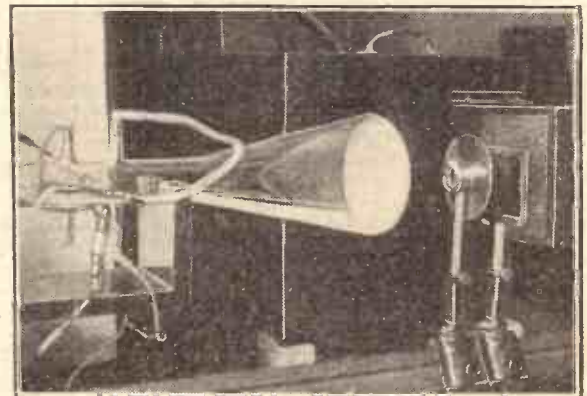
So, for their ordinary research work in "mikes," the B.B.C. engineers take a suitable microphone (condenser type) and calibrate it by the Rayleigh Disc method. Then, when they want to make a quick test on the microphone, they have only to connect it up to the same gear as the standard condenser "mike," and by means of a change-over switch they can check its output by direct comparison.

After making careful tests with their standard microphone the engineers have checked up the performance of all the new "mikes," including the R.C.A. and B.T.-H. microphones, which are the latest newcomers.

The tests are so accurate that they often surprise engineers who have only a working experience of microphones.

The delicate Rayleigh Disc shows up

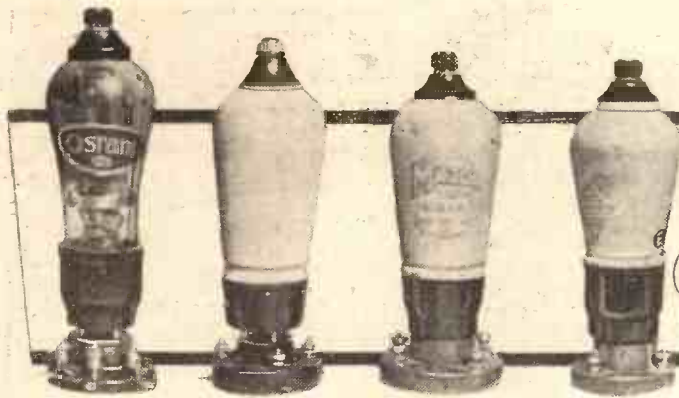
### SCIENTIFIC TESTING METHODS



Oscillographs are used in connection with microphone testing. The wave form of the currents handled by the microphone is traced on a screen by the cathode ray.

the high spots of the B.B.C. "mikes." It shows that if the average response (judged by that popular unit the decibel) of a carbon mike is , it has a response of 6 down in the bass at about 60 cycles, it drops to nearly zero at 600 cycles, and rises to a peak again at about 4,000 cycles.

This dip in the characteristic suits some of the new studios, and it is therefore, thanks to the Rayleigh Disc, that the B.B.C. engineers have been able to find the right microphone for every studio.



# That H.F. STAGE

By *[Signature]*

**T**HE construction of an H.F. stage, either as an addition to your present receiver or as part of a new one, is no longer the uncertain venture it used to be before we had these super-efficient S.G. valves and "canned" components. Nevertheless, the H.F. stage is still the most likely place for trouble to occur in a newly-built receiver.

### H.F. Oscillation.

You may get no results at all, but that is not really serious, as obviously there must be some mistake in wiring or construction which should not take long to find if you are sure of your valves and components.

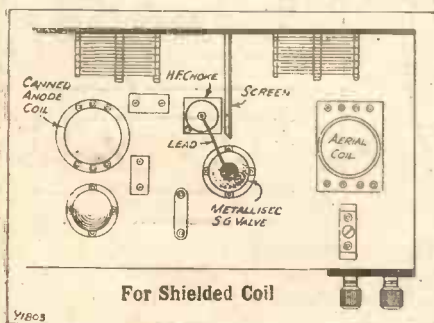
The other extreme is an H.F. stage that is so lively that it oscillates over certain parts of the wave-range when both variable condensers are brought into tune. This fault can be particularly exasperating, as you can never achieve successful long-distance reception with the H.F. stage in this condition.

But even this is not so disheartening as to find that the H.F. stage refuses to give anything but mediocre results, when satisfactory long-distance reception is equally impossible.

### Particular Symptoms.

Now it is not much good trying haphazard adjustments and alterations in the hope of improving matters; all that does is to waste time. Of course, you may be lucky and hit on just the right

### SIMPLE SCREENING PERMISSIBLE



thing, but you are more likely to get at the root of the trouble—which may be something quite trivial in itself—if you have some knowledge of the possible snags, why they cause trouble, and their symptoms.

The particular behaviour of the refractory H.F. stage will then suggest to you the most likely alteration or adjustment

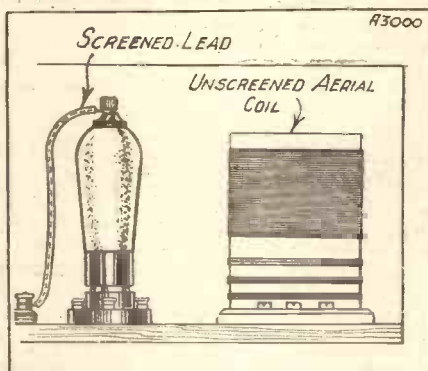
★.....★  
**Is your H.F. stage unstable—or not so sensitive as it should be? Troubles of this nature, as our contributor points out, are often caused by something quite trivial, and are easily traced if tackled in the right way.**  
 ★.....★

to make. A few tests should then quickly result in the performance of the H.F. stage coming up to scratch.

Take the case of the receiver where the H.F. stage is far too lively. The cause of this uncontrollable oscillation must be some spurious back-coupling between the anode and grid circuits of the S.G. valve, usually most prevalent over the lower part of the tuning range.

This may be due to stray magnetic coupling between the coils, or the aerial

### WATCH THIS POINT! HOW SENSITIVITY IS REDUCED



If the positioning of an S.G. valve and unscreened aerial coil are as shown above, it is advisable to use a valve of the metallised type and also to employ a shielded anode lead. When one tuning coil is "canned" (left) a simple baseboard screen separating the two tuning condensers is often sufficient. If, however, both coils are unscreened they should be well spaced, and the screen arranged as on the right.

coil and the H.F. choke, or stray capacity couplings between the components in anode and grid circuits, or even due to the wrong method of wiring up.

If you still use unscreened coils, they must be well spaced and with a metallic screen between them, which screen must also separate the two tuning condensers. Don't mount the S.G. too near the aerial coil if it is not a metallised valve, and beware of an H.F. choke with a big field that strays all over the place.

A plain S.G. can be shielded by covering it in the metal foil from cigarette or tobacco

wrappers, earthed to the negative filament pin by a twist of bare wire. Also, if your components are not of the latest screened type, do not attempt the modern compact lay-out; but, nevertheless, make your grid and anode S.G. leads as short and direct as possible. Shielding the lead from the S.G. anode is also a dodge worth trying.

### Concerning Layout.

If you use two "canned" coils, or even only one totally screened coil, for the second tuned circuit, together with a metallised S.G., you won't require much screening—just a simple screen between both tuning condensers.

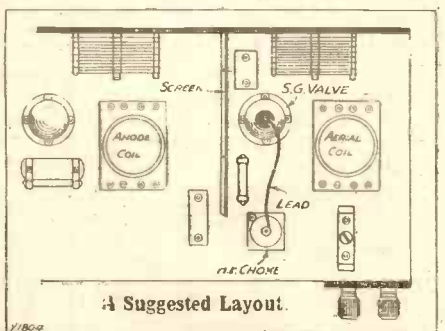
If the latter is an enclosed ganged component, then you can cut out metal screens and adopt a more compact lay-out. Even then you may get instability if the aerial coupling or the detector damping is very light, or if you run too many earthing wires to a common lead going to the earth terminal.

When a variable- $\mu$  valve is used, you can often counteract any tendency to oscillation by slightly increasing the negative bias on the H.F. valve.

### Preventing Leakage.

Another frequent cause of instability in a sensitive H.F. stage, particularly if your earth is not a good one, is the leakage of H.F. energy past the detector into the L.F. section, whence some of it finds its way back through various hidden couplings to the grid circuit of the S.G. valve. Such remedies as the H.F. grid stopper, and perhaps an H.F. filter in the loudspeaker leads, suggest themselves here.

### WELL-SPACED COILS ESSENTIAL



Now what about the case of the H.F. stage which lacks sensitivity? Obviously, something must be damping down the S.G., and more than counteracting any stray back-couplings which, in moderation, account for a good deal of the excellent sensitivity of the average H.F. stage.

(Continued on page 282.)



**WAVE-CHANGING WITH PLUG-IN COILS**

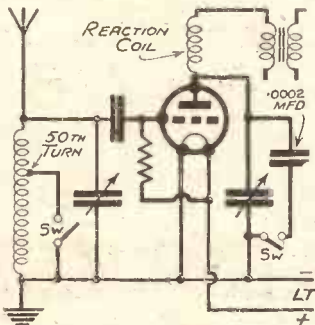
THE efficiency of the original plug-in coils cannot be questioned, and no doubt more radio "fans" would use them were they able to transfer reception from one wavelength to the other without changing coils.

Being a devout "sticker" to the plug-in coils, I endeavoured to find a way to do away with the necessity of changing coils. The coil that is normally used for long-wave reception is taken and it is noted whether the aerial currents travel through it from plug to socket, or vice versa.

Supposing the plug is the one in question, the turns of wire from here are counted and at about the 50th turn the wire is bared. (Even with complicated coils it is possible to do this.) A wire is taken from this tapping to a terminal on an ordinary push-pull switch, the remaining terminal of which goes to earth. When the switch is "on" the short length of coil only is used.

As for reaction, the largest coil that will serve with the reaction condenser all out, on the medium wave band, is used.

It is generally found that when the reaction condenser is all-in this serves the long waves effectively. Or if this is not the case connect one side of a



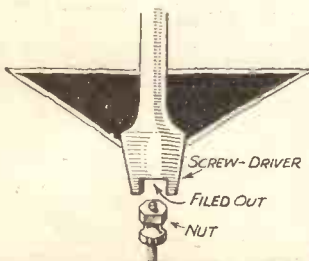
Wave-change switching with plug-in coils can be arranged for in this manner.

0002 fixed condenser to one side of the reaction condenser, and when the set is used for long waves the other side is connected to the other side of the reaction condenser.

**A SCREWDRIVER-SPANNER**

WHEN wiring up sets, etc., it will be found that some nuts are in a position where it is impossible to use a pair of pliers or a spanner.

With some little difficulty the nuts can be screwed on a couple of threads or



A filed screwdriver, as shown in the diagram, deals with awkward nuts.

so, but tightening up proves a different matter.

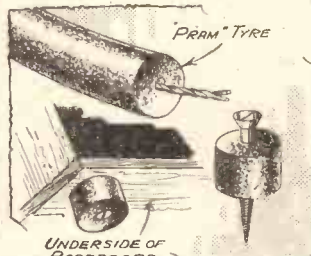
However, the following dodge will be very useful:

A screwdriver with a fairly long and wide blade can be filed in the manner shown in the diagram, and by using it as an ordinary screwdriver, the difficulty is easily overcome.

**BASEBOARD LEGS**

IT is sometimes necessary to raise the baseboard owing to sub-baseboard wiring, and rubber legs are not always available.

An excellent substitute can be made from short lengths of 1-in. diameter pram tyre, by extracting the wire and substituting wood screws.



Pieces cut from an old pram tyre make excellent rubber legs on which to mount a sub-baseboard.

**ONE GUINEA FOR THE BEST WRINKLE!**

Readers are invited to send a short description, with sketch, of any original and practical idea. Each week £1 ls. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

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

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. Christopher Malley, of 29, Brelade Road, Stoneycroft, Liverpool, to whom a guinea is being awarded.

These improvised supports form a rigid and well insulated method of raising the baseboard, the height of which can be adjusted according to the length of pram tyre cut.

**REVIVING EBONITE SURFACES**

GOOD ebonite, as is well known, is a mixture of pure rubber and sulphur, and, like other rubber compounds, is likely to change in appearance with age. This is especially true of the old type high quality unpolished panels used in many sets some time back, and whose appearance is detracted from by this ageing effect, which takes the form of a brownish tinge covering the surface where it has been exposed to the light.

As such panels are still serviceable and are sometimes cut up for use in other and later design sets, it is useful to know that the surface can be got back to its original finish without a great deal of trouble.

This is done by smearing the surface with a paste consisting of magnesium carbonate, obtainable at a chemist's, which is well rubbed in with the aid of a small pad and cleaned off after being left overnight, this process, in the case of a set, being conveniently done when some repairs or modernising are undertaken.

A light polish with a clean rag followed by the usual rub over with an oily one results in the finish being even and very little different from that when new.

**LOOSE VALVES**

IT is a common experience for valves, particularly mains valves and others with comparatively large glass envelopes, to loosen at the base. If this is not attended to at the outset the user is very liable to damage the internal wiring of the valve.

I have found that if a little methylated spirit is run in between the glass and the base to soften the cement, on pressing the two parts together and leaving to dry a thoroughly firm joint is made.

**TUNING MADE EASY**

A QUARTER of an hour spent in affixing station names to a degree-marked tuning dial will surely result in hours of greater pleasure for those members of the household who, on account of the trouble they may experience in searching for some particular broadcast, allow it and many other good programmes to pass unheard.

It is not suggested that the dial should be plastered with all the names of the stations the set is capable of receiving; a dozen of the best ones, including British, should be aimed at.

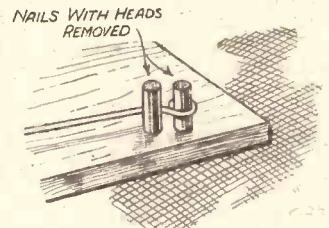
A list of broadcasting stations, printed in minute type, may be taken from one of the valve booklets distributed free by wireless dealers.

Before cutting, a line should be ruled through every chosen station name—a black line indicating the medium wave, and a red one for the long wave.

Each station name is then cut out, abbreviated if necessary, and then gummed to the dial. In applying the gummed name-strip, a darning needle will prove useful.

**WIRE LOOPS**

IF you have no wire-bending pliers and wish to make workmanlike loops at the ends of your wires, procure nails of the same size as the terminals, remove their heads and drive them into



Two nails arranged as shown make perfect loops in wire.

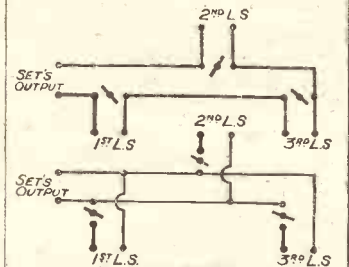
a stout piece of wood, in pairs, just far enough apart to allow a piece of the wire used for wiring up to pass between them.

Pass the end of the wire between the nails, as in sketch, and then, using an ordinary pair of pliers, the wire can be drawn around the nail to meet. Hold with the pliers and pull the free end, when a neat loop will have been made which can easily be slipped off the nail.

**LOUDSPEAKER EXTENSIONS**

MANY people these days are realising the convenience of having loudspeakers in several rooms, and it often happens that a programme is required in one room while silence is preferred in either or both of the others.

Silencing a speaker by pulling a wire off is a crude method, and simple switching can easily be carried out at the speakers with simple on-off switches.



The two alternative connections for switching extension speakers.

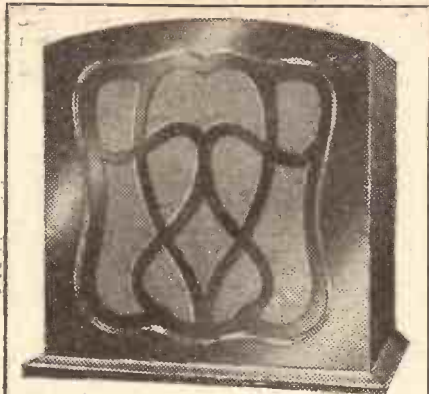
These can usually be fitted to some convenient part of the speaker, and should be connected as shown in the diagrams. Two arrangements are shown (1) for loudspeakers connected in series and (2) in parallel.

It will be seen that when the speakers are in series the switches are placed in parallel with the windings in order to short them out, and when they are in parallel (2) the switches go in series with the windings to cut them off when necessary.



Mark the long and medium wave stations with different colours to distinguish them on the dial.

# PICK YOUR BARGAIN



**KENWELL POWER PACK**, as illustrated. Electrifies your present Battery Set. For A.C. Mains. With **MATCHED MOVING-COIL SPEAKER** in Handsome Walnut Cabinet. Usual Price, £7/15/0. Our Price, £4/0/0, or 12 monthly payments of 7/4.

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**KENWELL ALL-ELECTRIC 2-VALVE SET**. Detector and Pentode complete with Speaker, ready to play. For A.C. or D.C. Usual Price, £7/10/0. Our Price, £4/0/0, or 12 monthly payments of 7/4.

**KENWELL 2-VALVE DE LUXE A.S.2**. Detector and Pentode. Complete with P.M. Moving-Coil Speaker. Ready to play. Usual Price, £9/15/0. Our Price, £5/5/0, or 12 monthly payments of 9/8.

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**LOEWE CABINET SPEAKER** with 4-pole Balanced Armature Movement. Our Price, CASH or C.O.D., Carriage Paid. **17/6**

USUAL PRICE 39/6.

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(Described this week.)

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2 Igranic Indigraph dials, types 'Vinil' and 'Vinad'	14	6	
1 Set of Atlas Short-Wave Coils	10	0	
1 Peto-Scott Cabinet	15	0	
3 Mullard Valves as specified	1	12	3

# Q. P. B.

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	£	s.	d.
1 Peto-Scott Panel, ready drilled, 16 x 7 in.	4	8	
1 Lissen Hypernik L.F. Transformer	12	6	
1 R.I. "Class B" D.Y.39 Transformer	12	6	
1 Varley Q.P.P. Output Choke D.P.39	16	6	
1 Set of Valves as specified	1	9	9
1 Cabinet	15	0	

## DOUBLE-DIODE TRIODE

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Author's Kit of First Specified Parts, including ready-drilled Panel and Assembled Baseboard, but less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £9 7 0.

Set of Specified Ferranti Valves .. £3 5 6  
1 Peto-Scott Cabinet .. 17 6

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(Described this week.)

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	£	s.	d.
1 Ferranti Power Transformer, type S.V.84	1	16	0
1 Igranic C.H.2 Smoothing Choke	1	9	6
1 Ferranti Rectifying Valve R.H.4	15	0	

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## JUST RELEASED. LISSSEN ALL-ELECTRIC SKYSCRAPER 3

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FROM THE TECHNICAL EDITOR'S NOTE BOOK

**TESTED AND FOUND?**

**THOSE POWER PLUGS**

I DON'T suppose my experience is exceptional, but I have had a lot of trouble with power plugs and sockets.

And this has caused me no little wonderment. Ostensibly such articles are simple enough and yet they can cause as much as, and more, annoyance than an intricate piece of mechanism.

In connecting up one is apt to encounter clumsy connecting screws which either won't screw down nice and firmly on ordinary flexible wire, and tiny little screws with coarse threads which only loosely engage with it.

And then there are plugs and sockets in which there is no provision for taking the strain of the lead. Every pull on this directly bears on the terminals.

When it comes to the use of the articles, the situation even worsens. Sometimes the pins fit too tightly and brute strength is needed to insert and remove the plug.

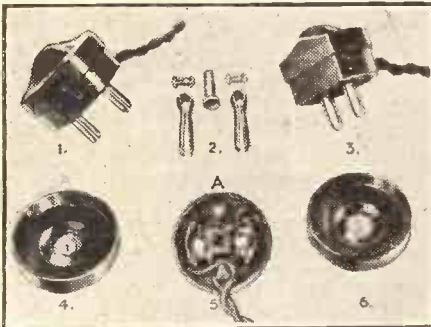
On the other hand, they are as liable to be too loose and bad contacts result.

But all these faults must have come to the attention of nearly everyone having a mains set.

And in view of this I predict an immense popularity for the new Clix Wall Plug, which definitely is a soundly designed and trouble-free article.

In regard to connections these are made in a highly ingenious and efficient manner merely by inserting the wire and screwing on the cover.

And a tortuous path is arranged for the wire inside the plug so that strain is absorbed. The pins are very springy and what is even more important, they retain their springiness however badly they are handled. They are also able to make efficient contact with sockets varying considerably from standard.



A detailed illustration of the Clix Wall Plug. 1, 2, and 3 show two types of plugs and the pin details. 4, 5, and 6 depict the interior and two types of covers.

**"CLASS B" TRANSFORMERS**

It will be quite unnecessary for me to remind you that "Class B" sets require special components, for you have all now had an opportunity of examining full specifications of such instruments.

And you will have noticed that the "Class B" valve is totally different from all other "output" valves. Indeed, in order to discover the equivalent of the normal power valve in a "Class B" receiver you must go to the valve which precedes the "Class B" valve.

The latter is power operated and, therefore, it must be supplied with a "drive" valve which is of the power type. Obviously, therefore, the coupling between the two has to be of a special nature. The standard form of L.F. transformer will be absolutely unsuitable.

And so we have had to add another component to our lists, i.e. the "Class B"

Drive Transformer. In a way it is rather a good job it totally differs from the ordinary type, because that renders it impossible for improvisations to be made.

(Of course, I'm not thinking of the manufacturer who attempts to keep abreast the times by making the smallest possible alteration to existing designs and providing the ineffective result with suitable labels!)

Certainly, it is an advantage if you can twist the functions of a piece of apparatus so that it will fit in with a new job. But some people will twist so far that they completely lose their way!

However no amount of twisting will render an ordinary L.F. transformer even remotely suitable for "Class B" work. Very exceptional qualities are demanded and these are only to be found in transformers skillfully designed for the job. Which is another way of saying that you should be careful in your selection of make.



The Ferranti "Class B" Drive Transformer.

Among the first-class "Class B" transformers which can be confidently recommended are those made by Ferranti. Actually, they can be included in the first two or three. I have been testing one of the Ferranti A.F.17 C's in a new "P.W." design, and find that it is extremely good.

It has the following specification: Ratio, 1:1; Primary Inductance 18/12 henries; Secondary Resistance, 120 ohms each half; Price, 15s.

**AN AUTOMATIC WIRELESS CLOCK**

I have encountered a large number of "wireless clocks" during the course of the years but practically all failed by being switches first, their time-keeping departments being very much "also rans."

And in any case, until I received one of Messrs. Kallmann's Automatic Wireless Clocks, I had never seen one able to switch a mains set on and off.

In appearance the device is a neat, artistically-designed timepiece with no indication of its special purpose except the flexible lead which comes away from its back. And it keeps excellent time, too!

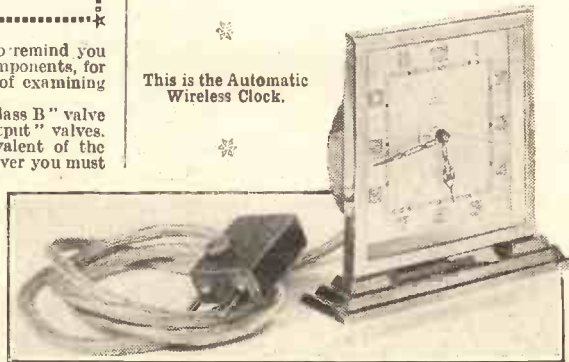
By means of the unobtrusive little controls the clock can be set at anything up to ten hours in advance for either switching the set on or off, and this it does correctly and effectively.

Lighting or electric kettles, etc., can be similarly controlled, if desired.

In addition to the switching there is an alarm (one of those discreet "burrs"), although this remains "quiescent" until a further little control is operated.

Of course, this fine little piece of mechanism is also perfectly suitable for switching a battery set.

This is the Automatic Wireless Clock.



**NEW BLUE SPOT SPEAKER**

The British Blue Spot Co. Ltd., recently sent me one of their 29P.M. loudspeaker units. It is a permanent magnet moving-coil instrument and, complete with transformer retails at the most attractive price of 32s. 6d.

But it must not be confused with the general run of "small" units. In my opinion, it is definitely superior to the great majority of that class.

For one thing it possesses a degree of sensitivity not usually associated with the "juniors." And it can handle a fairly large input, larger than that supplied by the normal "three."

Its transformer provides for close matching of ordinary power valves and pentodes.

The response is particularly bright, a quality which is typical of Blue Spot productions.

And there is a commendable freedom from peaks. I would advise all "P.W." readers who are contemplating the purchase of a new speaker to make a point of hearing one of these Blue Spot 29P.M.'s.



Blue Spot's 29P.M. Model.

**THE LUCERNE CONFERENCE**

How Europe's wavelengths may be distributed in the future.

The future of European broadcasting will in a large measure be decided at the conference of the governments of European countries which will meet on May 16th at Lucerne. This conference, unlike the Prague conference of 1929, which was only a conference of European postal administrations, is one of governments, and its decisions will thus bear even more weight than the Prague decisions did.

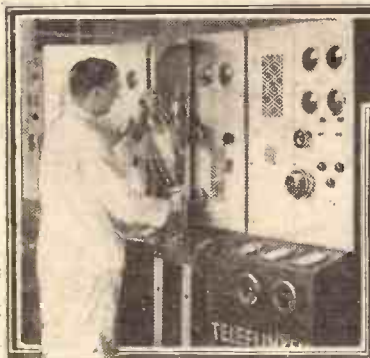
As we all know, the U.I.R. met at Brussels in February, in great secrecy as usual, to discuss the expert advice it had been asked to submit to the European governments. This advice was duly circulated and the governments made amendments and suggestions and handed these in to the Swiss government by April 20th.

The U.I.R. has kept great secrecy over this tentative wave-plan, but I have been able to gather the fundamental principles upon which it has been built from an official source. According to this, European wavelength distribution will take place as follows:

In the vast wave-band from 200 to 2,000 metres, broadcasting officially has practically sole use of all waves from 200-545 metres and from 1,250 metres to 1,875 metres. Apart from these wave-bands, broadcasting has the use of the wave-bands from 1,250 metres to 1,176 metres together with non-public services (police, etc.) providing that no interference occurs.

The band 1,176 metres to 1,132 metres is shared with the aeronautic services. Outside these official bands the U.I.R.

(Continued on page 284.)



# Berlin's Ultra-Short Waver

From OUR BERLIN CORRESPONDENT.

**P**ROFESSOR ESAU of Jena University first started tests with ultra-short waves for broadcasting in 1926 or 1927. Old "P.W." readers may still remember reading an interview I had with that gentleman on the subject, that appeared in 1928. Later the German Post Office became interested and continued tests at Chemnitz. But do not let us forget that the very first man to use ultra-short wavelengths was the discoverer himself, Heinrich Hertz.

## Choosing a Site.

Then the Lorenz Company continued tests, and finally Telefunken placed a small 1.5 kw. transmitter on the roof of its Berlin laboratories, and it was with this transmitter that the long series of experiments were carried out which led to the firm offering to lend the Post Office a high-power ultra-short-waver to prove conclusively that this type of wave has its very good uses, especially for television.

The Post Office, being bound to strictest economy, still hung back, till somebody had the brilliant idea of suggesting that the old power plant used for the former Langenberg station could easily be used for the new ultra-short-waver. And so the German Post Office has come by the world's most powerful ultra-short-wave transmitter free of charge.

"No doubt Telefunken hopes to get orders in the near future, but that is still to be seen.

Tests were extensively carried out in Berlin to decide where the transmitter should be erected. Some were for the "Europahaus," one of the highest buildings in the centre of the town; others were for the Berlin Funkturm, contending that the added height of the aerial would make up for radiation losses owing to the transmitter being situated at the western outskirts of the town. The latter school of thought won the day.

## A Fortunate Discovery.

It seems providential that only about a year ago the German G.E.C., the A.E.G., had produced a new type of high-frequency cable suitable for use as a feed cable for all wavelengths. This cable consists of a special low-loss copper wire mesh "rope" surrounded by air insulation and then properly shielded.

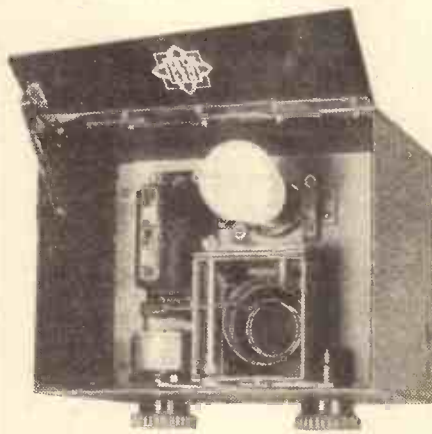
The "rope" is kept in position by porcelain rings. This is a very efficient low-capacity type of high-frequency cable which is already used at Königswusterhausen instead of the now obsolete above-ground feeder lines.

I say it seems providential, because with-

out this cable it would hardly have been possible to erect the transmitter at the foot of the Funkturm and the aerial at the top. As it is, the transmitter is in a room immediately below the Funkturm on the ground floor of the exhibition hall No. 4, practically opposite the Witzleben medium-wave station, which is across the hall on the first floor.

The aerial leads go from the transmitter down to the basement, where the two leads are united into one by a very ingenious new circuit. One lead is made exactly half a wavelength longer than the other before the connecting point to the out-lead, thus all complicated tuning or phasing apparatus is unnecessary.

## FOR THE SET-OWNER



This is the simple adaptor that the Berlin listener can buy to add to his set and convert for ultra-short-wave reception on 7 metres.

Then the cable goes out underground and away up to the top of the Funkturm to the aerial 138 metres above Berlin. That is the top of the aerial had raised the height of the Funkturm by two metres to 140 metres.

The cable ends in a small tuner box, from where the leads go up to the rod, which is a quarter wavelength long and acts as aerial. The counterpoise is immediately below and looks something like an umbrella frame.

One witty Berliner is stated to have said that the Funkturm was afraid of the rain and had put up its umbrella, which had been blown inside out by the strong wind.

The whole work of bringing up the cable and the mounting of the aerial were done at night so as not to have to shut the Funkturm to the public during the period of work.

I was present while the men hoisted the

aerial up to the top. The light of the Funkturm stood still one morning from 1.30 to 2.30 a.m., while the aerial was hoisted from the top platform to its stand above the lamp-house.

It was eerie work with the clouds flying past in the light of the lamp. But that night's work is a story to itself.

## Behind the Barrier.

Now for the transmitter proper. I already mentioned that the power supply, generators, etc., and the "lead-out" of the aerial feed cable were all down in the basement. The transmitter is not very big. But it is a giant in power.

Wondering visitors to the exhibition could enter the room where the transmitter stands and watch it from behind a barrier. An engineer of Telefunken's had had a good idea and darkened the windows during periods when the transmitter was not needed, had put a small quarter-wave coil on top of the artificial aerial circuit, and a flame burned from the top point of the coil after it had been "lit" by a short connection to earth that was immediately removed.

The energy of the transmitter is such that it will keep this flame burning indefinitely in spite of the lack of a second electrode. The nitrogen in the air is burned and the smell was accordingly none too pleasant.

The wavelength of the station is 7 metres, or 43 thousand kc. The transmitter can be straight-line modulated with bands up to a breadth of 300,000 cycles, sufficient for over 120 scanning lines at 25 pictures a second for television.

## Large Power Required.

Reaction for receivers for reception of such bands is naturally out of the question, and even with the use of superhets the power of the transmitter has to be pretty large to warrant good reception over a certain area. The power of the transmitter is 15 kw. telegraphy and 4 kw. 70% mod. for telephony.

The two last valves had to be specially constructed for the transmitter, and even with the special construction intricate neutralisation circuits had to be developed to balance the stages. Each valve has an electron emission of 10 amperes at 6,000-volt anode tension. Waves right down to 6 metres can still be produced with the high power when using these special valves.

The transmitter is crystal controlled. A wave of 56 metres is produced across a crystal in the first stage, the output is 0.1 watt. In the second stage the frequency is doubled, the output is 0.8 watts on 28 metres, then in the next stage the frequency is again doubled and the wave brought down to 14 metres with 4 watts output.

## Valves in Parallel.

Then follows an amplifier stage bringing the power up to 70 watts. In the fifth stage the wave is brought down to the required 7 metres, the output is 150 watts here. In the sixth stage the usual type of S.W. valve is used to bring the power up, and finally in the seventh and last stage the power is brought up to 15 kw. by the two special valves in parallel.

The modulation of the transmitter takes place in the sixth stage. The grid of this valve is modulated.



JUST as, a few months ago, almost every receiver one came across in kit form consisted of S.G., Detector and L.F., so now everybody seems to be talking about Q.P.P. or "Class B." While simplicity and uniformity were once the keynote of the home constructor's set design, so now bigger and better output has become almost a fetish.

How refreshing it is, then, for the regular receiver critic to find himself up against a receiver which quite frankly goes all out for distance!

Such a receiver is the Telsen "Super Selective" Four, a set of parts which I have recently received for test under my own conditions.

I agree entirely with the Telsen Technical Staff when they maintain that there is a demand for a highly sensitive battery receiver. The spirit of adventure inherent in most of us will always urge an exploration of distant parts—even if it only be by radio.

#### Very High Selectivity.

But—and it is a very big but—just as no real traveller could ever find himself in two places at once, so no radio explorer wants to receive more than one country at a time. And so we come against the ever-present question of selectivity.

How have Telsen tackled the question? The "Super Selective" Four incorporates two stages of screened-grid high-frequency, followed by a leaky-grid detector, and, coupled by a 10-1 coupling unit, to a high-efficiency pentode. The two tuned high-frequency circuits, together with the tuned grid circuit of the detector valve, provide three tuned circuits which enable a very high degree of selectivity to be obtained in practice as well as in theory!

The use of Triple-Matched coils and a Triple-Gang condenser provides the con-

## KIT KRITICISMS

# THE TELSEN SUPER SELECTIVE 4

By MR. PETER SIMPLE

ventional one-knob tuning without impairing efficiency.

Another feature of the receiver is the extensive decoupling which conforms with the most up-to-date practice both in the high- and low-frequency circuits.

#### Easy to Construct.

As the photographs on this page clearly show, metal is used throughout the chassis work. Besides maintaining perfect mechanical rigidity and allowing for no small amount of "under-baseboard" component mounting and wiring, this system ensures the maximum screening.

Let me here digress for one moment to reassure the would-be constructor who has taken one look at the photographs and

decided that the wiring of such a set is not for him.

I will allow that it looks just like a factory job, but I will also guarantee that you will be able to turn out a job looking just as professional. I've done it myself, and like our Chief Radio Consultant, I can very rarely turn out a neat-looking affair!

The constructor's kit for the "Super Selective" Four is the greatest labour-saving outfit I have come across for many moons. All the metal plates and panels are beautifully drilled ready for the mounting of components, and Telsen, as I have had occasion to mention before, is one of those thoughtful firms which provides not only every nut, bolt, screw and wire, but also adds to the kit a complete little set of tools. I never cease to be grateful for that piece of gratuitous kindness.

No, the building is not going to cause you any trouble—you do not even have to know how to read a blueprint, although a full-size one is provided.

#### Pleasing Appearance.

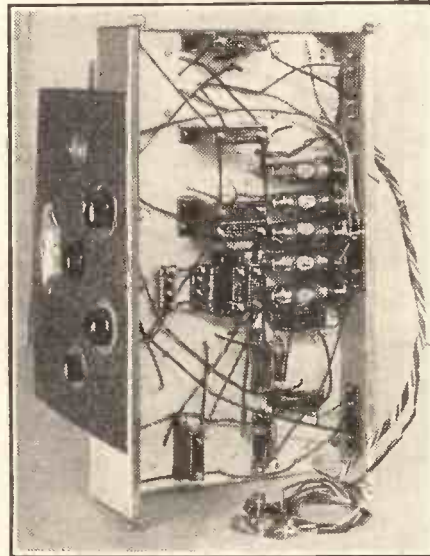
Especially do I like the appearance of this receiver when built up. The small panel is a pleasing touch, the all-metal construction gives a feeling of security, and the appearance of the screened coils and the gang condenser makes it hard to believe that the receiver has been home-constructed from standard parts.

Finally, what of the actual results?

Perhaps, if I say quite simply that every station I wanted was there, clear, loud and uninterfered with, it will show you that the "Super Selective" Four is, above all, a dependable receiver for the long-distance enthusiast.

In fact, I can give no higher praise to the Telsen engineers when I say that for range, selectivity and quality the "Super Selective" Four is the equal of any factory-built set in its class, and is an excellent proposition in every way.

## BELOW THE SURFACE



A view of the underside of the metal chassis, showing how resistances, condensers, and most of the wiring are kept away from the larger components.

I HAVE always been under the impression that electrical measuring instruments were delicate pieces of apparatus. But in the light of what recently happened to a Ferranti Multi-Range voltmeter, I'm not at all sure about it!

It appears that one of Messrs. Ferranti's clients had the misfortune to drop the instrument in question from a high shelf on to a concrete floor. Personally, after having inspected the remains, I rather imagined that somebody must have been trying to measure the E.M.F. of a steamroller!

The surprising thing about it was that when the bits and pieces were returned to Ferranti, just as a matter of interest what remained of the actual measuring mechanism was subjected to a test which revealed it to be working perfectly freely and to have a maximum error of only 2 per cent!



Weekly jottings of interest to buyers.

While in the interests of meter manufacturers generally, I must continue to advocate delicate handling, this accidental happening to a Ferranti instrument is a striking tribute to its robust constructional features.

#### Surname as Trade Mark.

So rarely is it possible to register a surname as a trade mark that the recent granting of such a concession in the radio world is a matter of particular interest.

For something like nine years now the name of Bulgin has been synonymous with gadgets; gadgets for every conceivable radio purpose. Switches, signal lamps, fuses, terminals, *everything!*

And now a range of high-quality components, which I am confident will go much farther to enhance the prestige of this enterprising organisation.

To have changed the name at this stage would obviously have been a regrettable step from every point of view, for it is upon the name that the reputation has been built up.

(Continued on page 288.)



# BUILT FOR BROADCASTING

Details of the new £10,000 organ for the B.B.C. now being installed at Broadcasting House.

From a SPECIAL CORRESPONDENT.

THE B.B.C.'s correspondence files show that organ music is, and always has been, one of the most popular features of their programmes. There are several reasons for this, the chief probably being that as an instrument the organ is unrivalled for the opportunities of "individual expression" that it affords.

To the uninitiated listener, one first-class instrumentalist sounds very much like another, whether his instrument be the pianoforte, the violin or the 'cello; but no two organists ever sound alike! The same might be said to apply to organs themselves. It is a far cry from the whimsical versatility of the cinema organ to the dignified voice of the church organ, and in between these extremes we have the whole range of concert-room organs.

## All-Electric Operation.

It is this range that is shortly receiving a noteworthy addition, in the shape of the new All-British Compton organ being installed in the concert-room at Broadcasting House.

This, as is only fitting, will be quite the last word in modern organs, and no pains are being spared to make it specially suitable for broadcasting.

The modern electric organ is a complex instrument; every impulse from the organist at the console has to be conveyed to the organ itself by electricity, and this is responsible for making the whole console one huge switchboard.

Probably the word "stop" conveys nothing more to most listeners than "something pulled out by the organist to alter the tone." Actually a "stop" connects a certain rank of pipes to the keys at the console, one pipe for each note. In the modern organ this actual "stop" is merely a switch, actuated by a small button moved by light pressure of one finger.

When this switch is in the "on" position, so to speak, it means that the air is allowed to reach the particular set of pipes comprising that stop, and that as the appropriate keys are touched at the console, their corresponding pipes "speak." With the switch in the "off" position, the whole of that particular rank of pipes is "dead."

## Controlling Tone and Volume.

There are 149 stops on the B.B.C. organ, although this does not mean that there are 149 complete ranks of pipes. Each rank may be used in several different ways and at several different pitches, for the B.B.C. organ is arranged on the "extension" principle, which we need not go into here.

The arrangement of stops on the B.B.C. organ is interesting; neither the old "draw-stops" nor the modern "stop-tabs" (as in cinema organs) are used. Instead we have neat little buttons, with the names of the stops engraved upon them, and bearing small electric light bulbs inside their translucent heads.

When they are lightly touched with the

finger, the bulb lights up and the stop is "on." A second touch extinguishes the light and puts them "off."

In addition to the stops themselves, the organist has at the console some sixty

## A CONTRAST



The man at the back is holding a 7" pipe in his hand. The total length of the large central pipe is 18' 6".

"pistons," mostly situated between the four "manuals," or rows of keys. He can touch these with his thumb, without removing his hands from the keys themselves, and they control certain combinations of stops, which can be set to the organist's own requirements.

On the B.B.C. organ it will actually be possible to "build up" from the merest whisper to the majestic roar of the full organ without touching a stop at all.

The entire organ is concealed behind a grille, and is enclosed in expression chambers with shutters 3 inches thick, opened at will by the action of pedals at the console. These pedals, rather like the blowing

pedals of a harmonium, are responsible for this, while a fourth similar pedal gives a crescendo right up to full organ by actually adding the stops for the organist.

"Down below," in addition to these pedals and the "foot-pistons," which do the same work as the thumb-pistons already described, the organist also has the lowest 2½ octaves of the organ arranged with the usual pedal-board. This is mentioned because there are still people who refuse to believe that the organist is "playing notes with his feet." Practically all the bass is looked after by footwork!

## Wide Frequency Range.

You will realise by now that with all this complex mechanism at the console, the electrical side of the organ is also fairly intricate. A flexible cable containing several hundreds of insulated wires connects the console—the "brain" of the organ—with the speaking pipes themselves, as well as the shutters of the expression chambers. Inside the chambers are the relay mechanisms that convert the electrical impulses into the actual energy responsible for the "speaking" of the pipes.

The pipes themselves, by the way, vary in size from a replica of a small knitting needle cut down to ¼ inch in length, up to a 32-foot "drainpipe"! Altogether this accounts for a compass of nine octaves, the frequency of the note emitted by the 32-foot pipe being about 16 cycles, while that of the smallest is over 10,000 cycles!

By now you are probably beginning to understand why organ music is not the easiest thing in the world to "put over" perfectly, or even to reproduce perfectly in the home.

## Not a Cinema Organ.

The current for the action itself is supplied by two dynamos giving a maximum of 50 amps. at 12 volts, and arranged so that the second will automatically "cut in" if the first should fail.

The builders have asked me to make it clear that this organ will contain no "effects" whatever, but will simply be a large concert instrument. The train-whistles, bells, motor-horns, etc., associated with cinema organs are looked after by the B.B.C. effects department as usual, while the new organ will speak for itself.



## ADJUSTING THE ACTION

There are 2,362 pipes, and 149 electrical stops, some of which were being adjusted when this picture was taken.



# RADIOTORIAL

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

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

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

## QUESTIONS AND ANSWERS

### USING A SET IN INDIA.

E. T. L. (S. Croydon).—"A young cousin of mine is going out to India in June, or earlier and when he telephoned me the news to-day I said I supposed he would take out a wireless set to keep touch with home when possible.

"To my surprise he said No. because it appears that someone who was in India several years ago, and is now working for his firm in England, had told him that it was quite impossible to get any broadcasting out there at all. Surely this is not correct, because I have seen letters in your paper from India and places farther away than that, recounting satisfaction with broadcasting programmes.

"Any information you can give would be appreciated, as if he is going to do any wireless at all out there he ought to take the set out with him rather than wait till arrival there and then have extra expense of carriage.

"Naturally, he could not expect in India to pick up regular and contrasting programmes like we get here, but on the other hand that is a long way from the 'quite impossible' idea that he now holds: 'What is the true position about reception in India?'"

He has certainly been misinformed about it, as we have frequently had letters from readers in India who have been delighted with their sets' performances.

Nevertheless, conditions in India are entirely different from those obtaining here, and only in the chief "European" centres, such as Bombay Calcutta and Colombo, is there any hope of a regular service from a local station. Ordinary wavelength reception is often spoilt for long periods by atmospherics, but there is comparative immunity from this on short waves, and stations from all over the world are regularly received by this class of set, or by an ordinary set fitted with a short-wave adaptor.

Much depends upon the district to which he is going, but even if an ordinary receiver does not appear to have much chance of good reception there, we feel sure a short-wave would be an excellent investment.

### THE "1933 FOUR" IN BENGAL.

The following extracts from a letter to the Editor, written by Mr. Tullis, from Fort Gloster, Bengal, India, throw an interesting

## DO YOU KNOW—

the Answers to the following Questions ?

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

- (1) What is the highest-powered European station now officially listed ?
- (2) Does it hurt an accumulator to keep it continually charging (by a trickle-charger) or discharging ?
- (3) Why is it that the voltage of a battery is (within limits) independent of the current taken from it, whilst that of a mains unit varies considerably with the current consumption ?

light upon reception in that part of the world on ordinary wavelengths. He says :

"I have now got the 'P.W.' '1933 Four' under way, and am pleased to say getting very good results. In fact, it compares very favourably with sets of greater power.

"When I tune in to long-distance stations—and all the stations out here certainly are

### "AIRSPRITE TWO" AGAIN— "REALLY AMAZING."

The Editor, POPULAR WIRELESS.

Dear Sir,—Some little time ago I decided to build the "Airsprite Two" with a view to obtaining quality rather than quantity. Having built it I find—to my considerable surprise, I must confess—that I have both.

I have seen very few comments on the performance of this really amazing little outfit, and it certainly does seem a shame if somebody does not sing its praises.

I find the tuning is rather sharp and the aerial and reaction condensers require some fine adjustment, but if these are used properly remarkable selectivity and power are obtainable.

I am using a 60-ft. outdoor aerial, which at no point is higher than 20 ft. from the ground, and my valves are P.M.1.L.F. and Lissen P.T.225 Pentode. The loudspeaker is a Rola energised m.c. (6 volts).

I can obtain the following stations at quite comfortable strength for a small room and some have to be detuned slightly.

Long Waves : Luxembourg, Warsaw, Eiffel Tower, National, Radio Paris, Hilversum.

Medium Wave : National and Regionals, Vienna, Florence, Brussels No. 1, Munich, Langenberg, Prague, Rome, Beronmunster, Breslau, Rome, Poste Parisien, Fécamp, Turin, Milan, and several others I have not yet identified.

I think everyone will admit that for a 2-valve set this is pretty good, and the quality is really excellent. I wish I could have afforded to build the 3-valve now.

I built the set without the aid of a blue print and without much knowledge of wireless. Wishing your excellent journal every success.

Yours truly,  
LEONARD F. SIMMONS.

Pathfield Road, S.W.16.

long-distance—the programme is rather killed with static\* (\*NOTE.—Atmospheric interference.—Ed.), a most common complaint out here, I can assure you. However, when I go over to our local (Calcutta) I can't work the set at full power, the volume is too great.

"I am using a mains eliminator and a P.M.202 output valve, the one you specified. To be quite frank, I am more than satisfied with the set, and think it gives marvellous reception, to be working under such difficult conditions as we experience here.

"I have just received the POPULAR WIRELESS with the short-wave adaptor, and am very busy getting the components together, as I am sure it will be just what I require to get the best possible results from my set.

"Once I have the A.T.B. going and the short-wave adaptor fitted I don't think there will be a better set within a very wide range. You will see I am most enthusiastic—I have to admit it myself, but who would not be after building the '1933 Four' and getting such marvellous results ?

"I got 'Home' on the long waves at 11.30 p.m. last night, very loud, although very noisy with static.

### WHICH WAS RIGHT ?

The modern practice of coating the bulb of a valve with a metallic deposit for shielding purposes, and connecting this coating to one of the valve pins so that the shield is earthed via the pin in question, is well known. But many readers have been puzzled by apparent discrepancies in the illustrations, which have appeared to indicate which filament pin is joined to the coating, and which is not.

A typical letter, which clearly expresses the difficulty, is the following, from a Blackburn, Lancs, reader :

"I would like to draw your attention to what seems to be a slight discrepancy.

On page 1190 of your issue dated February 11th, 1933, in an article headed 'For Effective Screening,' there is a diagram giving the terminal

to which the coating of metallised valves is connected. On page 1201 of same issue, in an article headed 'Valve Tips,' there is a diagram and a statement that 'the disposition of the pin (connected to coating) in relation to the grid and anode pins . . . has now been standardised.'

"Then follows this diagram :

"Now you will observe that in Figs. 1 and 2 of my letter it is the opposite fila-

ments which are said to be joined to the coating. Could you let me know which is correct ?"

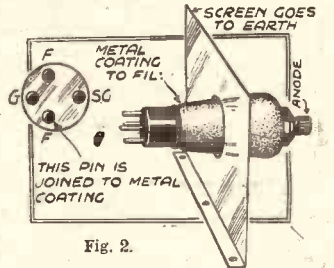


Fig. 2.

The answer is that both diagrams are correct. But it is important to note that one shows the valve holder and the other the valve.

The valve holder is drawn in detail, with wiring attached, and if it is viewed from the plate, with the grid terminal farthest away, the "earthing" filament terminal is the one to the right, as marked.

Now if you look at the other diagram, you will see that it depicts not the valve holder but the pins on the base of the valve itself. And it correctly indicates "This pin is joined to metal coating."

Because the valve must be turned upside down to look at its connecting pins it may appear, at first sight, that the "earthing" pin in question is not going to fit into the correct filament socket as shown on the preceding diagram. But the appearance is deceptive, and if one takes an actual valve and a valve holder, and marks the pin in question by keeping a finger on it, it will be found that the

(Continued on page 282.)

## HOW IS YOUR SET GOING NOW ?

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

Whatever your radio problem may be, remember that the Technical Queries Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scales of charges, can be obtained direct from the Technical Queries Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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

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

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**Double  
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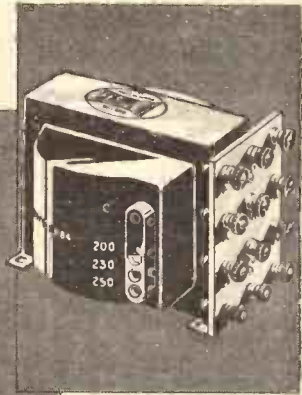


**Condenser Type C6.**  
4mf. Test pressure 1050v. D.C. Maximum D.C. Working Pressure 525v. Maximum A.C. Working Pressure 350v.  
Price **8/6**



**Rectifying Valve Type R4.**

Full wave rectification, 2.5 amps. 4 volts. Can take up to 350-0-350 volts. Gives maximum smoothed D.C. output of 120 m/A. Price **15/-**



**Mains Transformer Type SV84.**

For use with Ferranti Rectifying Valve Type R4, to give an H.T. D.C. output when smoothed of 330v. 70 m/A, and the following A.C. L.T. outputs, each L.T. winding having a centre tapping: 4v. 2.5 amps. for filament of Rectifying Valve: 4v. 5 amps. for indirectly heated valves, 4v. 1 amp. for output valve. Price **35/-**

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**BLUESPOT**

**RADIOTORIAL  
QUESTIONS AND ANSWERS**

(Continued from page 280.)

"pin" (or leg) of the valve which is marked as being joined to the metal coating is the one that will fit into the socket which is marked as the "earthing filament" socket. So both diagrams are correct.

**CHARGING FROM D.C. MAINS.**

A. M. W. (Reedham, Norfolk).—"Being a regular reader of 'P.W.', and greatly interested in wireless, I should be glad if you could explain to me how to be successful in charging my L.T. accumulator from the mains.

"I connected up exactly as shown in the sketch in 'Radio Simplified for Beginners,' 'P.W.' dated March 18th last, with a lamp in series for eight hours continuous.

"Result nil. My accumulator did not pick up any voltage. Perhaps I may have connected wrong, but I had lamp in series with the positive lead from mains which I connected to + on accumulator.

"The other lead, of course, connected to — on accumulator. Would this be correct, or

**"P.W." PANELS. No. 122. KIEL.**

The German station at Kiel relays the Hamburg programmes on 232.2 metres, its power being 25 kw.

In addition to low power, it is handicapped by sharing the wavelength with a Swedish station, Norrköping, but, nevertheless, it is often received clearly in this country.

The interval signal, consisting of the Morse letters K I (— — — — ·), is an aid to identification. Distance from London, 470 miles.

would I connect positive from mains with lamp in series to — on accumulator. Or would I connect negative from mains with lamp in series to — on accumulator, or vice-versa?

"As I have to take my L.T. some distance to be charged your advice would be doubly welcome to me."

When charging the important thing is to arrange that the positive of the mains is connected to the positive of the accumulator, and of course the negative to its negative side. Whether the lamp is in series in the positive lead or in the negative is unimportant from the charging point of view, though a qualified electrician will arrange to have the accumulator in one lead in preference to the other because that particular side is earthed.

Your connections would result in correct charging, but the amount of this would depend upon the resistance of the lamp you had in circuit.

You appear to have expected an immediate increase of the accumulator's voltage, whereas the ordinary lamp will only allow for a trickle charge.

As the name implies, this is quite a small charge, the idea being not to "pick up" a run-down battery, as is done in ordinary recharging, but to give it a refresher, and thus keep it constantly in good condition.

For successful trickle-charging the accumulator should be properly charged and "well up" to start with, and as soon as it is off duty for the night the trickle-charge is switched on. During the night the "trickle" brings the battery up to tip-top condition again, and the next night the operation is repeated, and so on.

The trickle-charger should be switched on for a number of hours that will enable it to put into the

**THE ANSWERS**

TO THE QUESTIONS GIVEN ON PAGE 280 ARE GIVEN BELOW.

- (1) Luxembourg, the new long-waver, now testing on 1,191 metres.
- (2) No; it is beneficial for the accumulator to be always active. But, of course, the "trickle-charger" must be able to supply sufficient to make good what is taken out on discharge.
- (3) Because the battery, unlike the mains unit, has a low internal resistance.

**DID YOU KNOW THEM ALL?**

accumulator approximately the same amount of "juice" that the set takes out of it. (Actually, somewhat more, but there is considerable latitude in this, and "trickle" overcharging seldom does harm.) The battery can thus always be kept in tip-top condition, and will never require an ordinary recharge.

**"REGULAR" H.T.B's.**

Further to the test report on these batteries, which appeared in "P.W." No. 567 (page 182), we are requested to point out that the firm

trades under the name of Polchar's Wireless, Ltd. The address is 20, Bridge Street, Bristol, and the price of the battery is 7s. 6d.

**THAT H.F. STAGE**

(Continued from page 273.)

We will presume that the trouble is not due to insufficient screen or anode volts or a "dud" grid-bias battery (a little negative bias on the S.G. is often useful, though not essential). Poor results may then, be due to excessive damping of the tuning circuit, either by the aerial being coupled too-tightly or by excessive detector damping such as you sometimes get with the grid detector.

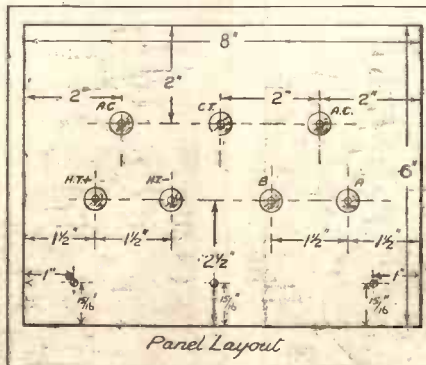
The obvious remedies are to shift down the aerial tap or use a series-aerial condenser, and to tap down on the second coil the detector grid lead. Also, try the effect of an additional small condenser across detector anode and filament of a capacity not too large as to upset reaction control.

With the tuned-grid H.F. coupling which, incidentally, is more likely to be perfectly stable than the tuned anode—the H.F. choke in the S.G. anode circuit may be letting you down. A poor choke can cause heavy damping of the second tuned circuit, so that, if all else fails, try another H.F. choke, preferably one specially designed for this position.

As regards the regulation of screen volts, where this is done by resistances, you want to be sure that the S.G. is getting all the volts it is supposed to be getting. A faulty resistance, either in a direct series feed or in a potentiometer feed, can completely upset the working of the H.F. valve.

You can check this by temporarily disconnecting the screen terminal and connecting it by a separate lead to a tapping of some 60 to 80 volts on the H.T. battery.

**THE DOUBLE D.T. POWER-PACK**



Panel Layout

The panel-drilling dimensions to which reference is made on page 280.

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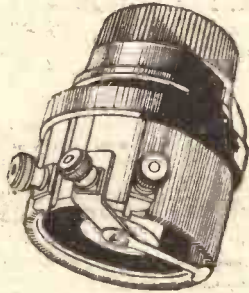
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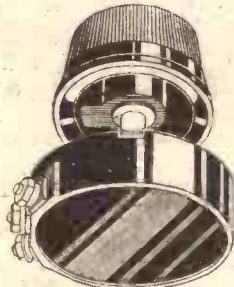
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## TELEVISION PROGRESS

(Continued from page 261.)

### The Farnsworth Tube.

In the Farnsworth cathode-ray transmitter the picture is focused as a whole upon a photo-electric plate forming the cathode of the tube, and the resulting electron emission from the cathode carries the picture within itself, so to speak, along the whole length of the tube. That is to say, if a fluorescent screen were interposed at any point along the electron stream, the original image would be reproduced upon it.

This alignment of the picture along the stream is ensured by means of a strong magnetic field which maintains each electron in its proper position as the whole stream moves along the tube. Any relative movement of the electrons would, of course, cause the picture to become blurred. At the far end of the tube the picture carried by the stream is swung by the magnetic control field to and fro, and up and down, past a central aperture in a screen. Electrons passing through the screen fall on to a "target" anode, where they set up current variations corresponding to the light and dark areas of the original picture.

### Moved Bodily.

This is a reversal of the usual method of scanning. Instead of exploring a stationary picture by a moving spot of light, the picture in the Farnsworth transmitter is moved bodily past a stationary aperture, through which the various parts of the picture are thrown in rapid succession. The tube used by Farnsworth in reception operates in much the same way as the Zworykin tube already described.

## THE LUCERNE CONFERENCE

(Continued from page 276.)

suggest that it would be possible to operate stations as follows:

One station between 1,150 and 1,110 metres if it is situated in northern Europe and does not produce more than 10 microvolts per metre on the Mediterranean coast.

Russian stations between 340 and 420 kc. as well as West European stations might produce interference with the aeronautic and naval wireless beacons operating in this band.

One station round about 730 metres, as long as it does not produce more than 25 microvolts per metre at night on the Mediterranean coast. Further stations might be placed within the band 400 to 485 kc. under the same conditions. These bands would then have to be attributed to stations in South-Eastern Europe. Possibly further stations might be placed within the band 583 metres to 545 metres. But, again, here care would have to be taken that no interference occurs with naval stations.

### Eastern Europeans.

As regards stations working between 1,875 metres and 2,000 metres, it has been found that Kaunas, for instance, does not produce any interference 5 degrees west of Greenwich. Therefore it can remain.

Thus according to the opinions expressed by the expert body a number of European stations, mostly in Eastern Europe, at a

A common problem in all television systems arises from the fact that the amount of light available for scanning is usually too small to produce an adequate response from the photo-electric cell. One possible remedy is, of course, to increase the sensitivity of the cell for a given intensity of light, but there is a limit to what can be done in this direction.

Another possibility is to amplify the intensity of the light normally available after reflection from the scanned image. Even when the scanning ray is made as strong as possible, the reflected light is always a mere fraction of the original, and its effect on a photo-electric cell is correspondingly weak.

### A "Light-Amplifier."

The arrangement illustrated in Fig. 4 is designed to amplify the intensity of a given ray of light, either after reflection from the picture being scanned or when reproducing a picture at the receiving end.

The light-amplifier tube T is separated by a thin metal-foil plate P into two chambers A, B. The part A is highly exhausted, and contains a photo-electric cathode K, whilst the part B is filled with low-pressure gas.

The light ray to be intensified enters the tube as shown by the arrow and, falling on the photo-electric cathode K, produces a stream of electrons which are attracted to the positively-charged plate P. The plate is sufficiently thin to allow the electrons to pass through into the gaseous chamber, where they immediately create a glow-discharge many times stronger than the original ray. The light so amplified is applied either to a photo-electric cell or is thrown directly on to a viewing screen.

distance from the seaboard will be able to operate in bands not attributed to broadcasting by the Madrid conference.

Wavelength separation will, in all cases, be 9 kc. The U.I.R. regret that this may in some cases impair quality, but that in general receiving sets would have to be designed with varying degrees of selectivity so that the sideband cut-off could be less for local reception than for distant listening.

### Waves To Be Allocated.

The following types of waves will be allocated:

*Exclusive waves* in the old sense.

*Wavelengths shared* with one station situated at great geographical distance (Ondes partagées).

*International common waves*, for stations keeping within 10 cycles of their allotted wave, power up to 2 kw., for stations that can only achieve a 50-cycle exactitude, power limit of 200 watts.

*Waves used by stations using synchronisation apparatus (single wavelength working)*. These waves will be used by nationally, and in certain cases also internationally, synchronised stations. Why international single wavelength working? Because it will not in all cases be possible to space stations working on an international common wave at sufficient geographic distance.

There are many difficulties which have to be overcome, but it is hoped that the Conference will be of considerable assistance in preventing any further increase in ether chaos.

A.A.G.

## "THE TRUE ROAD TO RADIO"

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MANY readers will recognise the above title as that of the sumptuous volume prepared by Ferranti, Ltd., for the benefit of all technically-minded users of the firm's apparatus.

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Among the long and lavishly illustrated chapters are "Detection," "Audio-Frequency Amplification," "The Power Stage," "Energy Supplies to the Receiver," "Radio Receiver Circuits," and so forth—all excellently done. But probably the most popular section is that devoted to High-Frequency Amplification.

The whole process is set out with admirable lucidity, and the thoroughness of the treatment can be gauged from the titles of the sub-sections: "Definitions of Selectivity and Quality in a Set," "Demodulation due to Reception of Two Stations Together in a Receiver," "Reduction of Radio-Frequency Distortion," "Minor Difficulties of Radio Frequency Amplification" and "Wavetraps or Rejectors."

Obtainable from Ferranti, Ltd., Hollinwood, Lanes (or through any bookseller), strongly bound, and with its many beautiful illustrations, clear diagrams, etc., it is certainly a book that no radio technician will like to be without. "The True Road to Radio" gives mathematical proofs of many of its contentions. These are in the form of appendices, and do not require to be read by the non-technical reader.

## MIRROR OF THE B.B.C.

(Continued from page 266.)

Rosenkavalier" on the opening night (Monday, May 1) of the Grand Opera Season at Covent Garden, have already appeared. Now comes the news that on Tuesday, May 2, Regional listeners are to hear the whole of "Rheingold," one of the few operas to be broadcast complete during the season.

On the following night the third act of "Valkyrie" will be radiated from National transmitters.

### Slavery To-Day.

How the estimate is arrived at that there are no fewer than five million slaves held in bondage under nearly twenty systems of slavery to-day will be mentioned by Lady Simon in her talk in the series, "Slavery, 1883-1933," on Monday, May 22nd.

Lady Simon will also produce evidence of contemporary slave-raiding, slave-trading and slave-owning and have something to say about the treatment meted out to these unfortunate human beings. On the following Tuesday the sixth of the same series of talks will be given by Lord Cecil of Chelwood who will deal with the emancipation period 1914 to 1933 and will put forward proposals for the future.

## THE "H.A.C." SHORT-WAVER

(Continued from page 271.)

tuning control in conjunction with the reaction control.

Late in the evening you should find the Americans on this band. Between 46 and 50 metres there are at least four of them that should come over at good strength on the average night between 10.30 and midnight. But you will find all this out for yourself. You can't help getting them if the set is properly made; a short-wave set that doesn't get the high-powered Americans is in the same category as a broadcast-wave receiver that only gets three or four stations.

### Looking for Sydney.

If you go down one step with your tuning coils you will now find the 31-metre band. Use a "6" for each grid coil and a "4" for reaction, and you should cover a range of something like 30 to 50 metres. You may find the 49-metre crowd again, right at the top of the dial. You can certainly count on finding the 31-metre group of stations near the bottom.

These include two Americans—W1XAZ (Springfield) and W2XAF (Schenectady). This is the spot, also, in which to look for Sydney when he is transmitting. You may find him between 6 and 9 p.m., and again between 5 and 8 a.m., if you don't mind early rising.

The lower band, using two "4" coils as grid coils and a "6" as reaction (unless it works with a "2," which is better still), includes two groups of broadcasting stations—one on 25 metres and the other round 19 metres.

The 19-metre group will probably be productive of the loudest transmission you will ever hear from America. W2XAD (Schenectady) and W8XK (Pittsburgh) will both be found here, and, though their strength varies more with conditions than does that of the stations working on 31 and 49 metres, they attain real loudspeaker strength on a good night.

### Finding Six Continents.

Bearing in mind that "H.A.C." in the title, you may as well look for South America right away in the 31-metre band. Both Rio and Buenos Aires come in well in the late evening. Asia will probably be represented by Bandoeng, Java, although you may be lucky enough to catch a transmission from Tokio on 19 metres. He is not easy to find, though.

I have no hesitation in saying, however, that there is no reason whatever why you should not succeed in finding all the six continents (South America counting as the sixth) within a week of completing this receiver. But don't forget that you may have the misfortune to start up during a period of bad conditions. If you don't hear much at first, don't necessarily blame the set.

Patience is a virtue which all aspirants to success on the short waves simply *must* possess. Therein, in fact, lies the amazing fascination of short-wave listening. It is not often that an evening's searching brings positively no rewarding programme. There is, though, an intriguing element of uncertainty about it all. Reliance can be placed on receiving a programme, but exactly where it may come from is often very much a speculation.

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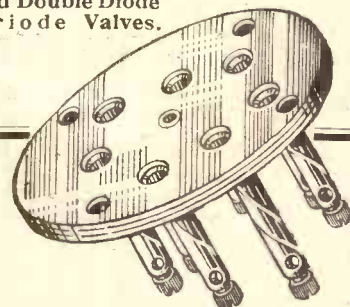


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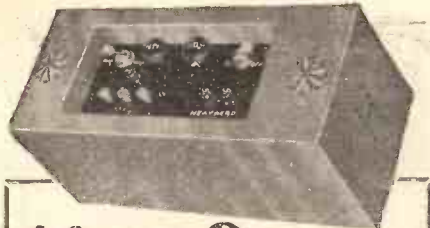
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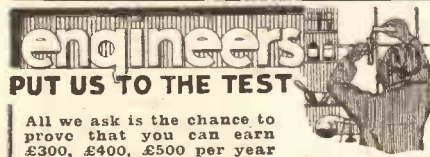


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# TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

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

### Needle Amplification

MANY readers have asked me from time to time whether it is better with a record which is either on the poor side as regards quality, or which has perhaps been used a great deal, to use a "loud" needle and little amplification or to use a "soft" needle and correspondingly greater amplification.

This is not at all an easy question to answer and I can only give you the results of tests which I have made at various times on different kinds of records. I should say at once that the general impression I have formed is that it is better if the record suffers from most of the ordinary defects, to use "soft" needles or at any rate not more than "medium" needles, and to make it up in the amplification. But a great deal depends on particular conditions and upon the type of record, also the relative amount of surface noise.

### Interference Ratio.

If you use loud needles you generally increase the ratio of surface noises to music, but this ratio again can be considerably altered if you have a scratch filter, or other suitable filter in the circuit, so that you see the answer to the above question depends, amongst other things, upon the type of circuit you use.

Another objection to the loud needle is that the mechanical reaction between needle and record is definitely greater, and if the record track is already a bit broken or worn, the loud needle is apt to make matters rapidly worse.

### Subdued Tone.

The argument would seem to be in favour of the soft needle (or even, according to some of my readers, of the "fibre" needle), but it is not quite so simple as that, because the soft needle, although avoiding surface noise to some extent, does not always pick out the sound properly—I suppose because it does not fit the track—with the result that you get a "thin" quality.

Incidentally, I detest fibre needles myself, although I know a good many people use them, partly for their subdued tone and partly under the impression—a mistaken one, in my opinion—that they "preserve the records."

On the whole, with bad or worn records, I am inclined to favour the use of a soft or medium needle, with the necessary amount of amplification. But it really comes down to trying out different needles for different records, and it is quite impossible to generalise.

### All-Wave Tuning.

Many sets nowadays are made with so-called all-wave tuning. In reality, of course, all-wave tuning is somewhat of a misnomer, because what actually happens is that the set has switching or other arrangements by which it can be given a tuning range in the short waves, medium waves or long waves.

Generally speaking, the long waves are from about 2,000 metres down to 1,000 metres, whilst medium waves, or so-called "broadcast" wavelengths, are roughly between 600 and 200 metres, perhaps a little less than 600 metres, and short waves anything from 100 metres downwards. It is not a particularly easy matter to arrange a set to work efficiently on different wavelength ranges, even the long wave and medium wave ranges, and more so when it comes to very short waves.

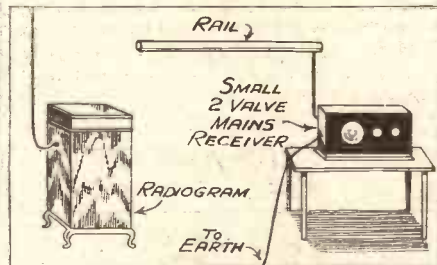
For this reason some experimenters prefer to have one type of receiver solely for medium and long waves, and another receiver for short-wave working. I should perhaps mention, for the sake of those of you who have not hitherto gone in for short-wave reception, that this is now in very considerable use for long-distance transmissions, and there is a great deal of interesting matter to be picked up on the short waves, amateur as well as professional.

### Energy Absorption.

I was talking two or three weeks back about the absorption of energy from one aerial to another nearby, and I came across a curious case recently. The sketch shows roughly the arrangement.

The instrument on the left was a rather powerful multi-valve radiogram, whilst

### A CASE IN POINT



The arrangement of the two sets to which Dr. Roberts refers above.

that on the right was a two-valve all-mains receiver of continental origin.

The horizontal part in the centre of the diagram is actually a large curtain rail, about 12 ft. long, and consisting of a metal tube about 3 ins. in diameter.

The absorption effect was due to capacitive coupling between the aerial and rail and when the latter was not used the trouble disappeared.

### L.F. Chokes.

When going in for an L.F. choke it is a good thing to remember that the specified inductance of the choke should be the working inductance under the actual working load, and not merely the inductance under no load. I dare say you know that the inductance falls more or less rapidly with the D.C. current through the choke.

The rapidity with which it falls depends, of course, upon the design of the choke, and

(Continued on next page.)



## ELECTRADIX BARGAINS

NO STORE IN LONDON has so comprehensive a stock of Scientific Apparatus at such low BARGAIN PRICES as ELECTRADIX RADIOS for:

The Electric 4, all mains, A.C., £7. M.C. Speakers, 12/6. 100 v. Motors, 15/-, Pedestal Mikes, 17/6. Stampings, 50 per cent. off list. Prism Monoculars, 18/6. Headphones 2/9. Superseders, 37/6. Bakelite 8-in. Frets, 1/-, Photo Cells, 15/-, Two-gang Condensers, 12/6. Formo '0005 mid., 2/-, Tekade, 1/3. Fixed T.C.C., 8 mid., 460 v., 5/6. 2 mid., 1/6. New Portable Cases, 8/6. D.P. Mains 10-amp. Linked Tumbler Switches, in watertight case, 2/6. COILS. Cosor 3-pin medium, 1/- each. Aerial, reaction, long, short, and multiple tuning Coils, 2 1/2 in. by 3 in., 1/6. Ribbed Former, only 9d. Two-pin Coils, B.B.C. or short-wave, 6d. Tapped Inductances, 11 in. by 4 1/2 in., 4 taps, 3/6. Tapped Inductances, 9 1/2 in. by 7 in., with 7-stud rotary switch, 5/-. 1,000 Ebonite 6-ribbed small 1 1/2 in. dia., 1 in. long, 2d. Star Reaction Tuners, broadcast band, new, 9d. each. Igranite Unitone Couplers, usually 2/6; Major and Minor, 9d. each. Fellows 5-pin Aerial Coils, 200/500. Listed 5/6; Sale, 3/9 each. Six-pin Bases, 8d. Igranite Gimbal Coils, 1/-, Holders, 2/-. Igranite Twin Unitone Couplers, 1/-. Vario-couplers, 4/-. Two-pin Coils, 6d. Coil Holders, 2-way, 1/6; 3-way, 2/6. 12-in. Spark Coils, £8. Medical Coil Sets, 6/6, 10/6, 15/-, and 21/-. True-view Camerascopes, 2/- each.

For CLASS B Amplification . . .



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BATTERY SUPERSEDER makes H.T. from your L.T. 2-volt battery, rectified and smoothed. Gives 3 tappings with output exactly suited to Class B Amplification and lasts indefinitely. A boon and blessing to those who are not on the mains. Reduced from £3 15s. New and Guaranteed. 37/6 from us only.

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218, UPPER THAMES ST., LONDON, E.C.4

### LOUD SPEAKERS REPAIRED, 4/-

(Blue Spot a Speciality, 5/-)  
Transformers and Headphones, 4/-. Eliminators, Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkwell 9069  
E. MASON, 44, EAST ROAD (nr. Old Street Tube Station), LONDON, N.1.

### SOMETHING NEW! THE CROFT AERIAL TUNER

with capacity reaction.

All wave lengths from 200—2,000 metres.

This tuner, when used with simple circuit supplied free with each tuner, gives good volume and selectivity.



No special parts or screens required. Easy to build and operate. Don't delay. Get one by return of post.

9/- POST FREE.

THE EXACT MANUFACTURING CO., Croft Works, Priory Street, COVENTRY.

### ARDEN TRICKLE CHARGERS

2-6 v., with WESTINGHOUSE METAL RECTIFIERS, complete. 1/2 amp., 11/9. 1 1/2 amp., 19/11. 7 days' approval. Carriage 9d.

Send for Illustrated List and Guarantee.

ARDEN AGENCY (Accessories) Wollaston, Wellingboro'

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WE invite readers to support our Advertisers—care being taken to accept only announcements of reputable firms!

## TECHNICAL NOTES

(Continued from previous page.)

an efficiently designed choke will show only a gradually falling curve over the desired range, whilst with a badly designed choke there will be a rapid drop as the D.C. current rises from zero to a low value.

### Inductance and Load.

When I speak of the design of the choke, this means that there should be ample cross-section of core, the core being of good quality magnetic material of high permeability and, particularly, the air-gap should be properly proportioned. At first sight you might think that an air-gap would be all wrong, and that the best and most efficient choke would be obtained with a continuous magnetic core.

For reasons which it would take too long to go into just now, however, the air-gap is found to tend very much to constancy of inductance over the working range, and the best manufacturers of these components have now worked out designs which give remarkably good results.

### A Question of Rating.

As regards the rating, it is, as I say, important not only that this should specify the inductance under actual load, but also that the choke should be capable of standing up to quite a considerable increase of load without a very serious drop in the inductance. To give one or two cases in point, a choke having an inductance of, say, 30 henries at zero D.C. load should not drop to much less than 25 henries at 15 to 20 milliamps load.

In the case of a choke starting with much higher zero-load inductance, say, 90 or 100 henries, the drop will generally be somewhat more rapid, and a good choke starting with 100 henries inductance will not drop to less than, say, 60 henries with 15 to 20 milliamps D.C. Chokes are also designed to stand currents up to 40 to 50 milliamps without any serious drop in the inductance; the inductance in such a case may, for instance, drop from 40 henries to 30 henries.

### High-Class Components.

The foregoing figures will give a rough idea of the drop which can be tolerated in a good-class component. I should emphasise once again the importance of using good quality chokes, because otherwise you may find that the choke is letting you down badly owing to the working inductance being much below that which you were led to expect.

### Indirectly-Heated Valves.

Radiograms fitted with indirectly-heated mains valves—as, of course, all modern radiograms are—take a certain amount of time to “come on” owing to the delay in heating-up of the cathodes of the valves. This lag varies considerably with different types of valves.

Furthermore, the delay will be equal to that of the slowest valve in the series. You may have high-frequency valves which heat up fairly quickly, whilst a power valve will perhaps take much longer.

If you are using the set quite a lot, it may be worth while to leave it running, in which case, the valves remain fully operative all the time. This, however,

(Continued on next page.)

# LIGHTNING

## SEEKS YOUR AERIAL!

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No need to worry, no need to switch off—once fitted to your aerial a GARD will give you permanent protection. Get one to-day, it's worth while.

£100 GUARANTEE with every GARD

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IT SHORTS THE SHOCK

Sold by all Radio Dealers.

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GRAHAM FARISH LTD., BROMLEY, KENT.

### RADIO SUPPLIES

Send your list of Radio needs for our quotation: Kits, Parts, Sets, etc. Everything in Radio stocked, prompt delivery, 7 days' approval. Catalogue free. Taylex & Standard Wet H.T. replacements stocked.

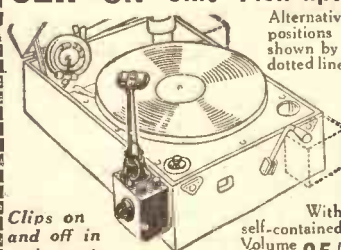
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### CELESTION MOVING 25/- COIL SPEAKER

(List Price £2.10.0). Post & C.O.D. Free. Send for this amazing bargain to-day.

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40 STOCKWELL ST., GLASGOW, C.1.

### NEW BELLING-LEE CLIP-ON Unit Pick-up.



Clips on and off in an instant.

Alternative positions shown by dotted lines

With self-contained Volume Control 35/-

Electric Reproduction from your PORTABLE gramophone without loss of portability.

Write for Booklet.

**BELLING-LEE**  
FOR EVERY RADIO CONNECTION

Cambridge Arterial Road, Enfield, Middx.

PLEASE be sure to mention "Popular Wireless" when communicating with Advertisers. Thanks!

## TECHNICAL NOTES

(Continued from previous page.)

involves stopping the motor either by means of the automatic stop or simply by stopping the turntable with the hand whilst one record is removed and another record placed in position.

I should mention that there is really little or no harm done to an ordinary electric gramophone motor by stopping the turntable whilst the motor is still switched on, especially if the motor is of the induction type. Of course, the turntable should not be stopped suddenly, as this imposes a great strain on the governor, and if stopped by hand it should not be held stationary any longer than necessary.

### Automatic Brakes.

As regards the automatic brake, my experience is that quite a large percentage of people do not bother with the brake at all. When the record is finished or drawing to a close they get up and remove the pick-up just as they would do if the automatic brake were not fitted.

However, what I was going to say was that if you want to operate the motor without switching off the valves you can easily do so by fitting an additional switch in series with the automatic brake (which is itself in series with the feed of the motor). The switch should be fitted at some convenient position, preferably either alongside the main switch of the radiogram or on the motorboard.

It then becomes a simple matter to switch off the motor when you want to remove a record and put another one on and then to switch on again, exactly as you are accustomed to do with an ordinary spring gramophone. In this case, the valves remain operative all the time and you do not have that "lag" with the music or speech from the record "fading in," which may be very nice on movie pictures, but which is very objectionable on sound.

### Portables.

A portable wireless set, to be really portable, must be battery driven. The semi-portable types, which can be carried from room to room and used on the mains, are very nice indeed, but they are not portable in the strictest sense of the word. The truly portable set is one which can be taken out into the country or out in a boat on the river, and the same applies to a portable gramophone. We have so-called portable gramophones with electric motors which can very conveniently be plugged into the electric light, but you can't take them down on to the sands at the seaside or anything like that.

At the same time it is often very useful to have a machine which can be used for the above-mentioned pleasurable occasions and can also be adapted for electrical reproduction in the home when you have your radio set handy for the amplifier. This can be done by fitting the portable gramophone with an ordinary soundbox and with an electrical pick-up in addition, the pick-up being used when an amplifier is available and the soundbox being used on other occasions.

### Attaching a Pick-up.

Generally with a small portable there is not room on the motor board to fit any of

the ordinary standard pick-ups, but the new Belling-Lee Clip-On pick-up meets the need admirably. You don't have to worry about the space on top of the motor board, because this unit clips on to the side of the portable gramophone, the pick-up arm then falling into the proper position over the record. The unit has a self-contained volume control which is very handy. If you want to take the gramophone outdoors you can instantly detach the pick-up unit, when the machine is as it was before. This strikes me as a very sensible and practical device and one which should appeal to a large number of users of portable gramophones.

### Steady Running.

I notice that somebody is making bakelite turntables for gramophones, which are said to be superior to metal ones owing to their lightness in weight. This may be all right for a portable from one point of view, but personally I think that a certain amount of mass (giving momentum) in a turntable is very useful for steady running.

Some time ago I made a number of accurate tests on turntables of different weights and turntables artificially loaded, so as to find out the acceleration when first switched on and also the effect of heavy passages on the record.

I came definitely to the conclusion that a turntable that was too light in weight was a disadvantage. After all, the turntable constitutes a flywheel, and in that way forms part of the motor, and you

## NEXT WEEK

### How to Build A COMPACT CONSOLETTÉ

also

### THE D.C. "AIRSPRITE"

and a

### SPECIAL ARTICLE

By Lady Snowden

Etc. Etc. Etc.

Wednesday "P.W." Threepence

cannot expect the motor to run nearly so uniformly with rapidly varying loads unless you have something in the nature of a flywheel to help it out.

### An Electrical Attachment.

Whilst I was on the Continent I noticed a tiny electric motor sold for the purpose of adding as an attachment to an ordinary spring-driven gramophone so as to make it electrically driven. This had a little rubber wheel arrangement which drove the turntable and the motor was arranged so that it could be immediately attached and detached.

The idea is that if you have electric light available you can use this for driving the machine, whilst at other times you can work the gramophone by its ordinary spring motor. This does not appeal to me very much, however, because for one thing I think it is not a very economical way of doing the job, and for another if this attachable motor is fitted to most ordinary gramophones it may upset the spring arrangements inside.

## THE LISTENER'S NOTEBOOK

(Continued from page 266.)

the value of the News Bulletins if the B.B.C. were to follow up some of their S.O.S. messages with the sequel? There may, of course, be little if anything to report, but however insignificant the sequel, there's more satisfaction in knowing it than being left completely in the dark.

Another football season is virtually over, and Saturday evening bulletins are the poorer for it. Cricket results are a feeble substitute. But this is only my opinion, yet I am bold enough to think that I could find some listeners to agree with me.

Football results are indeed good radio fare, and that's why I am going to make yet another protest against the B.B.C.'s practice of withholding them on Good Friday. If Good Friday came at the beginning of the Soccer season instead of the end I wouldn't make such a fuss. But Good Friday comes when Soccer has reached its most exciting stage. Soccer results then are all-important.

## THE LINK BETWEEN

(Continued from page 278.)

Fortunately, by the recent decision of the Registrar of Trade Marks, such a course will not now be necessary. The name of Bulgin is inscribed as indelibly in the official records as the reputation that it carries is planted in the minds of all home-constructors! Congrats, Messrs. Bulgin, and best of luck for the future.

### "Class B" to Stay?

Nothing could be more of a radio "fashion guide" than my trade correspondence file.

At the time when Q.P.P. was beginning to catch on, something like 60 or 70 per cent of my correspondence was directly to do with the new system in one way or another.

Now, it is nearly all "Class B," and frankly I'm not surprised. To my way of thinking, "Class B" has many advantages over Q.P.P. from the home-constructors' point of view, and I am confident that it has come to stay.

Incidentally, while on the subject, it is opportune to mention that several of the leading H.T. battery manufacturers have written to advise me that they are producing special batteries for "Class B" operation. That should help considerably to popularise the scheme.

The fact of the matter is that for the complete and lasting success of "Class B" amplification it is vitally necessary to use an H.T. battery of very low internal resistance.

It is true that "Class B" is essentially an economical way of obtaining a comparatively large output for a low average consumption, but one should not overlook the fact that the battery may in some cases be called upon to deliver peak currents of anything up to 30 or 40 milliamps.

For that reason, in your own interests you should pay due regard to the choice of a suitable battery.

For your guidance in this respect, Ediswan, Pertrix, and Siemens are all producing special models for the job, and unofficially I believe that the other leading firms are following the same procedure.

Be wise—spend, if necessary, a little more initially, and then you will enjoy the full benefits of the new scheme.

### New Wearite Mains Transformers.

Rather as I imagined would be the case, the new range of Power Transformers by Messrs. Wearite is meeting with tremendous success.

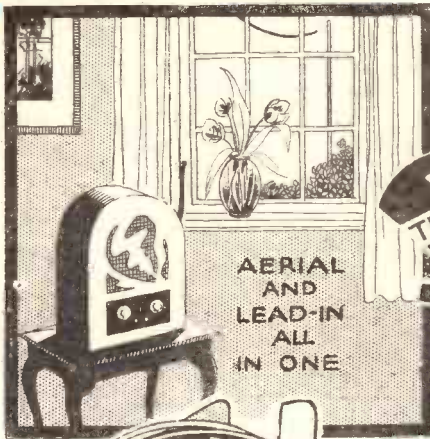
The extreme manufacturing precision that is so evident in their existing range of components leaves no doubt concerning the efficiency of these new lines, and I am confident that Wearite Mains Transformers are assured of a big future.

For all who are interested, a well-prepared leaflet concerning these new lines is available under "P.W.'s" postcard literature scheme, and I shall be happy to make arrangements for copies to be sent upon receipt of the usual postcard.

If you are contemplating the purchase of a mains transformer, take my advice and obtain a copy of this leaflet before you make a decision. (No. 33)

## OUR POSTCARD SERVICE

Applications for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.



# SUPERIAL

THE AERIAL WHICH MADE BROADCASTING POPULAR  
ELECTRON'S SUPER-AERIAL

## MAKES A FREE OFFER!

Superial is your aerial and lead-in, *all in one*. No more cracklings due to faulty joints, frayed wires and bad connections. No more losses through dirty insulators. No need to cut down or mutilate any tree in your garden. If your Superial touches trees or sheds, let it! The thick rubber insulation will protect it and prevent any loss of efficiency; the extra heavy vulcanised rubber insulation which will not crack or rub off, as other so-called insulations will with time and wear.

Haul your Superial as taut as you like—it is too strong to snap. Fading is encouraged by a loosely swinging aerial—avoid this tantalising fault.

## THE ONLY REALLY EFFICIENT INVISIBLE OR INDOOR AERIAL

If you cannot put up an outdoor aerial or want an invisible aerial, run Superial round your picture-rail or wainscoting—fix it with our special pins. Increase your selectivity and hear stations unheard before.

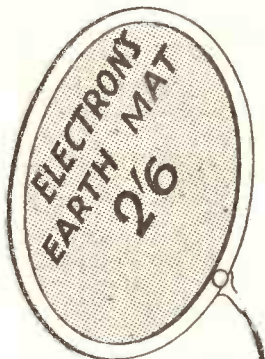
And it is so easy to handle, so flexible. It is all covered, too, so you won't soil or injure your hands.

Be wise—follow thousands of others and  
"Fit and Forget" Superial.

## FREE ELECTRON EARTH MAT

TO EVERY PURCHASER OF A SUPERIAL WHO SENDS US HIS OLD AERIAL OF ANY MAKE, SIZE OR AGE.

To all purchasers of a 75 ft. or 100 ft. SUPERIAL we are giving free of charge one of the celebrated Electron Earth Mats, acknowledged to be the most efficient form of earthing.



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ATTRACTIVELY BOXED IN VARIOUS SIZES

100 ft. - 3/6	75 ft. - 2/6
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**The NEW LONDON ELECTRON WORKS Ltd.**  
19, EAST HAM LONDON. E.6

Telephones:—Grangewood 1408-9-1363

Telegrams:—"Stannum, London."

*The New London Electron Works, Ltd., hereby guarantee to pay damages up to £100 to any purchaser of Superial (Electron's Super Aerial, with its extra heavy vulcanised insulation) should it be struck by lightning, thereby causing damage to the set, for a period of two years from date of purchasing the aerial.*

You have only to send us your old aerial, no matter the size, shape or age, together with the SUPERIAL CARTON. The Electron Earth Mat will be sent by return of post, together with our £100 Free Lightning Insurance.



### CUT OUT THIS COUPON AND POST NOW

with your empty SUPERIAL carton and our official cover note will be sent immediately.

NAME (block letters).....

ADDRESS.....  
(Retailer's name and address)

Date purchased..... Length.....

Post to: THE NEW LONDON ELECTRON WORKS, LTD.,  
19, East Ham, London, E.6.

# H.T. costs cut to 1/- a year



A.C. Mains					
Class	Type of Set	Annual running cost of batteries	Ekco Unit suitable	Cost price of Ekco Unit suitable	Annual running cost of Unit*
1.	Screened-Grid 3; Straight Three, and smaller sets	50/-	A.C. 12 12 m/a Output	55/- or by Easy Payments	1/-
2.	S.G. Three with Pentode; Screened-Grid Four; Sets with "Class B" Output	75/-	A.C. 18 18 m/a Output	67/6 or by Easy Payments	1/6
3.	S.G. Four with Pentode; Super-Hets; 5-Valve Sets; Sets with "Class B" Output.	100/-	A.C. 25 25 m/a Output	77/6 or by Easy Payments	2/-
D.C. Mains					
1.	Any set shown above	50/- to 100/- as shown above	D.C. 15/25	39/6 or by Easy Payments	Class 1 1/-
2.			15 or 25 m/a Output		Class 2 or 3
3.					1/7

L.T. charging costs 6d. a year extra (instead of 25/- a year!).  
Combined H.T. and L.T. Charger Units from 79/6 (for A.C. Mains only).

\* Based on 3 hours' daily use.

Study the table shown alongside. It gives some illuminating facts about running costs of sets. It shows that whatever your set, providing you have electric light, you can reduce its running costs to a negligible amount by installing an EKCO Power Unit in place of expensive batteries! It shows that an EKCO Power Unit saves the money it costs in the first year of use! And Easy Payments are as low as 3/8 per month. All you have to do is to connect the suitable EKCO Unit in place of the battery, plug in to the electric light or power and switch on—that's all! No alterations to set, valves or wiring. Consult your dealer or post coupon below.

### EKCO Units and "Class B"

All standard EKCO Units have adequate regulated capacity for use with receivers employing "Class B" amplification. Models AC.18, AC.25, K.18 and K.25 are particularly recommended.

To E. K. COLE, LTD., Dept. A.5,  
Ekco Works, Southend-on-Sea.

Please send me FREE illustrated literature of EKCO All-Electric Radio.

Name .....

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## ELECTRIC POWER UNITS

# THE NEW "CATKIN" VALVES—FULL DETAILS

## A FASCINATING RADIO COMPETITION

# Popular Wireless

SCORES OF PRIZES FOR READERS

No. 571.  
Vol. XXIII.  
May 13th,  
1933.

EVERY WEDNESDAY PRICE 3<sup>d</sup>

# THE "CATKIN" 3

THE FIRST SET TO USE ALL-METAL VALVES!



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The foremost suppliers of guaranteed Kits to the Grams : Dirrad, Sedist, London

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**MANY MORE RADIO HOURS**

**PER BATTERY!**

fit

# PERTRIX

NON SAL-AMMONIAC

## H.T. BATTERIES

Month after month Pertrix H.T. Batteries continue to give that generous output of steady current so vital to the true tonal rendering of speech and music. The results are certainly amazing—yet the reasons are not far to seek. Pertrix Batteries are constructed of entirely different materials from those used for all other batteries. Pertrix zincs do not corrode, because there is no sal-ammoniac; this means no deterioration when the battery is out of use. Pertrix have immense recuperative powers—for, while inactive, they build up their power for the next day's radio. Fit Pertrix next time—they give service until the last ounce of power is out!

**REMEMBER NON SAL-AMMONIAC MEANS EXTRA LIFE!**

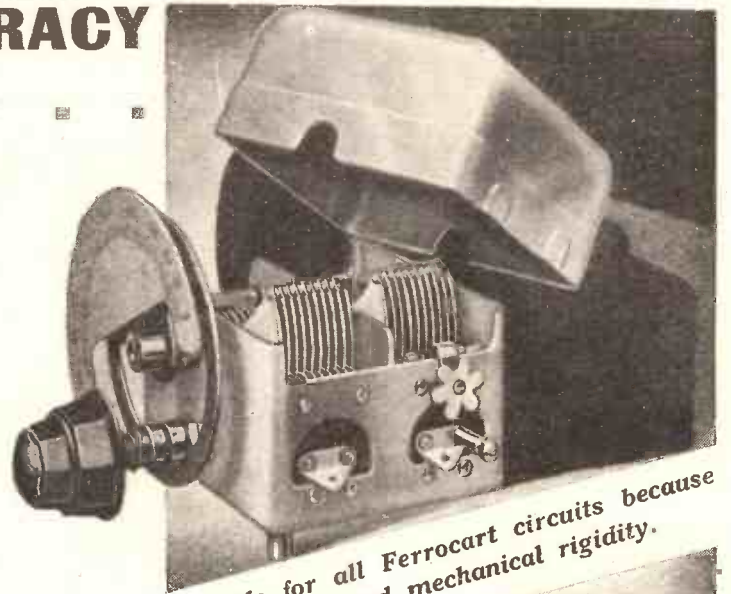


**BRITANNIA BATTERIES, LTD.** 233, Shaftesbury Avenue, London, W.C.2  
Works: : : : Redditch, Worcs.

## FOR UTMOST ACCURACY IN TUNING

Gives extremely fine tuning. Similar in construction to the "NUGANG" Condensers, but the trimmer of front section is operated independently from the receiver panel by means of a second knob concentric with the main tuning knob. Rigid one-piece chassis, very robust construction. Trimmer to each stage. Heavy gauge wide spaced aluminium vanes. Special bearings to rotor ensure permanent accuracy. Capacity '0005. Matched to within  $\frac{1}{2}$  mmfd. plus  $\frac{1}{2}$  per cent. Complete with disc drive and bakelite escutcheon plate.

2 gang - 18/6      3 gang - 27/-



J. B. Gangs are very suitable for all Ferrocart circuits because of their extreme close matching and mechanical rigidity.



**J.B. UNITUNE**

Write for **FREE** Catalogue

# PRECISION INSTRUMENTS

Advertisement of Jackson Bros. (London), Ltd., 72, St. Thomas' Street, London, S.E.1.

Telephone: Hop 1837.



**THE FIRST AND FOREMOST RADIO WEEKLY**  
 Scientific Adviser : **SIR OLIVER LODGE, F.R.S.** Chief Radio Consultant : **P. P. ECKERSLEY, M.I.E.E.**  
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*The Paper that Made Wireless Popular*



**A RETIREMENT  
 WHO WILL WRITE ?  
 SCHOOL TALKS  
 "NIGHT EFFECT"**

## RADIO NOTES & NEWS

**POOR "UNCLE"  
 RADIO ON CARS  
 THOSE CRITICS  
 AMERICAN VIEWS**

### The B.B.C. Controller.

I HEAR that at the end of this year the B.B.C. will have to say good-bye to its Controller. Admiral Sir Charles Cappendale, who is to retire under the age rule. He has been president of the International Broadcasting Union since its formation in 1925, and has been as popular in that as in the B.B.C.

I have seen it stated that his position at Broadcasting House will not be filled, but that his duties will be divided between two senior officials.

### Correspondent Wanted.

MR. ROBERT A. PIERSON, 5406, Winthrop Avenue, Chicago, Illinois, U.S.A., who is an amateur radio operator, is anxious to get into touch with English experimenters or, in fact, any English citizen who would care to write to him.

As Mr. Pierson is an American, you may take it that he means any Briton. I mention this because I know that the Scots and Welsh are sensitive about the point. Well, I hope that some of you will respond.

You will probably be rewarded by an insight into the American modes of thought, which I personally have found refreshing and stimulating.

### Big Prizes for Readers.

BE sure to read all about the "P.W." competition which is announced on another page this week.

There is no entrance fee, and, in addition to the big cash prize, we shall be giving away many valuable components and accessories, including the very latest types such as the new "Class B" apparatus.

Loudspeakers, ganged condensers, complete coil units, transformers—all will be going free of charge, as announced on page 294.

### Delightful Definitions.

WHILST glancing through an American radio book, evidently written before the third electrode got into valves, I was cheered to find the following two gems: "There are four principal forms of electricity, namely, static, current, magnetism." "Definition of aerial. When sending, this wire is often termed a sending wire when receiving, it is frequently termed a receiving wire; and it is also called an antenna."

I would add that when neither receiving nor sending it can be called just plain "wire."

### Broadcasts to Schools.

THE schedule for the summer term is now available. On May 8th the kids were lectured on "Trade Ties the World Together." I imagine that the speaker was glad that the "mike" could not put up its hand and ask about Russia.

I select "Glow-worms, Cuckoo-spit, Silver-fishes" and "Mixed and Small Farming" as the prize-winning items of the term for their pertinence, relevance, and educational value to youngsters who are training for the battle of jobs.

## INCOMPARABLE SERVICE!

This week, as usual, "Popular Wireless" leads the way, presenting **THE "CATKIN" THREE**

The first set ever designed to employ the new all-metal valves **FOR HOME CONSTRUCTORS**

(See page 293.)

### Direction-Finding at Night.

FORMERLY direction-finding was subject to certain limitations during darkness, when the accuracy of the bearings obtained was thrown out owing to what is called "night effect."

The recent development of the Marconi-Adcock aerial system has now made it possible to work the D.F. reliably during the most critical "night effect" periods, which will be greatly to the advantage of night flyers and is being widely adopted by aviation authorities.

### Radio Licences Increasing.

AT March 1st there were 4,480,250 radio licences in force in Germany, an increase of 52,650 since February, but of these no less than 551,690 were free.

Free licences since February increased 17,440.

In Great Britain at March 31st the total was 5,498,700, an increase for the month of 71,000. Depression here does not appear to affect people's determination to be uplifted, does it?

### Reggie's Romance.

ADMIRERS of Reginald King (and his orchestra) may be interested to know that his broadcast of Billy Mayerl's music on May 2nd was his first appearance before the "mike" since his marriage to Miss Beatrice Thomas.

Mr. King and his wife first met as fellow students at the Blackheath Conservatoire. Although they both passed on to the Royal Academy of Music they did not meet there; in fact, they did not meet again for some years. All's well, however, that ends well.

### A Cry from the Heart.

J. L. (Aldgate, E.1) writes the sort of letter that warms our hearts, because it comes straight from his. He bought an all-mains set which, after a few days, began to crackle—just like mine.

His dealer—evidently a mystic poet—said that all D.C. mains sets had to crackle in the nature of things. But J. L., being a go-getter, decided to help himself, and accordingly searched the Press for practical information. See next paragraph and small handbills.

### "P.W." Fills the Bill.

J. L. bought three weekly wireless papers, after perusing which he discarded one as too advanced and another as uninteresting and unduly technical. Remained "P.W.," which taught him not only how to put his set in order, but more about radio than he thought possible.

So we have won a satisfied reader and have received justification of the faith we had in ourselves. Thanks, J. L., the pleasure is ours. I hope you will be bitten severely by the radio bacillus and become an incurable case.

### Troubles of a Householder.

I BEG to report further in the matter of my new superhet-cum-grammy. My last bulletin announced noises from the  
 (Continued on next page.)

# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

pit, since when I have had my domestic lighting circuits vetted with a "megger," and have discovered an earthing wire and two defective switches.

In addition to this, I have found on my own account that the local radio expert who I employed to move my "E," "A" and power connections from one room to another, had bunched them all together and carried them in parallel along the floor—a fatal error which I have had to correct myself.

Gosh! I heard the whole town switching its lights on and off. Take warning from this doleful lay.

## Troubles of an "Uncle."

IT is a notorious fact, as any man will agree, that sometimes the tribute of affection is greater than the recipient can bear with dignity and comfort.

This philosophical remark owes its birth to the news that one of the artistes of the Children's Hour, having voiced the complaint, "I am only a little lamb, but I wish that I had



a blue ribbon and a bell," found more than two hundred parcels, each containing a blue ribbon and a bell, next morning. Poor blighter!

## Telegraphic Responses.

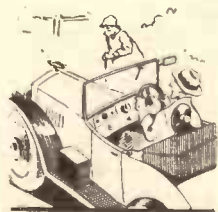
H. M. (Doncaster).—I do not know what Marconi thinks of greyhound racing. But I'll hazard the guess that he doesn't think of it at all.

R. S. (Southsea).—I agree with Mrs. R. S. I find it safer to agree with the ladies—and then do what I like. *Let them think they have won!* And then you can carry on with the set.

L. S. N. (Cambridge).—All is forgiven. Come back and try our A.V.C.—since when you will use no other. "P.W." is three jumps ahead of all competitors and imitators—and then some.

## Car Radio.

STRANGELY enough, coinciding with an attempt to build up the car radio market in Great Britain there is a fight in America between radio and car interests on one side and a Bill in the Legislature of Pennsylvania to prohibit the use of radio receivers in motor cars.



The radio and car people say that radio provides a safety

factor, inasmuch as it tends to reduce speed.

What the promoter of the Bill argues I do not know. Anyhow, it is estimated that car radio sales in the States during 1933 will be some 250,000 sets.

## My Article on Early Radio.

THIS is now in the lion's den, or Editor's sanctum, as some authorities have it. Whether you read it depends on H.M. In the course of writing it I came to the

conclusion that we "were giants in those days," considering that we made even our own crystals. But I do not deprecate these days. We have bigger and more numerous "fish to fry," and the radio game is now hotter by far.

## Noisy Speakers.

IN the course of my perusal of the trade press I have gleaned the news that Liverpool, Carlisle and Bedford have adopted a "noisy speaker" by-law. In other words, these towns have taken power to bid uproarious orators "put a sock in it."

It would be beneficent to apply a similar by-law to the H. of C., Hyde Park, our "char," pork butchers, and all loudspeakers capable of piercing party walls.

## SHORT WAVES.

Auntie (listening to broadcast programme): What are they playing now, dear?

Niece: Schubert's Unfinished Symphony, Auntie.

Auntie: That's very interesting, dear. I once knew a Mr. Schubert.—"Punch."

"The following is a list of wireless programmes for the week," we read in a contemporary.

After glancing down the list, however, we are inclined to think that only the very strong will be able to stand the strain.

## S O S

Nervous Announcer: Will the deep depression which left Iceland a few days ago, and was last heard of moving along our Eastern seaboard, kindly return home at once, as his twin brother is dangerously ill?

Boy (during guest's generous entertainment): Well, Mum, it does save the wireless, anyway.—"Punch."

## Radio is Not Depressed.

ALONG with the healthy increase in issued licences we may consider with satisfaction that the radio exports of Great Britain during March were some £33,300 in advance of those for February, and £35,726 more than in March last year.

We cannot, unfortunately, consider these facts as proof of reviving world conditions—for they are still very sick—but they are on the right side, and nowadays we have to be thankful for minute mercies.

## The Wicked B.B.C.

I GET a lot of fun out of some of the so-called radio "critics." Not acting as one myself, save in rare spasms, I feel at liberty to criticise them.

Accusing the B.B.C. of ignoring criticism—which is perfectly true in a general sense—one critic says, "The B.B.C. persists in putting over the Ridgeway Parades, despite persistent criticism." How naïve, in a newspaper man, too.

I think the B.B.C.'s reply, if it deigned to reply, might well be, "Where are the critics, anyway?" Incidentally, what's the matter with the "Parades"?

## Empire Day Pot Pourri.

A MIXTURE indeed, but one full of delightful contrasts, will be available on Empire Day, May 24th—the day when little Englanders wear black ties and dream of red flags, sickles, hammers, etc.

Lord Jellicoe broadcasts a speech in the morning, and at the Empire Day Luncheon at the Junior Carlton, Mr. J. H. Thomas

and the Archbishop of Canterbury will orate. There will be a special Empire Day programme in the evening.

## The Plastics Industry Show.

PUTTY and all that, sez you. So should I have dismissed plastics before I visited the Plastics Industry Exhibition, which was held in the Science Museum, South Kensington, after being opened by Lord Irwin.

The industry produces goods worth at least twenty million pounds per annum, ranging from loudspeakers to artificial flowers.

Our modern life, it would almost seem, cannot persist without plastics, and what radio components owe to them is common knowledge amongst us. What we lack still is cheap, *droppable*, vases and teacups, etc.

## How Do They Do It?

IN an article in a Sunday paper, written by an American visitor, British broadcasting is compared, unfavourably, with American. The writer of the article alleges that the sponsored U.S.A. programmes provide much greater variety and better quality than ours.

I don't agree about the quality, nor do I share the American's objections to an English announcer coughing before the "mike." "No American announcer would dream of it," he says. Nor would an English announcer, but how can a man bottle up a cough? Only by bursting.

## U.S.A. Objections to B.B.C.

THE secret of cough control is an American patent, then. Continuing, our visitor shrewdly puts his finger on the "doomp" and the tuning signal as undesirable, but unaccountably fails to condemn those irreverent Greenwich "pips" which interrupt comedian, divine, poet and music composer without fear or favour.

He glories in the fact that he pays no licence fee. He boasts that no American announcer ever asks pardon for misreading. That I can easily believe. Besides, we don't want a perfect B.B.C.; our national genius tends towards the cussing of our institutions.

## Where is My "Fidelia"?

THAT'S a good bit about the French station which was, I assume, so hard up for material that it accepted an S O S message from a lady who had lost a

dog. Madame got the tyke back, but the incident inspired the journalists to ask her to sponsor a weekly "dogs' hour" as a welcome change from gramophone records.

Well, that's an idea.

Our tortoise, Muriel, has not turned up this spring.





# "P.W." AGAIN FIRST!

## Full details of the Remarkable "Catkin" Valves

"P.W." again first—and with "Catkins!" What does it all mean?

It means that still another development has taken place in the valve world, the far-reaching consequences of which may have a very important bearing upon the future technique of set design. It means that "P.W." has again soared ahead of all competitors by providing its readers not only with an exclusive description of what must necessarily be regarded as one of the most remarkable valve developments for many years, but concurrently with complete constructional details of the first set ever to be published incorporating the new valves.

Not just an announcement, not merely a description of the new valve itself, but as much *practical* information as it would be possible to cram into any one issue is the substantiation for our claim to be first with the news.

And what news, too! Marconi and Osram—names that are household words—about to produce a range of valves in which the orthodox glass container is entirely dispensed with.

In view of the rapidity with which development has followed development in the valve world, and all in a matter of about two months, the reader might well pause to wonder where it is all going to end. Why worry? Of one thing you can definitely be certain. Underlying all this amazing activity is the reassuring prospect of greatly increased efficiency with hitherto unequalled economy.

### Made From Metal.

New valves, new circuits, new standards! And with the advent of "Catkins," it is no idle thought to suggest that the time may not be very far distant when glass-enclosed valves as we know them to-day become very different things! But that is looking a little too far ahead.

For the moment we can afford to neglect the future and concern ourselves only with the present. What, then, is a "Catkin"—perhaps we had better say a *radio* "Catkin"?

Superficially, it is—or looks like—an electrolytic condenser case with a series of ornamental holes in it and with valve pins at the base in place of the usual fixing lugs. Perhaps the description is a little crude, yet it will serve to give you a mental picture of all that can be seen of this remarkable new valve.

Actually, it is a valve that is made almost entirely from metal. You can drop it, in fact you can treat it just as roughly as you

By The "P.W." Research Department.

Ahead of all competitors, "Popular Wireless" is able to give the first full details of the very latest development in radio technique—the "Catkin" valve. Made without any glass bulb at all, and with remarkable advantages of permanent electrode spacing and durability, this amazing new valve will shortly be available all over the country.

like within reason, but it will still be every bit as efficient when you have finished with it! And that is only just the fringe of the story.

### The Actual Anode.

When valves were first thought of, the necessity of mounting the electrodes in a vacuum no doubt carried the minds of the designers to a parallel case—that of the electric lamp. Broadly speaking, the two processes were similar, and in consequence, since the desired degree of vacuum could be obtained from the use of a glass container, no thoughts of other methods even arose.

the material is thin glass to appreciate the care that must be exercised.

In what one might justifiably refer to as the revolutionary principle of construction of the "Catkin" valve, the glass container is entirely dispensed with.

The actual anode of the valve, which takes the form of a drawn copper cylinder, is the "envelope" in which the vacuum is contained.

Thus, in consequence of the convection currents in the air surrounding the outer side of the anode, the valve can be run much more coolly, and the chances of extraneous gasses being given off at the consequential lower temperatures are much more remote.

It is the shape of this anode that gives rise to the name "Catkin," although the designation is not altogether unconnected with the larger types of transmitting valves known as the C.A.T. class, in which somewhat similar principles are involved.

### Fixed Electrodes.

The interior assembly of the electrodes in a "Catkin" valve is carried out in a way which is bound to result in absolute rigidity. The other electrodes are held in their correct positions with respect to the anode by accurately stamped mica distance pieces, so that however the valve is knocked about, relative movement is practically impossible. In order further to ensure that no relative movement shall take place, mica distance pieces are also employed to locate the cathode centrally inside the grid.

The pinch through which the electrode support wires are brought out is interesting in as much as it is a drastic departure from standard practice. In place of the usual

glass pinch, a piece of sheet metal is firmly pressed around the support wires over what appears to be an insulating collar of mica.

The platinum wires from the lower ends of the electrode supports are then melted into a circular glass collar and pass finally to the valve pins. This glass collar, incidentally, serves to seal off the vacuum.

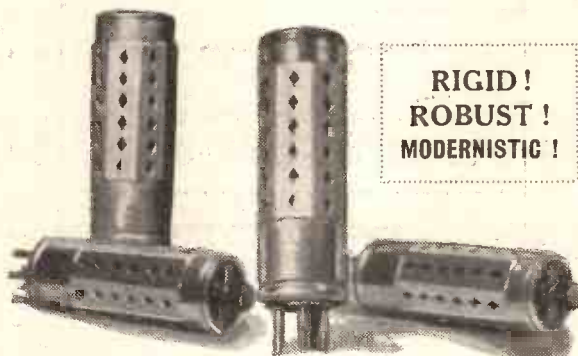
### Spaced Supports.

One advantage of this method of construction would appear to lie in the fact that wider spacing of the electrode supports is possible, and inter-electrode capacities should in consequence be lower.

The only part of the valve which is visible to the eye, the "glorified pepper-pot," is actually no part of the valve at all, unless one can call an electrostatic screen an

(Continued on next page.)

### WHAT THEY LOOK LIKE



**RIGID!  
ROBUST!  
MODERNISTIC!**

Instead of the familiar glass bulb "Catkin" valves have all-metal cases. Their internal construction also is phenomenally robust, details of this being given in the accompanying exclusive article.

But efficient as modern valves are today, there are difficulties to be overcome consequent upon the use of a glass bulb, not from the point of view of a user so much as from that of a manufacturer.

For instance, to take just one obvious example, the efficiency of a valve may be upset very considerably unless all forms of extraneous gas are completely removed, and to do away with that possibility the interior of each glass bulb has to be scrupulously cleaned before it can be used.

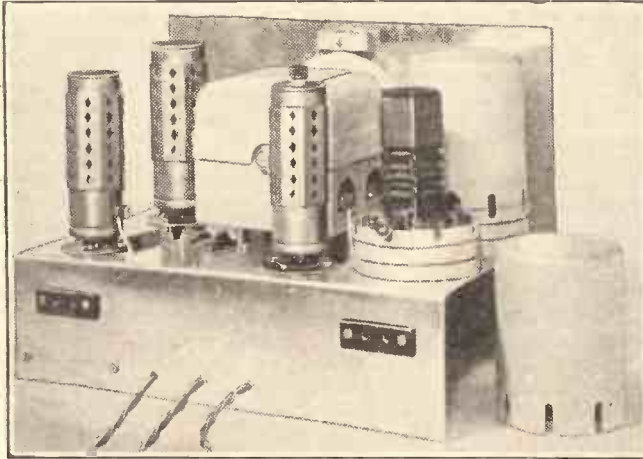
One must be fair and admit that with modern valves trouble from this source is rare in the extreme, but that is only because the British manufacturers are so very thorough. The fact that it has been overcome in so far as the finished valve is concerned does not lessen the manufacturing difficulties. One has only to remember that

**"P.W." AGAIN FIRST!**

(Continued from previous page.)

essential part. That is the function that it fulfils, although it is also intended to serve as a protective cover for the valve "envelope" which, of course, is the anode. Without this protective cover, the valve would be getting down to the old "peanut" valve dimensions.

**WORLD'S FIRST "UNBREAKABLE" SET**



This is how the new valves look in the "Catkin" Three, the world's first "all-metal" receiver, which is fully described on other pages in this issue.

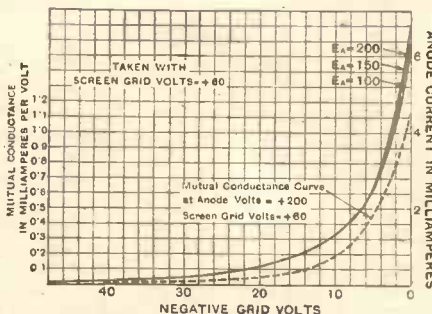
As it is, its overall dimensions are not appreciably smaller than those of existing types, although the diameter is uniform throughout.

**Radically Different Principles.**

The arrival of a new valve incorporating principles of construction so radically different from those of existing types naturally provides the technical mind with considerable food for thought. It is obviously much too premature at this stage to offer any sort of concrete suggestions as to the electrical potentialities of the new valve, but certain definite facts emerge from a cursory examination of the mechanical advantages.

For instance, the new valve is phenomenally robust, the significance of which is two-fold. In the first case, it will stand up to rough handling without the slightest risk of the electrical characteristics being impaired. That is definitely an advantage from the point of view of

**SMALL LEAKAGE CAPACITY**



In the V.M.S.4 "Catkin," which is of the indirectly heated cathode type, the anode-grid leakage capacity is brought down to minute proportions.

the user, but it is likely to affect the manufacturing side to an even greater extent.

The mechanical soundness of the principles involved will no doubt lead to greater uniformity between valves of similar types, but over and above that the whole chain of events in the manufacture of the valve should be considerably simplified. In years to come, that fact alone should have far-reaching effects upon price levels.

Then again, the fact that the operating temperature of the valve is likely to be very much lower due to the "air cooling"

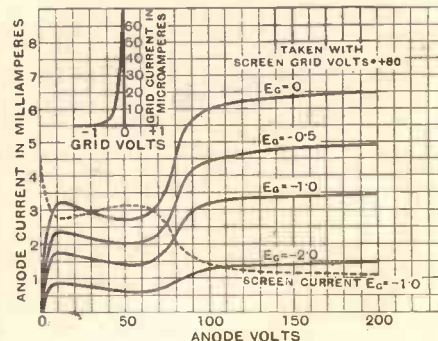
principles involved is definitely an advantage from the technical point of view. In addition to increasing the useful life of the valve, it should appreciably affect the overall efficiency of certain types, particularly on the output side of the set.

At the present time the output available from a power valve is to an extent limited by the rate at which heat can be got away from the surface of the anode. The principles of construction of the "Catkin" should provide scope for considerable improvement in this respect, since the question of

heat dissipation is to an extent overcome. Who knows, it may ultimately lead to "mains" output from battery sets without push-pull!

Another advantage that occurs to the mind is that from our own investigations into the causes of microphonic troubles, it is a safe prediction that the phenomena will be entirely absent with the method of construction employed in "Catkins."

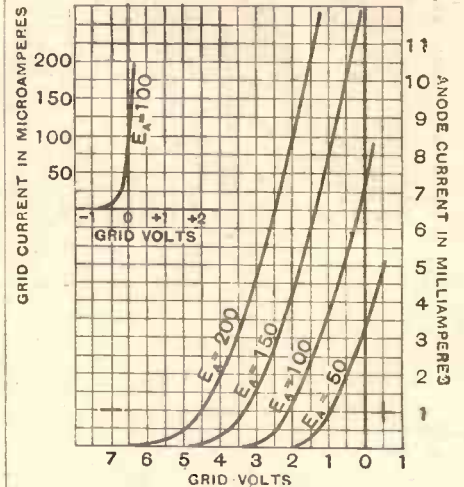
**"CATKIN" CHARACTERISTICS**



The "curves" of the M.S.4B. "Catkin"—an S.G. H.F. amplifier, with indirectly-heated cathode.

In view of the radical departure from standard practice that is made in the production of these new valves, it will be interesting to follow the progress that is made. For the present, "Catkins" will only be available as Marconi and Osram M.S.4B's V.M.S.4's, M.H.4's, and M.P.T.4's, although we have it on the best authority that the whole of the existing ranges of these two well-known makes will ultimately be dropped in favour of the "Catkin" method of construction.

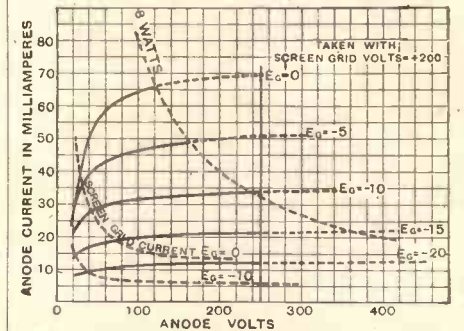
**FOR H.F. AND L.F. AMPLIFYING**



The A.C. "Catkin" of the M.H.4 type—which is to be known as the M.H.4 "Catkin"—has an amplification factor of 40, and mutual conductance of 3.6.

As for the four that are being produced now, the characteristics will remain identical with those of the existing glass-bulb types. In other words, it will be possible to replace valves of the types mentioned above with "Catkins" of similar designation, as soon as they become generally available.

**THE NEW PENTODE**



The impedance of the M.P.T.4 "Catkin" is 33,000 ohms, the mutual conductance being 3 and the maximum anode dissipation 8 watts.

**SHORTS ABOUT SHORT WAVES**

When building a two- or more valve short-wave set it is a good plan to first try it out as a one-valver only, to ensure that the detector stage is working at its maximum efficiency before amplification.

A short-wave tip worth remembering is to use as small a reaction coil as possible, coupled right up as close as it can be to the grid coil.

A short-wave tuning condenser is always best connected straight across the grid coil, and not to any convenient point on the earth-flament circuit, as in an ordinary broadcast receiver.

For the short-wave grid condenser a capacity of .0001 or even less is sometimes better than the more conventional .0003 mfd., giving easier reaction control.

In spite of the development of the screened-grid amplification, for short waves the old-fashioned det. and L.F. circuit is still the most popular and successful.

# THE "CATKIN" 3

## The First Set to Use ALL-METAL-VALVES



THE first set to use all-metal valves! That is the astounding claim that can be made on behalf of the three-valver we introduce to readers this week.

### Efficiency.

The new valves are of the "Catkin" type, which are practically unbreakable from a mechanical point of view and of most efficient electrical design. Their novel appearance can be judged from the photograph of the "Catkin" Three with the valves in place, and this picture gives a good idea of the remarkably modern aspect of the set design as a whole.

With these valves and the chassis layout the receiver presents a unique appearance of pleasing severity, and business-like cleanness of line. Just think of it. All-metal valves, a metal chassis, canned coils, screened variable condenser—all matching to a "T."

Efficiency, too, goes with the all-metal design, for the screening is wonderfully complete, enabling high-stage gains to be obtained without any trace of instability or trickiness in adjustment.

### Pentode Output Valve.

The valves are of the indirectly-heated A.C. type, and include a variable- $\mu$  S.G., a detector, and a pentode output, thus providing completely up-to-date volume control with an output power that will satisfy the most exacting.

Elsewhere in this issue will be found full descriptions of the new valves, so there is no need to go into their technical aspects here.

The valves are similar to the V.M.S.4, M.H.4, and M.P.T.4 Marconi and Osram A.C. valves, but are totally enclosed in metal. The connections to them are the

This is the only home-constructor design which employs the entirely new valves now being introduced to the public. It opens up completely fresh vistas of unbreakable-valve receivers.

A "P.W." Research Department Production.  
DESIGNED and DESCRIBED by K. D. ROGERS.

## THE MOST UP-TO-DATE SET YOU CAN BUILD!

Three "Catkin" valves, the very latest development of the radio industry are employed, making this set the last word in receivers, and entirely

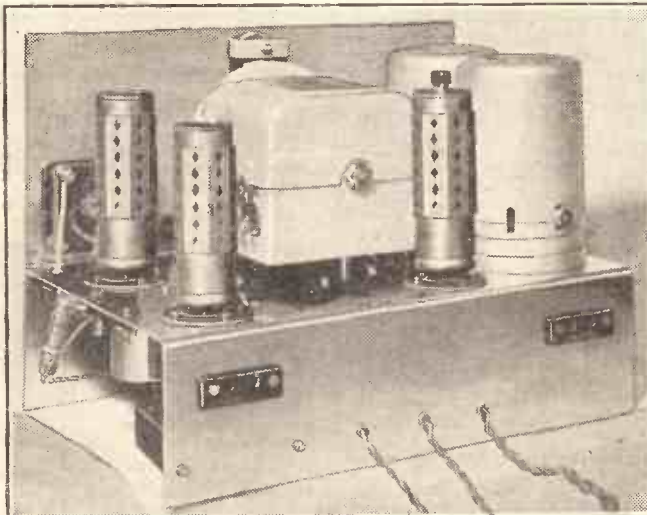
## UNIQUE!



same, and with the metal construction it will be possible to make the valves very much more efficient. Those needed for this set are the V.M.S.4 "Catkin," the M.H.4 "Catkin" and the M.P.T.4 "Catkin."

The beauty of line of the set is by no means its only strong feature, though it

## INSTABILITY IS IMPOSSIBLE



Not only are the valves all-metal, but the tuning condenser and coil units are completely screened. As a metal chassis is employed, the receiver thus inaugurates an "Ironclad" era.

## A COMPLETELY SCREENED CHASSIS DESIGN!

The layout of the set is quite novel, but in spite of this its simplicity of construction and its remarkable compactness are simply **ASTOUNDING!**

must be admitted that it is one of the finest chassis designs that have so far been developed. It is as efficient as it is pleasing in appearance.

### Distance.

The circuit has been specially chosen to suit the new valves, and provides easy control with the highest efficiency. There is not the slightest suspicion of A.C. hum in the output, and the power and quality leave nothing to be desired.

Distance getting, too, is an easy matter on the "Catkin" Three, for the variable- $\mu$

S.G. valve enables complete refinement of control to be obtained where sensitivity is concerned—without any tuning upset.

Reaction also assists in pulling in the far-distant programme, while the trimming vane on the condenser enables the tuning to be always exactly matched, though the advantages of single-dial, ganged tuning are kept in their entirety.

The construction of the receiver is not so difficult as it may appear, for the chassis consists merely of a couple of sheets of 18-gauge aluminium, one for the panel, and one for the baseboard and the back piece. The baseboard sheet is bent at right angles to form a sort of bridge with sides 3 in. high, and a top portion 7 in. deep.

### Cutting the Holes.

This bent sheet is bolted to the panel and forms what would be the baseboard and the "terminal strip" of the normal ebonite and wood set.

The cutting of the holes for the valve holders and the variable condenser escutcheon can be carried out by a proper cutting tool in a brace, or they can be knocked out after the circumference in each case has been

(Continued on next page.)

# THE "CATKIN" THREE

(Continued from previous page.)

drilled round with an ordinary drill. The variable condenser should be mounted first, and when the holes that take the three fixing bolts have been positioned correctly, the condenser must be removed while the components under it are mounted. Unless this is done it will be impossible to fix these. Care must be taken, however, that the holes for the condenser feet screws are left clear when the under components are being mounted.

### Earthing Fixed Condenser Cases.

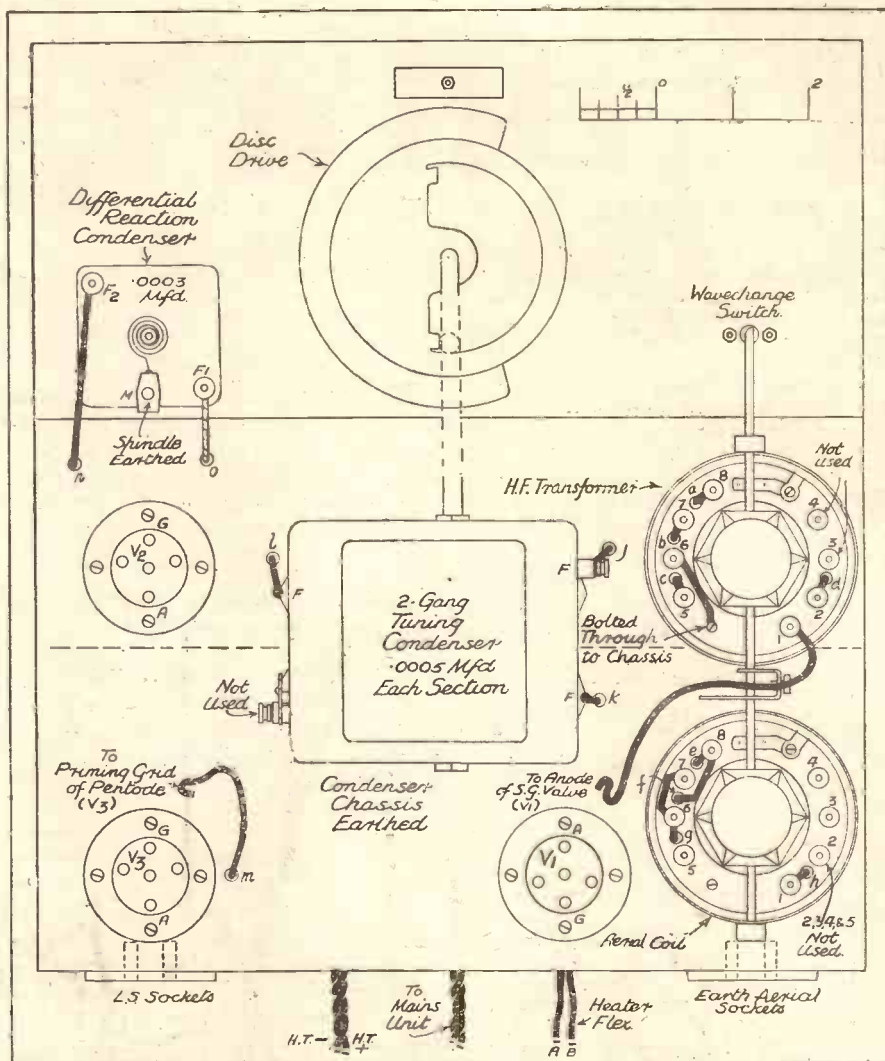
The enamel on the feet of the round fixed condensers should be scraped off so that the condenser's casing may make contact with the earthed metal chassis, while the moving vanes of the differential reaction condenser make contact with the chassis through the fixing on the panel. In the case of the volume-control potentiometer, however, the spindle must not come into contact with the metal, and the insulating bush provided by the manufacturers must be used here.

All the holes in the chassis should be smoothed off with a file or countersinking bit to prevent the insulating sleeving of the wiring being cut where it passes through the chassis.

### The Last Wiring.

The 2-mfd. output condenser will have to be mounted last of all the components, for it cannot be placed in position until the wiring to the last valve holder has been completed.

There are six leads from the "Catkin" set, which are taken to the power pack (to be described shortly). These leads are the mains control from the on-off switch on the volume control, the two L.T. (heater) leads, (Continued on next page.)



The deep chassis enables a large percentage of the components to be accommodated beneath the metal "baseboard." This makes the design very compact, and at the same time imparts a most attractive neatness to the complete assembly. The connections above the baseboard are given in this diagram.

## ALL STANDARD COMPONENTS ARE USED FOR THIS REMARKABLE SET

Component	Make used by designer	Alternative makes of suitable specification recommended by designer	Component	Make used by designer	Alternative makes of suitable specification recommended by designer
1 Aluminium panel, 11 in. x 8 in.	—	—	1 5,000-ohms resistance with terminals	Graham Farish "Ohmite"	—
1 "Baseboard" (aluminium), 13 in. x 11 in.	—	—	1 1,000-ohms resistance with terminals	Graham Farish "Ohmite"	—
1 Cabinet to take panel with baseboard clearance, 7 1/2 in. deep	Peto-Scott	—	1 3,000-ohms resistance with terminals or with wire ends	Graham Farish "Ohmite"	Dubilier 1 watt
1 2-gang .0005-mfd. variable condenser	J.B. "Unitune"	—	1 300-ohms resistance with terminals or with wire ends	Graham Farish "Ohmite"	Dubilier 1 watt
1 .0003-mfd. differential reaction condenser	Graham Farish	Telsen, Lotas	1 .25-meg. grid leak with wire ends or terminals	Goltone	Graham Farish "Ohmite," Igranic, Lissen Tunewell
1 2-mfd. fixed condenser	T.C.C. type 80	—	1 Set twin matched screened coils	Telsen W.287	—
1 2-mfd. fixed condenser	T.C.C. type 50	Dabilier, Telsen	1 Screened H.F. choke	Graham Farish H.M.S.	Wearite, Bulgin H.F.8
1 50-mfd. electrolytic fixed condenser	T.C.C. type 521	—	3 5-pin chassis-mounting valve holders with terminals	Clix	—
2 1-mfd. fixed condensers	Dubilier 9200	—	1 Pentode output choke centre tapped	R.I. "Hypercore" 30/20 henries	—
1 5-mfd. fixed condenser	Dubilier 9200	—	1 L.F. transformer	Lissen "Hypernik"	—
1 .0002-mfd. fixed condenser	Dubilier 870	—	2 Twin socket strips	Belling-Lee 1047	Bulgin F.30
1 .0001-mfd. fixed condenser	Dubilier 870	—	3 yds. insulating sleeving	Goltone	Wearite
1 10,000-ohms potentiometer with on-off switch and insulating bush	Bulgin V.S.32	—	6 yds. 18-gauge tinned copper wire	Goltone	Wearite
2 20,000-ohms resistances with terminals	Graham Farish "Ohmite"	—	1 yd. screened wire	Goltone H.F./114	—
1 15,000-ohms resistance with terminals	Graham Farish "Ohmite"	—	Flex, 6 B.A. bolts and nuts, etc.	—	—
1 600-ohms resistance with terminals or with wire ends	Graham Farish "Ohmite"	Dabilier 1 watt			
1 50-ohms resistance with terminals or with wire ends	Graham Farish "Ohmite"	Dabilier 1 watt			

## THE "CATKIN" THREE

(Continued from previous page.)

and the H.T. positive and negative connections.

The connections from the switch should be made early on in the construction of the set, so that they may be connected to the switch terminals while these are still easily accessible, and before they are crowded in by other components. These leads are taken out through a hole in the back of the chassis.

The heater connections, too, should be done early, and these are taken out through another hole. Finally the H.T. connections are taken through a third hole.

It will be noticed that the aerial and earth, and the loudspeaker sockets have to

be so mounted that the marking is upside down as read from the back of the set. This is essential because the screws in the shanks of the sockets are so fixed that unless this is done it is impossible to get at them to tighten them up.

### How To Operate.

The operation of the set is perfectly straightforward. The trimmer of the gang condenser is unscrewed, and a low medium-wave station is tuned in. Then the trimmer is so set that the receiver is

in tune when the adjustable trimming of the concentric knob on the condenser is in the centre position.

That is all that has to be done in the way of trimming, for the adjustment on the panel face allows accurate tuning to be obtained throughout the wavelength range. Reaction is perfectly normal, and the volume control is handled in the usual way.

## "CATKIN" ACCESSORIES

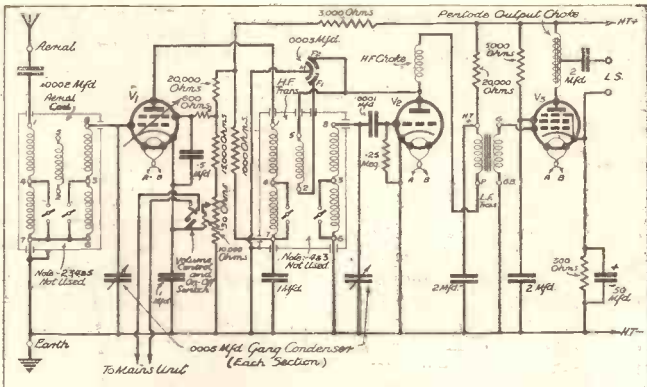
**LOUDSPEAKER.** — B.T.H., R & A, Epoch, Blue Spot, Marconiphone, Ormond, H.M.V., Celestion, Rola, Amplion, Igranite.

**MAINS UNIT.** — To be described in "Popular Wireless."

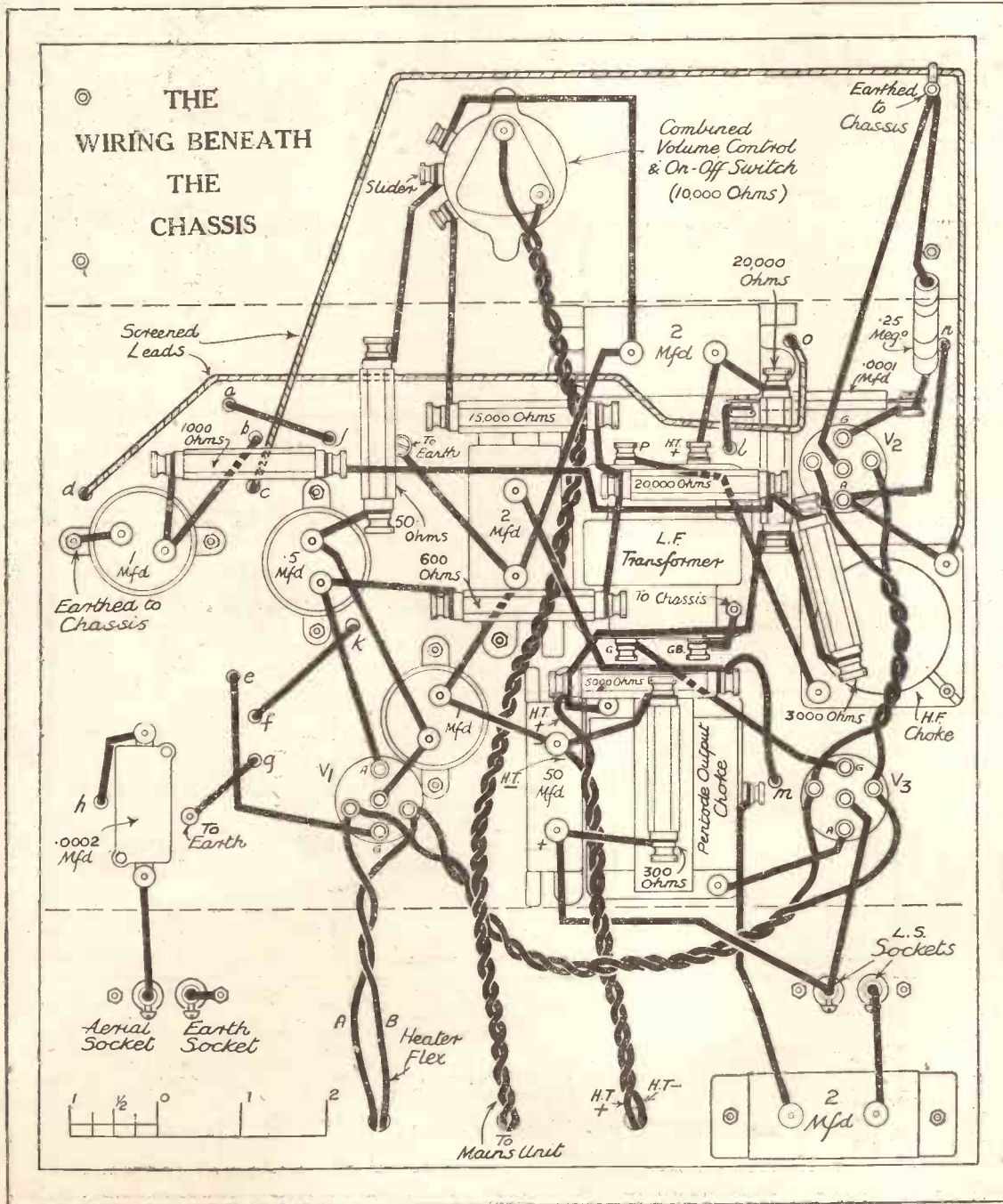
**AERIAL AND EARTH EQUIPMENT.** Goltone "Akrite," Electro "Superial," Graham Farish "Filt" earthing device.

The connections to the power pack will be given in detail when the description of the unit is published. Meanwhile constructors can get on with the building of the main part of the receiver, conscious that they will, when finished, have a really up-to-date design, capable of providing a host of stations at full strength, and with a quality that is of the highest class.

The lettering where wires pass through the chassis corresponds with the lettering on the other wiring diagram.



The "Catkin" Three circuit, which has been specially chosen to suit the new valves. The diagram below shows the under-chassis arrangement. Note that the long lead which runs close to the panel is screened.



# LOOK—A RADIO COMPETITION FOR ALL!

Easy—Novel—Fascinating—Instructive—You'll like "Radiopics."

ALSO 50 VALUABLE PRIZES FOR SET - BUILDERS — LOUDSPEAKERS, GANGED CONDENSERS, COIL UNITS, "CLASS B" TRANSFORMERS, Etc., Etc.

Nothing to Pay!

THIS week POPULAR WIRELESS presents its readers with a special new feature—an entirely novel and entertaining competition which is as easy as it is fascinating. The prizes **MUST** be won—and all entirely free to "P.W." readers.

All you have to do to win the £25, or one of the other prizes, is to solve a few attractive little puzzle-pictures representing the names of wireless stations.

Below is the First Set, each picture denoting one name only—while all the answers are to be found in the short "key" list at the side.

Solution No. 1 is given you as a start. What are the five other names here? Solve them with the help of the list, and write the answers **IN INK** (and in **BLOCK LETTERS**) in the spaces provided.

Afterwards cut out the picture-set and keep it until next week, when we shall publish six more of these entertaining puzzles. Each set will have its own "key" list, and in the Sixth and Final Week full sending-in directions will be given. There is **NO** Entrance Fee!

Start Winning To-day!

## "RADIOPICS" SET 1

The winning "stations" in "Radiopics" Set 1 are all given in this short "key" list:

- CORK
- LONDON NATIONAL
- EIFFEL TOWER
- BOMBAY
- MIDLAND REGIONAL
- ABERDEEN
- ROME
- FLORENCE
- CALCUTTA
- VIENNA
- RADIO PARIS
- NAPLES
- PITTSBURG
- SYDNEY
- CARDIFF
- OTTAWA

<p>NATIONAL</p>		<p>SM</p>
<p>1 LONDON NATIONAL</p>	<p>2</p>	<p>3</p>
<p>IFF</p>		
<p>4</p>	<p>5</p>	<p>6</p>

### COMPETITION RULES (TO BE STRICTLY ADHERED TO).

The **FIRST PRIZE** of £25 will be awarded to the competitor whose solution of the complete series of puzzles is correct, or most nearly correct—and the other prizes in order of merit. No competitor may receive more than one prize, or share of a prize, and in case of ties the Editor reserves the absolute right to divide the prizes, or their value, as he thinks fit.

All solutions must be written **IN INK** on the "Radiopics" puzzle-sets. Any number of different attempts may be made, but each attempt must consist of a full series of the six sets, which must be quite separate and

distinct from any other attempts. Entries including sets mutilated, or bearing alterations or more than one solution in each space, will be disqualified. No responsibility can be taken for delay or loss in the post or otherwise, nor will proof of posting be accepted as proof of delivery. No correspondence will be allowed.

The decision of the Editor will be final and legally binding, and entries will only be accepted on this understanding. Employees of the proprietors of POPULAR WIRELESS must not compete.

FORWARD, "P.W." READERS—OVER 50 WINNERS WANTED!



# The D.C. "AIRSPRITE"

THE D.C. mains user is not the most fortunate of listeners. Often he is luckless enough to be passed over when the question of a new set design is under consideration, and it not infrequently falls to his lot to see a new type of receiver put out in either battery or A.C. form with no D.C. version available.

There are, of course, reasons for this state of affairs. The D.C. user is in the minority and his numbers are a relatively small proportion of the total number of listeners. Set design is, after all, largely a matter of supply and demand.

Secondly, until comparatively recently, all-electric D.C. receivers were by no means easy to design.

Battery valves had to be used, and apart from design difficulties, the power output was always very limited; in fact, there was little or nothing to be gained over the L.T. accumulator-cum-H.T. eliminator arrangement.

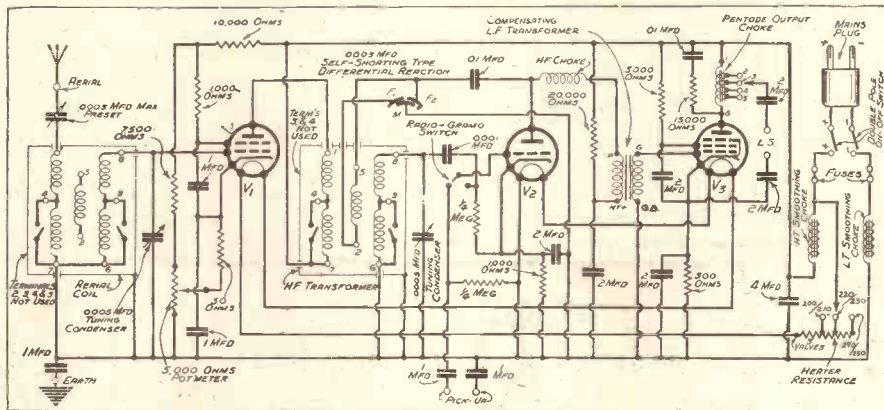
Valve development has changed all this,

and made it possible now to design D.C. mains sets giving results fully equal to their A.C. equivalents. The D.P.T. output valve used in the D.C. "Airsprite," for example, is capable of handling 2 watts of undistorted energy, which is more than enough for the finest moving-coil quality in the home.

Inspired by the success of the battery and A.C. versions of the "Airsprite," the "P.W." Research Department decided to add this all-electric D.C. model to the series. D.C. users are therefore now in the position of being able to enjoy the advantages of automatic tone balance combined with full mains power output.

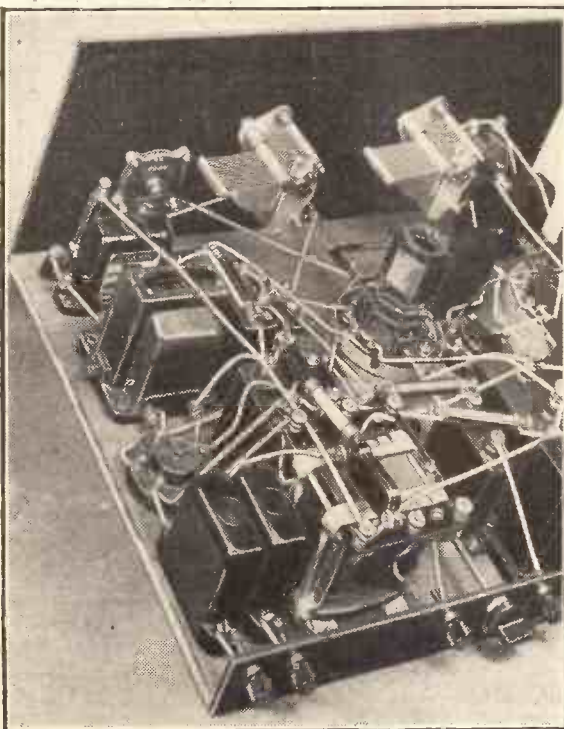
Reference to some of the special features of the D.C. (Cont. on next page.)

A magnificent no-battery receiver for D.C. mains, incorporating all the "Airsprite" advantages, including Automatic Tone Balance for quality reception of distant stations.  
Designed and Described by The "P.W." RESEARCH DEPARTMENT.



A circuit of many special features, including matched and filtered output, isolated pick-up leads and A.T.B.

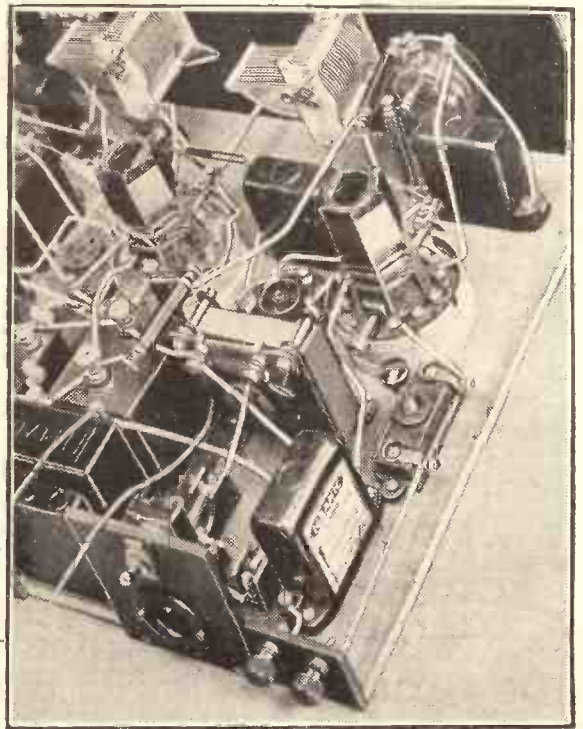
Near the aerial and earth terminals (below) is the special safety on-off switch, on a small separate "panel" of its own.



## Special Features

- ↓
- AUTOMATIC TONE BALANCE
- ★ NO BATTERIES
- ★ PENTODE OUTPUT
- ★ FOR ANY D.C. MAINS 200-220v.
- ★ GRAMOPHONE OR RADIO
- ★ "AIRSPRITE" SELECTIVITY

The powerful output end (left), showing the radiogram switch placed between the pick-up terminals.



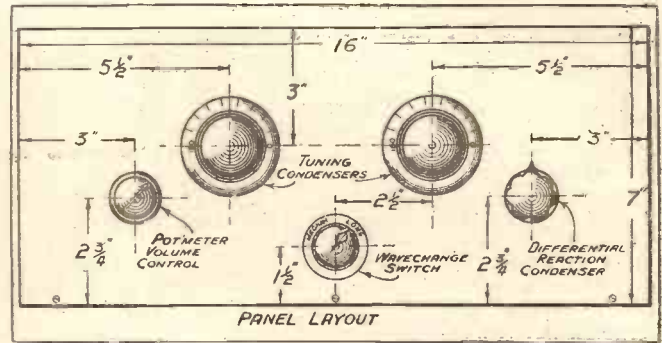
## THE D.C. "AIRSPRITE"

(Continued from previous page.)

"Airsprite" will at once reveal the set's potentialities.

The H.F. stage, for instance, is fully tuned, and the S.G. valve incorporates variable-mu control which, as many readers will appreciate, provides a progressive variation of volume and prevents any overloading of the valves on powerful transmissions.

for record reproduction as a change from radio. The output valve is a high-efficiency pentode capable of supplying an abundance of undistorted energy to the loudspeaker. The set is equally suited to all types of speakers and has a tapped choke output circuit to enable the required matching to be achieved.



An easy panel to drill and an easy set to handle.

## WHAT YOU NEED FOR THE D.C. "AIRSPRITE"

Component.	Make used by the designer.	Alternative makes of suitable specification recommended by the designer.
1 Panel, 16 in. x 7 in.	Goltone	Permcod, Becol, Peto-Scott
1 Baseboard, 16 in. x 12 in.		
1 Cabinet to suit above		
2 6005-mfd. variable condensers	Peto-Scott Utility W319	Camco, Osborn, Gilbert
1 .0003-mfd. diff. reaction condenser	Ready Radio "Airsprite" type	Ormond No. 6 slow motion, Polar No. 2 SM Ormond Slow-motion, Telsen, J.B.
1 .0003-mfd. (max.) Preset condenser	Goltone	Telsen, Ready Radio, Colvern
1 4-mfd. fixed condenser	T.C.C. type 80	
3 2-mfd. fixed condensers	Igranic	Dubilier, Telsen, T.C.C.
2 2-mfd. fixed condensers	Dubilier type B.B.	See above
1 2-mfd. fixed condenser	T.C.C. type 50	See above
3 1-mfd. fixed condensers	Igranic	See above
1 1-mfd. fixed condenser	Telsen W227	See above
1 1-mfd. fixed condenser	T.C.C. type 50	See above
1 .01-mfd. fixed condenser	Dubilier type 610.	See above
1 .0001-mfd. fixed condenser	Goltone	T.C.C., Lissen, Graham Farish
1 .01-mfd. fixed condenser	Dubilier type 670	Telsen, Lissen, T.C.C., Dubilier, Ready Radio
1 5,000-ohm wire-wound potentiometer	Lewcos Standard	Wearite, Telsen, Bulgin, Igranic, Colvern
1 1-meg. grid leak with wire ends or terminals	Goltone	Ready Radio, Igranic, Lissen, Graham Farish
1 1-meg. grid leak with wire ends or terminals	Graham Farish "Ohmite"	"Ohmite"
1 20,000-ohm fixed resistance with vertical holder	Graham Farish "Ohmite"	Dubilier 1-watt type
1 1,000-ohm fixed resistance with vertical holder	Graham Farish "Ohmite"	
1 7,500-ohm fixed resistance with terminals	Graham Farish "Ohmite"	
1 5,000-ohm fixed resistance with terminals	Graham Farish "Ohmite"	
1 1,000-ohm fixed resistance with terminals	Graham Farish "Ohmite"	
1 300-ohm fixed resistance with terminals	Graham Farish "Ohmite"	
1 10,000-ohm fixed resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier 1-watt type
1 50-ohm fixed resistance with terminals	Graham Farish "Ohmite"	
1 15,000-ohm fixed resistance with wire ends	Dubilier 1-watt type	Graham Farish "Ohmite"
2 Screened coils	Telsen No 216	
1 H.F. choke	Telsen W.75	Lewcos M.C., R.I., Bulgin, Lissen.
1 Mains double-pole on-off switch	Bulgin S.104	Bulgin, Tunewell
1 Radiogram switch	Ready Radio W.B.	Benjamin, Telsen, Lissen, Ready Radio
3 5-pin valve holders	Tunewell	
1 Pentode output choke	R.I.	
1 1-hy. .25 amp. L.T. smoothing choke		
1 H.T. smoothing choke	Ferranti R.10	R.I. "Varitone," Varley
1 Compensating L.F. Transformer	Telsen "Audiformer"	DP.35, Lewcos L.F.T6A
2 Single mains fuse holders	Bulgin F.12	Belling & Lee
1 Terminal strip, 8 1/2 in. x 1 1/4 in.	Goltone	
1 Terminal strip, 2 in. x 1 1/4 in.	Goltone	
1 Piece ebonite, 3 in. x 2 1/2 in.	Goltone	Peto-Scott, Becol
6 Indicating terminals	Belling & Lee	Bulgin, Ealex, Clix, Goltone
6 Yds. insulated sleeving, and 8 yds. 18-gauge tinned copper wire	Goltone	Wearite
2 1-amp. fuses		Belling & Lee
1 Switch bracket, 2 in. x 1/2 in.	Bulgin	
1 Coupling, 1 in. x 3/8 in.	Wearite	
1 Bush to suit 3/8 in. spindle	Wearite	
1 Spindle, 4 in. x 3/8 in.	Wearite	
2 Anode connectors	Belling & Lee	
1 Coil coupling switch assembly	Telsen W.217	
1 Heater resistance	Bulgin M.E5.	

We would mention at this stage that both the pick-up and loudspeaker terminals are completely isolated from the mains.

Then we come to the A.T.B., a method of tone compensation developed by Mr. G. V. Dowding and dealt with in detail in the February 4th issue of "P.W."

A.T.B. automatically compensates for the high-note losses caused by reaction. Reaction is a very valuable feature in any circuit but, normally, it has one big disadvantage. Although it reduces the circuit damping and improves both volume and selectivity, it does so at the expense of the higher musical frequencies.

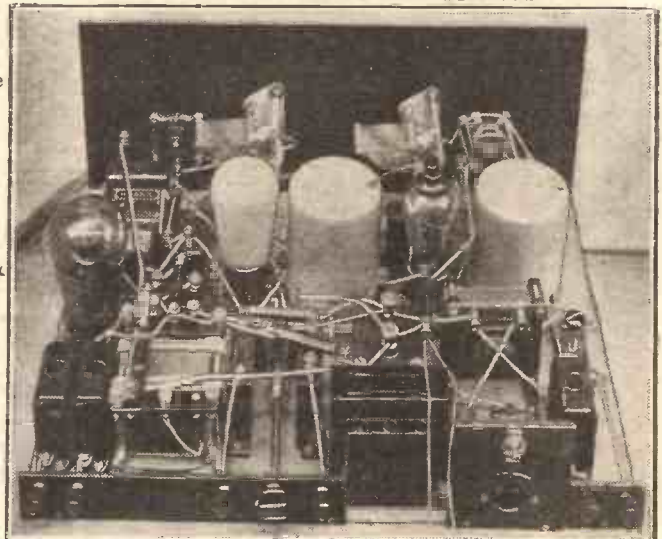
Most readers will, no doubt, have had practical experience of this effect. They will have noticed that the reproduction, in the case of the more distant transmissions (when reaction is applied) is somewhat "boomy" or muffled, and lacking in that crispness and clarity associated with the local programmes.

In the D.C. "Airsprite," when the differential condenser is in the "all out" position; as it would be for the reception of the nearer stations, the set functions in much the same way as any other quality design.

But directly the reaction knob is rotated so as to apply reaction to the circuit, the A.T.B. comes into operation so as to maintain substantially constant fidelity, irrespective of the amount of reaction employed.

The scheme has a big advantage over the usual reaction methods inasmuch that the entertainment value of distant programmes is greatly enhanced. There is, (Continued on next page.)

## COMPACT AND EFFICIENT



There is a radio to gramophone change-over switch in the grid circuit of the detector, so that a pick-up can be used

Enormous power is developed, and yet there is no crowding, and construction is quite straightforward.

## FIRST-CLASS ACCESSORIES

LOUDSPEAKERS.—R & A, Amplion, Celestion, Ferranti, B.T.-H., Blue Spot, Clarke's Atlas, G.E.C., H.M.V., Marconiphone.  
AERIAL AND EARTH EQUIPMENT.—Electron "Superial," Goltone "Akrite" and Graham Farish "Filt" earthing device.



# THE D.C. "AIRSPRITE"

(Continued from previous page.)

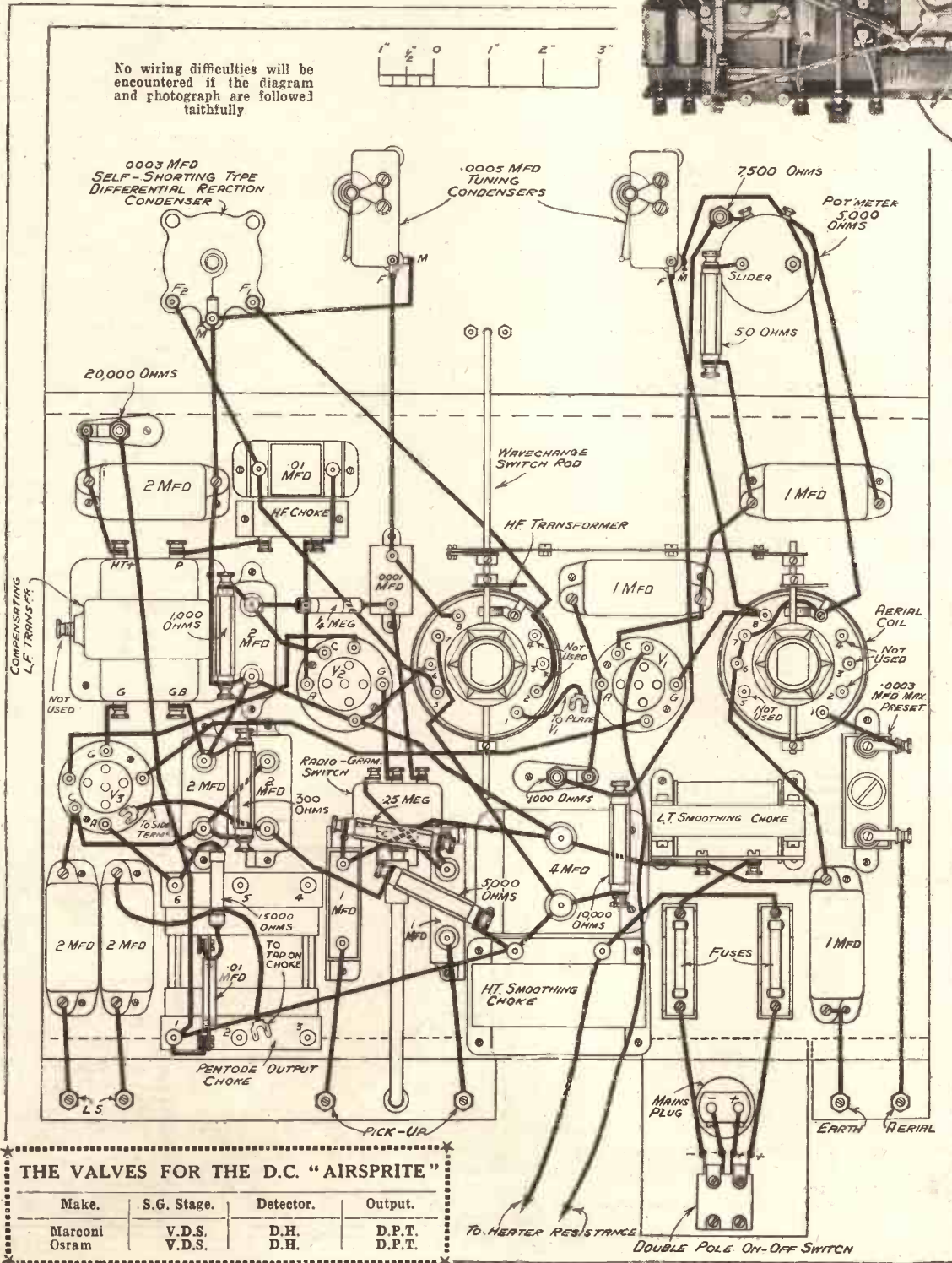
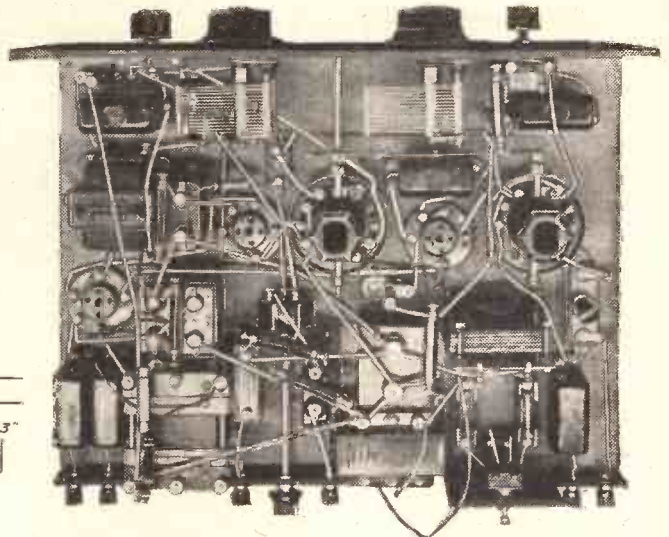
however, one important point in connection with A.T.B.—the reaction condenser must be provided with a shorting strip so that it is cut out of circuit when the moving vanes are in the "all out" position.

With regard to the constructional side, there are no special points that need watching. The layout and wiring are quite straightforward, and constructors will not

come up against any difficulties if they follow the wiring diagram carefully.

The "radiogram" switch has an extension rod which passes through the baseboard terminal strip to a control knob located between the two pick-up terminals.

It is essential that the switch should be mounted in this manner,



since any increase in the length of the detector grid leads is liable to cause loss of efficiency and possibly instability.

The heater resistance (a Bulgin M.R.5) is mounted on the side of the cabinet and connected to the set wiring by the two leads marked "To Heater Resistance" on the diagram.

This resistance is tapped to suit various mains voltages, and the appropriate tapping should be chosen according to the voltage of the supply.

As a safeguard in the event of accidental short-circuit a fuse is provided in each mains lead and these should on no account be omitted.

There is a .0003-mfd. preset condenser in series with the aerial lead which acts as a selectivity control. The knob on the preset is adjusted to suit individual conditions, and the best setting should be found by experiment on actual broadcasting. Adjustments inside the set should not, however, be carried out with the receiver switched "on."

There is nothing difficult about the operation of the set. The aerial, earth, and loudspeaker are joined to their respective terminals, the leads to the heater resistance having first

(Continued on page 320.)



THE other day a friend came to me in real distress. He had ordered a first-class mains set of which he had great expectations. When it was delivered, he eagerly stripped off the wrappings, connected it to a carefully erected indoor aerial, plugged into the mains and tuned in the Regional.

He heard the Regional programme well enough, but he heard something else even louder. This something else was a series of violent "plops" that completely spoiled reception.

"Plop, plop, plop, plop; plop." Then a few seconds' silence, and once again: "Plop, plop, plop, plop!"

#### The Culprit.

The next evening, finding that in no way could he get rid of the noises, he consulted me. Did I think that the trouble was caused by an electric sign, since there were several of these devices near by?

I replied that one of these was most certainly the culprit. He looked at me in despair.

"What can be done about it? Must I put up with having my radio reception ruined for good?"

I told him, as I have told several others in similar difficulties, to write to the B.B.C. about it.

People often exclaim: "It's no good writing to the B.B.C. about anything!" but this remark does not hold good where radio interference problems are concerned. Indeed, the Corporation pays special attention to the matter. In every instance, a carefully prepared questionnaire is sent first of all, and, if the listener fills this in carefully, it puts the B.B.C. in touch with the chief features of the complaint.

#### P.O. "Sleuths."

The matter is then put into the hands of the local P.O. engineering staff, who seek out the offending apparatus, approach the owners, and suggest remedies for the interference. About 10,000 cases are dealt with annually by the Post Office, and 3,000 of these are passed on from the B.B.C.

The chief providers of interference are electric motors and generators; battery chargers of the rotary type, such as are often used in cinemas; high-frequency medical apparatus; flashing and neon signs; lifts; and tramway and trolley-bus systems.

When the actual cause of the trouble is a mystery, an ordinary battery portable receiver is used by the P.O. sleuths for tracking down the offending apparatus. Usually the engineer follows the run of the street mains with this set. The interference increases in volume as the source is

Every listener who suffers from electrical interference should read this interesting and practical article.

By RONALD GRAY.

approached, and he doesn't have much difficulty in locating the culprit.

Interference is always best cured at the source, and "suppressors" have been evolved to suit the various types of plant. Almost invariably they are successful.

Don't let me give the impression, though, that nothing whatever can be done at the listener's own premises to minimise the disturbances. To some extent it can. And here let me mention an interesting fact that modern research has discovered about interference from electrical plant.

Most people imagine that the interference comes by direct radiation from the motor or whatever it may be. Actually, however, cases of direct radiation are fairly rare. Nearly always the trouble comes in the form of high-frequency disturbances brought to the listener's house via the mains, and radiated from the house wiring.

#### House Wiring to Blame.

In other words, the house wiring acts as a sort of transmitting aerial for the interference, and in really bad cases the amount of disturbance picked up on the receiver aerial, lead-in and coils may be nearly as great as the signals from the local station! This explains why indoor aerials are particularly apt to pick up "man-made static." They are right in the centre of the radiated disturbances from the house wiring. It always pays to use an outdoor aerial where interference is experienced.

One of the latest forms of cure, where there is plenty of space available, is to erect the aerial well away from the house, or from neighbouring houses, and to use a lead-in to the receiver of lead-covered wire, with the covering earthed.

With screened coils in the receiver, such a scheme is often remarkably successful. Although

it may result in a slight reduction of strength, this is well compensated for by the resulting freedom from unwanted noises.

Another dodge is to connect a 2-mfd. high-test voltage condenser from each mains lead to earth, as near as possible to the point where the mains enter the house. This is usually a job that should only be tackled by a qualified electrician.

Older remedies, such as the use of a counterpoise earth, or alterations in the situation or direction of the existing aerial, are often effective. The basic remedy for "man-made static" lies with the manufacturers of electrical plants. In the future, as the importance of the subject becomes more realised, apparatus will be designed in such a way that it is innately free from interference.

This is the only really satisfactory method, for the subsequent addition of "suppressors" is always inconvenient, and sometimes expensive. The day, no doubt, will come when even such domestic gadgets as vacuum cleaners and refrigerators will bear a label reading "Guaranteed Free from Interference to Radio."

May it come soon!

## CORRESPONDENCE CONTRASTS.

A Quiet Superhet and Noisy Coal.

#### A QUIET SUPERHET.

The Editor, POPULAR WIRELESS.

Dear Sir,—Whenever superhets are mentioned, so is noise. I had a seven-valve "Supersonic Igranlic." When the trimmers and ganging were adjusted it was so quiet that I had to touch one of the screws through the panel to make it crackle to be sure the set was still working, if the "Interval Signal" had not been put in. I was using a D.C. mains unit on D.C. (noisy) mains. It drove an N. K. and a Blue Spot in parallel.

Yours faithfully,  
Luton, Beds. R. H. TURNER.

#### COAL CAUSES CRACKLES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I wonder if anyone has observed the following before.

My set is an S.G. 3 all mains A.C. I was playing about with the fire with a poker about 2 ft. long, and when I touched a piece of "coal block" I heard a faint crackle in the set (which was working). I thought it a coincidence, so I rubbed the block with the poker, and I heard scratching through the speaker. Another day (two days later) a piece of coal broke with a crack, and there was quite a crackle in the speaker. Set and fire are about 3 ft. apart.

This is not a query but perhaps an interesting item.

Yours faithfully,  
Luton, Beds. H. TURNER.

## TREATING A TRAM



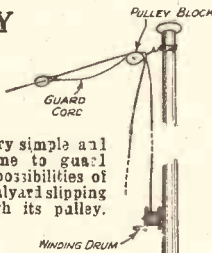
"Stopper Chokes" being fitted to one of the Kingston trolley cars, to prevent interference with listeners.



**AN AERIAL GUARD**

**C**OLLAPSE of an outdoor aerial can often be traced to rusting of the wire where it passes over the pulley. This failure, which necessitated taking down the pole, will only cause slight inconvenience if a guard cord has been fitted on as in the sketch.

**SAFETY FIRST**



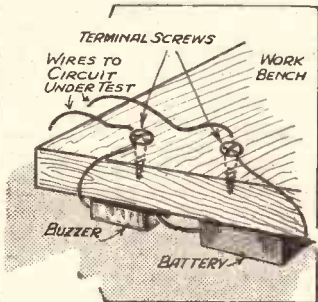
Here is a very simple and useful scheme to guard against the possibilities of your aerial halyard slipping right through its pulley.

The cord (or wire) should be a little over twice the length of the pole, the surplus being coiled on an old wire drum free to revolve. A new halyard can now be drawn through with the greatest ease.

**A QUICK CIRCUIT TEST**

**F**IX two terminal screws about two inches apart, into the end of the work-bench. Connect one of the screws with a buzzer underneath the bench, and the other screw to a battery which is also connected with the buzzer, as shown in the diagram.

**BUZZER TESTER**



A buzzer and an ordinary flash-lamp battery will provide a means of rapidly testing low resistance circuits.

When you wish to test a circuit, place one of the circuit wires on one screw, and the other wire on the other screw.

If the circuit is complete, the buzzer will be set in motion.

**USE YOUR BROKEN FOUNTAIN PEN**

**N**EVER throw away parts of broken fountain pens. The barrel with a B.A. rod slipped through makes a good lead-in tube.

Again, cut in short lengths can be used for mounting components raised from the baseboard.

Two barrels can easily be fitted for use as testing prods. In fact, a use for all broken parts of a fountain pen can be found by the wireless man.

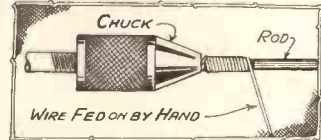
**MAKING SCREENED LEADS**

**U**NSCREENED leads are often the source of instability and uncontrollable reaction in H.F. stages. When screened wire is not available a very serviceable sheath can be made from a closely-coiled spiral of tinned copper wire such as is used for wiring up.

The wire can be wound on a rod held in the chuck of a hand drill. The rod used should be slightly smaller in diameter than the inside size of the finished screen, since the wire springs out when the tension is released.

The best size of rod to use can best be found by experiment. The sheathing is quite flexible and can be soldered easily.

**SCREENING SHEATH**



An easy and effective method.

**AN EMERGENCY ADAPTOR**

**A** USED electric-light bulb makes quite a good temporary adaptor. The "horse-shoe" type filament bulb serving best for this purpose.

Simply break the glass container

large enough to allow the glass prong to pass through. Make it rather tight fitting.

Then cut a groove each side of the cork to accommodate the main wires. Take a length of flex and pull back the sleeving 3 inches and cut off 2 inches of wire, leaving 1 inch to connect on to the main wires of the bulb.

Having placed cork on to the prong and each wire up the appropriate grooves, connect the flex leads to the same. Now pull the surplus sleeving down over the joints and press down into grooves on the side of cork, thus effectively insulating the main leads from each other, and after binding round the cork with insulating tape the job is complete.

**GUARDING INSULATION**

**T**HE following hint may be of interest to readers.

When wiring up screened coils with "Glazite," I have found that the insulation is very easily cut through by the edges of the slots in the "can."

Short pieces of "systoflex" slipped on the ends of the wire where they enter the can, will prevent this and the inevitable "short."

**SWITCHING THE DIAL LAMP**

**M**ANY modern sets have dial lights. If the set is battery driven it is usual to mount a switch on the panel to switch off the light when it is not

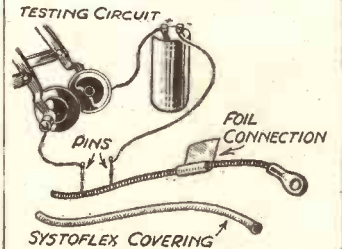
to the switch, however, connect L.T. + to the terminal.

When the on-off switch is pulled out, as shown in the sketch, the set is switched on, but the dial light is off. On pulling out the switch further the dial lamp is also lit.

To switch off the dial light push the switch in until switch knob is right in. Care should be taken to see that the brass strips are arranged correctly.

**REPAIRING RESISTANCES**

**S**PAGHETTI resistances, through ill-handling, sometimes develop a break in the winding. Provided the damage is small a repair can be effected in the following manner.



Use two pins connected to a cell and telephones for locating a break in the spaghetti.

First remove one end connector, then gently slide off the systoflex covering, locate the break by using a couple of pins as test prods in series with phones and dry cell.

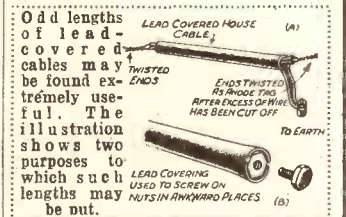
Clean the wire round the break by lightly dabbing it with fine emery paper. Then wrap a piece of tinfoil round this cleaned portion, tie with cotton and replace the systoflex and connector.

The resistance is naturally reduced a little and care must be taken that the current is well within the former rating of the resistor.

**LEAD-COVERED CABLE**

**I**F you are soon to have the electric light installed in your home, pay attention to the short ends of lead-covered cable which will be thrown away by the electrician.

One short end will prove useful as a screened anode lead, it being only necessary to cut it to the required length, allowing enough of the lead covering to reach a suitable earthing point. The sketch should make this idea clear.



A second piece if cut as in the sketch (B) is, to my knowledge, the best way of holding nuts or terminal heads that need to be screwed on in awkward places. The beauty of this holder is that it can be opened or closed to grip any sized nut, and can be actually turned as a screw-driver to screw-on the nut.

Being malleable, lead is easily shaped into a wander plug, using the spade tag idea to grip the wire that needs to be joined to it.

**WE PAY FOR YOUR RADIO IDEAS!**

Readers are invited to send a short description, with sketch, of any original and practical Radio idea. Each week £1 ls. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

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

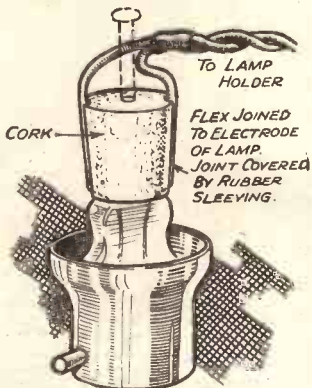
Will readers please note that the Editor cannot, under any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by A. W. Turner, North Cottages, Hatfield, Herts., to whom a guinea is being awarded.

and filament leaving the two main wires and glass prong. Trim off all jagged edges with pliers.

Next, obtain a medium-sized cork (such as is used in a medicine bottle) and pierce a hole through the middle

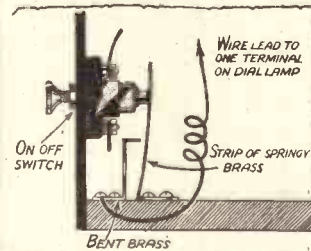
**USING OLD LAMPS**



A handy adaptor can be made from the base of a burnt-out electric lamp and a small cork.

wanted in order to save low-tension current.

**VERY SIMPLE**



Two strips of springy brass mounted behind the on-off switch, as shown, will automatically make or break the dial lamp circuit.

This switch often spoils the look of the panel and if the simple apparatus shown in the sketch is used, it may be done away with.

One terminal of the dial lamp must be connected to the wire lead from one of the brass strips, as shown. The other terminal goes to L.T. - or +; if + is connected to the on-off switch connect - to this terminal, if - is connected

THE MIRROR OF THE B.B.C.

By G.H.M.

## B.B.C. PROMOTION

Empire Day Programmes—Developing Variety—In Memory of Wish Wynne—  
Midland Features—An Exciting Relay.

THE B.B.C. has decided to promote by ability and not by seniority. Not that there has yet been much opportunity of promotion by any method because of the comparative youthfulness of the staff.

But there was an unfortunate impression that the small nucleus that came in with Sir John Reith in the very early days was destined to get all the plums. This misapprehension is dispelled by recent changes not yet officially notified.

Maurice Gorham takes over the "Radio Times." I invite more examples of this kind; let's get the work done as well as possible, and avoid stagnation as much as penalisation.

### No. 10 Studio Essential.

There has been a lot of ill-informed talk about the B.B.C. being able to get on without No. 10 Studio (at Big Tree Wharf), or something equivalent. The fact is that there simply must be such a place, and, as there is no certainty of tenure at the other end of Waterloo Bridge, the B.B.C. is strenuously searching for an alternative. Up and be doing, all ye bright estate agents.

### Empire Day Programmes.

In addition to the speeches by the Archbishop of Canterbury and Mr. J. H. Thomas from the luncheon at the Junior Carlton Club, the Empire Day programmes on Wednesday, May 24th, will include a short message by Lord Jellicoe for National listeners during the morning and a special Empire Day broadcast as part of the evening transmissions.

### The Development of Variety.

The B.B.C. are at last giving recognition to the talent of John Sharman, the vaudeville organiser who has been responsible for literally hundreds of variety hours. Until recently the official view was that his work was more administrative than creative and his name was never heard by listeners.

To-day it is being realised that variety programmes are created—not just administered—and that but for John Sharman the B.B.C. would never have developed vaudeville to anything more than "one or two turns before the microphone."

No doubt the talent in Mr. Maschwitz, the new variety director, will be quick to find a similar virtue in Mr. Sharman, so we shall soon be hearing a great deal more of him than hitherto.

### The Late Wish Wynne.

It seems unfortunate when broadcasting has done so much to swell the funds of charitable organisations that listeners have not responded to the B.B.C.'s own appeal, made through its official paper just over a year ago, to raise £1,000 to perpetuate the memory of Wish Wynne, surely one of the most popular artistes who ever appeared before the microphone.

Poor Wish Wynne died on Armistice Day, 1931, and nothing could have been more appropriate than that her charming

personality and her wonderful talents for character studies should be remembered by giving her name to a bed at St. Bartholomew's Hospital, London. The £1,000 required to do this has not materialised by a long way, so that it has now been decided to build a children's open-air enclosure, to be named after her, which will be run in connection with the existing Children's Ward of the Hospital.

### "P.W.'s" POWER



The "P.W." Research Department is magnificently equipped for modern radio needs, its power supply including a 5-kw. converter, and new high-voltage D.C. apparatus, part of which is shown above. All frequencies and voltages of A.C. are also obtainable for testing purposes if required.



Weekly jottings of interest to buyers.

THE precious secret is out! As a result of the supreme effort by "P.W.'s" Technical Department, you are able this week to read the very first news of the new "Catkin" valves.

It is a little too early yet to anticipate what is likely to happen as a result of this amazing development, but at least I can assure you that you need have no fears of your present valves becoming obsolete.

While it is true that four of the most popular of the Marconi and Osram A.C.

There is still time for those who can afford, even in these hard times, to send their contributions to the Hospital Treasurer, because the Governors have generously decided to give about £60 from Hospital funds to make up the difference between the amount so far collected and what it will cost to build the Wish Wynne Memorial Enclosure.

### New Midland Talks.

A new feature in Midland Regional talks begins at the end of May when, at monthly intervals, a series of reviews will be broadcast of achievements and progress in Engineering in the Midlands. A number of discussions are also being arranged, the first of which will be given on Tuesday, May 16th, when Major Vernon Brook, who is a consulting automobile engineer, and Mr. A. W. Kimberley, a Birmingham business man, will debate the proposition "Are motor-cars more nuisance than they are worth?"

### For Scottish Listeners.

The difference between life and things as they are supposed to be and as they really are will be the basis of a light entertainment which the Silver Citizens are presenting in the Aberdeen studio for Scottish Regional listeners in the near future.

Ethel Lewis and Rae Elrich have each written sketches for this show, which should perhaps be accurately described as a revue, and is appropriately entitled "Fiction and Fact"; while the music, all entirely original, is being written by Ruby Duncan, Jimmy Ross and Bill Thomson.

### An Exciting Relay.

Many famous racing motorists will compete in the Shelsley Walsh Open Hill Climb, upon which a running commentary will be broadcast for Midland Regional listeners by Major Vernon Brook and Mr. F. J. Findon on Saturday, May 27th. The event is one of the most popular in Great Britain and attracts about twenty thousand spectators along the thousand yards' course with its two difficult "S" bends. The record for the course is 42.4 seconds.

valves are to be changed over forthwith to the "Catkin" method of construction, I am given to understand that it will be many months before all the valves in these two famous ranges are available as "Catkins."

Even then, existing types of valves will still be available, I imagine, in the other well-known ranges, and one must be fair and point out that with "Catkins" it would appear to be more a question of mechanical than electrical improvement.

### Send a Card.

All the same, it's a safe prediction that the advent of "Catkins" will create quite a stir in the radio world. And in keeping with the lead established by our Technical Department, I propose to open a "Catkin" radio literature waiting list, so that "P.W." readers can have all the valve-makers' details the moment they are available.

Just send me a postcard marked "Catkin literature" with, of course, your name and address, and you shall have details with as little delay as possible.

(Continued on page 316.)

# ECKERSLEY EXPLAINS-



"I wonder if there is any advantage in using push-pull?" our famous contributor asks—and then proceeds to analyse the subject in his own inimitable style.

He also gives some very interesting comparisons between H.T. battery supply and that from a mains unit, and draws some important conclusions regarding the quality obtainable under varying loads.

I WONDER if there is any advantage in using push-pull? Startling statement! But let's have a look at it.

I put it this way. With a single valve just doing ordinary amplification you can get, unquestionably, practically distortionless amplification. But you get less and less distortion—or so says theory—if you work with more and more factors of safety. So that when you come to power output stages where you want every ounce of efficiency you are in danger of running too near the distortion limits.

### Real Value of Push-Pull.

If you use push-pull, however, any distortions due to slightly non-linear amplification cancel out. But do they? Well, let's say that that is the tendency, anyway, and that you can "blast" on a push-pull circuit without doing much harm. You cannot blast to the same degree on the single-valve output circuit.

So that really the supposed advantage of push-pull is that you get more out for a given amount in than when you use two valves in parallel. How much more? Not, in my opinion, so very much more if in each case "Class A" amplification is used.

For ordinary receiver work one big valve run with a good factor of safety might be just as good as two valves using "Class A" magnification. Two valves involve two filaments, one valve only one. No, really? Yes, really. The real value of push-pull, in my opinion, comes when "Class B" amplification is used, because then you can economise in high-tension power and still keep freedom from distortion.

Isn't it amusing that the real push-pull patent—which is really the patent for "Class B" amplification—is now being found truly useful, while the extension of the old patent to "Class A" amplification (a perfectly justifiable extension) is not so useful as was at first imagined.

### Mains and Q.P.P.

My advice to everyone and anyone is if they are going to use push-pull to go "B classing," or as some of you would say, "Q.P.P.-ing."

But F. Y., of Crouch End, says he has an old-time A.C. eliminator giving 12 ma. at 120 volts. He wants to use Q.P.P., but has been told that the "regulation" of his eliminator will be too bad to allow him to.

But says F. Y., my eliminator is feeble like a battery, and so I want to use it like a battery—I can use "Class A" push-pull with my eliminator, so I am told, why can I not use quiescent push-pull?

Well, of course, when you use quiescent push-pull your battery only supplies

### LONG-WAVE REACTION

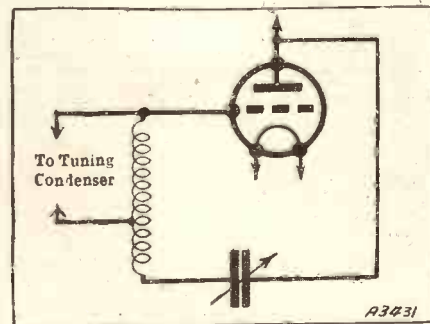
R. Y. P. (Doncaster).—"The reaction control of my four-valve set acts very strangely on long waves, although normal on medium waves.

"Increasing reaction on long waves does not increase signal strength, and if the knob is turned far enough the set oscillates, all signals then becoming inaudible.

"I have made sure the reaction coil is correctly connected, and am at a loss to find the cause or cure of the trouble."

Not knowing your circuit, I cannot give you the detailed cure, but I think your difficulty is explained by saying that the "phase" of the fed-back impulses from the valves is different from the phase of the incoming signal.

Study the use of different methods to obtain reaction—I like the one I have drawn.



For smooth long-wave reaction our Chief Radio Consultant likes the straightforward arrangement shown above.

power when the programme is on—when the transmitter is modulating (as it seems to me about 50 per cent of the time!!!). But obviously a battery wears out. It has a capacity of so many milliamperes hours, say, 3,000, meaning it will have 100 hours life discharging at 30 ma.

Now if that battery has only to supply current when the programme is actually on, and not when the B.B.C. stops transmitting, and moreover if that battery only supplies current in proportion to the strength of the transmitter modulations (so that it is only supplying about 2 or 3 ma. for Delius—Hamilton Harty conducting—but, say, 30 ma. for Wagner), then obviously it may last twice or three times as long as when it supplies—as with "Class A" amplification—30 ma. regardless of modulation, depth and continuity thereof.

### Doesn't Run Down.

But an eliminator has a capacity of infinity ampere hours provided you renew the bits. Anyway, an eliminator doesn't gradually run down. The mains are always there—very reliable these mains. But if you ask an eliminator for 120 volts and 30 ma., and it is only designed for 120 volts and 12 ma., you will find it will give, say, 60 volts 24 ma., 30 volts and 48 ma., 120 volts 12 ma., and perhaps 240 volts 6 ma.

This is not really quantitatively true; all I mean to indicate is that, due to bad regulation, the more current you attempt to pull out of an eliminator the less volts will come out of it. With a steady load, however, you can get a steady so many volts and so many ma. But with Q.P.P. the load varies, now big, now small, now medium, just as modulation dictates. So the volts rise up for no modulation and collapse on the loud passages.

### Saving Ampere Hours.

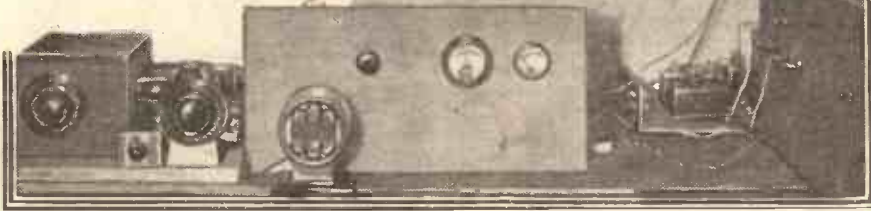
This gives a poor sort of result as regards the valves. A battery, up to certain limits, keeps the same voltage for a current of 0, 1, 2, 3, up to, say, 30 ma. if it's a good battery. But it takes a powerful eliminator to approximate to the same performance; in effect, no eliminator will do so, but regulation can be made good enough for all practical purposes.

Q.P.P. is then essentially a device to save ampere hours, not an arrangement which allows for economy in maximum—if only momentary—available power

In other words, Q.P.P. is a device for preventing something which can run down from doing so any earlier than it need.

Batteries which exhaust themselves quickly with steady current outputs, keep up their strength very much longer with the varying load imposed by Q.P.P.

# Short-Wave Notes *By W.L.S.*



THE past week has been, for me, one of those that would indeed be devoid of cheer were it not for the daily arrival of the postman. The organised domestic riots that are dignified by the misleading name of "spring cleaning" usually succeed in turning even the sacred radio-den into a lumber room, and in consequence of this I shall have to rely on other people's findings for this week.

It is not often that I can say that a whole week has passed without seeing me with the 'phones on; but, just for once, all my listening has been done via moving-coil loud-speaker on 261 and 356 metres! To all those who are similarly immersed in spring cleaning, may I tender my heartfelt sympathies?

## You Never Know!

Two or three correspondents enquire about a Spanish broadcasting station on about 35 metres. Can this possibly be Guatemala City on 33.5? No, I quite realise that Guatemala City is not in Spain, but mistakes like this *have* been made before.

The next question brought up by readers is that of "chassis" sets.

"Do you honestly think," asks one, "that the extra trouble in making the set is repaid by better results?" As a matter of fact, I certainly do. For one thing, the extra trouble is not very considerable. When you have finished with the small amount of manual labour entailed in drilling a few dozen holes in the aluminium chassis, the "extra trouble" is behind you.

The wiring, if anything, is easier than that of a panel-and-baseboard set, since the business of shaping the right-angle bends carefully, to make the thing look nice, does not arise.

When you have finished the set, I am positive that there is a greater chance that it will work perfectly straight away, simply because you are allowed less latitude in the matter of copying the designer's layout.

Furthermore, you will have that very desirable metal panel and baseboard, which you *might* have left out from the ordinary type of set, in the innocent belief that it "didn't matter."

## A Permanent Institution.

Most important of all, you will have a really *permanent* set. Everything will be rigid, and it will look so much like a commercial job that you will not be tempted to play about with it and alter things.

Yes, I like chassis sets very much. I have told the Editor so in no uncertain terms, and he is allowing me to make a small two-valver in chassis form. After that, perhaps, my pet "one" will also be transformed.

This Short-Wave Club business seems to be spreading, and I feel a great responsibility, since I really started one or two people

off on the idea in the first place. Goodness knows what I may have started! However, a nice letter and photograph have reached me from the Hon. Sec. of the Coventry Short-Wave Club, from which it would appear that the said Club is very much alive.

I commend the Coventry Short-Wave Club's idea to all others in search of something new. On their recent Field Day they ran a Radio Treasure-Hunt. The members went out in groups, complete with short-wave portable receivers, and clues were

Among the many items of interest dealt with in this week's Notes are the identity of a mystery 33.5-metre station, and the advisability of using chassis construction for short-wave sets. The technical topics include a reader's suggestion for curing ploppy reception and some notes on new developments, such as Ferrocart Coils and H.F. Pentodes as applied to short-wave work.

transmitted at given times by two local transmitters on 40 metres.

As a result of the above, some ultra-portable (or should it be "infraportable"?) sets will be unearthed for the next Field Day. This Club, by the way, meets weekly, and has a short-wave receiver and an artificial-aerial transmitter installed at Headquarters. Have any of the others got as far as that yet?

"J. B. M." (Glasgow) reports a few changes in conditions. He finds W 8 X K quite good once more on his 25-metre wave (first time for weeks), and W 2 X A F and W 1 X A Z on 31 metres much better than

of late. Yes, "J. B. M."—W 3 M N on 20 metres would certainly be an American amateur. It is safe to assume that any "W" call-signs incorporating a figure and not beginning with "X" are amateurs.

Among the American hams that have been coming over well on 'phone during the past month or so I have logged W 9 B H T, W 1 D M O, W 1 A F J, V E 3 H E (Toronto, Canada), and W 8 D L D.

## Day and Night.

"W. G." (Southampton) has been logging plenty of amateur 'phone, and I see that he mentions most of the above, and also two Egyptians—S U 1 E C and S U 6 H L. This same "W. G." seems to find even more of interest off the short-wave broadcast bands than on them.

"C. H. M." (Marazion), sends me a diagram of his receiver, and asks that I should pass on his arrangement to any reader troubled with "ploppy" reaction. His scheme is simply to use two reaction condensers in parallel. One of them is presumably smaller than the other (although he doesn't say so).

As a matter of fact, I don't think the ease of control of the reaction condenser would help matters much in a really bad case of "plop." No matter how slowly you can approach the point of oscillation, when you get within a hair's-breadth of it, over she goes with that noise like an earthquake that we have all met.

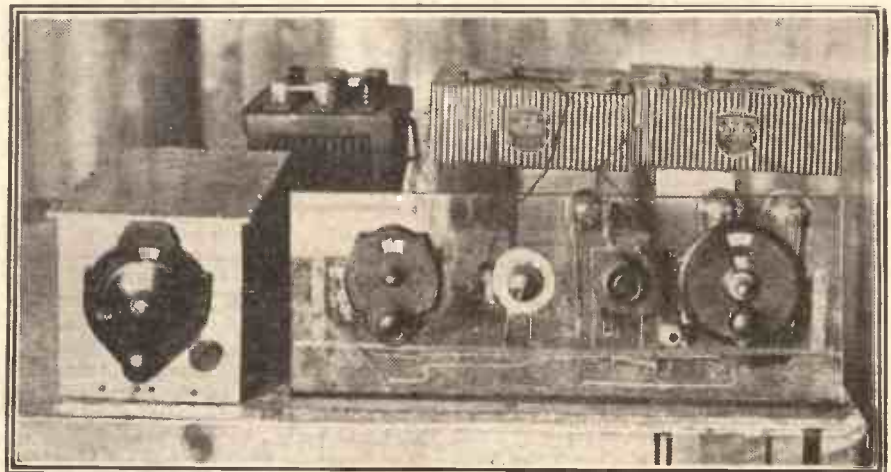
But the scheme of using a small reaction condenser in parallel with the standard one should be quite useful to the man who has already got a good set and really wants to get the most out of it.

## H.F. Pentodes on S.W.

"A. T." (Liverpool) wants me to get busy with the new high-frequency pentodes for short-wave work, possibly in conjunction with short-wave Ferrocart coils. Yes, "A. T."—I *am* alive to all the latest developments, but these things want a lot of quiet experimental work before anything is said about them. Candidly, I have not had much luck with the H.F. pentode as yet, but I'm still playing with it.

In re Micromesh valves, I have been using the H.L.A.1 as a detector, and find it altogether excellent in every way. It seems to be the valve par excellence for use in a single-valve set, where one can afford 4 volts 1 amp. for L.T. supply.

## AUSTRALIAN AMATEUR'S GLASS-PANEL RECEIVER



Some historic short-wave broadcasts have been picked up on this set and relayed to Australian listeners. It belongs to 3 U Z Melbourne, and the circuit is S.G. and Detector, to which a two-L.F. amplifier is added.



# The COMPACT CONSOLELETTE

AN ALL-ELECTRIC DESIGN  
FOR A.C. MAINS  
featuring  
RADIOGRAM SWITCHING  
"BREAK-THROUGH" ELIMINATION  
FULL-WAVE RECTIFIER  
and  
MOVING-COIL LOUDSPEAKER

Designed and described by  
The "P.W." Research Dept.

If you have A.C. mains you are very lucky because A.C. supplies provide the most adaptable and least expensive of all sources of power for radio sets.

This Compact Consolelette we are about to describe costs only two or three shillings per year to run as compared with the two or three pounds, or thereabouts, that are needed to keep a battery set in only H.T., let alone L.T.

And for inexpensiveness and ease of construction and compactness the Compact Consolelette is undoubtedly the most effective set of kind that has ever been presented to the home constructor.

### Perfect Safety.

There may be some who fear to tackle the assembly of a mains set lest they get shocks, blow main fuses, and so on.

There need be no cause for alarm. Providing the wiring is carried out in exact accordance with our wiring diagram and the golden rule of never opening the set without first switching off is observed, the likelihood of trouble is negligible.

So far as main fuses are concerned, these will be adequately protected by the small fuses in the set itself, for these will burn out at a current that could in no way damage the main fuses or any other part of the house wiring system.

The Compact Consolelette is a "detector and one-L.F." set, i.e. there are three valves including the rectifier.

### Interesting Circuit.

But as they are A.C. valves they are able to achieve results almost equal to those usually reckoned quite good for a battery set using two stages of L.F.

The circuit is interesting. There is a choke in the aerial which can be switched in to eliminate very serious break-through of a medium-wave station on the long waves. You could omit this choke and its switch if you are well out of the swamp areas—i.e. are not close to one of the big B.B.C. transmitters.

A straightforward dual-range coil figures in a "leaky-grid" detector circuit in which

the differential reaction method ensures smooth and efficient regeneration.

There is automatic grid bias, and pick-up terminals are provided. The L.F. stage is transformer-coupled and adequate decoupling is inserted.

Full-wave rectification is employed and a

But it must be noted that not any mains-actuated speaker will prove suitable. The particular type needed (and detailed in the accompanying list) is one specially designed so that its field winding can carry out the double duty successfully.

(A shield is inserted so that the moving-coil is screened from the field winding.)

### Simple Cabinet Construction.

All the components in the set are of a standard and easy-to-obtain nature. Of course, you must make sure that you obtain the correct mains transformer, and we also strongly urge you not to try and "make do" with any other deviation from the list of our recommendations.

The cabinet is a very simple affair, and no great carpentry skill will be needed to make it. The front is 3-ply and the top, bottom and sides, 7-ply. The back is left open so as to prevent resonance occurring, though it can be covered with silk or other thin fabric to keep the dust out.

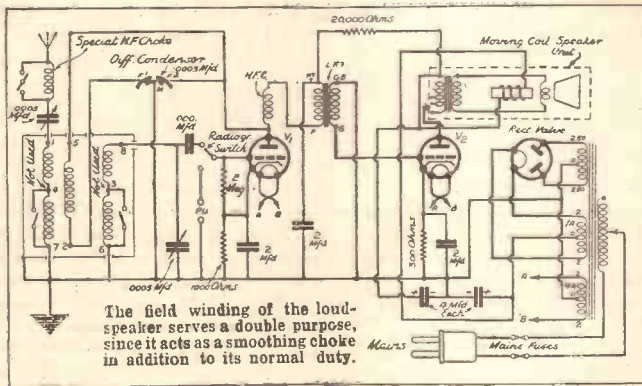
You will be able to glean the cabinet dimensions from the accompanying diagram. The 3-ply front acts as both the main operating control panel and the loudspeaker fret.

### Cutting the Fret.

You do not have to adhere strictly to the design of fret as shown in the original model. You can vary the pattern if you like, though you should aim at retaining roughly the same total area of aperture.

Obviously the best method of cutting out the fret is to employ a fret-saw. The

(Continued on next page.)



### COMPRESSED EFFICIENCY

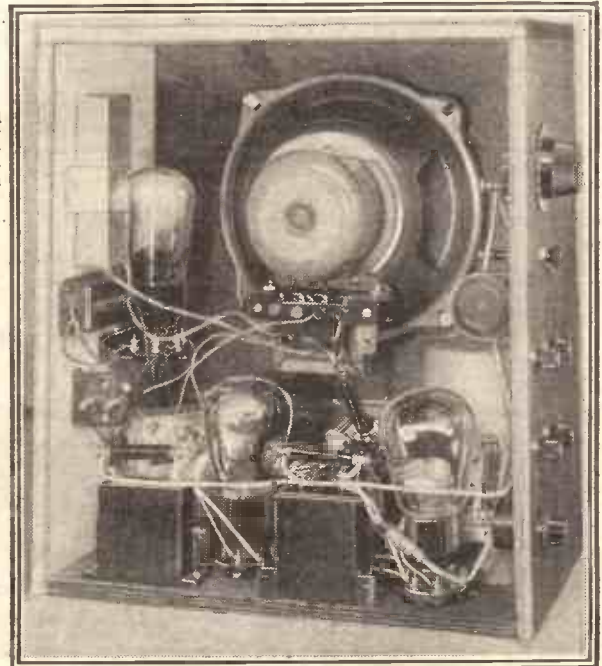
Although the set is self-contained in its small cabinet, the carefully arranged layout enables full advantage to be taken of the high-magnification given by modern valves.

sound economy note is struck by the use of the field winding of the moving-coil speaker for smoothing.

This constitutes a direct saving for it eliminates the necessity of using any smoothing chokes, and these are not exactly inexpensive items.

### Efficient Speaker.

The loudspeaker itself, which is built into the home-made cabinet, is one of the least costly types. Yet simply because it is mains actuated it achieves an excellent efficiency.



## THE COMPACT CONSOLETTA

(Continued from previous page.)

loud-speaker unit should be screwed on to a "baffle" of  $\frac{3}{4}$  in. or  $\frac{1}{2}$ -in. wood cut so that it just fits into the cabinet leaving a  $3\frac{1}{4}$  in. space at the bottom to enable it to clear the variable condenser. A circular hole the size of the diaphragm of the speaker should be cut in the baffle and this hole covered with thin silk.

### Curing "Break-Through."

Some of the components are mounted on the sides of the cabinet as you will see. Keep their relative positions as close as possible to our original model. The coil is raised  $\frac{7}{8}$ -in. by means of a block of wood.

As we have already indicated, you need not include the aerial choke and switch in the first instance. The set can be assembled and wired up without them, the aerial going straight to the .0005 condenser.

Then if, when you test the set, you are troubled by break-through you can add them. It is a simple task to do so and does not interfere with the remainder of the construction.

As the electrolytic condenser "pack" is not provided with "feet," it will have to be held in position with a bracket. But it can stand on the fuseholder, so the bracket need only be a simple affair such as a strip of copper foil or thin leather fixed in place by a couple of drawing pins.

### The Wire to Use.

Be careful that you wire up the electrolytic condenser correctly. Its black lead must go to earth. (It is joined to the most convenient point for this—i.e. to one of the 2-mfd. condenser terminals.)

Make loops in the ends of all the leads so that should any terminal

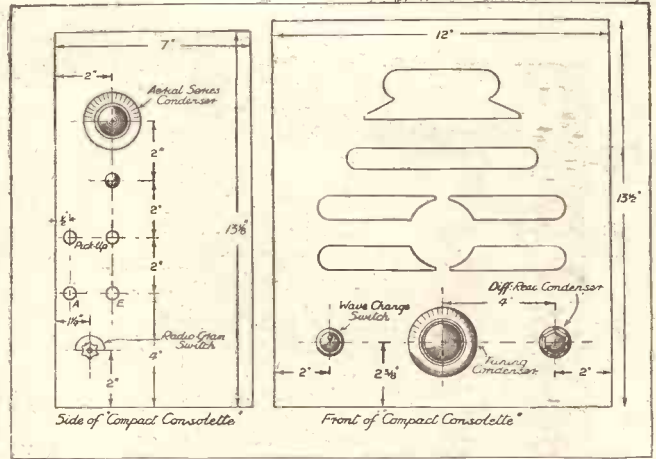
come loose the wire on it does not slip off.

And don't employ thin cotton-covered wire for wiring-up.

Use a stiff wire of, say, 18 gauge, and an insulating covering such as Systoflex or a ready-to-use conductor like Glazite for all the leads except those shown as flexes.

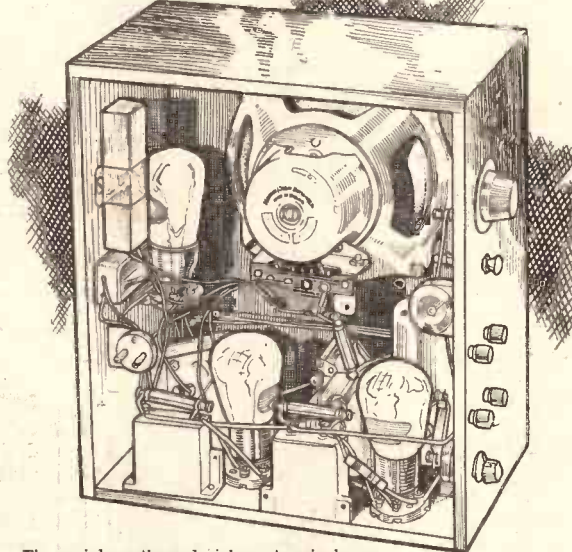
These, the loudspeaker and valve-heater leads, should consist of rubber-covered flexible. The valve-heater ones can be twisted together in pairs to reduce the possibility of incipient hum.

When the wiring is complete give it a very



All the necessary drilling dimensions are given in these two drawings of the front and side of the cabinet. The switch immediately below the aerial series condenser knob enables an H.F. choke to be inserted in series with the aerial to prevent "break through."

## REALLY COMPACT



The aerial, earth, and pick-up terminals are mounted on the side of the cabinet, and the mains plug can be seen on the left close to the rectifier valve.

thorough check and pay particular attention to these points.

(1) The mains plug to which the mains will be joined is connected to no component or point other than the fuses.

(2) The fuses join only to the mains plug and the primary of the mains transformer. Before going any further in your checking, see that you have adjusted the rotating disc on the mains transformer to show the voltage of your supply.

### No Preliminary Adjustments.

If this is your first mains set you will have to get used to the rather uncanny "hotting up" which follows every "switch on." You switch on but nothing happens for about 30 seconds while the heaters of the valves are warming up. Then the set gradually becomes alive.

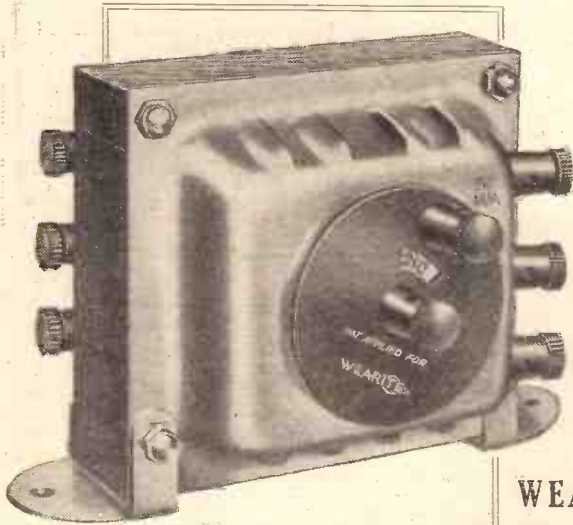
As there are no H.T. or G.B. adjustments, the Compact Consolette is at once ready for action the moment the aerial and earth

(Continued on page 308.)

## THE COMPONENTS YOU WILL NEED TO BUILD THE CONSOLETTA

Component	Make used by designer	Alternative makes of suitable specification recommended by designer.	Component	Make used by designer	Alternative makes of suitable specification recommended by designer
1 Screened coil	Telsen 216	—	1 L.F. transformer	Lissen "Hyper-nik"	Telsen, R.I. "Hypermite," Varley "Nicket," Igranic "Midget"
1 .0005-mfd. variable condenser	Ormond No. 5 S.M.	—	1 Mains transformer	Wearite disc type T.21A.	—
3 2-mfd. fixed condensers	Dubilier B.B., Telsen W.226, and T.C.C. type 50	Igranic	1 Double fuseholder	Belling Lee No. 1033	—
1 4-0-4-mfd. ditto	Hellesen dry electrolytic	—	4 Indicating terminals	Belling Lee type R.	Bulgin, Goltone, Igranic
1 .0001-mfd. ditto	Dubilier 670	T.C.C., Telsen, Ferranti	1 .0003-mfd. differential reaction condenser	Graham Farish	Telsen, Igranic
1 20,000-ohm resistance with terminals	Graham Farish "Ohmite"	—	1 .0005-mfd. solid dielectric condenser	Lissen L.N.5103	Polar, Graham Farish, Telsen
1 1,000-ohm ditto, or with wire ends	Graham Farish "Ohmite"	Dubilier 1 watt	4 yds. insulating sleeving	Goltone	Wearite
1 300-ohm ditto	Graham Farish "Ohmite"	Dubilier 1 watt	5 yds. 18-gauge tinned copper wire	Goltone	Wearite
1 2-meg. grid leak with wire ends or terminals	Goltone	Graham Farish "Ohmite," Dubilier 1 watt, Igranic, Tunewell	Flex, screws, etc.	—	—
1 H.F. choke	Telsen W.75	Lewcos M.C., Graham Farish "Snap."	1 Mains connector plug and socket	Goltone M.C./9 and L.S./31	—
1 "Anti-break-through" choke (see text)	Lissen L.N.5145	—	1 Adaptor for mains	Goltone R.80/90	—
1 On-off push-pull switch	Bulgin S.38	Lissen, Telsen	1 piece foil, 5 in. x 1 1/2 in., for fixing electrolytic condenser	—	—
1 Radio-gram rotary ditto	Bulgin S.86	Telsen, Lissen, Benjamin	1 Loudspeaker	Magnavox No. 144, 2,500 ohms	—
2 Vertical-mounting 5-pin valveholders	W.B.	Lissen, Telsen	1 Block of wood, 3 in. x 2 1/2 in. x 1/2 in. for coil mount	—	—
1 horizontal-mounting do.	W.B.	Lissen, Telsen	1 Cabinet (see text)	—	—





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**COMPACT CONSOLETTA**  
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Mains Transformer

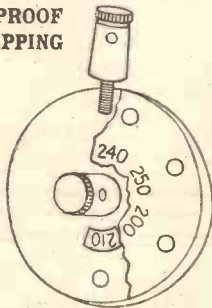
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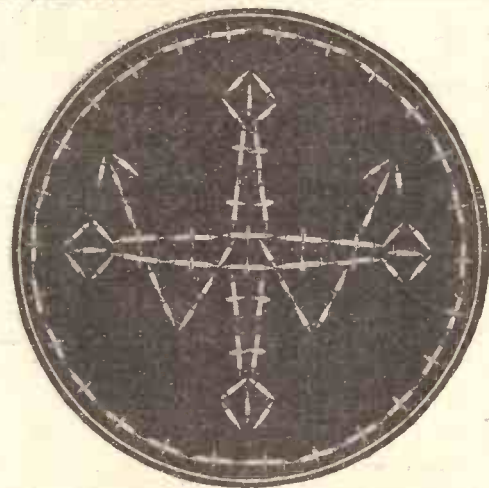


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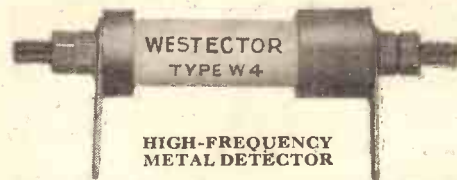
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# THE "COMPACT" CONSOLETTA

(Continued from page 306.)

and mains are joined to it. The small .0003-mfd. variable is a selectivity adjustment and can be left set, once its most suitable adjustment has been found.

Its setting depends upon local conditions and the selectivity requirements of the individual constructor.

### Cabinet Dimensions.

When it is rotated as far as possible in an anti-clockwise direction the condition of maximum selectivity is reached. Right round in the opposite direction gives you a minimum of selectivity.

Of course, there is bound to be some loss of power as the selectivity is increased; that is always inevitable. And so you should aim at as little an increase as possible.

But the set starts off with a most excellent inherent selectivity, and it also possesses a generous reserve of power, so that it will not be difficult for all to obtain satisfactory results.

Some may decide to vary the selectivity control as between long- and medium-wave stations, or even between different sections

of the one waveband. That is certainly the way to get the maximum performance from a set, though we do not advise those whose experience of radio is slight to attempt such *finesse* of operation.

Later on, when they have got to know the set, they can add still more alternative programmes to their "log" by exploiting methods of "hotting up" of that kind. Now, as the wiring diagram appears on this page, we are going to retrace our steps a little and amplify our remarks about the cabinet.

You can obtain the measurements of the front and sides of the cabinet for the drilling diagram on a previous page. The remaining side has the same overall dimensions. The bottom, which also acts as the baseboard, measures 11 1/4 inches by 6 5/8 inches.

The top, as you will note by the wiring diagram, overlaps the sides and measures 12 inches by 7 1/8 inches.

That you may have already gleaned, and in this event will regard our figures as confirmation.

### Aerial Requirements.

Well, we think we have now covered every aspect of the construction and installation of the "Compact" Consolette, with the exception of mentioning that it needs a

## WE RECOMMEND

**VALVES.**—Detector: Mullard 354V, Mazda A.C./H.L. Cossor 41M.H.L. Marconi and Osram M.H.L.4. Micromesh H.L.A.1.  
Output: Cossor 41M.X.P. or Micromesh P.A.1.  
Rectifier: Mullard D.W.2, Micromesh R.1, Cossor 506B.U., Mazda U.U.60/250, Marconi or Osram U.10.

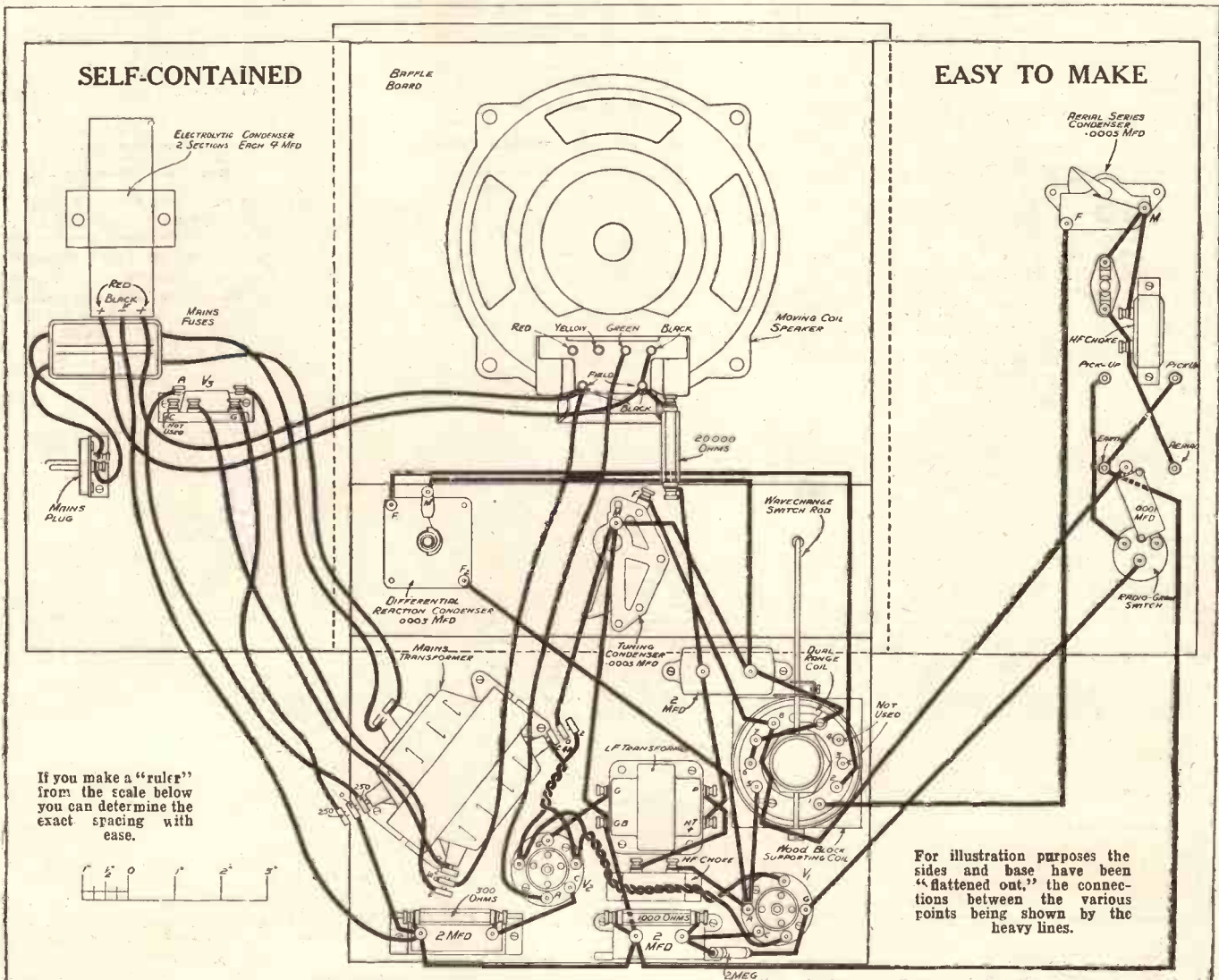
**AERIAL AND EARTH EQUIPMENT.**—Goltone "Akrite," Electron "Superial," Graham Farish "Filt" earthing device.

fair outdoor or good indoor aerial if it is to give the first-class performance of which it is capable.

We nearly said, "After all it is only a two-valve," but having carefully tested it under adverse as well as good conditions, we hesitate to do so, for it is one of the most virile little programme collectors that we have ever had under observation.

### High-Quality Reproduction.

It is, indeed, a revelation of compacted efficiency. Its output is much greater than those whose previous experience of radio has been confined to battery sets would anticipate, and the reproduction is of a particularly high standard. And simply because of the absence of batteries it maintains both of these qualities with an almost uncanny consistency.



# RADIO SIMPLIFIED

# A PRACTICAL OUTLINE FOR BEGINNERS

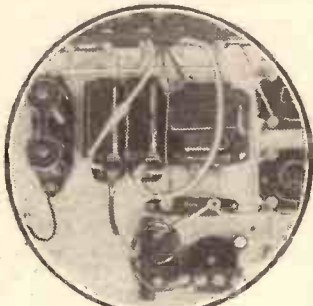
ONE of the reasons why electrical work is interesting is that all the electrical units are scientifically and not casually derived. The volt, the ampere and the ohm are inter-related in a way that the yard, the mile, the pound and the ounce are not.

Thus, if a pressure of one volt is exerted across a resistance of one ohm, the current flowing will be exactly one ampere.

### Inter-related Units.

These and other fundamental electrical units all "fit in" with one another in a way that older measurements do not. This is possible because electrical science is a new one, and its units were scientifically created instead of being handed down the generations like the mile and the yard have been handed down by our forefathers.

### RESISTANCES IN SERIES



The value of two resistances joined in series is the sum of the individual values. For instance, a 50,000-ohms spaghetti in series with a 30,000-ohms will be equivalent to 80,000 ohms.

A good example of the interrelation between units is that from which we can calculate the power that is being employed. The unit of power is the watt, and the symbol for power is P.

The formula for power is:  
 $P \text{ (Watts)} = E \text{ (volts)} \times I \text{ (amps.)}$   
 So if a pressure of 1 volt is causing a flow of 1 amp. (which incidentally infers a resistance of 1 ohm) the power being expended is exactly 1 watt—all the units being hand-in-glove, as it were.

### Dealing with Watts.

Like the other units, watts can be dealt with easily, for large or for small quantities, by transforming them by means of the prefixes already discussed in this series.

If we are dealing with thousands of watts, as for instance

when discussing the power of a broadcasting station, we use the prefix kilo- to mean  $\times 1000$ ; and so instead of saying that the power of the London Regional is 50,000 watts we shorten it to 50 kilo-watts (50 kw.), which is another way of saying the same thing.

Similarly, if we were instead discussing a comparatively minute quantity, such as the power

Alternatively, we know from Ohm's Law that  $E = R \times I$ .

So the (a) formula  $P = I \times E$  might be expressed as  $P = I \times (R \times I)$ .

And in its simplest terms this is  $P = I^2 \times R$ , which is the statement made at (c).

The home constructor is chiefly concerned with power in choosing resistances to carry a certain current safely (the re-

Ohm's Law is expressed  $V = I \times R$ , and if  $I = 50$  milliamps (i.e. .05 amp.) and  $R = 500$  ohms, the voltage in question is obviously the product of these two

$$V = .05 \times 500 = 25$$

The 50 milliamps which we have been discussing is quite a likely figure for a large output valve's anode current.

## Radio Calculations

in a single valve's plate circuit, we need not come down to bothersome fractions of a watt, such as 1-1000th (or .001); but we use the prefix "milli" (meaning 1-1000th), and thus .001 watt becomes 1 milliwatt.

### Three Definitions.

This very handiness of the electrical units, however, means that there are several ways of stating the same thing. And thus the power P may be defined in three ways, as follows:

- (a)  $P = I \times E$ .
- (b)  $P = \frac{E^2}{R}$ .
- (c)  $P = I^2 \times R$ .

Such elasticity in expressions is

extremely useful, but is apt to be confusing to the beginner, who may not grasp why (b) and (c) above mean the same as (a). A little consideration will make it clear.

We are told above (a) that  $P = I \times E$ , and we had already learned from Ohm's Law that

$$I = \frac{E}{R} \qquad \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} \text{, etc.}$$

So the equation  $P = I \times E$  can obviously be re-written as

$$P = \frac{E \times E}{R}$$

Reduced a step further this becomes  $P = \frac{E^2}{R}$ , which is the statement made at (b).

sistances being rated in watts), or in connection with charging apparatus.

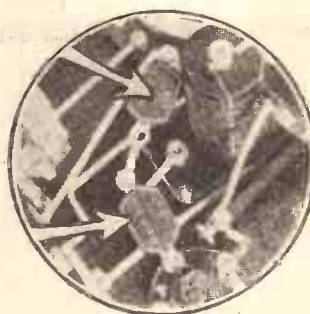
### A Practical Problem.

Suppose a 500-ohms resistance is to be used and the current it is to carry is 50 milliamps, what should be the watts rating of the resistance?

In this instance (c) above is applicable and becomes  $P = (\text{current})^2 \times \text{resistance}$

$$= \frac{(50)^2}{1000} \times 500 = 1.25 \text{ watts}$$

If, therefore, we insert a resistance of 500 ohms in a circuit which we know will carry 50 milliamps under such circumstances, the resistance will probably be damaged if it is rated at less than 1½ watts.



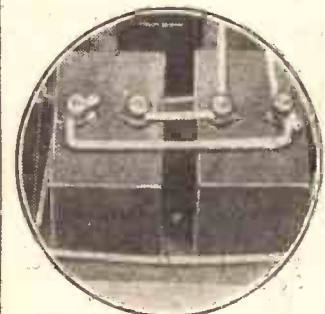
The total value (c) of condensers in series is always less than the lowest individual value. (The formula is

### Electrical Horse-Power.

Such a valve would most probably also require a grid bias of roughly 25 volts. So, by making the anode current of a valve traverse a resistance, "automatic bias" can be obtained from the "dropped" volts.

Before leaving this subject of units it may be of interest to

### CONDENSERS IN PARALLEL



The values of condensers joined in parallel are simply added together, to find the total capacity. For instance, a 3 mfd. joined to a 2 mfd. would be equivalent to a 5-mfd. condenser.

compare the electrical and the mechanical power ratings.

The familiar "horse-power" is 33,000 foot-lbs. per minute, and is equal to 746 watts. And a kilowatt (1,000 watts) is approximately 1.34 horse-power—roughly 1½ h.p.

### Time and Quantity.

It is obvious that the time factor enters into horse-power, and it may be wondered why no time appears to be implied in its electrical equivalent.

Actually it is. For the ampere is not a quantity of electricity, as so often imagined, but is a rate of flow.

The quantity involved is not often mentioned. It is the coulomb, and a flow of one coulomb per second is one ampere—another good instance of electrical science's "hand-in-glove" units.

ubiquitous Ohm's Law is equal to the occasion again, for we know the value of the resistance and we know the current to be passed through it, viz.: 500 ohms and 50 milliamps respectively.

In one form, as we know,

Special Beginners' Supplement—Page 2.

**A** GRAMOPHONE pick-up can be used in conjunction with any radio set incorporating one or more stages of L.F. amplification.

It is a simple piece of apparatus and one that can easily be connected into any straightforward circuit. A pick-up is the electrical equivalent of the sound box used with the ordinary acoustic gramophone, the reproduction obtainable from a pick-up employed with a good amplifier and loudspeaker being definitely superior to that of its acoustic prototype.

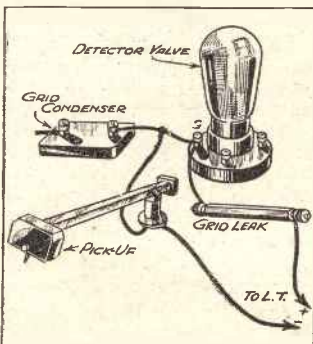
How does a pick-up work? It consists of a needle which in some types is attached to an armature, or in others itself forms the armature. Surrounding this armature is a coil of wire, the ends of which are attached to two lengths of flex which pass along the pick-up arm and are joined to the pick-up terminals on the set.

**How it Works.**

There is also a permanent magnet, arranged so that the magnetic field between the poles cuts the coil of wire and the armature. The pick-up is placed on the record in exactly the same way as the sound box of an acoustic gramophone, and in fact the treatment, in so far as playing the record is concerned, is precisely the same.

When the record revolves, the undulations on the sides of the sound channels or grooves on the record move the needle, and therefore the armature, thus producing a change in the intensity of the magnetic field cutting the "speech" winding. This, in turn, causes voltages to be set up between the two ends of the coil.

**HAS DISADVANTAGES**



When the pick-up is joined as illustrated above there is nothing to prevent the radio programmes from being heard as the background. Moreover, the valve has no negative bias on its grid, and consequently distortion may occur. In practice the pick-up would, of course, be connected externally to two terminals or sockets and not left in circuit all the time.



If now we connect the two pick-up leads which are joined to the ends of the "speech" coil to the grid and negative filament (or G.B.—) of an amplifying valve, the voltages generated in the coil will be applied to the grid circuit of the valve, and can therefore be amplified in the usual way.

In practice the pick-up is joined either in the detector grid circuit or in the grid circuit of the first L.F. stage. If, for example, there is one L.F. amplifying stage, then it is best to connect the pick-up in the detector circuit. If, on the other hand, there are two efficient L.F. stages, it is probable that the total magnification obtained with a reasonably sensitive pick-up will be too great when it is connected in the detector grid circuit; hence it is common practice to join it in the first L.F. circuit.

Now, a word of explanation about connecting a pick-up in the grid circuit of the detector valve.

How can the detector valve amplify the voltages when its primary function is to detect? What happens is this: All three-electrode detectors are also amplifiers, and if voltages are applied across the grid and filament terminals, the valve will behave in exactly the same way as any other amplifying valve.

Actually, fairly good results can sometimes be achieved by joining the pick-up directly

between grid and negative filament of the detector without applying any grid bias to the valve, but this scheme has the disadvantage that the valve overloads very easily, and distortion may therefore occur, which will be magnified by the succeeding stage, with the result that the final reproduction is not as satisfactory as it could be.

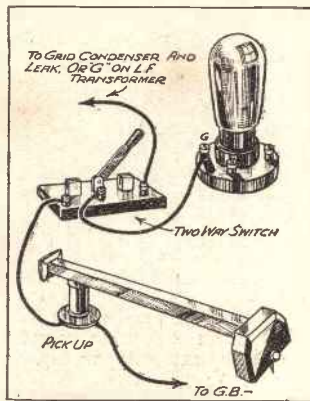
Moreover, unless there is some form of switching for changing over to pick-up and also disconnecting the radio side of the set, there is nothing to prevent programmes from the local or other stations from being superimposed as a background upon the recorded music.

In some cases it is possible to overcome the background of the radio by de-tuning, or alternatively the aerial can be disconnected, but this is rather a clumsy procedure, and it is much better to employ a switch which will cut the radio side out of circuit when the pick-up is in use.

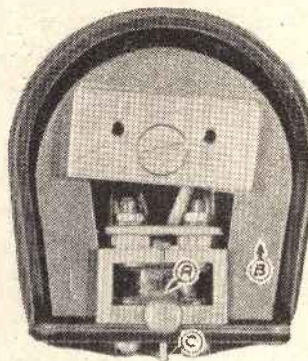
One convenient method is to use a single-pole change-over switch, as shown in the sketch on this page.

To connect it in the grid circuit of an ordinary leaky grid detector, the wire which goes from one side of the grid condenser and grid leak to the grid of the detector valve is removed. Instead the grid of the valve is joined to the common terminal on the switch, that is the terminal to which the

**A POPULAR SCHEME**



A simple and effective method of changing from radio to gramophone and vice-versa is to use a single-pole two-way switch connected as shown above. Various types suitable for panel mounting are obtainable.



Here we see a pick-up with its cover removed. "A" is the "speech" coil surrounding the armature, "B" the magnet, and "C" the needle which is attached to the armature and moves in sympathy with the sound track on the record.

moving arm of the switch is joined.

One side of the switch is then taken to the grid condenser and the grid leak, while the other side of the switch is connected to one pick-up terminal; the remaining pick-up terminal being joined to G.B.—, usually about 1½ volts.

In this way the detector valve performs as a distortionless L.F. amplifier with grid bias applied to its grid in the normal manner.

**Cutting Out Scratch.**

As far as volume controlling is concerned, the best place for the control is by the side of the turn-table, the volume control taking the form of a potentiometer, as shown in the sketch. This will enable the output from the pick-up to be adjusted at will without the introduction of distortion, and there will be no possibility of overloading any of the amplifying stages.

Normally the potentiometer resistance should be fairly high, and it must be remembered that the lower the resistance value the more marked is the effect on scratch and also the high musical frequencies.

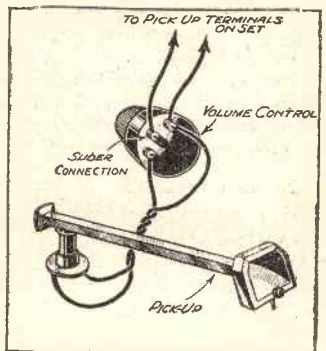
Thus with care the scratch may be cut down to any desired strength, simply by suitably choosing the resistance value; but an alternative is to connect fixed resistances across the potentiometer winding, neglecting this point in the potentiometer itself.

**Transformer Connection.**

Sometimes extra volume may be obtained by connecting the pick-up to a set via a transformer.

The secondary terminals (usually marked G and G.B.) are connected to the set's pick-up terminals, while the pick-up itself is connected to the primary (P and H.T.) terminals of the transformer. An ordinary L.F. transformer is suitable.

**ADJUSTING VOLUME**



The best way of controlling the volume from a pick-up is to employ a potentiometer which can be mounted close to the gramophone motor turntable.

**NEXT WEEK: MORE ABOUT PICK-UPS AND SWITCHES AND THEIR USES**

# THE VISCOUNTESS SNOWDEN J.P. ON — SPENDING LISTENERS' MONEY



**I**N my last article I recorded the fact that the sum taken from B.B.C. funds by the Government was £1,567,500 in 1932. The number of licences has greatly increased since the end of that year. It is, therefore, reasonable to assume that the sum taken this year will not be less but more.

Indeed, there must be added to it as a first increase the £250,000 which has been promised as a further gift. This makes a magnificent total of £1,407,500 filched from listeners by the Government in this year of our Lord 1933!

Included in this sum, as I have already stated in this journal, is a reservation of £110,000 for income-tax. I do not agree that the B.B.C. should be called upon to pay income tax out of the finances of a public service so necessary and so vital to the State as broadcasting; but for the sake of the argument let it be allowed.

### More than Spent.

The sum of £261,500 extracted from the total by the Post Office is more than is actually spent on the work done for the B.B.C.; but, again, to add weight to the argument, let this sum also be taken. There is, in this case, *some* return for the money.

£110,000 plus £261,500 totals £371,500, which, when subtracted from the grand total of £1,407,500, leaves £1,036,000. Suppose we make a present to the Government of £36,000, there is left, in round figures, a sum of £1,000,000, which by no stretch of imagination can be justly claimed by the Government for extraneous uses. This money belongs to the radio public.

I admit that these are not normal times and that the present need of the State is very grave. The question I should like to ask, and to which I am prepared to give an answer, is this: Is there any way of reconciling the claim of the State on the generosity of the B.B.C. and the interests of the 5½ millions of listeners who pay for the broadcasting service? I think there is.

### Relief for Unemployed.

My proposals would involve a very large annual building programme, which would employ considerable numbers of bricklayers, plasterers, joiners, glaziers, fitters, iron-workers, road-makers, paper-hangers, painters, gardeners, etc. These people would be withdrawn from the ranks of the unemployed and to that extent would relieve the State of their support.

England has no State Opera House worthy of its name and fame. The Covent Garden Opera House has marvellous acoustics, and if it could be acquired for the State and sufficiently modernised, this should be done; but there are persistent

Our distinguished contributor's proposals are of special interest to-day, and although you may not agree with the schemes outlined below you will agree that they are boldly conceived and cogently presented.

rumours that the site is wanted for business purposes, and if this is inevitable, a new Opera House should be built.

I imagine an Opera House sufficiently worthy would cost at least £1,500,000 even if the State provided a site. If £250,000 a year were spent in this fashion, a magnificent Opera House would emerge at the end of six years.

Similarly, a State National Theatre sufficiently large to enable seats to be sold



### FROM QUEEN'S HALL

At present important musical broadcasts are relayed from the Queen's Hall or other similar centres of music because, unlike our neighbours on the Continent, Britain has no State Opera House.

cheaply is badly wanted, and I would allot a similar sum, £250,000, for that purpose, the State providing a site out of its many unused plots of land. In this case £250,000 a year for six years would provide work for an army of workmen, the result exhibiting itself in a theatre of which the nation could be proud.

At the end of six years these large annual sums would be available for the building, in conjunction with the local authorities, of municipal theatres and opera houses in the large provincial centres of population,

and even in some of the smaller towns.

I would also set aside a sum of £100,000 a year for six years for the building of a superb concert hall in London, which should also be constructed for cheap seating. An alternative estimate the cost of such a building, including a site, to be about £500,000. At the end of either term the Provinces would also begin to benefit in a like manner, though where halls abound the money might provide municipal orchestras of quality.

I would allot an annual subsidy of £100,000 a year each for the National Opera and the National Theatre. The former would consider the interests of Sadler's Wells and the Old Vic., which would become training schools for the larger enterprise.

### What is Wanted.

All this calls for the establishment of a Ministry of Fine Arts, but lacking that, I suggest an Opera Council and a Drama Council for the control of the finance, working under the aegis of the State through its representatives, the B.B.C., who would exercise the right of decision in cases of acute difference of opinion.

The Concert Hall would be the property of the B.B.C., and a home worthy of it would at last be found for the B.B.C. Symphony Orchestra, or any other orchestra which might care to hire it.

There would still be an annual £200,000 to dispose of, and I would suggest that this money might be spent to improve the quality of programme items by providing better facilities for education and training.

I would give £50,000 for the purposes of adult education, this sum to be administered under the Board of Education by the Adult Education Council, of which the Archbishop of York is the present chairman. The B.B.C. should be well represented on the governing body.

### To Promote Education.

I do not know what sums the heads of the chartered academies and colleges of music would consider sufficient to relieve them of financial anxiety and the necessity of taking unsuitable pupils, but I would give the Royal Academy and the Royal College of Music in London, the Royal College of Music in Manchester, the Academy of Music in Glasgow, and the Royal Academy of Dramatic Art in London £25,000 a year each. The Music Advisory Committee of the B.B.C. might be asked to administer these monies and receive reports.

There remains £25,000, and I would allot this to the Board of Education for the

(Continued on page 318.)

## STATIONS WORTH HEARING

A review of recent conditions on the "broadcast" bands, including details of stations that are coming in well.

By R. W. H.

**D**ESPITE the wonderful record of fine weather, long-distance reception during April, 1933, was almost as good as it has been at any time during the winter. May, so far as it has gone, is proving a worthy successor, and there seems every reason to suppose that we are in for a record wireless summer.

### Fading and Atmospherics.

Atmospherics have not yet been troublesome except on odd days and nights, but we must expect occasional bother from this kind of interference at any time of the year. What is very surprising is the small amount of fading that is noticeable even amongst stations such as Nürnberg and Trieste, which use wavelengths in the lower part of the medium-wave band.

It is below 300 metres that fading is nearly always at its worst when it does occur and the fact that there is hardly any down there at present is another proof of the excellence of long-distance conditions.

On most recent nights when I have spent an hour or two in discovering how many stations were receivable with reasonably good volume and quality the log has contained some fifty entries, which is very nearly as many as made their appearance in it during December and January.

There are a few heterodynes, but the stations which are affected mostly suffer only on occasional nights and only one transmission of importance is now permanently spoilt. This is the Ecole Supérieure on 447.1 metres. Stations occasionally, though very rarely, interfered with are Nürnberg, Bordeaux, Genoa and Milan.

### Reliable Programmes.

On the other hand, Beromünster is now free from the heterodyne that had been marring its programmes for so long. This seems to have been of Russian origin, and I believe that the offending station has now gone on to a much higher wavelength.

In my last notes I mentioned that Lyons Doua was beginning to be worth attention from the long-distance enthusiast. Since then this station has shown a splendid record and the reader should certainly not omit to try for it on 465.8 metres, a little below Langenberg. The Lyons programmes are good and the station can now be relied upon as a provider of first-rate entertainment.

The two Brussels transmitters have not yet increased their power, though both of them are about to go up soon to 50 kilowatts instead of their present 15. As reception from them is now usually very good, we may hope for quite remarkable results when the change is made.

Another station, this time on the long waves, which is likely to become before long one of the most popular of Continentals, is Kalundborg. The output rating is at

present 7.5 kilowatts, but the decimal point is due to be removed early this summer. As Kalundborg with its present power is a genuine daylight station it should be a marvel when the new plant is in operation.

It was stated on the best authority some months ago that the Eiffel Tower would close down as a broadcasting station very shortly after the Government had taken over Radio-Paris. The transfer of the latter was made at the end of last year, but the Eiffel Tower is still going strong.

### On Long Waves.

Most of us would be glad if it would stop sending out broadcast programmes, for then the giant Warsaw would have a real chance of showing us what it can do.

Have you ever heard Kaunas, the longest-waved of all the long-wave stations? Probably you have never troubled to turn up beyond the settings required for Huizen, which works on 1,875 metres. Kaunas is 60 metres higher on 1,935, and is sometimes very well heard. The station, by the way, closes down rather early as a rule, so don't leave it until too late in the evening.

All of the important long-wave stations

## B.B.C. AND N.B.C.



Mr. Aylesworth, President of the N.B.C. (left), broadcast a talk to British listeners when visiting this country some time ago, and here he is introducing Major Gladstone Murray of the B.B.C. to American listeners, from a New York studio.

are coming in magnificently just now. Zeesen had a period of variability, but this now seems to have come to an end.

Luxemburg is now transmitting regularly on 1,250 metres, and if you haven't heard this station yet I can guarantee that you will have no difficulty about finding it. Oslo is quite free on most days from the jamming that was a nuisance some time ago, and Motala is providing wonderful reception.

### A Splendid Group.

There is a splendid group of stations now at the top end of the medium-wave band between 459.4 and 550 metres. Beromünster, Lyons Doua and Brussels No. 1 I have already referred to. The others are Prague, Florence, Vienna, Munich and Budapest. In addition, both Sundsvall and Riga come through well at times.

On most sets all of these stations are to be found between 75 and 100 on the condenser scales, and except on the rare

(Continued on page 316.)

## THE LISTENER'S NOTEBOOK

Some points from the programmes, and comments on interesting items recently served up by the B.B.C.

**A**S a Southerner interested in Soccer, it gives me something of a pain to suggest that whenever two Northern clubs meet in the Final again, what about a commentator from the North who knows, and easily recognises, his men? I don't like to make the suggestion, for Mr. Allison is a popular broadcaster, but the Everton-Manchester City final broadcast was too full of uncertainties and corrections for it to be called a successful one.

### Too Many Voices.

I can't let such a high-light as "Coriolanus" with Sybil Thorndike in the cast pass without comment. Frankly, I didn't like it, and I had heard all I wanted to hear of this play after hearing Part I. Apart from Sybil, the cast wasn't able to cope with the big lines. "Coriolanus" isn't an ideal broadcast play. The lengthy war scenes at the beginning which, with their movement and colour, undoubtedly pleased a Shakespearean audience, weren't appreciated over the air, where there is no visual appeal.

Once again we were faced with that vexing question of countless voices. They seemed to take more sorting-out than ever!

### Those Big Casts.

Peter Creswell, the producer, did his best possible, I'm sure. This question of a crowded cast is the biggest problem producers have to solve, and I am not very hopeful of an early solution.

A failure to find a solution may mean the ruling out of many plays as broadcast fare. Of course, "Coriolanus" isn't the best-known or liked of Shakespeare's plays. On these grounds the play was an unwise choice.

### From the Book.

In future, whenever possible, I shall follow the broadcast of a big play from the text. I remember I did this when Galsworthy's "The Forest" was broadcast, also Marlowe's "Dr. Faustus," and I enjoyed them both much more than I would have done without the text.

### Are They Too Long?

I am rapidly coming to the conclusion that no broadcast play should exceed sixty minutes. And there are some that cease to hold one's attention after forty-five minutes.

### "I'll Tell You Everything."

As I thought, Mr. Priestley's Friday evening talk is a very popular one, and I've heard more than one listener regret that it is always too short. After listening to the opening talks of his, the nature of Mr. Priestley's programme is now pretty clear.

"I'll Tell You Everything" is too vague for anything, of course. One's fears, one's hates, one's delights, through Mr. Priestley's eyes, are all so delightfully personal! And as there's none of the thank-God-I-am-not-as-other-men-are atmosphere about the talks, there's nothing in them to cause irritation.

### Music-Hall Style.

It isn't often that I am moved to give an ordinary variety hour a pat on the back: But I was definitely impressed with one given recently.

To be precise, it was the one in which Tessie O'Shea figured. There was something of the real old music-hall style about her turn. She's got the real music-hall voice, too, and she sings the right sort of song.

Although there was no leading up to her act in the show, she came on and got her audience at once. Surely this is the acid test of a good music-hall artiste?

I also liked Harold Williams' baritone, although he didn't seem quite right in a variety programme.

Then there was Norman Long, who is no stranger to listeners. One good thing about Norman Long is that he changes his songs pretty frequently. When an artiste "records," too, this is just as it should be.

### Christopher's Choice.

Talking of records reminds me: Isn't it a fine innovation on the part of the B.B.C. to give printed details of gramophone recitals? I've already avoided listening-in to one gramophone hour. This step has been long overdue, because gramophone recitals, sometimes extraordinarily good, can also be extraordinarily bad.

What I mean is that sometimes Christopher Stone's selection has been so against my taste that I have sworn never to listen to him again. On the other hand, I've often wanted to shake him by the hand.

(Continued on page 316.)



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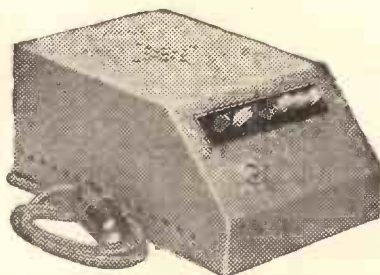


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Messrs. H. CLARKE & CO. (M/CR.) Ltd., George Street, Patricroft, Manchester. NAME..... ADDRESS..... Please send me full details of "ATLAS" Mains Units. 30/16



**A HANDSOME SPEAKER.**

IN a recent issue I reviewed the Blue Spot 29 P.M. permanent magnet moving-coil loudspeaker unit. Favourably, of course. It would be strange indeed if Blue Spot produced anything not able to produce favourable comment and reviews.

Well, I have since been able to test the unit built into a handsome oak cabinet, in which guise it is known as the Blue Spot 22 P.M., and sells at 45s. All that I have said about the unit applies to this



Here is the Blue Spot 22 P.M. Speaker.

complete speaker. It is a fine instrument and thoroughly deserves its trademark.

But I cannot help saying that I wish Blue Spot would make it simple for me (and others) to remember their different models. Why does the 29 P.M. Unit become a 22 P.M. cabinet model? Why is the 99 P.M. transformed into 32 P.M. when it is provided with an admittedly excellent cabinet?

I should have thought it would have been better merely to add a "C" to indicate the cabinet and leave the figures unaltered.

Still, I suppose Blue Spot can justifiably point out that their productions are worth remembering even if a spot of Pelmanism is needed!

**FOR SUPERHET SETS.**

Superhet sets are comparatively easy to build and to operate and give wonderful results—providing the circuit and components are carefully selected.

Particularly it is imperative to apply great discrimination to the choice of intermediate transformers. And the task of the home constructor is immensely facilitated if these are accurately adjusted by the makers.

The constructor is in good hands, if he places his faith in Lissen apparatus, for Lissen are masters of



Two of the Lissen Superhet Transformers. One with its shield removed.

the art of the manufacture of components for those who assemble their own sets.

And the Lissen intermediate-frequency band-pass transformer is an excellent example of the high-

class, low-price apparatus with which the firm has built up its great reputation.

It is an unusually compact and well-screened component and its design, construction and finish are all above reproach.

We strongly recommend it to the attention of all superhet enthusiasts.

**ADDING "CLASS B."**

One of the greatest attractions of "Class B" amplification is that it can easily be added to the majority of existing battery sets.

This is because the type of valve that must of necessity precede the "Class B." stage is similar to that usually employed as the output valve of a set.

The addition becomes very simple when the "Class B" stage is built up in the form of an adaptor.

The first commercial adaptor to be produced was, I believe, the one due to Sound Sales, who have exhibited considerable enterprise throughout in regard to all aspects of the new development.

Their adaptor is styled the "Sound Unit" and it retails at 35s. less valve. It is an apt name, for the unit is a quite sound proposition.



The Sound Sales "Class B" Conversion Unit.

**WHAT THEY'RE SAYING—**  
about the "W.L.S." One, the Sky-Hawk and Television.

**HE WANTS AUSTRALIA NOW!**  
The Editor, POPULAR WIRELESS.

Dear Sir,—When the "W.L.S. Short-Wave" One first appeared in "P.W." of April 16th, 1932, it immediately appealed to me by its simplicity, and having heard of the marvellous distance spanning properties of short waves, I decided to build it, mainly with the intention of hearing America direct.

I must say that the biggest "kick" I got in the course of all my wireless experience was when I heard a nasal voice announcing W 2 X A D.

But the raison d'être of this letter is to place on record the reception of the Roosevelt inauguration in daylight, on one valve. I also had a friend in to verify this.

My only remaining ambition is to log Sydney, Australia, which I have not yet been able to do, but after last Saturday I am ready to expect anything.

I must add my thanks to those of your other readers for a splendid set.

Yours faithfully,

Burley, Leeds. F. STEVENSON.

It is built into a compact, attractive case, provided with all the necessary terminals and can be added to any set easily and quickly.

The circuit is such that in the case of three or four-valve sets of certain types, it is possible to dispense with the original final stage of amplification.

We have tested the "Sound Unit" with several different receivers and in all cases it gave first-class performances.

It was indeed most intriguing to transform sets with outputs one thought of as "small or medium battery" to full "Class B"; the new principle's effects are greatly emphasised by such close comparisons.

**MICROMETER TUNING.**

Success in short-wave reception largely depends upon "closeness" of tuning. You must be able to contrive extremely precise balancing between the reaction and tuning controls in order to tune-in a large majority of the stations.

Those who have not had experience on the short-wave bands might think that it is something like the juggling required to bring in the very weak ordinary wave broadcasters.

To some extent it is, but the big difference is that whereas in that case only thin, muffled programmes are heard after a period of "wagging" on the short waves what sounds like the carrier of an extremely weak station may turn out to be a full loud-speaker result when it is "resolved."

That "precise balancing" I have mentioned does not necessarily imply the need for great personal skill, with good slow-motion dials it can be achieved by almost anyone.

In this connection it is of considerable interest to note that Igranice have re-designed their already famous Indigraph Slow-motion Knob and I'll fitted with micrometer adjustment.



The Igranice Indigraph Slow-motion Dial with micrometer adjustment.

This dial is the ideal short-wave control. Its "direct" drive has a reduction ratio of 9 to 1, while the micrometer adjustment gives the colossal reduction of 600 to 1. You cannot see the movement of this latter, it is so fine.

And there is not the slightest indication of slip or backlash. With such a dial short-wave tuning becomes even simpler than "broadcast" tuning, once the carrier of a station is located. It is by far the best dial for the short waves that I have ever handled, and if there is a better one I'd very much like to have it brought to my notice—not that I can visualise the possibility of or even necessity for anything better!

**THE "SKY HAWK" IN WEST WALES.**

The Editor, POPULAR WIRELESS.

Sir,—It is now three months since I built up your "Sky Hawk." Perhaps you would like to know how it is working in West Wales, where many sets can't find the foreign stations.

I have logged these stations with easy turn: Huizen, Radio-Paris, Königswusterhausen, Daventry, Eiffel Tower, Warsaw No. 1, Kalundborg, Oslo, Hendon Aerodrome and Southampton.

And on the short waves these are all at full loudspeaker strength (there are many others, but they are fading): Munich at 533 metres, Prague, North Regional, Lyons P.T.T., Rome, Berlin, Athlone, Midland Regional, Leipzig, Toulouse, Scottish Regional, Stuttgart, London Regional, Strasbourg, Milan, Poste Parisien, Breslau North National, Hilversum, London National, Fécamp, Cork, Plymouth and Fishguard—a small broadcasting station to the trawlers at sea. I am about 16 miles from this station. Is this a record?

I thank the "P.W." for such an amazing set, and for one so easy and cheap to build.

I am, yours faithfully,  
Crymmych, Pembro. JAMES EVAN JAMES.

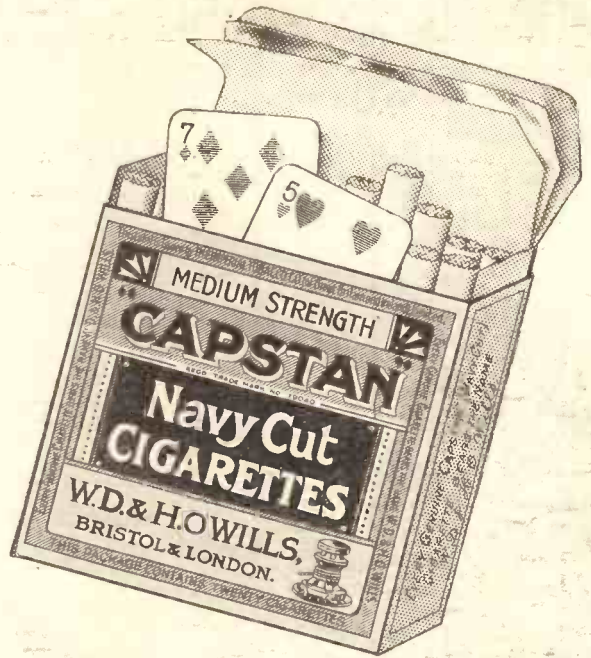
**TELEVISION ON A RECORD?**

Dear Sir,—It has occurred to me, being a "P.W." television investigator, that a gramophone record of the "vision" of some person or persons, would be useful for experimenters with televisions. It could be used with a pick-up and could therefore be used for experimenting over and over again, instead of one having to wait till the next television broadcast before being able to try out a new dodge.

Yours faithfully,  
Bushey Heath, Herts. G. TUCKER



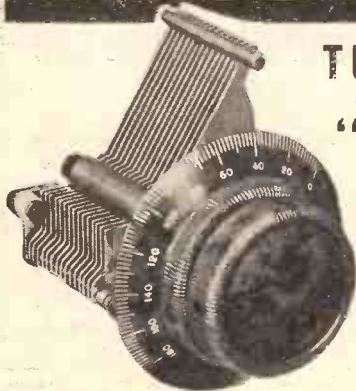
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**BLUESPOT**

## STATIONS WORTH HEARING

(Continued from page 312.)

occasions when conditions are unfavourable every movement of the tuning knobs in this region brings in something.

It is convenient to divide the medium-wave band for searching purposes into five sections. The first of these is that already mentioned from 459.4 to 550 metres, the next is from 355.9 metres (London Regional) to 441.2 metres (Rome), and third from 301.5 metres (North National) to 352.1 metres (Graz), the fourth from 261.5 metres (London National) to 298.8 m. (Tallin), and the fifth, wavelengths below 261.5 metres.

### Congested Wavelengths.

It will be noticed that there is a gap between the first and second sections. This is because the intervening wavelengths are either devoted to groups or are so congested that nothing is to be heard clearly.

In the second section Rome and Stockholm are both first-rate and Belgrade has given me good reception on many recent evenings. Madrid is very faint at present, and Berlin Witzleben is only occasionally well heard.

Athlone comes in at gigantic volume and Katowice continues to be very good. Toulouse has unfortunately ceased to transmit for the moment as a result of the fire which burnt down the greater part of the station. Lvov is sometimes good and Hamburg is nearly always worth attention.

### Four Giants.

In section No. 3 between 301.5 and 352 metres there are four giant foreign stations in Breslau, the Poste Parisien, Milan and Brno. The first of these are very fine, but Brno varies greatly, being at full loud-speaker strength on some nights and quite faint on others. Strasbourg, Brussels No. 2 and Göteborg generally give good reception. Bordeaux Lafayette is occasionally heterodyned but usually good.

In the fourth section Moravska-Ostrava should always be tried for when the London National is silent. Lille is sometimes very good, whilst both Turin and Heilsberg are reliable standbys. Bratislava has come in very well on many evenings of late and Hilversum can be received at any time when it is working.

### Spark Interference.

The best stations between 261.5 metres and the bottom of the band are Frankfurt, Hörby, Gleiwitz, Trieste, Nurnberg, and Fécamp. In this section, particularly towards its lower end, spark signals are often more than a nuisance and reception of the low-wave stations suffers accordingly.

Another serious source of trouble is the way in which some of the smaller stations wander from wavelength to wavelength without any regard for the sufferings of their neighbours.

American stations are still to be heard, though good nights for transatlantic reception are now much fewer and further between than they were.

There does not seem to be, however, any immediate prospect of much change on either broadcast bands. The comparatively high power of many of the continental stations undoubtedly accounts for the reliability with which they are received in this country.

## THE LINK BETWEEN

(Continued from page 302.)

### Lectrolinx Supplementary List.

Some little time ago I referred in my notes to a Clix folder entitled "A Matter of Connection."

A supplementary leaflet has now been issued by Lectrolinx to describe the additions that have been made to the range since the earlier list was printed. One of these, I notice, is an efficient-looking holder for the new seven-pin valves.

Readers desirous of obtaining a copy of this latest Clix leaflet—the title of which is "Clix Further Aids to Constructors"—can do so through the medium of "P.W.'s" free literature service. (No. 34)

### New Ever Ready Depot.

For the benefit of our many wholesale and retail friends in the North, I am asked by Messrs. Ever Ready to announce that a further distributing depot for electric lamps and batteries has just been opened at 23, Gallowgate, Newcastle-on-Tyne.

The telegraphic address of the new depot is, "Eveready, Newcastle-on-Tyne," and the phone number is Newcastle 26553.

### OUR POSTCARD SERVICE

Applications for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.

### More "Class B" Speakers.

I recently gave a list of the speaker manufacturers who were producing special models for use with the new "Class B" output scheme.

I have since been advised that "Class B" speakers are also available in the W.B. and Baker's Selhurst ranges. Full details concerning types and prices are available on application to the makers in question.

### Lotus and "Class B."

While on the subject of "Class B" amplification, it is opportune to mention that a "driver" transformer has recently been produced by Lotus.

The new transformer is claimed to have an inductance of 30 henries under working conditions, which would appear to be a very satisfactory figure. The price is 11s. 6d., including royalties.

### NEXT WEEK

Read all about the  
**POPULAR WIRELESS  
SPECIAL  
SHORT-WAVE TESTS**  
from the  
**CRYSTAL PALACE**

*Don't Miss This!*

**"P.W." Wednesday. 3d.**

## THE LISTENER'S NOTEBOOK

(Continued from page 312.)

### Saturday Nights.

I don't think that the "Stars in their Courses" talks quite hit the mark; but that isn't the fault of the talks themselves, or of Mr. Agate who gives them.

Saturday at 9.20 p.m. isn't exactly the right time for them. That's the trouble. Saturday is essentially a day of relaxation for most people, and Richard II, Mark Antony, and Wolsey, for instance, would be more welcome on any other day but Saturday. We are a sporting nation, and only things with a sporting appeal should have pride of place in a Saturday evening programme.

Then, again, we cannot forget that the B.B.C. has given 9.20 of a Saturday evening a special significance. The "Escape" series will take a lot of forgetting.

# RADIOTORIAL

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

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

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

## QUESTIONS AND ANSWERS

### THE CAUSE OF THE EAR-SPLITTING HOWL.

T. L. H. (Kilmarnock).—"I have gained much in the past from your 'P.W.', and wonder if you could advise me re the 'Comet Three—Foundation Model,' which I have just built. The volume is just great. But it

### DO YOU KNOW—

the Answers to the following Questions?

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

- (1) It is often supposed that a crystal detector is likely to give better quality rectification than a valve detector. Is this assumption justified?
- (2) What is Great Britain's allotment of wavelengths under the present scheme for sharing those available in Europe?
- (3) What are the approximate distances to Cardiff and Swansea from the West Regional station which is now to replace the transmitters serving these two cities?

develops an ear-splitting howl, which starts low and gradually climbs to a high-pitched note.

"I have been very annoyed about this as I built the same 'Comet' circuit some months ago, and found it a great success. (I have tried reversing the secondary of my second L.F. transformer.)

"I made sure my earth is O.K., and I am using three valves, 2D.X., P.M.1 L.F., and P.M.202. Are these suitable?

"I have been told this howl could be overloading. If this is so will I require an output filter, and what are the connections for this?

"Will a 2-mfd. condenser do, and what henries will the choke have to be?

"This howl can be heard at any part of the tuning range.

"P.S. — Is the back number of 'P.W.' containing operating instructions for the 'Comet' Three still in print, and can I get one through my news-agent?"

The built-up howl, which, as you say, "starts low and gradually climbs up to a high-pitched note" is due to the fact that one of the valves is being shaken—possibly by a mechanical vibration, or possibly by the strong sound-waves coming from a loud-speaker placed too close to it.

Usually this trouble, which is known as a "microphonic howl," arises at the detector, and it can be cured by the use of a cushioned or sprung valve-holder (anti-microphonic), or by keeping the loud-speaker farther away from the set, in the case where the trouble is due to sound-waves from the loud-speaker.

Another cure is to wrap the valve in cotton wool (you can hold this in place with an empty valve carton), or arrange some similar vibration-preventer to protect it from external disturbances.

Probably you are using a rigid valve holder, and a change to one of the sprung type will be all that is necessary if you find that shifting the loudspeaker farther from the valves is not a cure.

You need not therefore go to the trouble and expense of a filter. But the condenser and a 20-henry choke would be quite suitable for that purpose if ever you decide to use one.

(It is certainly always an advantage when the loud-speaker is in a different room from the set, or when the H.T. is derived from the mains.)

The operating details for the "Comet" are now out of print.

The valves you name are quite suitable, and should give excellent reception when they are protected from the vibration to which they are now being subjected.

NOTE.—When difficulty is experienced in obtaining locally a back number which is not out of print application should be made to

The Amalgamated Press,  
Back Number Department,  
Bear Alley, Farringdon Street,  
London, E.C.4.

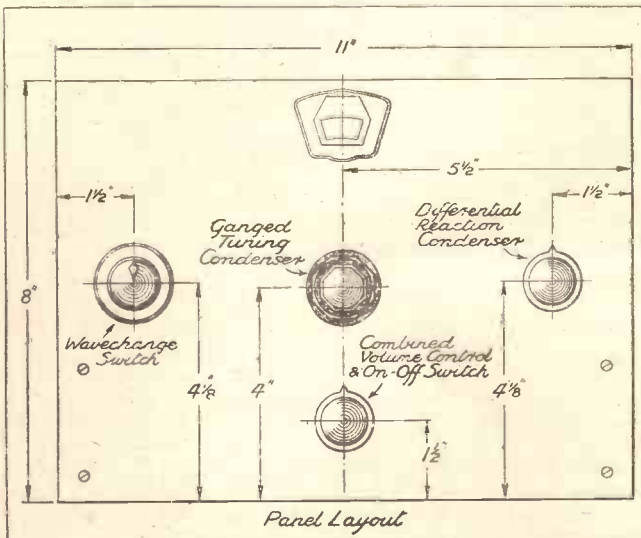
(Price 4d. per copy, post free.)

### FILTERING THE OUTPUT TO THE LOUD-SPEAKER.

R. F. H. (Crawley, Sussex).—"I have been asked by an acquaintance of mine to prescribe for his set, which developed an enormous appetite for H.T.

(Continued on next page.)

### OUR NEW "ALL-METAL" SET



Panel—Brilliant details of the "Catkin" Three. (See page 293).

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4-Pin - - - - 8d.

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D.C. 144 "L" 7" cone (illustrated above) 2,500 ohms field coil £2:0:0

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89, KINGSWAY, LONDON, W.C.2.

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

"His last two batteries lasted only about ten weeks (the two), and I have no doubt in my mind as to the reason for this. Because he was using cotton-covered leads for his extensions to the loudspeaker, running the pair of wires together round the picture rail to the next room, where he had a plug so that he could shift the loudspeaker over to that room when required.

"When I looked into these wires carefully I found the insulation very shaky in places, and at one point I saw a spark on moving the wires about a little. So there was no doubt about leakage taking place across the frayed insulation.

"He wants to keep the long wiring (but with new wiring, of course), so I have offered to put in a choke and condenser to filter the output to the loudspeaker.

"At present this long wiring and his flex for the loudspeaker go to the set's L.S. terminals.

"What I propose is to put in another pair of terminals on the terminal strip near the present L.S. terminals, connecting an output choke (20 henries), across the latter instead of the present arrangement of flex and/or cotton-covered wires.

"Then join one side of the 2-mfd. condenser to the L.T. negative or earth, its other side to one of the new terminals, and the other to one side of the 20-henry choke. Will that be O.K.?"

Yes, the connections named are O.K., provided your last-named connection (choke to new loudspeaker terminal) is made from that terminal of the

### "P.W." PANELS. No. 123. KONIGSBERG.

The Konigsberg station is situated about 882 miles from London, and works on a wavelength of 217 metres, which it shares with Karlstad, Sweden.

The power used is only 5 kw., but the station is comparatively well known in Britain because its programmes are relayed by Heilsberg, on 276.5 metres, with a power of 60 kilowatts.

The interval signal is the musical notes D flat, A flat, A flat, A flat, sent out three times in 4½ seconds, followed by a pause of 4½ seconds.

choke which is then joined (inside the set) to the plate of the last valve holder.

### TESTING D.C. MAINS.

L. W. T. (Westgate-on-Sea).—"A couple of years ago I was running a mains H.T. supply unit from A.C., but this is my first experience of D.C. mains, and I want to know how I can find out which is the positive main.

"Another thing I should be glad to know is an easy method of discovering which main is earthed by the electric light company.

"I understand that it often varies according to the particular house, and although I could no doubt find out by applying to the works I would much rather test it for myself if this can be done satisfactorily by simple experiment."

The tests are easily carried out by anyone of experience, but we hope that you will remember it is unsafe for anyone not experienced in this class of work to meddle with the mains wiring. Accidents very easily happen if the experimenter does not know exactly what he is doing. (Incidentally, it will

## HOW IS YOUR SET GOING NOW?

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

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

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

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

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

probably be found that the supply company's regulations depreciate any alteration to the wiring except by a qualified electrician.)

An easy method of finding which main is negative and which is positive is to make a simple electrolytic cell by dissolving a little salt in a tumblerful of water and inserting into this two leads from the mains, on opposite sides of the glass. A lamp of the ordinary household voltage should be in series with one of these leads to prevent excessive current being supplied accidentally.

When such a simple electrolytic cell is placed in series in this way it will be found that bubbles rise from the ends of the wires under water, and one of the wires will bubble much more freely than the other. The wire which has the excess of bubbles is the negative.

To find out which main is earthed, all that is necessary is to connect a lamp of the ordinary house

supply voltage to an earth, such as a water-pipe or buried earth plate, joining the other side of this lamp to a flexible wire that can be touched in turn on the negative and positive leads of the mains. The lamp will light when the lead is touched on one main, but not when touched on the other. And, of course, the main which does not light the lamp is the one which is earthed.

### USING A WESTECTOR.

H. J. (Swansea).—"Is it possible to use a cold valve (Westector) following an ordinary three-electrode valve, or must it be an S.G. in front?"

The maker's recommendation is that when used as a wireless detector at radio-frequency the "Westector" should be preceded by a low-impedance, high-mutual conductance screened-grid valve, by an H.F. pentode, or by a medium-impedance triode; but when working at intermediate frequency an ordinary S.G. valve can be employed.

Further details can be obtained from the dealer, or direct from the makers.

## SPENDING LISTENERS' MONEY

(Continued from page 311.)

promotion of scholarships, of classical concerts for children or for school orchestras. When the sums allotted for building become free, glorious things might be done for these things and for the encouragement of musical festivals and choral societies and for the proper training and travel of teachers of music and drama.

And all the time the high purposes of the B.B.C. would be served and the sense of grievance of a very large number of listeners who are feeling themselves cheated, but do not know how to make their grievance felt, would be allayed.

## THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 317  
ARE GIVEN BELOW.

- (1) No. \* \* \*
- (2) The B.B.C. has nine different wavelengths between 200 and 500 metres, and one long wavelength (1,554 metres).
- (3) The West Regional station is approximately 22 miles from Cardiff and 40 from Swansea. \* \* \*

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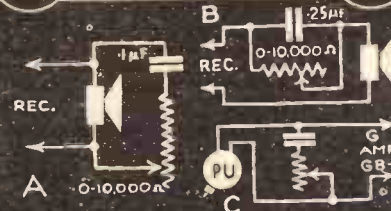
To remove excessive treble, such as is commonly necessary when a pentode is used, employ circuit A.  
To eliminate some of the bass and raise the pitch, use circuit B. The above must be used in conjunction with a filter output circuit. Fig. C shows a pick-up arranged to avoid excess of top register.

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**TECHNICAL NOTES**

Some diverse and informative jottings about interesting aspects of radio technique.

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

**Controlling the Local.**

If you are troubled with too great volume on the local station you can use a smaller aerial, as I mentioned two or three weeks ago—several readers have written to me about this—or you can connect a variable high resistance with a maximum value of, say, 100,000-ohms across the aerial and earth terminals. You want to be careful with this resistance, however, not to adjust it to too low a value, as if you do that you will flatten the tuning and you may get trouble with other stations coming in.

**Flat Tuning.**

An alternative form of aerial is that which is now used in a good many commercially made receivers and which is known as an internal aerial, but you can make the equivalent of this quite well for yourself. Detuning, by the way, is always a bad method of controlling volume, because even if it does not bring in other stations it will cause horrible distortion; usually it does both.

As I mentioned before, it is particularly important when you are juggling about with different types of aerial to use a good earth. If you have got a really good earth you can do all kinds of tricks with the aerial and get all kinds of quite good results, but if you have a bad earth you are very unlikely to get any real satisfaction.

**Improving Selectivity.**

When you find that your receiver is not selective enough, there are various things you can do to improve the selectivity, and one of them is to use a band-pass filter arrangement. This is often very effective from the selectivity point of view, and it has the important practical advantage that it does not, or need not, involve any great interference with the present arrangement of the set. In fact, it practically boils down to using an additional coil and a tuning condenser.

A pre-set semi-variable condenser of about .0001-mfd. maximum capacity

(Continued on next page.)

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## TECHNICAL NOTES

(Continued from previous page.)

is introduced in series with the aerial and adjacent to the aerial terminal. The tuner consists of the usual coil and variable condenser in closed circuit, one point of this circuit being taken, through the above-mentioned pre-set condenser, to the aerial terminal, and the other point to the earth terminal of the set and also to earth; the actual aerial and earth terminals are connected to two points on the coil—a dual-range tuner, in fact.

### Avoid Too Much Selectivity.

In using this arrangement it is important not to have the capacity of the pre-set condenser set to too low a value, because if you do the tuning will be exceedingly sharp and this will not only make things difficult, but will also tend to introduce distortion, especially on the higher frequencies.

An adjustment of the one condenser will necessitate an adjustment of the other, so that it may be, perhaps, a little tricky at first to operate it to the best advantage. When once you have got it properly adjusted, however, you will find it well worth while in view of the improvement in selectivity which it gives without loss of quality.

### Radio on the Continent.

I have just got back from a radio business trip in France, Germany, Holland and Belgium, during which time I took particular note of many interesting radio matters, which I will tell you about during the next two or three weeks. One of the first things which strikes me, by the way, is the great popularity of outdoor frame aerials—I mean the diamond frame aerial slung up on the top of a pole above the house. I have seen thousands of these, particularly in Holland, where they seem to specialise in them.

One would have thought that in the Netherlands, where the country is so flat, the indoor aerial would have been more popular than it appears to be, but I was told by many people whom I talked to that this particular type of outdoor aerial holds first place in the affections of radio amateurs over there.

### Recording Programmes.

I noticed that, since my last visit, home recorders seem to have made a great deal of progress on the Continent, far more than over here. I suppose this is a matter of psychology. Home recording doesn't seem to have caught on amongst British amateurs, notwithstanding several very good machines which have been put on the market at different times. In France, especially, they seem to take to home recording much more than we do, and they specialise on making their own records of radio items over the broadcast. Several of these machines were demonstrated for me, and I heard some really excellent records which had been made in this way.

### Synchronous Motors.

I was also struck with the popularity of the synchronous type of electrical gramophone motor over there. There are now several makes of this motor on the market, particularly the French market,

and they seem to have made more progress than in this country.

One of the most noticeable things—though not directly connected with radio—is the great popularity of home cinema machines. I noticed this in all the countries I visited, although in Germany and France it was particularly notable. France seems to be almost the home of amateur cinematography and, of course, everyone is looking to the addition of talkies; in fact, to a general linking-up of radio and home talking cinematographs. They seem to think that television is going to be a long time coming, and in the meantime the combination mentioned above is likely to prove a very big development of home entertainment.

### Makes Old Batteries Young.

Oh, by the way, one thing I forgot to mention was a marvellous new battery electrolyte which makes old batteries young. We have all heard about battery revivers from time to time, but generally regarded them with a certain amount of scepticism. This one, however, claims to be the real thing, and I was furnished not only with documentary and practical evidence of its efficiency, but also with information as to the uses of it by large concerns on the Continent. One of the railway companies has, I understand, actually placed an order for 25,000 litres, which sounds as though it must be a bit different from the others. Anyway, I thought it was worth while investigating, which I am going to do in the course of the next week or two, and I will let you know more about it later on.

### Sulphation.

I should add, perhaps, that it is claimed that if your battery is sulphated and pretty well on its last legs you only have to empty and wash it out, fill it with this new electrolyte (which looks for all the world like ordinary acid), and up it comes to full strength with a new lease of life. A motor-car battery which is too dead to turn the engine over has only to be replenished in the above way, when it will start the engine (without any further charge) in the briskest possible manner, and will also give another couple of years of useful life.

## THE D.C. AIRSPRITE

(Continued from page 299.)

of all been connected up to suit the supply voltage.

With the valves inserted—V. D. S. in V<sub>1</sub>, D. H. in V<sub>2</sub>, and D. P. T. in V<sub>3</sub>, and the mains plug in its socket—the set can be switched on.

The valves will take a few moments to heat up, this being a feature of all indirectly-heated valves.

Then the wave-change switch can be rotated to the medium-wave position and the two tuning condensers rotated until the “local” station is heard.

Having found the correct tuning setting the variable-mu control knob can then be rotated so as to adjust the volume to suit the needs of the moment.

Incidentally the flexible lead going to theappings on the pentode output choke should be tried on the differential tapping terminals because the output matching will depend upon the type of loudspeaker used.

A. J. R.

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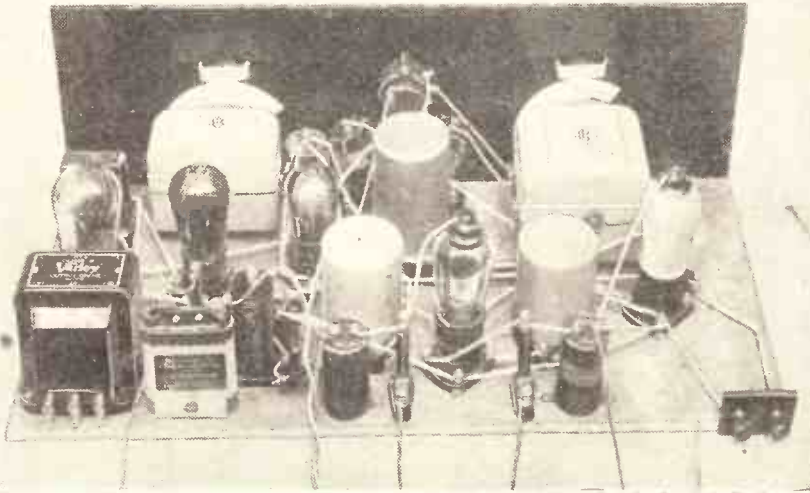
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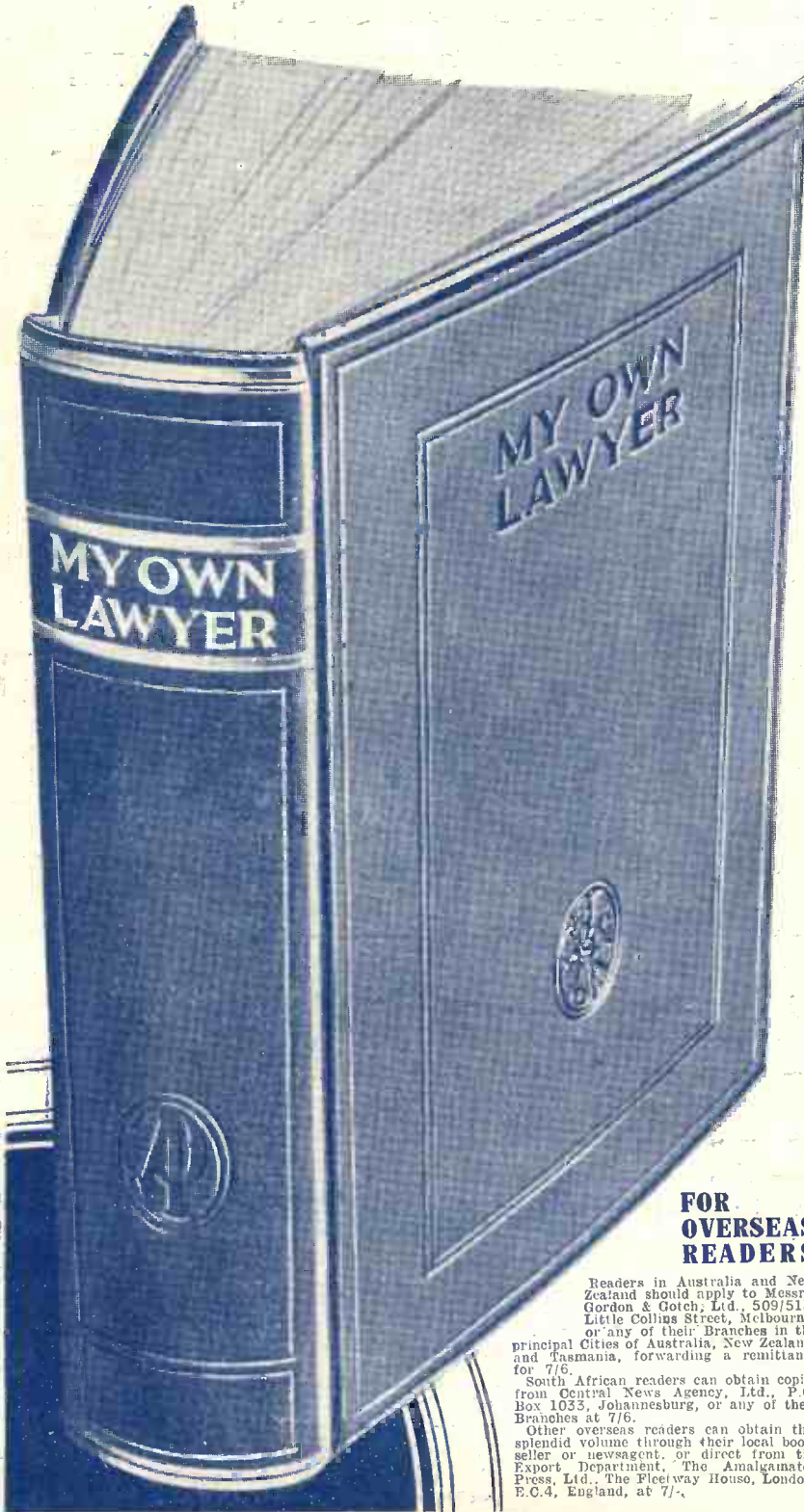
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1933.

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P.W. 20/5/33



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 Chief of Research Department: K. D. ROGERS.



**HISTORICAL REVIEW**  
**WATCH IT!**  
**COUPLE OF SOLDIERS**  
**'PHONING INDIA**

# RADIO NOTES & NEWS

**(H)ALL WRONG!**  
**WELSH COILS**  
**A PROBLEM**  
**RADIO AND DOLES**

The P.R.S. and the B.B.C.  
**T**HE Performing Right Society, which recently won a case to establish that music copyrighted by its members may not without a licence be broadcast by means of a radio receiver or gramophone, announces that it has licensed the B.B.C. for a period of four years. The terms of payment are calculated in accordance with the number of extant listeners' licences, but, adds the P.R.S., "the payment is no longer limited to 5% of the B.B.C.'s share of the revenue." My italics!

My Ancient History.  
**I** AM informed that my "historical" review has been diverted for publication in "Modern Wireless." When it appears I will let you know.

By the way, this month's "M.W." contains articles on the "Ferro" Three, the closest approach to superhet advantages ever achieved with straight circuits, and the "Dio-Q," by Mr. K. D. Rogers, which features Triode Q.P.P. and Diode Rectification. The issue contains also, *inter alia*, Mark Hambourg's "Thoughts about broadcasting." The "How to obtain better radio" feature is continued because the Editor dare not stop so popular a series yet.

New West Regional.  
**T**HE new West Regional at Washford Cross, near Watchet, Somerset, is about complete, and has been testing. It is to replace the existing Swansea and Cardiff stations.

The National programme will eventually be sent out on 261.6 metres, but the Regional station's wavelength will be 309.9 metres. Look out for interference between this and the Northern National on 301.5 metres unless your set is fairly selective.

Britain and Short Waves.  
**T**HE secretary of the Leicester Experimental Short-Wave Society, Mr. S. H. Whitley, 69, Wilberforce Road, Leicester, has something to say about the growth of foreign S.W. bodies in this country.

Well, I have more than once asked why Great Britain could not lead in this activity as it does in so many others. If no one sends me information about British efforts

I cannot evolve it from my inner consciousness, can I?

Very good! As a beginning, let twelve thousand British short-wavers write to Mr. Whitley, and may the good work go forward.

**FACTS.**

"Popular Wireless" will shortly celebrate its eleventh birthday. Born some six months before the first B.B.C. station was "on the air," "P.W." has maintained its premier position as the leading weekly wireless paper for those interested in all aspects and phases of the great hobby of radio. This is no idle boast, but a statement based on FACTS. For example, in the past few weeks this journal has exclusively described for the benefit of its readers:

- (1) The First "Class B" Set.
- (2) The First Home - Constructor Automatic Radiogram.
- (3) The First Multi-Mu Pentode Set.
- (4) The First "Class B" Portable.
- (5) The First Triode "Class B" Set.
- (6) The First Double-Diode Triode-Set.
- (7) and, as recently as last week,

**THE FIRST DESCRIPTION OF AN ALL-METAL-VALVE SET**  
**"THE CATKIN THREE."**

If you want your friends to enjoy the first reliable News of any development in radio, the first details of the latest Designs, and, in short, real reader service, then tell them about Britain's leading radio weekly—

**"POPULAR WIRELESS."**

"P.W." Will Be There.

**I** AM planning a great expedition for a part of my holidays this year. Tramping, of course.

I need some gruelling exercise in order to reduce the Tallis tallow which accumulates round the circumference during the winter. And I am going to take a copy of "P.W." to an unique point of the British Isles and leave it there, well and truly

affixed, till time or some vandal shall remove it.

The precise point must remain my secret until the deed is done and the photograph taken; we don't want any competitors forestalling us. Yours truly, Böswell Whymper. There!—anybody sharp enough to read the clue?

Soldiers Two.  
**I** HAVE done my 1933 good deed. It consists of making one exiled British soldier want to get into touch with another, on the subject of radio. See how beneficent is the influence of "P.W." The name and address desired by A. B. W. (Peshawar) is Private R. Philbrick (6137690), 1st Batt. E. Surrey Regt., Napier Barracks, Lahore Cantonment. (By the way, A. E. W. wrote to Mr. Carter for a "Radio Amateur Call Book," but got no reply. Did he send the rupees?)

Victor of Jutland.  
**P**OSSIBLY your first—and last—chance of hearing Lord Jellicoe speak will occur on May 24th, when he is to broadcast a message on Empire Day in the National morning programme. Lord Jellicoe is the Nelson of our day, and I hope that everyone who has kiddies will contrive to let them hear the voice of this historic figure. Speeches by Mr. J. H. Thomas and the Archbishop of Canterbury will be broadcast in the evening.

Empire on the Telephone.  
**W**ITH the opening on May 1st of the radiotelephone service between this country and India, the main lines of Empire telephone communication are complete, for you can now telephone to India, Australia, S. Africa and Canada for £2 a minute.

This system and that of the Empire broadcasting should together help greatly in linking our great Commonwealth mentally and spiritually—not to mention commercially.

Poor Henry.  
**O**NE of Henry Hall's admirers has smitten him to the quick by writing a letter of congratulation which constitutes the finest example of the left-  
 (Continued on next page.)

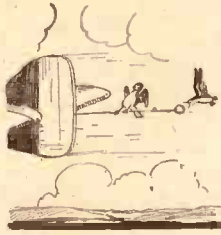
# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

handed compliment that I have seen for a long time. A lady—of course.

She writes, "We always feel that you were meant for a much better career than to conduct a dance band and we hope in time to see your name attached to something far more musical." To borrow a phrase from our domestic help—"She ain't got much tack."

## A New Air Wireless Idea.

**A**N invention for eliminating interference with aircraft radio by an aeroplane's own engine has been made by C. F. Jenkins of Washington.



As a rule an aeroplane's aerial is suspended under it as vertically as possible, or fastened along the leading edge of the wings. Mr. Jenkins has discovered that a radiation-free zone exists aft of the plane, and so he holds the antenna axially in this zone by letting it fly aft from the tail, a celluloid ball being attached to its end, so as to keep it horizontally taut.

The aerial in this position is said not to pick up radiation from the engine ignition.

## Jubbo Begins to Explain.

**J**UBBO or Tubbs or Fubbs his name is, according to how you decipher it. Well, Jubbs, etc., has made a quick come-back to my note of May 6th. He explains that his name is not Tubbs but—dear, dear! it really does look like Jubbo.

He explains further that his complaint is about the loudspeaker, the dog, toolbag and piano-tuner being merely side-issues. He thought that I seemed to be of a judgmental mind and so wrote to state his case. Even this second letter omits the Case! But one lives in hope.

## Components in Celtic.

**H**AZARDING a guess at the meaning of a published letter in Welsh—I trust that it is not too great a hazard—I gather that it is suggested that the following words should be added to that language. Gwerchyr (valve) sounds like our old friend "Gur-cha." Torch anogdorch (coil)—what a coil about a mere coil. Allres (battery)—almost English. Gorwasg (high tension). Trosvrdd (panel). Wybrell (aerial). Gwasgrewidydd (transformer)—no doubt about the transformation! Anogaeth (inductance). Now what about the Welsh for "sideband splash" and "Q.P.P.?"



## Great Reception Feat.

**H**AVE you heard anything of the test transmissions of the new "Radio Excelsior" broadcasting station at Buenos Aires which has just been completed? If you have, then I congratulate

you, for the station works on 361 metres with a power of 20 kilowatts.

In order to stimulate your competitive sense I may say that these test transmissions were received clearly by Marconi engineers at Chelmsford, Essex, in some instances on a frame aerial. "Radio Excelsior" has one of the world's highest broadcasting aeriels, namely, 700 feet.

## My Acoustic Problem.

**W**S. H. (Stroud), for whose nice letter I thank him nicely, is firmly of opinion that the humming of telegraph wires is caused by a current of air across them making them vibrate at their natural frequency.

Either the air currents make the wires vibrate or they do not, according to their strength. Hence even a varying wind, if it is strong enough, cannot do other than make the wires vibrate at their natural frequency, which is, of course, unvaried; and so the hum is of unvarying pitch.

My sole remaining query is, Why does the strength of the hum remain apparently

## SHORT WAVES.

From a newspaper: "Commander Lord Louis Mountbatten is appointed to Queen Elizabeth as Fleet Wireless Telegraph Officer."

S-sh! Whitehall doesn't know she's dead yet.—"Pictorial Weekly."

To keep his wife quiet, a man recently bought her a wireless set. But now she is so absorbed in it that he has to get his own dinner.

Television is said to have been so greatly developed that soon people sitting in a theatre will be able to watch a distant cricket match.

The advantage of the distractions offered by the stage will be appreciated when rain stops play.—"Punch."

## BIRTHDAY "DATES."

We understand there is no truth in the rumour that the B.B.C. are terminating the Children's Hour birthday greetings at the end of the year because whenever they broadcast a request for birthday dates, they receive several thousand small and sticky parcels of fruit.

constant, when it is a dollar to a dime that the strength of the air currents is varying?

## Flourishing Society.

**I** AM glad to observe that the Croydon Wireless and Physical Society still flourishes. I wonder how old it is? It seems that I have been referring to it, on and off, for years.

However, even the healthiest society likes new blood and more members, so Croydon and district readers should drop in on one of the Society's meetings and see how things are done. Mr. H. T. P. Gee (Hon. Sec.), 51-52, Chancery Lane, London, W.C.2, will be pleased to give you details.

## Short But Sweet Replies.

**T**N. (Norwich).—There is no mystery-mongering about Ariel's anonymity on our part. It is you fellows who weave the romances. Put it down to policy, for reasons which are not of public interest.

A. N. L. (Droitwich).—Sorry, but you have lost your wager. Marconi's mother was an Irishwoman. L. T. (B'ham).—It's

all in the books, dear lad. Can't you dig it out for yourself—same as me? You can't go far wrong if you get Fleming's book on radio. S. F. C. (Chester).—*Nil desperandum*. You can become a first-class radio fan without even knowing how to spell inductance—let alone understand it.

## Dutch Dolers.

**A** DUTCH doler is a Dutchman on the dole. It is reported that the Schoonhaven Council (Holland) has decided that no unemployed person may subscribe to a radio relay service or may acquire a wireless set without incurring the loss of unemployment benefit.

Luckily, the council does not forbid its dolers to acquire food for the body. But I remember—"Man does not live by bread alone." Useless to preserve the body and yet allow the mind to atrophy—and S. P. B. Mais would agree with me.



## Radio for Air-Taxis.

**M**AY 1st saw the opening of an air-taxi service, operated by Airwork, Ltd., from the air-port at Barton Moss, Manchester. The "last word" in everything, the first machine has, of course, a radio telegraph and telephone set aboard, which derives its power from a wind-driven generator mounted in the slipstream from the propeller.

All this we accept with scarcely a lift of the eyebrows, yet twenty years ago it would have been deemed a mad dream.

## The Latest in Hardware.

**F**ROM time to time I have chronicled for your delectation and information news of sets which, though having passed through tempest, earthquake, elephant stampedes, etc., have worked as well as (if not better than) they did when they first emerged from the test-room.

Now a well-known firm of set makers states that one of its sets was blown out of a house and halfway down the street by that Mitcham explosion, and although sadly damaged, nevertheless worked perfectly afterwards. I must order one of those against the time when my kid son next comes home from school.



## Better Luck This Time.

**B**EST wishes to Mr. Malcolm Frost, who has started again on his ambassadorial trip in the Empire after having had to return from his previous one owing to an attack of malaria. He is now going to Australasia, Ceylon and India—where I hope he will have success commensurate with the efforts he has made to get there.

In Ceylon and India he'd better take five grains of quinine daily. **ARIEL.**

# The "L.B." FOUR

DESIGNED and DESCRIBED  
By the "P.W." RESEARCH DEPARTMENT.  
THE FIRST LOW-BIAS VARIABLE-MU SET!

ONCE again POPULAR WIRELESS is first. This time it is in the use of two new battery valves, the Mullard "Class B" (P.M.2B.) and the new short grid base variable-mu screened-grid amplifier (P.M.12M.).

"Class B" amplification has rapidly become popular among home constructors and commercial-set makers alike, and one of the several attractions that it holds is the fact that very low voltages of grid bias are required. These are for the various "driver" valves only, for the "Class B" valves so far available need no bias.

### The Difficulty Solved.

Four-and-a-half volts is a most convenient bias to apply, for it can be obtained either from a small tapped battery, or from an ordinary flash-lamp battery. And that is the bias normally required by a "Class B" set, so far as the L.F. side is concerned.

The snag normally arises when we decide to use a variable-mu screened-grid stage, for here very much more than that figure is required by the various valves now on the market. If only these could be induced to give sufficient volume control with the same bias as is used with the "Class B" stage!

How often have you (and we too) uttered that wish?

It need not be only a wish much longer, for in a very short time the Mullard P.M.12M. variable-mu valve

Always in the forefront of progress, "P.W." this week presents a four-valve design embodying an entirely new type of variable-mu screened-grid valve. By virtue of this remarkable development in valve technique, the full power of the "Class B" stage can be completely controlled—from a whisper up to nearly 2 watts—with a grid-bias battery only about one quarter of the size normally required by variable-mu sets. A mere 4½ volts fulfils the grid-bias requirements of this up-to-the-minute receiver.

will be available, and this solves the trouble which has been worrying us all.

The P.M.12M. is a valve with a high mutual conductance, but a conveniently short grid base, resulting in a beautifully rapid control of volume as the bias on the grid is increased from zero to just a few volts. At 6 volts the valve pretty well "cuts off," but for all ordinary purposes 4½ volts provides ample control of volume.

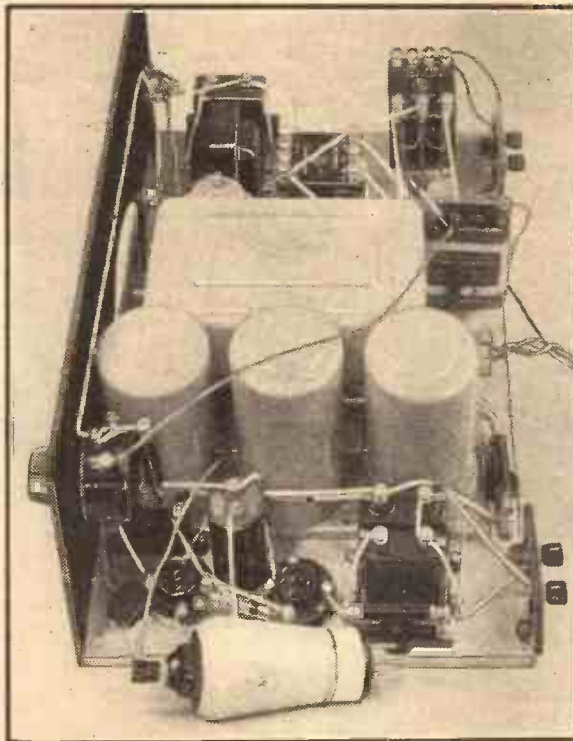
In certain cases where the valve is used very near to the local station it may be necessary to use 6 volts for biasing, but, as will be seen from this description of the "L.B." Four (Low-bias Four), the first set to use the new valve, this is an unlikely need, for a wide range of control is provided by the normal 4½-volt battery used in the "Class B" stage of the set.

Simple Construction.

The "L.B." Four is designed specially to take full advantage of the low bias requirements of the new valve, and is built in normal panel and baseboard style. It is particularly easy to construct owing to its carefully spaced layout.

The circuit comprises one stage of variable-mu H.F. amplification followed by the detector, "driver," and "Class B" valves. The aerial energy is fed to the variable-mu valve

(Continued on next page.)



THE NEWCOMER. Lying in the foreground is the completely new and highly efficient valve which has made this set possible.

## THE PARTS REQUIRED FOR THIS ENTIRELY NEW DESIGN

Component	Make used by Designer	Alternative makes of suitable specification recommended by designer.	Component.	Make used by Designer.	Alternative makes of suitable specification recommended by designer.
1 Panel, 16 in. x 7 in.	Goltone	Peto-Scott, Lissen	1 Screened H.F. choke	Bulgin H.F.10	Goltone, Wearite, Graham Farish HMS
1 Baseboard and loil, 16 in. x 10 in. deep	Peto-Scott	—	1 3-point push-pull switch	Bulgin S13	W.B. Lissen, Telsen, Wearite
1 Cabinet to fit above	Peto-Scott	Camco, Osborn, Lock	3-four-pin valve holders	Wearite	Benjamin, Telsen, Lissen
1 3-gang variable condenser, .0005-mfd. with disc drive	Radiophone (left-hand trimmers)	—	1 7-pin valve holder	Lissen	W.B., Benjamin
1 .0003-mfd. reaction condenser	Graham Farish	Polar, Lissen, Telsen	1 L.F. transformer	"Hypernik"	R.I., Telsen, Varley
1 2-mfd. fixed condenser	T.C.C. type 50	Dubilier, Telsen	1 "Class B" driver transformer	R.I. DY37	—
1 1-mfd. fixed condenser	Dubilier BB	T.C.C., Telsen, Lissen	1 "Class B" output choke	—	—
1 .25-mfd. fixed condenser	Dubilier BB	T.C.C., Telsen	1 Wandertuse	Belling & Lee	—
1 .05-mfd. fixed condenser	Dubilier 9200	—	2 Terminal blocks	Sovereign	—
1 .0003-mfd. fixed condenser	T.C.C. 34	Telsen, Dubilier, Lissen	4 Indicating terminals	Belling & Lee "R"	Goltone, Bulgin, Igranic, Chix
1 .0002-mfd. fixed condenser	Dubilier 665	T.C.C., Lissen, Telsen	6 Wander plugs	Goltone	Belling & Lee, Bulgin, Igranic
1 25,000-ohm potentiometer	Igranic	R.I., Lewcos, Varley	2 Accumulator tags	—	Belling & Lee, Elex
1 2-meg. grid leak, with wire ends or terminals	Goltone	Dubilier 1 watt, Graham Farish "Ohmite"	1 Twintap plug	Chix	—
1 100,000-ohm resistance with terminals	Graham Farish "Ohmite"	—	1 G.B. battery clip	Belling & Lee	—
1 20,000-ohm resistance, with horizontal holder	Graham Farish "Ohmite"	—	1 Anode connector	Bulgin No. 3	—
2 1,000-ohm resistances, with holder	Graham Farish "Ohmite"	—	4 yds. insulating sleeving	Belling & Lee	Wearite
1 3-gang coil assembly	Colvern K61, K62 and KGR	—	6 yds. 18-gauge tinned copper wire	Goltone	Wearite
			2 ft. screened sleeving	Goltone	Lewcos
			1 piece copper, 1½ in. x ½ in. x ½ in.	—	—

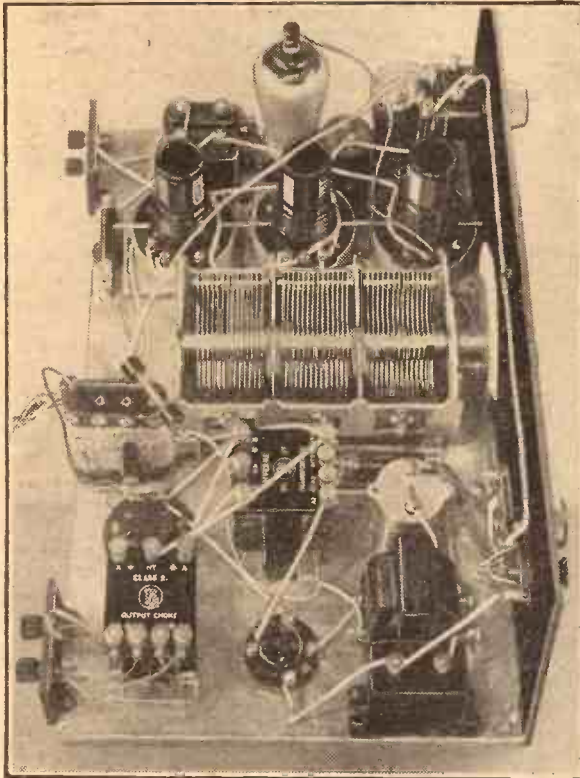
## THE "L.B." FOUR

(Continued from previous page.)

through a band-pass circuit, which is tuned with a ganged condenser, also linked to the tuned-anode circuit.

This arrangement is both sensitive and selective, the "K" type of Colvern coils being used throughout.

### "CLASS B" AS WELL!



The "Class B" valve also deserves special notice. The new P.M.2B, which is designed to operate in conjunction with a remarkably small "driver" valve, is employed, thereby materially reducing the H.T. current consumption. As will be seen from the circuit on the right, a band-pass filter is incorporated to achieve the high selectivity demanded by a sensitive receiver of this calibre.

Transformer coupling is used between the detector and the "driver" valve, this valve being coupled to the "Class B" through the special "driver" transformer.

This component is tapped to give different ratios, according to the requirements of the "driver" valve characteristics, and of those of the output valve. The output choke, too, is tapped, so that the "Class B" valve may be properly matched to the loudspeaker.

#### Power Output.

This is a most essential feature, for upon the suitability of the transformers depends the efficiency and quality of the L.F. side of the set.

Power output, too, is dependent on the transformer and choke matching, and we have here catered for a maximum "peak" power output of round about 2,000 milliwatts. This means that in normal circumstances, when the broadcast programme is at an average level of strength, the output will be some 400-600 milliwatts, which is easily enough for all ordinary listening.

Maybe it does not seem a lot of power

when it is written in plain figures, but it must be remembered that in every case where the maximum undistorted A.C. output of a valve is stated, the figure given is that attained on the heaviest broadcast modulation—i.e. about 80 per cent.

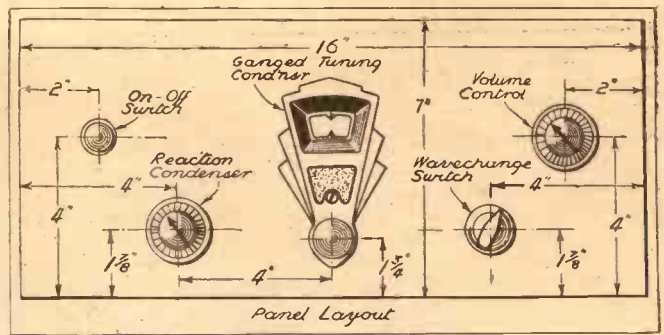
It may be reached fairly often when brass bands are operating—for the greatest modulation peaks come from the transients of the percussion and brass instruments, but as a general rule the modulation will not go much above 50-60 per cent, with an average of some 30 per cent. Thus, of 2,000 milliwatts possible "peak" output, we shall be using about 400-600 most of the time.

This state of affairs is important, for the power is taken from the H.T. battery, and if we were to use a fairly constant 2,000 milliwatts it would not only sound uncomfortably loud, but would also entail a very heavy drain on the anode battery.

Low Consumption. With the valve working at fairly high efficiency, as is the case with the "Class B" type, the anode current required for 400-600 milliwatts is not very much, while taking into consideration intervals and periods of time when speech is received, the average drain on the H.T. battery is remarkably small.

#### Low Consumption.

In the "L.B." Four a further point needs examination, for with the Mullard



Here are all the dimensions you will need for drilling the panel.

"Class B" valve—P.M.2B.—It is possible to use quite a small "driver" valve.

The "driver" stage of "Class B" amplification can run away with quite a considerable anode current, for it is not unusual to employ a small power valve as "driver," although it is normally biased as heavily as circumstances permit without the power output being seriously impaired.

With the P.M.2B. it is possible to use the P.M.2D.X. as a "driver," with the result that the anode current taken by this stage is a matter of a mere one or two milliamps. This is a most important feature in a set in which battery economy is being practised as far as is feasible.

#### Concerning Construction.

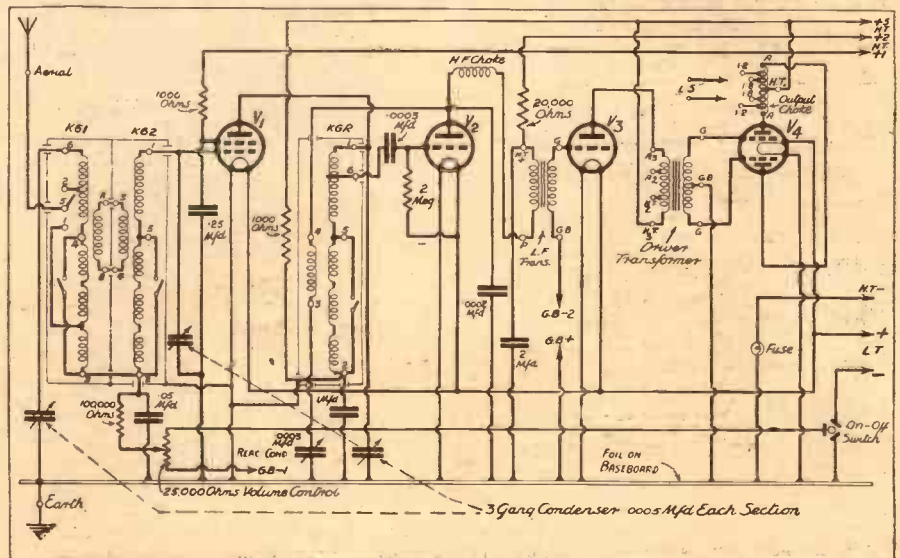
The total anode current of the set when no broadcasting is being received is well under 10 milliamps, and the average operating current works out at about 12-13 milliamps—well within the scope of a super-capacity battery.

There are one or two small points concerning the construction that ought to be brought out. The first is the need for a three-point on-off switch instead of the more usual two-point.

The 4.5-volt bias battery not only supplies the "driver" valve, but is connected across the potentiometer of the variable-mu valve, allowing volume control to be carried out with the bias battery potentiometer. This connection will cause a very small current to flow from the battery through the potentiometer, and this flow

(Continued on next page.)

### PLENTY OF VOLUME PERFECTLY CONTROLLED



## THE "L.B." FOUR

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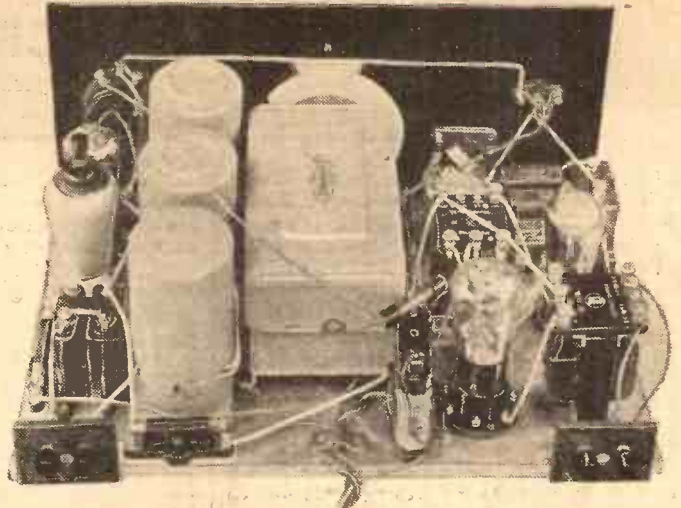
will take place day and night, whether the set is on or not, unless the circuit between the bias battery and the potentiometer is broken when the set is not in use.

To ensure this we use a three-point on-off switch, which not only breaks the L.T.

sunk into the moulding. Occasionally, however, one is found whose screw-heads are not sunk sufficiently to prevent contact with the metal foil on the baseboard.

Such contact, of course, constitutes a short circuit of the holder, and to ob-

## A WELL-BALANCED DESIGN



A general view of the receiver showing a carefully planned layout.

## VALVES FOR THE "L.B." FOUR

Make.	S.G.	Det.	L.F.	Class B.
Mullard	P.M.12M.	P.M.1H.L.	P.M.2D.X.	P.M.2B.
Cossor	—	210H.L.	210L.F.	240.B.
Mazda	—	H.L.2	L.2	—
Osram	—	H.L.2	L.P.2	—
Marconi	—	H.L.2	L.P.2	—
Hivac	—	H.210	L.210	—
Eta	—	B.Y.1815	—	—
Lissen	—	H.L.2	L.2	—

circuit when pushed in, but also that between the bias battery and the potentiometer.

A second point to be watched is the mounting of the horizontal resistance holders on the metal foil covering the baseboard. The terminal screws of these holders have the screwheads underneath,

viate this we always place a strip of thin card (postcard will do admirably) between the holder and the foil.

### Voltagcs Required.

When the "L.B." Four has been built, it has to be trimmed before it is ready for everyday use. Aerial, earth and loud-

speaker are connected, and the valves are placed in position: P.M.12M. in  $V_1$ , P.M.1H.L. in  $V_2$ , P.M.2D.X. in  $V_3$  and the P.M.2B. in  $V_4$ .

For H.T. we need 120 volts for H.T. + 3, and 75-80 volts for H.T. + 1, and about 60-80 for the detector (H.T. + 2). For bias give 3 volts for G.B.—2 and 4.5 volts for G.B.—1. A "wander fuse" in the negative H.T. lead is used to protect the valves and H.T. battery from any inadvertent short or wrong connection in the set.

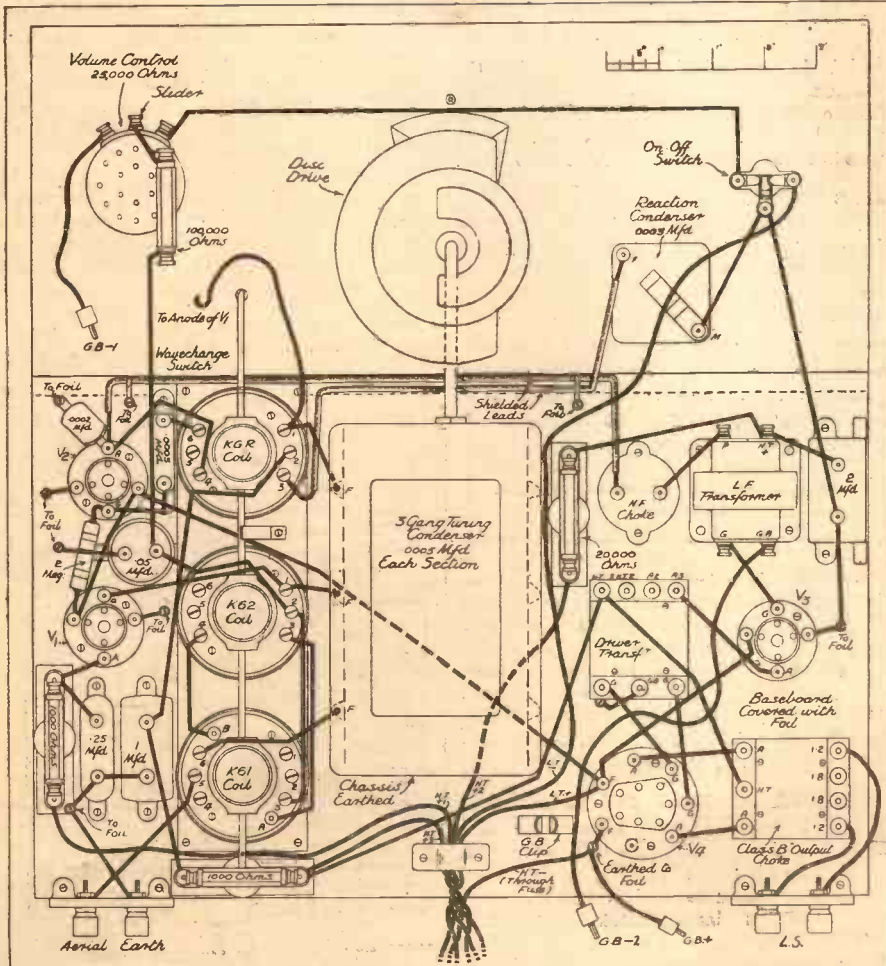
On switching on, turn the volume control hard on to the right (clockwise), and see that the reaction is well over to the left (off). Now try to tune in a medium-wave station between 0 and 30 on the tuning scale. (Note: as there are no wavelength markings on the Colvern coils, it is of value to note that the medium-band position of the wave-change switch is that in which the flat on the wave-change rod is horizontal).

### Adjusting the Trimmers.

When the station has been tuned in the volume control should be "decreased" until the transmission is just comfortably audible. The trimmers on the condenser should previously have been slacked off, and now, one at a time, they are adjusted to give maximum volume, it being borne in mind that the best trimming is that which allows accurate tuning with the trimmers slacked off as far as possible. That is, with the minimum added capacity applied by the trimmers.

With the trimming done (and it should be carried out slowly, by the way) the set is then ready for operation.

## HOW THE WIRING IS ARRANGED



Note the simplicity of the wiring in this completely modern design. The placing of the components is such that all vital leads are short and easily accessible to ensure maximum efficiency and ease of construction.

## RECOMMENDED ACCESSORIES

**LOUDSPEAKER.**—R & A. B.T.-H., Osmond, Celestion, Marconiphone, H.M.V., Epoch, Clarke's Atlas, Rola, Amplion.  
**BATTERIES.**—H.T., 120 volts. Ediswan, Drydex, Pertrix, Lissen, Magnet, Marconiphone, Silver Knight, Ever Ready, Siemens.  
 G.B., 4.5 volts. Siemens, Ediswan, Pertrix, Lissen, Drydex, Ever Ready.  
 L.T., 2 volts. Oldham, Ever Ready, Ediswan, Pertrix, Lissen, G.F.C. Block.  
**AERIAL AND EARTH EQUIPMENT.**—Coltone "Akrite," Electron "Superial," Graham Farish "Filt" earthing device.

THE MIRROR OF THE B.B.C.

By O.H.M.

# CONTROL BOARD SCRAPPED

Relays from Canterbury—Royal Musician—Recorded Opera—A Fine Record—Links with the Colonies.

THE Control Board has gone. Under the new scheme of things at Broadcasting House its work has become redundant, and the Director-General has accordingly decreed that it shall cease to exist.

The Control Board was formed in the very early days of the B.B.C., and since then has met every week to discuss special points of policy, difficulties internal and external, and, in fact, all the major issues of broadcasting in Great Britain. At first, only a few of the highest officials were on the Control Board, but of late it has grown unwieldy owing to the presence of the heads of practically every department, and Sir John Reith feared that the once-useful Control Board would get out of hand and create new difficulties instead of smoothing out old ones.

With characteristic decisiveness, therefore, he scrapped the whole system.

From Canterbury Cathedral.

Two relays, one for Regional listeners on Wednesday, June 7th, and the other for National listeners on the following day, will be taken from the Festival of Music and Drama in Canterbury Cathedral, on both of which occasions Dr. Adrian Boult will conduct Section F of the B.B.C. Orchestra, led by Arthur Catterall.

The Regional relay will consist of a Serenade performance, and the National relay of an Orchestral concert.

Henry VIII—Composer!

A suite for small orchestra composed by King Henry VIII, which has been arranged from ancient records by Robert Barclay Wilson, will be in a concert to be conducted by Mr. Joseph Lewis on Friday, June 9th.

Mr. Lewis and Dr. Adrian Boult have been invited to conduct the Three Valleys Festival in place of Dr. Malcolm Sargent, at Mountain Ash on May 18th, 19th and 20th. Dr. Sargent has conducted the Festival since its inauguration, but his recent illness will prevent him doing so this year.

Details of the Festival and of the two relays to be taken from it for West Regional listeners on Thursday and Friday, May 18th

## G. B. S.'s FILM TALK



Taken at San Francisco during his world tour, this photo shows Mr. Bernard Shaw speaking into the talkie microphone.

and 19th, respectively, have been given in previous issues. Seven choirs will take part in the Festival, and it would be difficult to find a better deputy than Mr. Lewis, who has had great experience in choral work.

Songs from the Talkies.

A special programme of theme songs from famous "talkies" is being arranged for performance by the B.B.C. Dance Orchestra on Saturday, May 27th. No broadcast dance band is more deservedly popular

with listeners than Henry Hall's "boys," who can be relied upon to give their usual type of snappy programme.

Opera by Gramophone.

The first broadcast of an opera by gramophone records will be heard on Friday, June 9th, when, between 1.45 and 3 p.m. the H.M.V. version of "I Pagliacci" will be given with Adelaide Saraceni, Alessandro Valente, Apollo Granforte, Leonildo Basil, and the chorus and orchestra of the Scala at Milan.

Bournemouth Veterans.

Forty years of unbroken service under that famous musician, Sir Dan Godfrey, will be completed by the Bournemouth Municipal Orchestra on Sunday, May 21st, and the occasion will be marked by a special anniversary concert in which the orchestra will be assisted by the Bournemouth Military Band.

It is, of course, only as it should be that such an important concert should be broadcast, especially as the singer will be the veteran Ben Davies, who first sang for Sir Dan in 1893, and that the programme will include "The Festival March from Tannhauser," the first piece played by the orchestra on May 22nd of the same year. A total of approximately thirty thousand concerts in forty years is indeed a wonderful achievement, notwithstanding the fact that the orchestra has only a fortnight's holiday each year.

Of this total about two thousand six hundred have been symphony concerts, at which six hundred performances have been given to the symphonies of Beethoven and three hundred to the symphonies of Brahms. Bournemouth should be proud of its fine municipal orchestra.

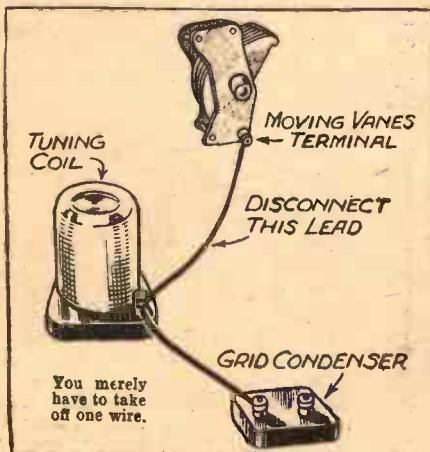
Links With Overseas.

Links which maintain friendship between people living in different parts of the world are many and varied, but few are so intimate as that established by Miss Agnes Stops, of Northampton, who as a traveller to all parts of the Empire has personally delivered

(Continued on page 346.)

### GETTING A BIT LOWER.

THE weather forecasts sent out from the A.A. station at Heston for airmen are of interest also to other listeners. But as the wavelength employed is right at the bottom of the long-wave band there are many sets that will not go low enough to bring them in.



### TWO TUNING TIPS

What to do if you can't quite get those weather reports, and how to arrange a simple indicator for dial readings.

Actually their tuning is not critical, so that it is possible to hear them so long as the set is tuned somewhere in the neighbourhood of their frequency. So if you cannot quite get down to them you may find disconnecting the variable tuning condensers will do the trick, because of the removal from across the coil of their minimum capacity.

#### SCREWS AS DIAL INDICATORS.

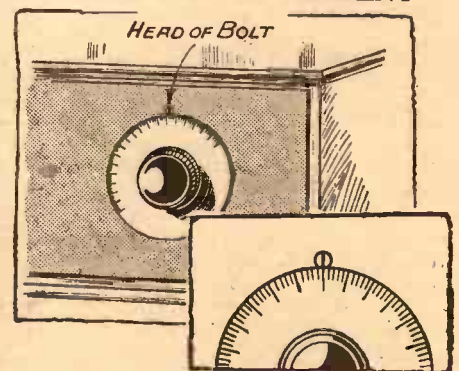
MANY are the ideas abroad for dial indicators, but the following one may claim simplicity if nothing else. It is for the plain type of tuning dial, and consists of a large-headed countersunk bolt and nut.

The head is arranged to come so that it is just overlapped by the edge of the dial,

and the cut in it is arranged vertically. The nut on the back of the panel finishes the job.

In cases where it is not possible to get the dial to fit really close to the panel, a cheese-headed bolt could be used, so that its head would fill the gap between dial and panel.

#### FITTED IN A MOMENT



The saw cut in the bolt is, of course, arranged vertically.



# Listen to 'P.W.'s' CRYSTAL PALACE TESTS

LAST summer may be said to have marked the commencement of real activity, on the part of numerous amateur transmitters in this country, on the 5-metre band of wavelengths, one of those officially allotted for amateur use.

### Quasi-Optical Wave.

This 5-metre band is absolutely different in its properties from any of the other bands on which the amateur transmitter works, in that it is not a band for "DX" work. Remember that long-

distance work is only made possible by the fact that the reflected ray from the transmitter reaches the distant receiver after having passed up through the stratosphere, onwards until it has reached the reflecting "layer."

Only in this way can wireless waves travel round the curved surface of the earth, for the "ground wave" is absorbed

at shorter and shorter distances as the wavelength is dropped. The "direct ray" is limited in its range simply by the earth's curvature.

All this can be—and is—said in another way by calling 5 metres a "quasi-optical" wave. Evidence has shown that 5-metre waves do behave in a manner approximating to that of light waves.

Now when we want to see a little farther than it is possible to see by standing on a brick, what do we do? Generally speaking, we stand on two bricks! Following this there are the expedients of a stepladder, and a flagstaff, and anything else that will give us a greater range of vision.

The higher we go, the farther away does the horizon recede. For this reason, a high location is most desirable if a long range for 5-metre radio waves is required.

### An Unofficial Record.

Throughout last summer, British "hams" took out portable receivers and transmitters into the hills of counties like Surrey and Sussex, and found, as one would expect, that the ranges they covered were substantially greater than they could ever hope to obtain from their "home" station with the attendant screening.

The record (and an unofficial one at that) stands at present at about

50 or 60 miles, for two-way communication in this country. In the U.S.A., by using mountains, fire-towers, and aeroplanes, they have reached figures well ahead of that. I believe about 170 miles have been covered over there in 'plane-to-ground communication, for the pilot of a 'plane equipped with a 5-metre transmitter can naturally talk to most of the country that is visible to him.

This year, the Research Staff of "P.W." in conjunction with several interested

vantage point for these preliminary tests, and I have been asked by those concerned (including myself!) to invite all readers of "P.W." who can receive on 5-metres to be on the look-out during the whole of the day.

### Co-operating With "P.W."

The receiver to be used "up aloft" is my own, as described in "Modern Wireless" last September, and on another page you will find a few details about the construction of a similar set.

The transmitter will probably be that of Mr. A. D. Gay (G 6 NF), although the call-sign to be used is G 6 Q B—the property of Mr. L. H. Thomas, already known to "P.W." readers.

Among others co-operating with us in these tests are Mr. P. Johnson (G 5 IS), who will probably take out a portable receiver and transmitter in a car, Mr.

H. D. Preece (G 6 H P) and Mr. A. E. Wood (G 5 A W).

It is safe to say that practically every amateur in the country who has a 5-metre receiver will, at any rate, be on the look-out on May 21st.

### Continuous Transmissions.

Those of you who are familiar with the Crystal Palace towers will know what a vast mass of metal they contain. For this reason it is feared that a certain amount of screening and absorption will be unavoidable.

In case this should prove serious, we are going to work with an aerial directed northwards from 10 a.m. till 2 p.m., after which we will pack up and go round to the south side.

Transmission will be almost continuous, and mostly on telephony. In the intervals, however, there will probably be some continuous or interrupted musical note for identification purposes.

Since we particularly want to know how the signals are being received, we want everyone who hears G 6 Q B (or any of the other stations co-operating) to send in a report. A detailed analysis of these reports—giving special credit to any outstanding performances—will be published as soon as they have been examined. Please mark them "5-metre tests, c/o the Editor, 'P.W.'"

Commencing at 10 a.m. on Sunday next, "Popular Wireless," in co-operation with a group of enthusiastic short-wave experimenters, is radiating a special series of 5-metre transmissions from the Crystal Palace, London. Every "P.W." reader who resides within a reasonable distance is invited to assist us in these important and interesting experiments, for which special permission of the P.M.G. has been obtained.

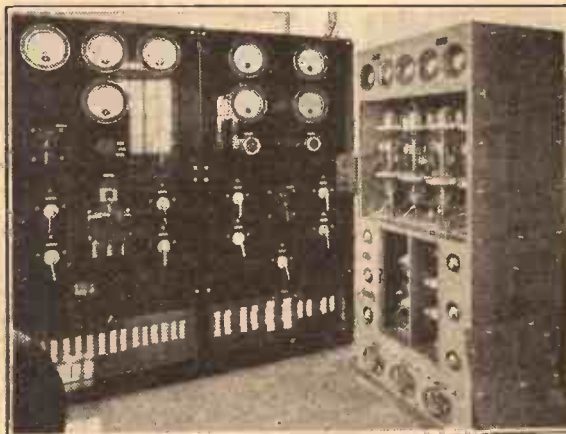
Five-metre technique represents almost unexplored territory full of revolutionary possibilities and an indication of the potentialities of our investigation is afforded by the nation-wide publicity which it is already receiving.

You will find full official details in this article by W. L. S., "P.W.'s" famous short-wave expert who is, of course, playing no mean part in our tests!

amateur transmitters, are endeavouring to "open the ball" by rigging up a 5-metre transmitter and receiver on the North Tower of the Crystal Palace, S.E.19.

The tests take place on Sunday next, May 21st, and if the results are at all encouraging they will be repeated, it is hoped, later on. Thanks to the kindness and interest of the General Manager of the Crystal Palace, Sir Henry Buckland, it has been possible to utilise this excellent

## THE B.B.C.'S ULTRA SHORT-WAVER



Engineers of the B.B.C. are closely investigating the possibilities of broadcasting on the very low wavelengths, and this is the power switchboard and modulator unit employed to radiate from the top of Broadcasting House.

# HOW TO BUILD A 5 METRE RECEIVER

## FOR THE "P.W." CRYSTAL PALACE TESTS

Read about this easily-made receiver, and then get in on the latest broadcasting development—ultra-short waves!

ELSEWHERE in this issue of "P.W." you will read of some interesting 5-metre experiments that are taking place on May 21st, Sunday next. Unfortunately it has not been possible to give a greater amount of warning than these few days, owing to the fact that, although the experiment has been planned in every detail for some months, the date itself had to be fixed somewhat hurriedly.

### "A Perfect Circuit."

Fortunately, however, the construction of a 5-metre receiver is a very simple business to anyone who has had any experience of building and operating short-wave receivers. Those of us who are concerned in next Sunday's experiment very much hope that we shall find, among "P.W.'s" readers, a few, at least, who will be enthusiastic enough to make a somewhat hurried entry into the 5-metre field and listen on Sunday.

The receiver illustrated and shown in schematic form on this page is the actual

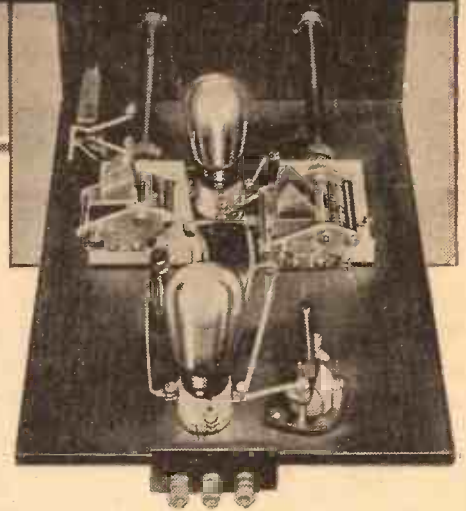
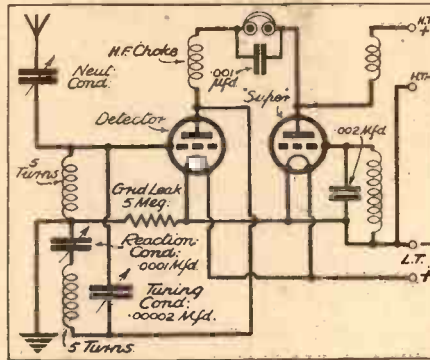
By a member of the  
"P.W." RESEARCH DEPARTMENT.

receiver that will go "up aloft" for the tests. It is also the same receiver that was on the "P.W." stand at Olympia last year, and was fully described in "Modern Wireless," September, 1932.

I am not suggesting that anyone should make an exact copy of this set, but the circuit is probably the most suitable that one could imagine, and it has given consistently good results.

Now if I breathe the word "super-regenerative," I don't want anyone to come

## CERTAINLY SIMPLE!



The complete 5-metre receiver is shown above, whilst to the left are the circuit, and another back-of-panel view.

quite what it seems, gives the effect of broadening out the tuning.

Strangely enough, a signal that is needle-sharp on the detector only can be tuned-in easily without a slow-motion dial when the "super" is put into use.

As for "How?"—the super-regenerator is a second valve whose job it is to oscillate at a frequency of about 50 kc. (a wave of roughly 6,000 metres). This valve is wired up to the detector in such a way that it interrupts the detector's H.T. supply at this frequency (i.e. 50,000 times per second).

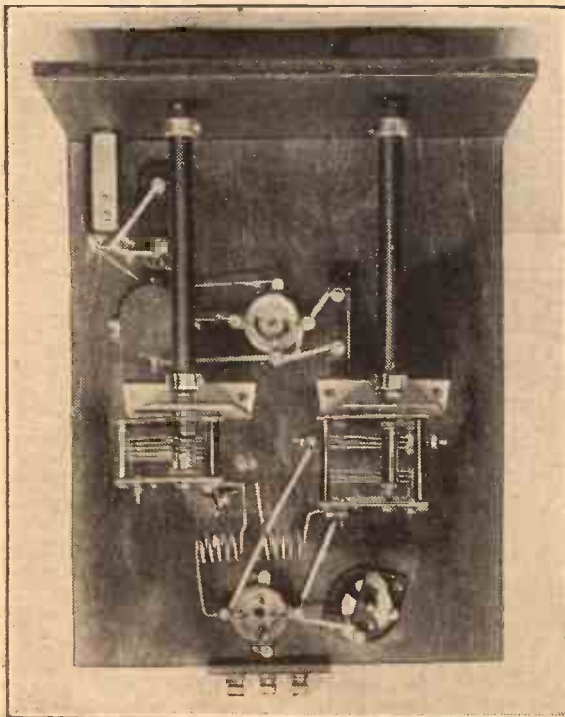
### Most Sensitive Condition.

We all know that a detector is most sensitive when it is just on the very edge of oscillation. Unfortunately, it is quite impossible to keep a detector working at that "sacred spot."

The nearest we have got to it, as yet, is to yank it backwards and forwards across that spot at the rate of 50,000 "yanks" per second! That is how our super works.

(Continued on page 346.)

## FOR FREQUENCIES OF SIXTY MILLIONS!



60,000,000 cycles per second is the frequency of a 5-metre transmission! So no wonder we require long extension handles for tuning, though otherwise the set is remarkably straightforward.

over giddy and turn over two pages at once. The "super" is a perfect little circuit for ultra short-wave work, and it gives no more trouble in operation than does a conventional "Det. and L.F. set." Let me explain the circuit.

The detector valve operates in a circuit of a type that is often used for short waves. It differs from the ordinary detector circuit only in two small details: First, that there is no grid condenser, and the leak is down at the filament end of the coil; and second, that the tuning condenser goes right from grid to plate, instead of across the grid half of the coil only.

### How and Why.

Now for the super. First of all, "Why?" Well, that is a long story, but suffice it to say that 5-metre signals aren't exactly strong with a normal set, and they're also very difficult to hold. The super-regenerator gives an enormous degree of amplification, and also, by a rather complicated process that isn't

## PARTS for 5-METRE RECEIVER

Component	Make Used
Panel, 6 in. x 10 in.	Goltons, or Peto Scott, Becol, etc.
Baseboard, 12 in. x 10 in.	—
1 .00002-mfd. tuning condenser	Cyldon "Series Gap"
1 .0001-mfd. reaction condenser	Cyldon
2 Ebonite extension rods, 6 in.	—
2 Plain 4-in. dials	—
2 Four-pin valve holders	Lissen
1 Neut. type baseboard condenser	Igranic
1 S.W. choke	Igranic
1 .001-mfd. fixed condenser	Dubilier 610
1 .002-mfd. fixed condenser	Dubilier 610
1 Jack and plug	Igranic P.65
1 5-meg. grid leak	Dub. 1 watt
Coils, S.W.	See text
Coils, L.W.	See text
3 terminals	Belling Lee
1 terminal strip	—
Wire, screws, flex, etc.	—

# ECKERSLEY EXPLAINS-



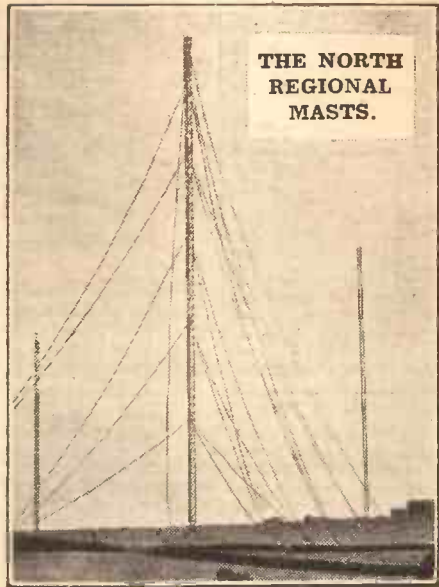
This week our Radio Consultant-in-Chief tackles a difficult subject in his usual lucid and go-ahead manner. He tells you why efficient inductances are desirable, in spite of the fact that the resistance of any coil can be reduced to zero by the application of reaction.

A. C. C., of Crouch End, writes: "I am rather puzzled about one or two points connected with reaction. As I understand it, reaction is capable of wiping out all the damping due to the resistance of the coil in a tuned circuit. If this is true, why should not a coil wound with No. 40 gauge D.S.C. be just as efficient as one with a winding of, say, No. 24 gauge?"

"If it is only a matter of applying a certain amount of reaction, then all coils are theoretically the same, and it seems unnecessary to wind them so that they have the lowest possible H.F. resistances. I feel that there is a snag in my reasoning, and perhaps you will explain it for me?"

This is a very intelligent question. People with textbooks are apt to take what textbooks say for gospel. I wonder what one ought to do when writing a textbook—put it very simply and leave a (wrong but nearly right) generalisation, or make reservations and perhaps muddle the reader.

I think it best to say, as a typical example, "Reaction—which ought to be called retroaction—involves the use of a valve to feed back impulses from its anode circuit into its grid circuit, which feed back



With the increasing power of broadcasters, reaction becomes less and less important, but, nevertheless, it must still be smoothly controlled to be effective.

has the effect of giving an apparent cancellation of the resistance of the coils.

"As the extent of the feed-back increases so the apparent resistance is further and further decreased until given a proper amount of feed-back the apparent resistance is zero. If the feed-back is still further increased then the resistance of the coils is negative, which is another way of saying that oscillation takes place. Now obviously the resistance cannot stay at zero."

### Effect of Coil Resistance.

I cannot go on in textbook style! Let's revert! Well, then, everything will be unstable just where the resistance is wondering whether to be positive, negative, or zero. One cannot—at least, I cannot—balance a pin on its end—the pin can fall all ways, the resistance can fall plus or minus.

Now, if the true positive resistance is big, this instability will be more marked. There is a "threshold" (good word) of oscillation which is bigger as the resistance of the coil (true) is greater.

You all of you must know the feeling of a good retroaction control in contrast to a bad one. You feel your way so easily up to the threshold—one foot in the copper coal-box forming the earth, afraid to move an eyebrow, but there just the same.

With a bad retroaction control—and this is often due to a too high resistance coil—you turn, the signal comes up and "plop!" you are in the soup and, like drawing a foot out of mud, how easy "in," how difficult "out"—what back-lash!

### The Technical Truth.

No! The point of a low-resistance coil is to give smooth retroaction. Moreover, it's a foolish design of set which relies too much on retroaction. No signals! No retroaction! is a bad slogan only permissible when economics dictate such a policy. And so, if your low-resistance coil helps you to do without intensive retroaction it has that value too.

Lastly, and after all that, there's another thing. Do I labour the argument if I talk about phase? All right, then, I won't.

But I am determined to tell the technical truth. In fact, the circuit by which the retroaction is obtained has a profound influence upon the "ploppiness." You have to get the phase of the feed-back to coincide with the phase of the signal. All right. That's all!

## TWISTED AERIAL AND EARTH LEADS

G. H. (London, N.16).—"I have been warned not to twist my aerial and earth leads together, but I prefer to do this for neatness' sake, because both wires have to pass through a room on the way to the set.

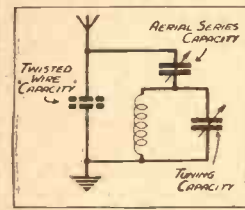
"How can twisting the leads together cause poor reception when they are both well insulated?"

Simply because they have a capacity effect. The vanes of a condenser are completely insulated, but they have a profound effect upon the performance of high-frequency circuits. If you will draw the twisted wires as a capacity you will see that my theoretical diagram gives you a possible effective electrical circuit caused by twisting the wires together.

Speaking broadly and neglecting the many spurious effects which might be introduced, a twisted wire capacity acts as a shunt to the signals and they pass straight to earth instead of going

through the set. If you did not have an aerial series capacity it would not matter so much, because the twisted capacity would be in parallel with the tuning capacity, but if that tuning capacity was ganged with other tuning capacities the twisted wire capacity would throw out the ganging.

On the other hand, if there was ganging it would be an essential of the circuit to have a small aerial series capacity so that the aerial capacity would not throw out the ganging of the first tuned circuit, and so you may say as a conclusion that the



twisted wire shunts the signals by capacity effects and militates against good reception.

P. P. E.

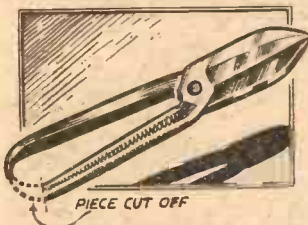
# RECOMMENDED WRINKLES



## USING METAL SNIPS

UNLESS properly handled, a pair of metal snips can prove very dangerous. The grip should encircle the middle of the arms or a piece of flesh from the centre of the hand will be nipped between the ends and a nasty blood blister will be the result.

Prevention may be secured in two ways. First, the tips of the snips may be protected by sliding over them pieces of rubber surgical tubing.



Your snips won't pinch your fingers if you treat them like this.

A better plan and one that I always adopt with a pair of new snips, is to get a hacksaw and cut off about half an inch from one of the ends. Then, no matter how careless one may be handling the snips, it is impossible to nip one's flesh.

## PANEL ILLUMINATION

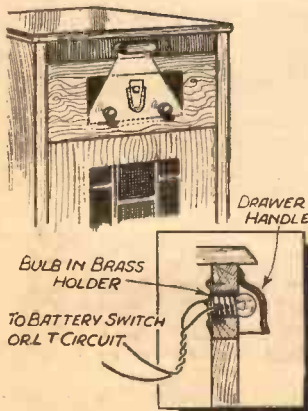
A VERY useful gadget and one which is both easy and cheap to make may be constructed as follows.

Many wireless sets, especially the older ones, have no provision for panel illumination, which makes it rather difficult to take readings should the set stand in a dark position.

A pleasing and practical "flood" light utilising a metal drawer handle of the type shown can quickly be arranged as indicated in the sketch.

If the inside of the handle is given a coat of white enamel before fixing, it will greatly improve the light given.

The wires to the bulb may be taken to the L.T. wiring, but, of course, this will place a bigger strain on the accumulator, and a more economical method is to use a separate switch. And in this way you may use up your old grid bias batteries, which have still sufficient voltage to light the flash-lamp bulb.



"Floodlight" your set with an old drawer-handle!

## WINDING FLEX CABLES

HERE is a wrinkle I find very useful in small wire winding, "a miniature rope walk."

Sometimes one wants to twist two single flex wires. Put the ends into the bite of a twist drill, put the loose ends through a piece of wood with two holes in it, turn handle and you get a very quick twist. Same can be done for three or more cables, and this method saves quite a lot of time.

## A FILAMENT RESISTOR

HERE is a variable filament resistor that can be used by the experimenter for various types of small receiving valves.

Place a terminal at each end of a small piece of wood for a base. Between them fasten an angle of sheet brass as shown.

Form the top edge over a small wire nail so that it forms a tube to take the pencil lead. Wire the base of the holder to one terminal.

Connect a length of flex to the other terminal and at its other end solder a small spiral spring that will grip the pencil lead as shown.

Split a pencil and remove the lead. Force it gently through the holder-tube and slip on the spring. Connect the terminals into the filament circuit.

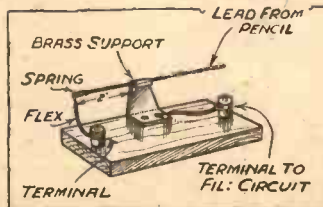
## ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 is. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

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

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. W. Wymer, 83, Montague Road, Leicester, to whom a guinea is being awarded.



The simplest of materials are employed to make up this efficient filament rheostat.

Sliding the lead through the tube will vary the resistance in the filament circuit. Two inches of the lead between spring holder and tube will be about right for lighting a 5-volt valve from a 6-volt battery.

Use a voltmeter across the two terminals to read the voltage dropped by the lead.

## DIAL LAMP SWITCHING

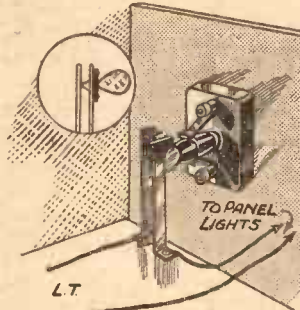
HERE is a neat way of switching a pair of panel lights without the need of a separate switch.

First of all solder a small can-shaped piece of brass to the end of the wavechange switch spindle.

Then a pair of contacts from an old jack switch are bent and mounted on the baseboard (as shown in sketch), to

one of which a small piece of insulated material is riveted.

It then only needs turn of the knob to switch the lights on or off. It is also suitable for shorting a series aerial condenser or "anti-break-through" choke.

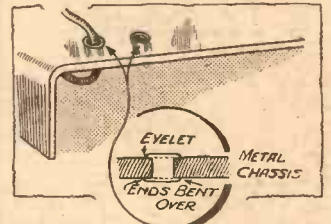


Make the wavechange switch operate the dial lights.

## TESTING HEADPHONES

HERE is a novel method of testing the sensitivity of headphones or

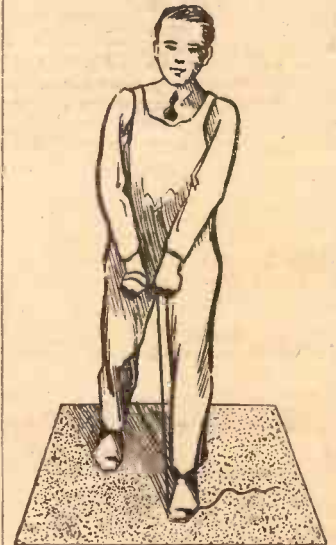
size as will just pass through the eyelets, is now used for all leads which pass through the chassis, there will be no risk of shorts, as the inside of the eyelets presents a smooth surface which will not cut through the rubber insulation. The method also gives a much neater finish to the set than if plain holes are used.



Ensuring a smooth passage for leads through a metal baseboard.

The idea may also be used when leads have to pass through the screening cans of coils, such as in the case when the tuned anode system of H.F. coupling is employed.

## WIRE STRAIGHTENING



This makes a perfect job.

MANY readers have submitted ideas for the straightening of wire, but so far no one has catered for the man who does not own a vice.

From practical experience I find the quickest and easiest way to straighten wire is this. Turn the wire twice round the right-hand, bend down and place the left foot on the wire, close to the right hand, then pull up with both hands, regulating the pressure of the foot.

## BEFORE YOU SWITCH ON

WHEN you have finished a new set, try this wrinkle as a precaution against burnt-out valves.

Connect a fusc bulb to the 2 filament terminals of the valve holder. (Do not connect to the anode or plate socket, or the bulb will certainly burn out). If it does not flash, switch the set on and try then. If the bulb lights, the valves may be put in their sockets.

loudspeakers, which may prove of value to readers.

Take two coins of dissimilar metals, such as a penny and a sixpence. Lay the penny flat on the table, and partly cover it with a scrap of damp blotting-paper. Lay the sixpence on the blotting-paper, and touch one tag of the 'phones on to the exposed portion of the penny, and the other on to the sixpence.

A distinct click should be heard on making and breaking circuit, due to the arrangement functioning as a very small battery, with the coins as plates and the wet paper as electrolyte.

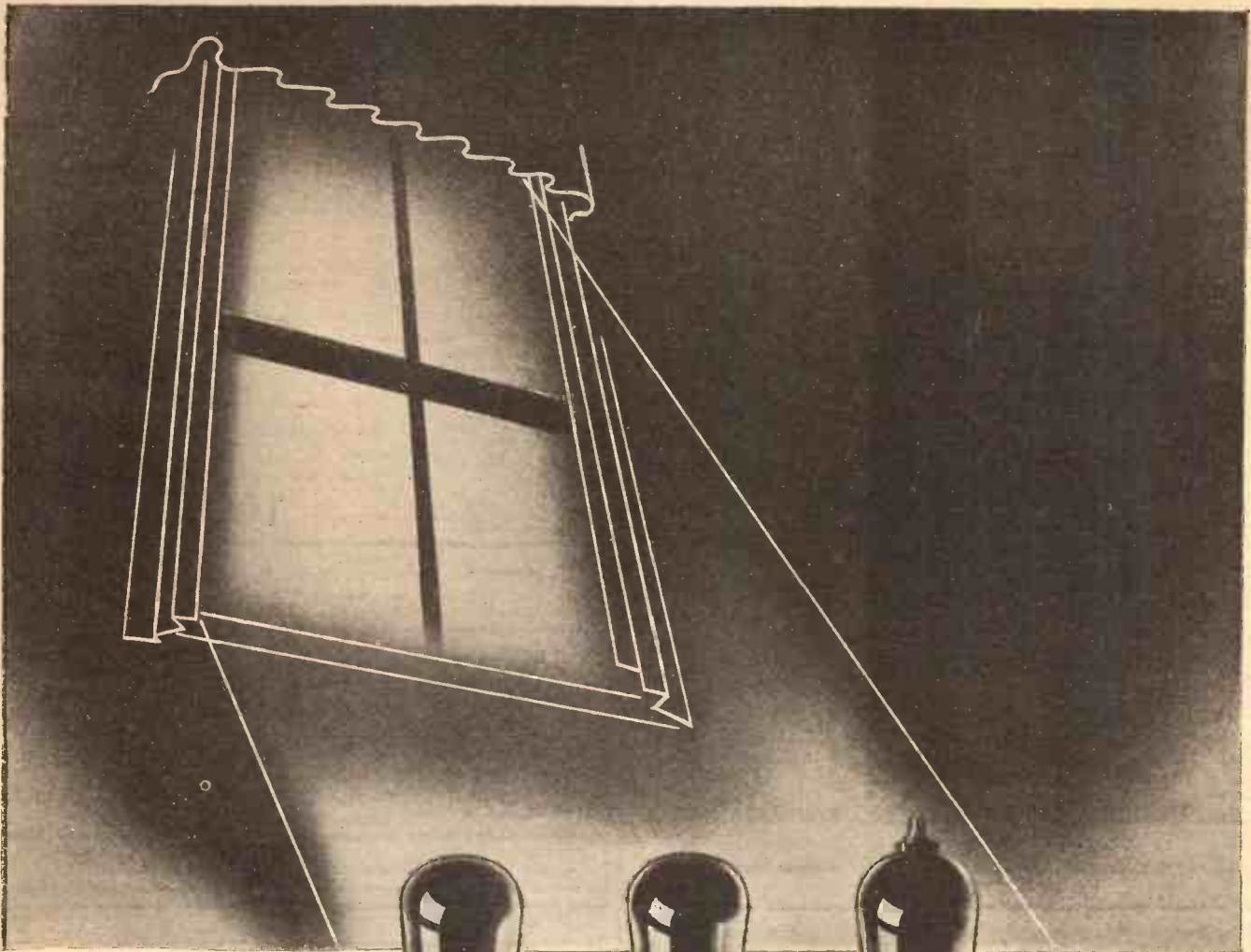
## GUARDING AGAINST SHORTS

WHEN constructing a set using a metal chassis instead of the usual wooden baseboard, particular care has to be taken to insulate the various leads which pass through the metal; especially with regard to such leads as those carrying H.T., as a short to the metal in this case would be a direct short across the H.T. battery or mains unit.

To safeguard such leads I use small eyelets such as may be taken off an old pair of shoes, or bought for a few pence from a boot-shop.

Suitable holes are drilled in the metal, and the eyelets passed through and the ends bent over flat on the underside of the metal chassis.

If rubber-covered wire, of such a



**When  
daylight evenings  
show up those valves**

Mullard 2-volt valves will give you radio this summer at winter strength. The difference in reception which comes with the lighter evenings can be ignored if Mullard valves are in your set. These 2-volt valves embody every modern constructional development in valve design, backed by the greatest name in valve production. Are consistent in characteristics. Absolutely reliable in service.

The P.M.12A for H.F. amplification, P.M.1HL for the detector stage, P.M.22 for high-gain output—or, if this summer has made you decide on a new circuit, a pair for Q.P.P.

Fit Mullard 2-volt valves. There is a Mullard valve-type for every valve-holder in every set. There is perfect Mullard radio waiting for you at any time.

ASK T.S.D. Whenever you want advice about your set or about your valves—ask T.S.D.—Mullard Technical Service Department—always at your service. You're under no obligation whatsoever. We help ourselves by helping you. When writing, whether your problem is big or small, give every detail, and address your envelope to T.S.D.; Ref. C.V.J.

**Mullard**  
**THE MASTER VALVE**

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

Arks



**'CHALLENGER' P.M. MOVING COIL**

The finest value ever offered. Unequaled at the price for fidelity, purity and volume. Ask your dealer to demonstrate. Price 35/- including 3-ratio Transformer.



**REPRODUCERS & AMPLIFIERS, LTD., WOLVERHAMPTON.**

Write for illustrated leaflet



of the complete range.

384

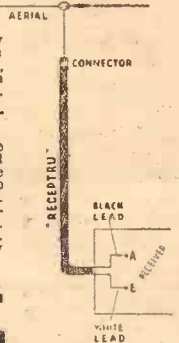
**A Desperately Needed  
Want filled at Last!  
Crackle, Background and  
"Mush" Eliminated . . .**

95 per cent. of so-called "atmospherics" is actually caused by local electrical machinery such as vacuum cleaners, refrigerators, flashing signs, trains, trams, etc. The interference may not come from your own house, but it may come from next door. "Receptru" definitely stops all those unwanted noises.

"Receptru" is a low-loss screened lead-in cable which completely eliminates crackle, background noises and "mush"—all these being trapped before reaching the receiver and drained to earth. The difference to reception must be heard to be believed. Music and speech are reproduced free from distortion, selectivity and volume are greatly improved. Any set user can fit "Receptru" in a few moments. Get one to-day from your dealer. If any difficulty send P.O. for 10/- and we will supply by return.

Price (15-ft. length) packed in attractive carton complete with instructions. Longer sizes at proportionate prices.

**10/-**



Specified For  
**POPULAR WIRELESS "L. B. 4."**  
British Radiophone 3-gang condenser  
with cover and disc drive. Price 33/-

**RECEPTRU**  
FOR TRUE RECEPTION

**BRITISH RADIOPHONE LTD.**  
Aldwych House, Aldwych, London, W.C.2

Telephone: Holborn 6744.

**A BRITISH RADIOPHONE PRODUCT**



"We're Fluxite and Solder—the reliable pair; Famous for Soldering—known everywhere!

To have a faulty connection—there's no REAL excuse; We'll solder to perfection—they'll NEVER wear loose!"

See that Fluxite and Solder are always by you—in the house—garage—workshop—anywhere where simple, speedy soldering is needed.

ALL MECHANICS WILL HAVE  
**FLUXITE**  
IT SIMPLIFIES ALL SOLDERING

All Ironmongers sell Fluxite in tins: 4d., 8d., 1s. 4d. and 2s. 8d. Ask to see the **FLUXITE POCKET SOLDERING SET**—complete with full instructions—7s. 6d. Ask also for our leaflet on **HARDENING STEEL** with Fluxite.

**FLUXITE LTD. (Dept. 324), ROTHERHITHE, S.E.16.**

**FOR ALL REPAIRS!**

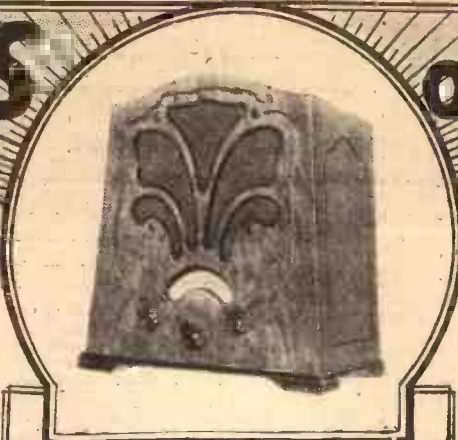


*Player's  
Please  
Everybody*



N.C.C. 145

# RECEIVERS of RENOWN



**THE MARCONIPHONE MODEL '253'**

An outstanding four-valve all-electric design for A.C. and D.C. mains.

**O**UT of all the homes in this country, only five million are licensed for radio reception.

When there are such sets as the Marconiphone Model 253 at prices so very far removed from the "luxury" level, one is left with the impression that there must indeed be something wrong with our programmes! On the standard of performance of this set alone, the number of licensed listeners should be double or even treble what it is.

But is it altogether a question of programmes? Frankly, we do not believe that it is. The B.B.C. may at times dish up programme material that leaves one with the metaphorical pain in the neck, but on the whole the standard is very high, and the percentage of "dud" hours is amazingly low considering the difficulties with which they are faced.

Then why are there only five million licensed homes?

Quite candidly, we believe it to be due to the fact that so many people are still living in the past. If the bulk of those people could only hear radio as it *really* is to-day, and not, alas, as it is sometimes heard in shop doors and over garden fences, then we are confident that the licence figures would rapidly double themselves.

**This Remarkable Instrument.**

Meanwhile, what are we going to do about it? One obvious way would be to ask all those who do not possess a radio installation to go along to the nearest dealer and hear a Marconiphone Model 253! That would certainly set the ball rolling.

But we can go one better than that by telling you something of our own experiences with this remarkable instrument, for we are convinced as a result of our tests that to find a commercial instrument more representative of all that is desirable in modern radio practice would be an impossibility. To those who, in the radio sense, are still living in the past, a demonstration of this set would be nothing short of a revelation.

It's not much good talking about frequency response, because apart from being a very overrated subject, discussion on such

lines tends to disguise the real point at issue which, boiled down, is simply "does it sound like the real thing?"

"... we are convinced as a result of our tests that to find a commercial instrument more representative of all that is desirable in modern radio practice would be an impossibility. . . ."

In so far as the Marconiphone Model 253 is concerned, it is true to say that with a darkened room and a bit of imagination, you might for all the world be in the studio

**"GOOD AFTERNOON, SCHOOLS"**



The standard of performance of the "253" is such that the instrument is officially recommended for use in schools.

itself! It gives results as near to quality perfection as any set we know, and in saying that we make no secret of the fact that there are few sets we do not know.

It will be obvious from our previous reviews under this general heading that we rate the question of quality of reproduction above all other considerations. But it should not be imagined for one moment that quality alone is sufficient.

For us to become really enthusiastic over any commercial receiver, the design has to be outstanding in what we consider to be all the vital respects. Sensitivity, selectivity, ease of operation, appearance, general utility—all are taken into consideration with the paramount one of quality of reproduction before we are content to pronounce our verdict.

In so far as the Marconiphone Model 253 is concerned, our opinion of the excellence of the instrument remains unaltered after careful

consideration of all these points. We repeat that it would be difficult in fact impossible to find any commercial instrument with the equivalent circuit that would be more representative of all that is desirable in modern receiver design.

Take the questions of sensitivity and selectivity. If any set of this category will produce thirty alternative programmes on a par with those that emanate from the local stations, then it is doing all that can reasonably be expected of it.

**Pick of the Programmes.**

What more, then, need we say of the Marconiphone Model 253 other than that when using it, to achieve the thirty alternative programme ideal is child's play? The pick of the European programmes are effectively harnessed under one small knob, and all you have to do is to turn it!

There is, of course, the usual provision for the control of volume, and the output from the set can be regulated from a mere whisper up to sound sufficient to fill a house.

These are the only controls in the operating sense, and with them it is possible to tour Europe with the greatest of ease.

That fact alone, based on our own experiences, is a sufficient indication of the overall efficiency of the instrument.

**TABULATED DATA FOR THE TECHNICALLY-MINDED READER**

**GENERAL DESCRIPTION.**—Self-contained transportable all-electric receiver for A.C. and D.C. mains operation.

**CIRCUIT DETAILS.**—Mains-operated four-valver consisting of screen grid, power-grid detector, power pentode and full-wave rectifier. Fully screened band-pass input is employed, and circuits are tuned by a carefully synchronised three-gang condenser. Condenser control knob is arranged to actuate a rotating pointer traversing separate semi-circular scales marked in medium and long wavelengths.

**CONTROL ARRANGEMENTS.**—The three controls at front of instrument are arranged as follows: Volume (left-hand knob), main tuning (centre) and four-position switch (right) giving medium waves, long waves, "gram" and "off" position. For correcting the initial setting of the pointer, a

zero-adjusting setscrew is provided immediately above main tuning control. Aerial selector switch for regulating degree of selectivity is provided at back.

**SPECIAL FEATURES.**—

1. Tuning corrector (see "Circuit Details").
2. Provision for connection of pick-up and external speaker (or speakers).
3. Transportability.
4. Provision for use of mains aerial where desired.
5. Undistorted output of approximately 2 watts.

**PRICE.**—Sixteen guineas complete.

**MAKERS.**—The Marconiphone Co., Ltd., 210-12, Tottenham Court Road, London, W.1.

**A**TMOSPHERICS are now in season, disputing with the B.B.C. the supremacy of the air. This is a pity, for summer concerts are often spoilt by these unmusical cracklings and explosions. And I suppose nothing can be done.

**The Brahms Centenary.**

Mr. Ernest Newman didn't seem to share with the musical world their enthusiasm for those Brahms Centenary concerts. "Brahms," he declares, "has never been neglected, and so a big centenary splash is unnecessary." Well, there's something in that. We mustn't forget, however, the growing fashion for centenary celebrations.

But if Mr. Newman didn't enthuse over Brahms, he went all out on Koussevitzky, "one of the three greatest conductors of this generation." As an advance advertising manager, Mr. Newman was superb. No one who heard him could fail to listen-in on the night Koussevitzky wielded the baton.

Mr. Newman didn't think it necessary to comment on the ill-fitting title this series of concerts bears—the London Musical Festival. Considering the very foreign flavour of the Festival music, the fact that it happened in London seems to me hardly sufficient excuse for christening it as they have.

**Pilgrim's Progress.**

Rather unique is the series of talks now being given by Mr. J. D. M. Rorke, entitled "A Musical Pilgrim's Progress." Their special interest lies, I think, in the fact that many listeners will see in Mr. Rorke's experiences something akin to their own. Who, for instance, hasn't had a Rorke experience in the realms of Chopin?

I felt sorry for Mr. Rorke that his talk was the fifth of the evening given on the same wavelength, and this didn't include two unbilled talks that sandwiched the Second News Bulletin that evening. This is heavy going, but the powers that be have promised "to keep it light" this summer, so we must bear up.

**Talks and News.**

On the whole, I think it a good idea to have someone expatiate at the end of the Bulletin on one

**THE LISTENER'S NOTEBOOK**  
Topical jottings on radio programmes and personalities.

of the items of news. The Everest hero's talk is the sort of thing that prevents us forgetting the marvels of radio.

Reading reported speeches of the famous is insignificant compared with hearing the speeches actually delivered.

The gallant commander tried to reproduce in his talk something of the thrill he experienced when he made those two memorable flights, but, despite his brave attempt, his flights of oratory fell very short of those he made over Everest. Still, that didn't matter!

**New Blood.**

Have you noticed of late the amount of fresh blood in all departments of radio programmes—fresh talkers, variety artists and bands, and, what is also welcome, something different in the type of fare?

Take, for instance, the Enterprising Holiday series of a Saturday evening. Mr. Reynold Bray's adventures among the Laps were thoroughly interesting, and he told them well, too!

**The Regular Fellows.**

While I welcome this new blood, I am bound to confess there are many old-timers whom we would sadly miss if their contracts suddenly ended. There is, first of all, that surprisingly large gallery of people known as "the microphone personalities."

We have regular appointments with them each week. I, personally, wouldn't miss them if I could

help it, and it is most disappointing if I am unexpectedly prevented from listening to any one of them. Priestley, for instance, I missed this week, and I feel sore about it. That gap can never be filled.

**A Record Suggestion.**

Then there are two orchestras I always consider worth while—"The Commodore" and "The Shepherd's Bush." They *always* please. Gramophone recitals are usually attractive, though I would like to hear more records of famous songs by famous singers.

We do get them, of course, but only very occasionally. A few more—say, at the expense of dance music or performances by whispering baritones—wouldn't come amiss.

**Those French Lessons.**

Rumour has it that the evening French conversations may be discontinued shortly. This is a pity and, I am bound to say, a mistake.

I don't know on what grounds this step is threatened. Surely not because the conversations are thought to be unappreciated. There must be hundreds of listeners able to keep their French up, thanks to the help these conversations offer.

And what about the professional classes who have long since abandoned their annual fourteen days' refresher course in Paris, now that this cheaper but effective alternative is here for the taking?

Listening-in to one or other of the French stations isn't quite the same thing. French announcers, etc., don't cater for the Englishman learning French, and so theirs isn't that sympathetic mode of speech we find with M. Stéphan and Mlle. Camille Vierre.

**Was it Nerves?**

Tuning-in just before 6 p.m. for the First News, I heard the tail end of the Children's Hour. Someone was playing a well-known Scottish air on the bells. I don't know what went wrong, but the performance was ignominiously faded out after one or two bad mis-hits. Nerves, perhaps!

**GRAND FREE-FOR-ALL RADIO CONTEST!**

**ALL-CASH FIRST PRIZE!**

**£25 AND 50**

**WIRELESS "EXTRAS" For Runners-Up.**

(The Consolation Prizes include: Loudspeakers—Canged Condensers—Coil Units "Class B"—Transformers, etc.—All useful items for set builders)

"Radiopics" is the great free radio competition which "Popular Wireless" invites you to enter and try for the £25 Prize offered. That cash sum must be won for solving a few sets of attractive picture-puzzles, all of which denote the names of wireless stations.

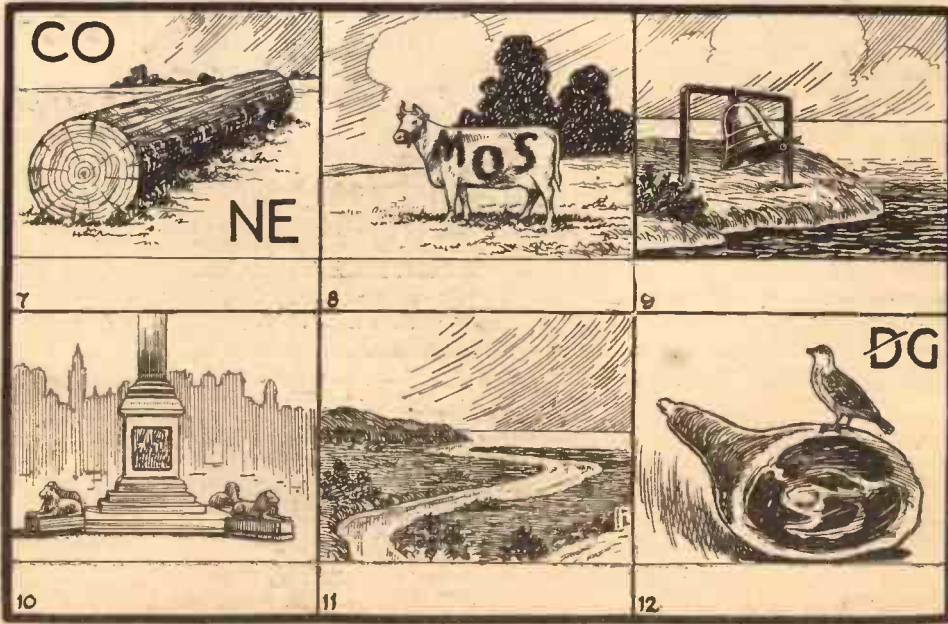
Puzzle Set No. 1 appeared last week—if you missed it ask your newsagent for a copy of "P.W." (dated May 13th)—then you can start winning to-day. Below is the Second Set for you to solve—each picture representing one station name. The answers are all quite easy to find, and as a further guide, all Set 2 solutions are in the "key" list below—thus it is merely a matter of fitting the right stations to the right pictures.

Write the answers IN INK (and in BLOCK LETTERS) in the spaces provided; then cut out the picture-set and keep it until next week, when we shall publish six more of these entertaining puzzles. Each set will have its own "key" list, and in the Sixth and Final Week full sending-in directions will be given. The competition rules appeared last week and will be reprinted later.

**"RADIOPICS" SET 2**

As for the purposes of the competition, wireless stations all over the world are being used, the following short guide list of names is given for reference with this week's pictures.

- HUIZEN
- BOURNEMOUTH
- HILVERSUM
- COLOGNE
- MELBOURNE
- FECAMP
- BELFAST
- TRAFALGAR
- WEYMOUTH
- MOSCOW
- HAMBURG
- BROOKLYN
- BELLE ISLE
- LYONS
- TURIN



**PRIZES MUST BE WON—NOTHING TO PAY!**





IT is a long time since we described the construction of a crystal set in "P.W.," but the reason is not that such instruments have largely gone out of use.

On the contrary, tens of thousands of listeners still manipulate catswhiskers. However, there have not been any startling developments in this sphere of radio during the past few years. And so the occasional description of a crystal set must adequately fulfil our readers' requirements.

**Modern and Original.**

It is very different with valve sets. During only the past few weeks, for example, we have been able to give the first details of valve receivers embodying such important developments as "Class B," "Cold valves," Double-diode Triode valves, All-metal valves, and so on (what a triumph for the "P.W." Research Department, by the way!).

Nevertheless, the "P.W." "Crystal Cube" is not a re-hash of a 1925 design. You won't find its exact replica in the pages of old volumes of "P.W.," for it is

Simple, inexpensive and reliable, there is much to be said for the crystal set. This is an extremely compact and convenient one, which covers both wavebands by means of a dual-range coil.  
By G. V. DOWDING, Associate I.E.E.

And what an economical method of reception this is! There are no H.T. or G.B. batteries to renew, no L.T. accumulators to be charged, no valves to wear out. Indeed, the whole outfit is almost everlasting and is, anyway, free from all maintenance costs.

Then, again, consider its reliability. Its simplicity renders it practically trouble-free.

The only snag is that you must use telephone receivers. But that is hardly a snag if you are a solitary listener. It may even be a great advantage where several people, all of whom may not wish to listen at the same time, have to share the one living-room.

It often happens that telephone receivers make for better listening and greater appreciation of programme items because they exclude extraneous sounds.

Finally, the initial cost of a

crystal outfit is very low. And good telephone receivers can now be bought for a few shillings a pair.

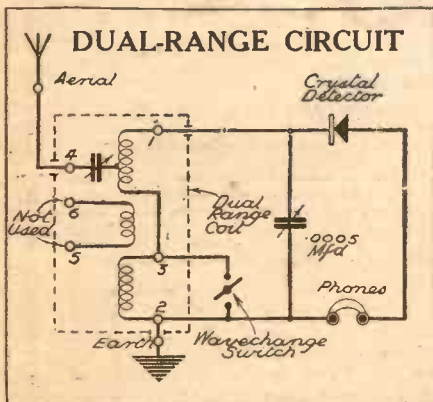
(The "Crystal Cube" will comfortably operate two or three pairs.)

Of course, some of the earlier 'phones were heavy and uncomfortable to wear, but modern ones aren't.

I believe a lot of people are doing without wireless purely and simply because they are not aware of the potentialities of the crystal. Also, in these hard times, there may be many who have to leave valve sets idle for long periods, as they cannot often afford the more or less costly battery renewals, etc.

**"Semi-Permanent" Detectors.**

All such should have crystal sets as standbys. The cost for listening four hours a day every day for years (if one wanted such a solid dose of radio) on a crystal set, is little if anything above the cost of the wireless licence.



definitely a modern and original application of the principle.

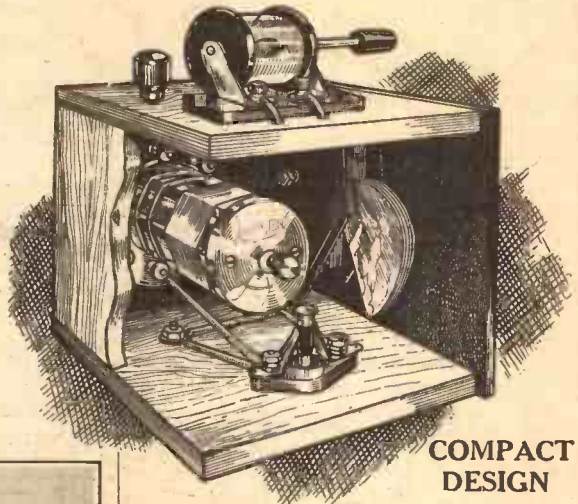
It employs a compact, dual-range coil unit for the efficient coverage of both medium and long waves and a modern and inexpensive solid dielectric tuning condenser.

You know, it is quite probable that many people consider that at least one valve is essential for good reception, even using headphones. But this is not the case.

**For Economical Reception.**

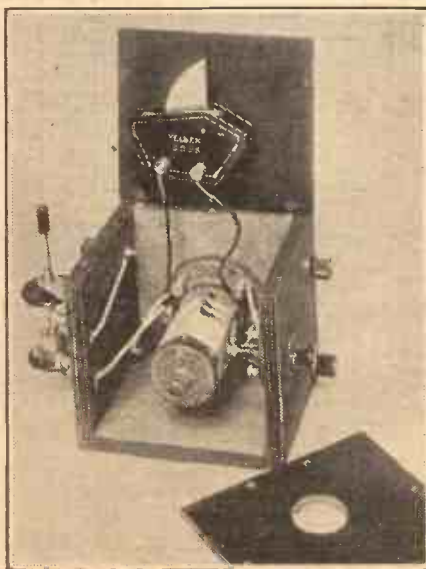
Crystal sets were fully satisfying hosts of listeners in the days when their single local stations were transmitting on relatively low power.

Now that all the stations are much more powerful it is possible to obtain excellent results up to twenty or thirty miles from a "Regional," providing the crystal set is used with a fairly good aerial.



Left and right are shown respectively the circuitual and the practical arrangements of the "Crystal Cube."

Note how the degree of selectivity can be varied by the knob on the coil unit, and how this is rendered accessible by a hole in the cover, shown in the photograph below.



And don't forget that a licence is as necessary for catswhisker work as it is for a valve set.

Talking about catswhiskers, it should be noted that there still are "semi-permanent" crystal detectors to be encountered now and then in shops.

These are something like grid-leaks in appearance and instead of there being at least a visible catswhisker with its operating knob, there will be a small screw adjustment.

**Construction of Cabinet.**

One of these detectors could be used, instead of the type shown in our original model, if desired, though we can't guarantee that all and every type which might be unearthed from old stock boxes will be in good working order.

The baseboard, back piece and side-

(Continued on next page.)

## THE "P.W." "CRYSTAL CUBE"

(Continued from previous page.)

pieces of the little cabinet can be cut from 3-ply. You could use 3-ply wood for the two panels without affecting the electrical efficiency of the set to any appreciable extent, but it would not look as nice.

The one panel needs to have a one-inch hole cut in it, so that access to the selectivity control on the coil can be obtained. Not an easy job, I fear, and I would advise you to try and get your local dealer or garage to oblige!

### Fixing the Parts.

Having cut all the material for the cabinet, and collected the parts, the components can then be mounted. Fix all these in position before assembling the cabinet or attempting any of the wiring.

The next step is to screw the baseboard, two side pieces, and back piece together.

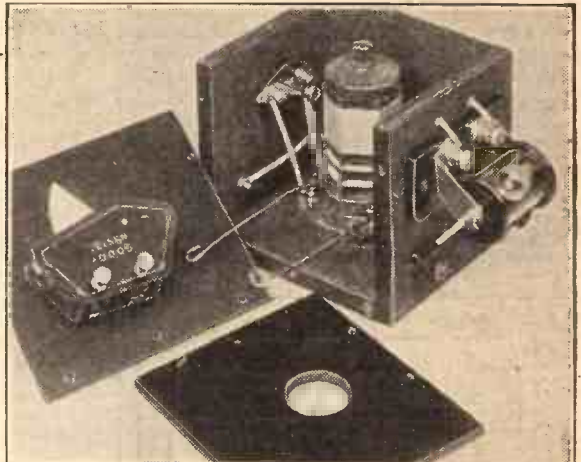
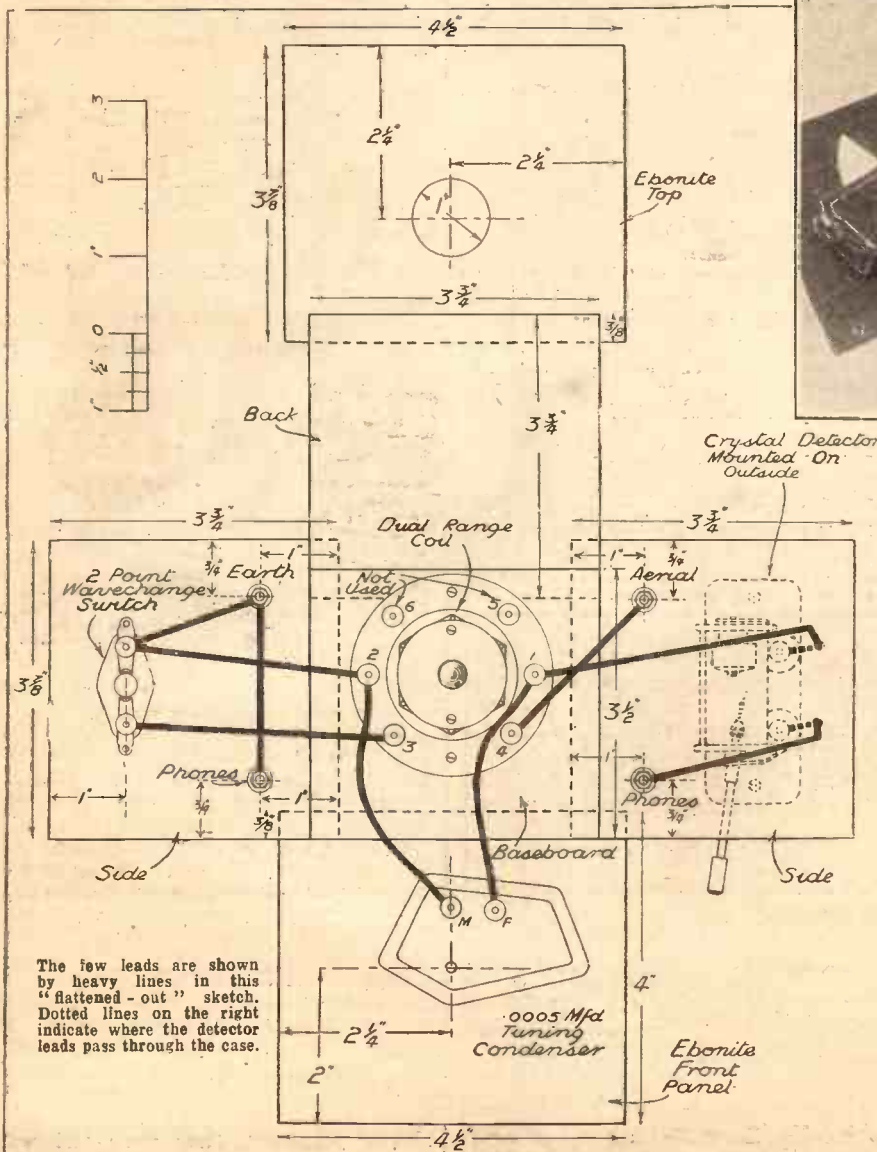
## "CRYSTAL CUBE" COMPONENTS

Component	Make used by designer	Alternative makes of suitable specification recommended by designer
2 Panels, 4½ in. × 4 in. and 4½ in. × 3½ in.	Lissen	Peto-Scott, Goltone
1 Baseboard, 3½ in. × 3½ in. × ½ in. (wood)	—	—
2 Side pieces, 3½ in. × 3½ in. × ½ in. (Wood)	—	—
1 Back piece, 3½ in. × 3½ in. × ½ in. (Wood)	—	—
1 Dual range coil	Lissen LM5180 Telsen W.193	Graham Farish
1 .0005-mfd. solid dielectric variable condenser	Ormond R.194 W.B.	Lissen, Telsen, Bulgin
1 Crystal detector	Belling Lee, type R	Bulgin, Chix, Igranic, Goltone
1 On-off switch	Goltone	Wearite
4 Terminals	Goltone	Wearite
1 yd. insulating sleeving	—	—
1 yd. 18-gauge tinned copper wire	—	—
Flex, screws, etc.	—	—

- Now connect up in the following order:
1. Aerial terminal to 4 on coil.
  2. One 'phone terminal to crystal detector.
  3. Crystal detector to 1 on coil. On the same terminal join by its one end a 4-inch length of flexible wire. This is one of the variable condenser leads.
  4. Switch to earth terminal.
  5. Same switch terminal to 2 on coil. On

- this coil terminal also join a piece of flex for the other variable condenser connection.
6. Earth terminal to remaining 'phone terminal.
7. Same coil terminal as in 5 should have 4-inch flexible joined to it for remaining condenser connection.
8. Other switch terminal to 3 on coil. After all these leads have been secured, the panel can be fitted and the condenser

### THERE ARE ONLY NINE CONNECTIONS TO MAKE



The wiring and general arrangement are clearly shown on this page; thus a quick comparison can be made between diagram and photograph as construction proceeds.

finally joined into circuit. Lastly the top panel can be screwed on.

There is little that need be said about the operation of the set.

The knob on the top of the coil unit is adjusted until there is adequate separation between the programmes, and the crystal detector is carefully and gently manipulated in order to discover a "sensitive spot." This is, of course, indicated by the greatest volume.

#### Detector Quickly Adjusted.

Don't be tempted to keep on juggling about with the detector. With a good crystal there will be a large number of sensitive spots all over its surface, and it should be very easy quickly to find one.

You won't find that the pressure of the catwhisker on the crystal will make a great deal of difference.

\*.....\*

**ANOTHER SURPRISE FOR YOU NEXT WEEK.**

Once again "Popular Wireless" will lead the way with exclusive details of another

**Entirely New and Important Radio Development for Home Constructors.**

Do not miss next week's "P.W." on any account.

\*.....\*

# BARGAINS



## LOEWE A.C. MAINS RECEIVER

Complete 3-valve Receiver, incorporating the famous LOEWE MULTI VALVE, with Permanent Magnet Moving-Coil Speaker. Ready to play. Maker's 12-months guarantee. Or £1 deposit. Balance in 11 monthly payments of 11/-.

**LIST PRICE**  
**£9 - 9 - 0**

**OUR PRICE**  
**£6 - 10 - 0**

MARCONIPHONE RADIOGRAM, A.C. only, Model 330. List Price 32 Gns. Our Price, 19 Gns., or 24 monthly payments of 18/7.

GARRARD AUTOMATIC RECORD CHANGER for A.C. Mains. Mounted on unit plate complete ready for fitting in position, including Garrard pick-up and tone-arm. Cash Price £10/0/0. Carriage Paid. **Send 18/6 only**

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Just pay a further 2/6 on delivery. Balance in 6 monthly payments of 2/6. **2/6** LOEWE CABINET SPEAKER with 4-pole Balanced Armature Movement. Our only Price, CASH or C.O.D., Carriage Paid, Usual Price 39/6. **17/6**

# PILOT AUTHOR KIT

## Exact to specification

### L.B. FOUR Described this week.

**KIT "A"** Delivered Carriage Paid on First Payment of **14/4** Balance in 11 monthly payments of 14/4.

Author's Kit of First Specified Parts, including ready-drilled panel, but less valves and cabinet. CASH or C.O.D., carriage paid, £7/16/9.

**KIT "B."** As Kit "A," but with valves only. Delivered, carriage paid, on first payment of 18/6. Balance in 11 monthly payments of 18/6. Cash or C.O.D., carriage paid, £10/1/3.

**KIT "C."** As Kit "A," but with valves and cabinet. Delivered, carriage paid, on first payment of 19/10. Balance in 11 monthly payments of 19/10. Cash or C.O.D., carriage paid, £10/16/3.

Set of Specified Valves, £2/4/6; Peto-Scott Table Cabinet, 15/-.

### "CATKIN" 3

Described last week.

**KIT "A"** Delivered Carriage Paid on First Payment of **12/1** Balance in 11 monthly payments of 12/1.

Author's Kit of First Specified Parts, including ready-drilled aluminium panel, but less valves, cabinet and eliminator. CASH or C.O.D., carriage paid, £6.12.0.

**KIT "B."** As above, but with valves only. Delivered, carriage paid, on first payment of 16/11. Balance in 11 monthly payments of 16/11. Cash or C.O.D., carriage paid, £9/4/6.

**KIT "C."** As above, but with valves and cabinet. Delivered, carriage paid, on first payment of 18/6. Balance in 11 monthly payments of 18/6. Cash or C.O.D., carriage paid, £10/2/0.

Set of Specified Valves, £2/12/6; Peto-Scott Table Cabinet, 17/6.

## COMPACT CONSOLETTA

Described last week.

**KIT "A"** Delivered Carriage Paid on First Payment of **9/-** Author's Kit of First Specified Components, less panel, baseboard, valves, and cabinet and speaker. Balance in 11 monthly payments of 9/-.

Cash or Cash, £4/18/0.

3 Cossor Valves as specified - - - £2-1-0  
1 Telsen Screened Coil W.216 - - - 8-6  
1 Wearite Mains Transformer T.21A - £1-5-0

## SPECIAL HALF-PRICE CASH OFFER

1 Peto-Scott "Class B" Driver Transformer (10/6); 1 Full-size Constructional Blue Print for "Class B" Conversion (9d.); 3 Pilot Radio Envelopes, with Full-size Blue Prints of 3-Valve A.C., 5-Valve Super-Het., 3-Valve S.G. Battery (3/-); Peto-Scott Short-Wave Book "How to Build 4 Short-Wave Sets," and Full-size Blue Prints (1/-). Value 15/-.

**7/6** only

ATLAS ELIMINATOR. Type A.C.244. Send Three tappings, S.G., detector and power output: 120 volts at 20 mA. Cash or C.O.D., £2/19/6. **5/6** only

Balance in 11 monthly payments of 5/6. ATLAS "CLASS B" Q.P.P. MAINS SEND UNITS. Model Q.P.24. H.T. unit for A.C. Mains. Cash or C.O.D., £3/12/6. Carriage paid, only. Balance in 11 monthly payments of 6/8.

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## PILOT "CLASS B" CONVERSION KIT

Converts your present Battery Set to "Class B" Amplification. Complete with all necessary components, INCLUDING "CLASS B" VALVE, wire and screws, etc. FULL SIZE BLUE PRINT, Assembly Instructions and Diagrams. **37/6** CASH or C.O.D.

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**KIT "A"** Complete Kit of Parts, including ready-drilled Panel, but less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £3/15/6. **7/6** 7/6 Deposit and 11 monthly payments of 7/3. **only**

**KIT "B."** As Kit "A," but with valves less cabinet. Cash or C.O.D., carriage paid, £6/18/0. Delivered, carriage paid, on first payment of 12/6. Balance in 11 monthly payments of 12/6.

**KIT "C."** As Kit "A," but with valves and table cabinet. Cash or C.O.D., carriage paid, £7/13/0. Delivered, carriage paid, on first payment of 14/-.

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## BRITAIN'S FINEST WALNUT RADIOGRAM CABINET



39 in. high; 22 in. wide, 15 1/2 in. deep. Speaker Compartment; 17 in. by 19 in. by 11 in.

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FROM THE TECHNICAL EDITOR'S NOTE BOOK

# TESTED AND FOUND?

## RADIO POWER PLUGS.

ONE of the great advantages of a mains set is that it merely has to be "plugged in" at any convenient power point and it is ready for use.

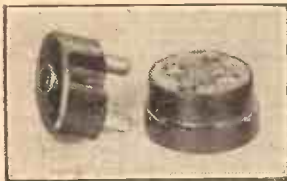
With an A.C. outfit it does not matter which way round the connecting plug is inserted, but, unfortunately, that does not apply to a D.C. set.

If you insert the plug wrongly, there is a delay of a half minute or so before you can discover your mistake. And even when you have done so, subsequent to the valves "heating up," there will be a further delay while you turn the plug round and the valves once again have to regain their operating temperature.

Thus a minute or more can easily be lost, which is very annoying when you want to catch an important program item.

There is a further snag. Because there can be no guarantee that a D.C. set user will always plug in correctly, it is not advisable to use those useful electrolytic condensers in D.C. sets.

Which all indicates how excellent it would be if non-reversible power plugs were universally used for D.C. mains.



The British General Wall Plug.

However, there is no reason why the constructor should not have them installed. British General make a first-class plug of this nature.

It is very strongly made, but is neat and of good appearance. And the pins slide into their sockets with that velvety, easy smoothness indicative of efficient, wide-area contact.

## A FERRANTI "CLASS B" COMPONENT.

I think I must initiate a campaign for calling "Class B" something else! In British radio engineering "Class B" means nothing; it is a term borrowed from America. And torn as it was from a definite system of nomenclature it loses its significance.

What about "Plus-Power" amplification? This would indicate an output stage operating on the positive side of the valve's characteristic, and the term also conveys the suggestion of an increase of output, and this is what happens in practice.

I'd like to know what readers think of it. Anyway, it is definitely descriptive, although someone may be able to invent an even better term.

In the meantime, I suppose we must continue to classify the principle without reference to the other methods of amplification!

"Class B" is undoubtedly here to stay, and I fancy next season will be, for battery folk, a "Class B" season. Already all the necessary apparatus for its application is available in "ironed out" commercial form.

No apologies need be proffered for any of it on the score of novelty. This must be obvious to all when such firms as Ferranti are advertising "Class B" components, for Ferranti do not go into production with anything but well-tested and tried articles.



One of the new Ferranti Transformers, the O.P.M.17(c)

menting with their O.P.M.17(c) transformer. This is for "Class B" output circuits.

It has the two resistance ratios of 1.6/1 and 23/1, with a primary D.C. impedance of 125 ohms each half, and a total primary inductance of from 9 to 29 henries, according to the current passed. It can handle up to 20 milliamps.

The price is 15/-, and that includes the push-pull patent licence fee.

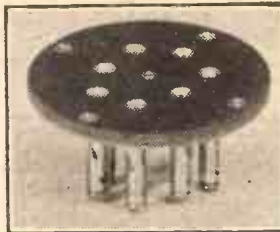
It is, of course, a first-class transformer, and is perfectly adequate for all "Class B" sets of average pretensions and represents excellent value for money.

## A VALVEHOLDER FOR "CLASS B."

I was rather anticipating that each of the new valves would require its own special holder. Which would have been regrettable.

Fortunately, there is now much closer co-ordination in the radio industry than there used to be, and so a valveholder pattern suitable for both "Class B" and double diodes, triodes and pentodes and, presumably, any other special multi-pin valve which might come along, has been standardised in so far as socket positioning is concerned.

The first chassis-mounting type



The Clix 7-pin chassis-mounting valveholder.

to come to my notice is one due to Electro-Linx, and I do not think I can do better than give you their own description of it, for it is succinctly and interestingly written and embodies intimate details which I am sure will interest our more mechanically-minded readers.

This valveholder incorporates the new floating socket mounting, whereby each socket will automatically align itself to any variation in centres, or angle of the incoming valve pins, in the new seven-pin bases, at the same time giving the maximum surface contact between socket and pin, which is a feature of paramount importance.

## THOSE PLUG-IN COILS

A Reader's Experiences.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue I noticed a query from T.B.B. (Oban), expressing surprise at the results on a Plug-in Coil Set.

He is like a lot more people, he does not realise that a plug-in coil set properly handled is much more efficient, powerful and selective than the so-called modern commercial factory set. Changing the coils, its so-called drawback, is in reality its greatest asset, the set can be made to cope with almost any difficulty.

If any of your readers think they know a modern "three" that will beat a five-year-old plug-in coil set for volume and selectivity, then I would like to know it.

During the last 9 months I have had demonstrated practically every commercial "three" on the market, certainly all those with famous names. They may be almost fool-proof and beautiful pieces of furniture, but from the point of view of volume and selectivity they cannot touch an old plug-in coil type.

However, the old set would not last for ever, and eventually I decided on a very popular S.G. det. and power pentode kit, especially wired up for use within 10 miles of a main station, as being the best; but only while I can get the parts and rewire and

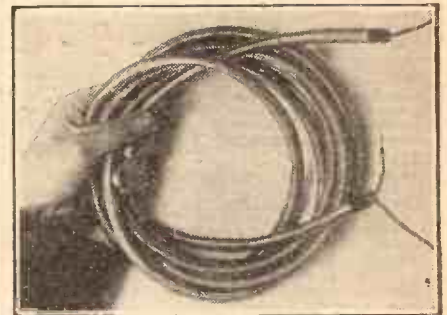
"A brief description of the construction is as follows:

Seven turned, helically slotted resilient Clix sockets of the well-known type are turned from the square rod, leaving a thin square shoulder at the top. These are trapped between two bakelite discs with a further centre panel, which contains squared perforations on the appropriate centres slightly larger in dimension than the dimensions of the square on the socket, into which the sockets are registered, and are allowed to float to fixed limits.

"It will be readily seen that this method of mounting, whilst preventing the sockets from being turned round, allows a limited horizontal float in all directions, thus allowing any deviations from correct centring of the valve pins to be satisfactorily compensated, and at the same time giving maximum surface contact without any side strain to the resilient segments of the socket.

"The ends of the sockets are formed with a side hole of such size that will take a double Systoflex wire, and are fixed by a knurled-headed vertical screw, enabling the constructor to fix the wire or wires either with a screw-driver or a pair of pliers."

## "RECEPTRU" SCREENED LEAD-IN.



The new British Radiophone lead-in.

Readers who experience interference from electrical apparatus should be keenly interested in a new British Radiophone product.

This is "Receptru" Screened Lead-In. It is a very ingeniously devised material and is most effective.

It might be thought by some that it would be a relatively simple matter to apply screening to an aerial lead. But this is far from being the case. At least, to do so and maintain an aerial efficiency.

The greatest difficulty is to achieve satisfactory shielding without introducing an unwanted capacity. In "Receptru" there are negligible losses from such a cause owing to the adoption of an entirely novel principle of separation between the lead and the flexible metal screening sheath.

Indeed, I failed to notice any difference of results when I used "Receptru" on a test set, except that the interference due to a noisy fan motor was entirely eliminated.

It is certainly very efficient, and I can recommend it to all who are troubled by local electrical radiations.

modernise the old set such as decoupling and slow-motion dials, etc., but I am definitely not altering the circuit of the set or dropping plug-in coils.

The kit set certainly gets plenty of stations on a 30 ft. indoor aerial, but the volume is poor in comparison with the old set, which will give me slightly better selectivity, especially on the long waves with a 75 ft. outdoor aerial, which I also use for short waves as well.

With the exception of Australia, I have had "all continents" on the loudspeaker. I live only six miles from the twin transmitters at Brookmans Park and use no pre-set condensers or wave-traps. 46 stations on the speaker when London is working and 62 at other times.

And this is where T.B.B., Oban, comes in; the basis of my old 3-valve set was founded on your 2-valve "All-waver," and published in "P.W." nearly six years ago. I doubt, Mr. Editor, whether you can improve the detector end, but what about the L.F. end? Won't you put your staff on and try? Remember, T.B.B., keep your grid condenser connections as short as possible, the largest grid coil you can use for your particular station with the aerial coil only a size smaller, please, but very loosely coupled.

Build it carefully, and you will give the local sceptics the surprise of their lives.

Yours faithfully,  
H. A. C. TODD.

Edgware.

P.S.—Nothing to do with the set, except to show how well and often I get America. Can any reader confirm my observations that there is a regular average increase in strength on the 49 metre band, as the time of "full moon" approaches, declining again as the moon waxes?

# RADIO SIMPLIFIED

## A PRACTICAL OUTLINE FOR BEGINNERS

**L**AST week we dealt with the principle upon which a gramophone pick-up works and also with simple methods of switching a pick-up into the amplifier circuit.

When a set has an S.G. stage it is desirable, although not essential, to provide a means whereby the filament of the S.G. valve is switched out when the pick-up is in use.

This, of course, does not apply to mains receivers, but only to sets of the battery type, where the filament current is derived from an L.T. accumulator. It is merely a question of current economy.

Reverting to the diagram of the switching scheme in last week's issue it will be remembered that a single-pole change-over switch was employed, the pick-up being inserted in the grid circuit of the valve by the

### TIMING BY CLICKS



A very light scratch on old record facilitates counting the number of revolutions per minute.

simple movement of the switch arm or knob.

If, instead of a single-pole switch we use one having two independent insulated arms operated from one knob, we can easily arrange matters so that the filament lead of the S.G. valve is "broken" upon changing over to pick-up, thus leaving in circuit only those valves actually required for amplifying the recorded music.

### "Class B" Advantages.

The modern pick-up is a sensitive piece of apparatus and needs only a moderate amount of amplification to build up the output to full loudspeaker volume.

In the past one of the biggest difficulties with battery valves was to achieve an output comparable with that from an acoustic gramophone. The undistorted volume obtainable

from an ordinary battery power valve is much less than that given by any of the acoustic types of gramophones.

The advent of "Class B" L.F. magnification has changed this, and it is now possible to obtain a large output—amply

so as to counteract the loss due to the recording system.

In practice this method works very well indeed, and there should be no need to apply further correction in the amplifying chain so far as the bass is concerned.



sufficient for all domestic requirements—with but a moderate expenditure of energy from an H.T. battery of the dry cell type.

Thus the man who is unfortunate in not having the mains at his disposal need not be deterred from building a radio-gram receiver or pick-up amplifier on the grounds of volume, because the "Class B" system has solved his problem in that respect.

### Boosting Bass.

A quality amplifier is just as necessary for pick-up work as it is for radio. The best results can only be achieved when the amplifier response curve is substantially even over the whole frequency range.

The recording limits of frequency extend from about 5,500 to 50 cycles. From round about 100 cycles downwards the average record falls off fairly rapidly and artificial "boosting" of the bass is desirable.

If the loudspeaker is unusually deficient in bass a tone compensating transformer can be used, but, generally speaking, it is on the higher frequencies where most of the correction is required.

There is, for example, the problem of scratch. Its frequencies are part and parcel of the musical range and can only be cut out at the expense of the higher notes.

Those to whom scratch is particularly objectionable must decide for themselves the extent of the high-note loss they are able to tolerate and apply the necessary correction accordingly.

### Try A Resistance.

In the absence of a tone compensating transformer or other device the effect of various values of resistances across the pick-up can be tried and noted. Also, a medium or soft-tone needle may often be preferable to the loud tone variety.

Then there is the question of record speed. Most records

methods of checking the number of revs. per minute at which the record revolves. One is to make a chalk mark on the edge of the disc or turntable and another mark opposite this on the cabinet or any stationary point.

Then count how many times the moving mark passes the stationary one in fifteen seconds.

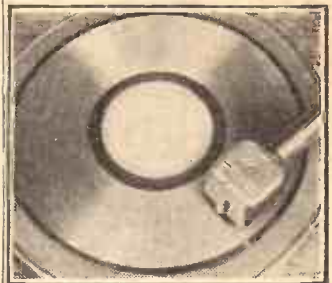
Multiply the answer by four and you have the number of revolutions per minute.

### Testing Speed.

It is best to carry out this test with the pick-up traversing the record grooves unless you are very sure that your motor does not slow down when a record is being played.

Another scheme is to make use of the stroboscopic principle. A stroboscope disc (these are obtainable from gramophone

### THE STROBOSCOPE



For those with A.C. mains the stroboscopic method of record-timing is the most convenient.

dealers) is placed on the record, which is arranged so that the light from an electric bulb working on alternating current mains shines upon it.

If the stroboscope disc is suitably chosen in regard to the periodicity of the mains supply, the black lines will appear to be stationary when the turntable is revolving at the proper speed.

### Final Hints.

Pick-up work is singularly free from troubles. Occasionally a very long lead between the pick-up and the set will produce instability and it is advisable whenever possible to earth the pick-up arm, and also the metal casing of electric turntable motors unless contrary instructions are given by the makers.

Incidentally, the pick-up leads should never be allowed to trail across the amplifying stages. This is a frequent cause of instability.

### DON'T PULL YOUR INSTRUMENT TO PIECES

★ ★

Unless you are very skilled it is not advisable to attempt to make internal adjustments to a pick-up.

★ ★



★ ★

If your pick-up develops a fault the wisest plan is to return it to the makers for expert attention.

★ ★

Many of the pick-ups at present on the market are designed to give what is often termed, a "bass hump" That is to say, the pick-up slightly over-amplifies the bass notes

should rotate at the speed of 78 r.p.m. Any departure from this may affect the tone and cause results to bear little resemblance to the original.

There are several simple

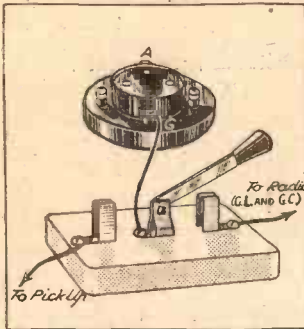
Special Beginners' Supplement—Page 2

MANY of our readers have successfully wired and used switches of various kinds when making sets, but have expressed uncertainty as to how these switches work.

Their action is mainly mechanical. From the electrical point of view all that the switch has to do is to make a contact, or contacts, between certain of its terminals, when in the one position; and to break the contact, or possibly make a new one (or several new ones) in the other position.

The simplest form is the "make-and-break" switch, a type well exemplified by the

**DOUBLE-THROW**



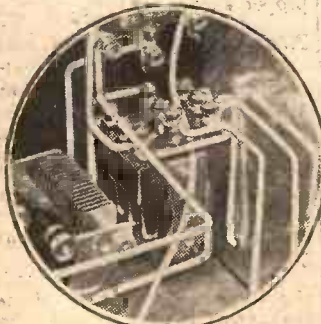
A radiogram switch which illustrates the principle of two-way switching.

ordinary filament on-off arrangement.

When the switch is turned to the "break" or "open" position the electrical circuit from the valves to the battery is interrupted, so obviously no current can flow, and the set is therefore inoperative. Movement of the switch restores the continuity of the wiring as the contacts come together, and so, in the "on" position, the set "comes to life" until its all-important filament current is cut off again.

**The Simplest Form.**

This is the simplest form of switch. And as there are numerous ways in which such contacts may efficiently be made or broken, we find that the make-and-break types are of several kinds, such as push-pull, rotary, tumbler and so forth.



The type of change-over switch generally used for elaborate schemes.

**SWITCHES AND THEIR USES**

Another common use for the make-and-break variety of switch is for wave-changing, in conjunction with a coil unit. And here we get a hint of the versatility of switches, for in the usual method of wave-changing the "make-and-break" apparently acts quite differently from the filament circuit arrangement described above.

What we require in wave-changing is an alteration in the number of turns of a tuning coil, across which the tuning condenser is connected.

**In Two Sections.**

The illustration below clearly shows how this is accomplished with a make-and-break switch.

The advantage of the method is that although the number of turns in use is altered, as desired, to tune either to the long or medium waves, no interference with the actual turns of the coil unit is necessary.

To understand how this is done, ignore the switch for the moment, and notice how the coil unit is divided into two tuning sections. The one marked "M.W." consists of some fifty or so turns, the number required for tuning over the medium waveband.

In addition there is the long-wave section, marked "L.W." This comprises about 150 turns or more, and one end is joined to the medium-wave winding, so the two sections are in series with one another.

In addition there is the long-wave section, marked "L.W." This comprises about 150 turns or more, and one end is joined to the medium-wave winding, so the two sections are in series with one another.

**Long-Wave Tuning.**

The outer ends of the two coils are permanently connected to the valve and to the variable condenser, which is thus joined across both windings—some 200 or so turns in all. And if we ignore the switch for the moment we have, in effect, a 200-turn coil, which is suitable for tuning from 1,000 to 2,000 metres (or, thereabouts) in conjunction with the tuning condenser.

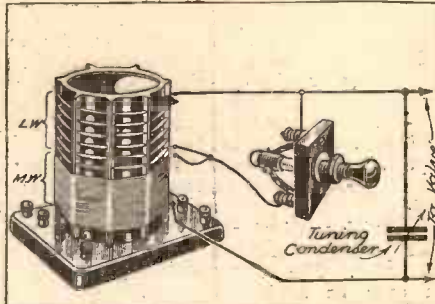
**A Short Cut.**

In practice, we also need another waveband, the "medium," covering from about 200 to 550 metres.

The switch provides for this by the ingenious arrangement depicted in the sketch. It will be seen that it is wired across the long-wave section.

When the switch is operated in its "open" position, its contacts are separated from one another. Consequently currents flowing from the fixed, or top, vanes of the variable condenser round to the moving (bottom) vanes, or vice versa, have to traverse the full 200 turns of coil. And thus we have the required long-wave arrangement—a 200-turn coil with a variable condenser connected across it.

To change to medium-wave reception we operate (generally pull out) the switch, so as to bring its contacts together into



For long-wave reception both sections of the coil are connected in series, the switch being placed in the "open" position, as shown.

the "closed" position. Immediately this happens the long-wave section of the winding goes out of action.

We have not interfered with the actual turns in any way by altering the switch, but we have introduced a short cut from one side of it direct to the other, through the switch contacts.

We have provided a shorter circuit. (And the operation is therefore known as "short-circuiting," or "shorting," the long-wave section.)

As a consequence, the current will not attempt to flow through the 150-turn winding, but it will virtually all take the short cut across the switch, and thus leave the condenser with the effect of only the remaining 50 turns of coil across it.

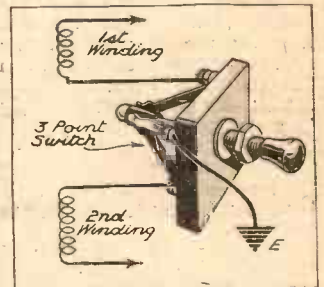
These "50 turns" will enable us to tune over the medium waveband. (In practice the

actual turn numbers will vary according to dimensions of the former, etc.)

By merely pushing in the switch, so as to "open" its contacts again, we can take away the short cut, and instantly have the full 200-turn coil in use again, for long waves.

Obviously, we can add a third contact to such a switch, and use this for some subsidiary wave-changing operation. For instance, we may have an extra reaction winding, required only on the long wavelengths. And we can treat this exactly like we did the 150-turn coil, shorting it whenever necessary by

**WAVE-CHANGING**



With multi-contact on-off switches, several windings can be controlled.

means of the extra switch contact.

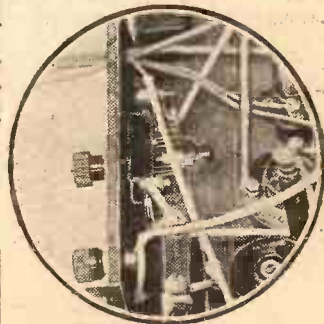
Instead of using a make-and-break switch for the more complicated circuit alterations, we employ a change-over switch. The simplest form of this, on which all others are based, is illustrated on this page.

**The Principle.**

Its principle will be obvious. When used for radiogram switching, we need to connect the grid of the valve either to pick-up, or to "radio."

So we join it to the "centre" or main contact of a change-over switch, and the outer contacts are led to the respective circuits. Thus, in one movement, we can disconnect the grid from pick-up, and join it to "radio," or vice versa.

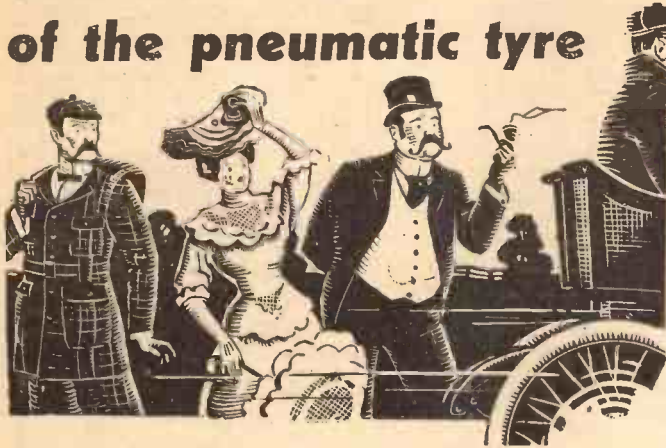
By adding further contacts to the switch, we can break a filament circuit, etc., simultaneously. There are, in fact, scores of variations. But the principles on which even the most complicated switches work are those which we have outlined in this article.



A push-pull type of change-over switch.

**NEXT WEEK:** "ADVANTAGES OF PARALLEL FEEDING" AND "THE USE OF GRAPHS."

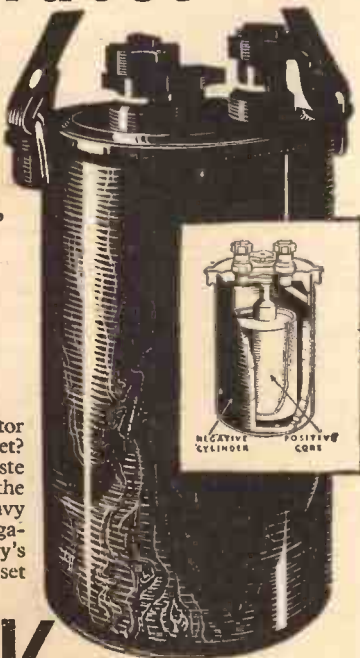
**A**s startling in its effects as the invention of the pneumatic tyre



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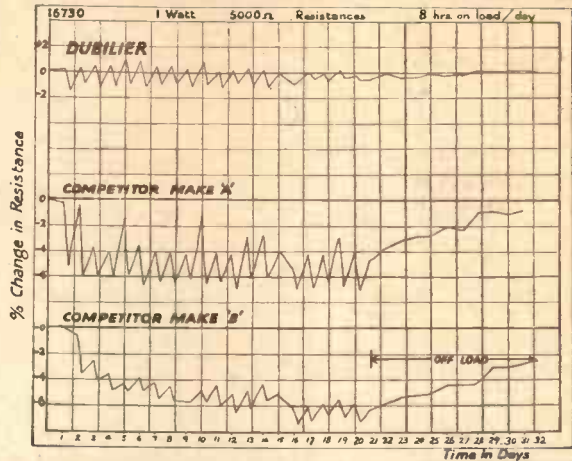
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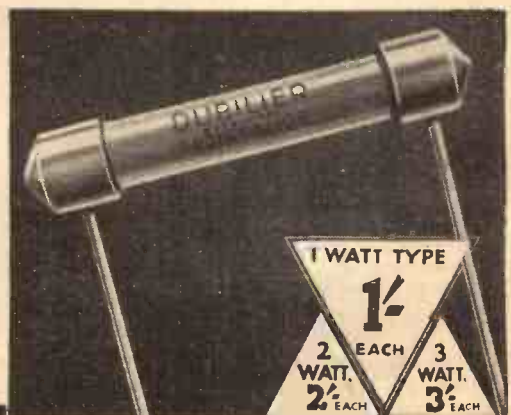
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# Prolonged Load Test proves Superiority of DUBILIER RESISTANCES



During a recent series of extended comparative load tests, carried out on Dubilier resistances and others of well-known makes of the same order, the performance of the Dubilier resistances was outstanding and proved without doubt their superiority. The series of tests were made to determine any changes in resistance value over a prolonged cycle of loading. In all cases the resistances were under load for a period of eight hours per day and were off load for the remaining sixteen hours. The results, given in the above chart, show a downward drift in the resistances A and B under these conditions, but the curve relating to Dubilier resistances, however, indicates that the change is very small and of a negligible character. The right-hand portion of the curves represent the recovery of the resistances as they were maintained off load for the period marked. Tests carried out by large users of Dubilier resistances over periods exceeding 5,000 hours continual heavy load, have proved extremely satisfactory, a very creditable performance of which Dubilier can be justly proud. Therefore, specify Dubilier resistances when ordering and be certain of complete satisfaction.

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# SHORT-WAVE NOTES

BY W. S. STELL

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

THE stage is all set for the hardy adventurers who intend to brave the terrors of the great heights and the high frequencies. If this doesn't convey anything to you, look elsewhere in this issue and be enlightened.

My own little 5-metre receiver has got to do a job of work, and I have a feeling that most of the 5-metre receivers in the country will be on duty on the same day! Let us hope that the experiment is a success—in which case it will lead to something (literally) higher.

### Conditions Not Too Good.

Spring-cleaning is over, and everything is so neatly stacked away in its appointed place that it will take at least a fortnight to find it. This being the case, I have once more been able to clear a narrow "corridor" across my room, giving access to the short-wave receiver. But I confess that it has not been used overmuch, as conditions have not proved too good.

My own private "Research and Construction Department," though, has been working overtime. I believe in making the best of spells of bad conditions, by testing out theories and building new sets.

I have come to the conclusion that one cannot beat chassis construction for short-wavers. I believe I have said this before, but I am now so certain about it that a little repetition for the sake of emphasis will not matter.

### Utility of Chassis Construction.

A friend of mine (who styles himself "a pure wet-nose" in short-wave matters) has made a blind copy of one of my own little sets, on a very small chassis. On the same night as he finished the construction he brought it round to me, and I honestly couldn't tell one set from the other, as far as results went.

As a matter of fact, the only difference between them, even in appearance, was that my wiring was of the multi-coloured variety (through using up old stocks) while his was all yellow!

That, I think, is a good example of the utility of chassis construction for short-wavers. Anyone making a blind copy of a set is bound to arrive at practically the identical thing that he has copied, and there is hardly any possibility of a discrepancy in results.

Some time ago I published a circuit diagram of a two-valver that pleased me very much. This used a screened-grid detector valve, resistance-coupled to a pentode.

### Testimonies From All Parts.

Although I only showed the theoretical diagram and made a few casual remarks about it, I have had a surprising number of testimonies to its efficiency from readers in all parts of the world! From South Africa, the U.S.A., and Norway have come letters thanking me for it, which make me feel rather conscience-stricken, since it wasn't really my own idea.

I have, however, built a set of this description (on a chassis, need I add?), and it will be appearing in "P.W." in the near future. I am not claiming anything epoch-making for the set—I never do, if I can help it—but I am pleased with it. It is quite one of the nicest two-valvers that I have ever handled.

Personally, I don't think I shall ever use anything but a "one" for amateur-band work, but for short-wave broadcast a "two" of this kind is very useful, and the S.G.-P. circuit certainly gives a reasonable amount of "punch."

### Another S.W. Competition.

J. B. M. (Glasgow) refers back to my recent paragraph on exaggeration and imagination. He says that people are sceptical enough about short-wave facts, and that he doesn't see the least reason for making use of any exaggerations. Once these people try for themselves, though—

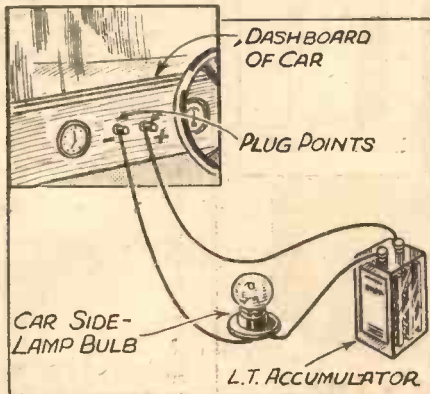
T. C. (Wakefield) wants another Short-Wave Reception Competition, and suggests the Whitsun week-end. I think this would be admirable, and suggest that readers listen from midnight on Whit Saturday till midnight on Whit Sunday—not necessarily without a break! Please send in detailed logs of either (a) broadcast stations or (b) amateur stations. Editor's decision final!

## CHARGING OVERNIGHT

A tip that may save you missing those short-wave tests or other transmissions you particularly wish to hear.

SMALL accumulators such as are used for radio can be charged from big ones such as are used in cars. And it is possible to charge up a small wireless battery overnight, in an emergency, by joining it up to the car's battery.

### SIMPLE CONNECTIONS



Be sure you connect the positive plug to the positive of the accumulator.

In series with the radio battery, connect a side-lamp bulb, which takes about half an ampere, and then join up the accumulator to the plug points usually provided nowadays on the dashboard of a car. Take care to connect positive to positive.

## The LINK BETWEEN

BY G.T. KELSEY

Weekly jottings of interest to buyers.

THE popularity of any service such as that devised by "P.W." to enable readers to obtain radio literature with the minimum amount of trouble and inconvenience is bound to suffer by the imposition of "regulations."

The whole beauty of the scheme lies in the fact that when you want a copy of a catalogue that is mentioned in these notes you have only to put your name and address, together with the appropriate number, on a postcard, and we do the rest.

But if many more people leave their names and addresses off their applications, we shall seriously have to think about the imposition of at least one regulation. Enough said! Those readers who are still waiting for catalogues for which they have "applied" will know what to do and to the others the remarks do not apply.

Incidentally, just before leaving the subject of postcard radio literature, may I appeal to you all to see that your cards are properly stamped before you post them? The arrival of cards that are unstamped or insufficiently stamped, causes delay all round, and we shall never succeed in getting a return-of-post service while that sort of thing goes on.

### OUR POSTCARD SERVICE

Applications for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G.T. Kelsey at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.

Fortunately, as one would expect from "P.W." readers, the percentage of "bad boys" is small, but it is not small enough completely to obviate delay. So that it is in your own interests that we make this simple request.

### That Interval Signal Again!

From the absence of comments in the press and otherwise, I began to think that listeners were at last settling down to the B.B.C.'s interval signal. But apparently I was wrong.

I have heard it referred to as the death-watch beetle in a cigar-box (and, alas, in far less complimentary ways), but the story that has just reached me from H.M.V. is something quite new.

It appears that an elderly lady bought an H.M.V. "Transportable Radiogram," and after it had been working for a couple of days she 'phoned her dealer and asked him to send a man round at once as someone was knocking nails inside the cabinet.

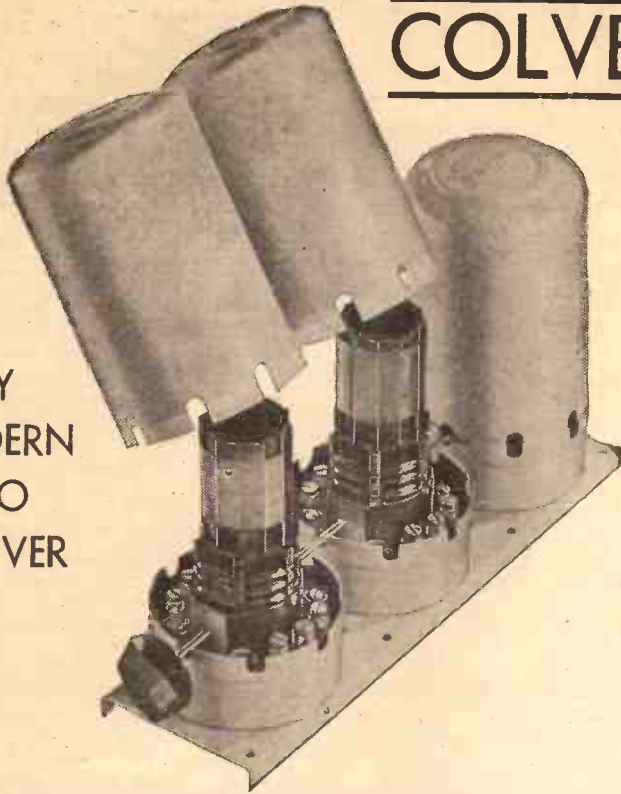
Yes, it was the interval signal, right enough. But it was an exceedingly puzzled service engineer that set out to track the intruder to earth.

(Continued on page 346.)



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# RADIOTORIAL

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

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

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

## QUESTIONS AND ANSWERS

### PENTODE IN TWO-TRANSFORMER SET.

F. L. P. (Birmingham).—"I should like to know if a pentode valve will work in a two-transformer set, the 'Comet' Three?"

"Some friends of mine tell me that it will, if I take out the last transformer and put in an output transformer in its place.

"If so, what kind of output transformer shall I get for it?"

You have been misinformed. It is not advisable to try to work a set with two L.F. transformers with a pentode as output valve.

True, you could reduce the set's amplification by using an output transformer instead of an L.F. transformer between the last and preceding valves, but you will be begging the question and wasting current, because the valve will be fundamentally unsuitable for the circuit.

Owing to its high magnification factor the pentode is usually unable to deal with the output when a preceding L.F. valve is employed, so it should always follow directly after the detector in normal circumstances.

### DUAL-RANGE COIL FOR "COMET" THREE.

E. J. (Oswestry).—"Would it be possible to put a Telsen dual-range coil in the 'Comet' Three? If so, how?"

The unscreened type Telsen dual-range coil may be used in the "Comet" Three if desired.

The connections are as follow:

The lead shown on blue print as connected to G on P.W. coil should be connected to 8 on Telsen coil; that shown to 83 to 6 and 7 on Telsen coil; the lead to A to either 1 or 2 on Telsen coil (terminal 2 giving greater selectivity); the lead to S1 to 3 on Telsen coil; the lead to S2 to 4 on Telsen coil; and the lead to B to 5 on Telsen coil.

The lead which connected S1 to the .002-mfd. pre-set condenser and the wavechange switch should be disconnected from the pre-set condenser, this lead then connecting from 1 on the Telsen coil to one point of the wavechange switch and to nowhere else.

The moving vanes terminal (M) of the tuning condenser should be connected to terminals 6 and 7 of the Telsen coil instead of to the terminal of the .002-mfd. pre-set, so leaving this terminal of the pre-set condenser (that nearer the edge of baseboard) completely disconnected.

If it is found difficult to obtain reaction at any part of either waveband, the .00013-mfd. differential reaction condenser should be replaced by one of .0003-mfd. capacity.

### EMPIRE STATION WAVELENGTHS.

In response to enquiries about the wavelengths, etc., used by the Daventry short-wave station, the following details issued by the B.B.C. will be of interest.

The two transmitters at the Empire Broadcasting Station at Daventry may be operated on any of the following wavelengths: G S A, 6,050 kcs. (49.59 m.); G S B, 9,510 kcs. (31.55 m.); G S C, 9,585 kcs. (31.30 m.); G S D, 11,750 kcs. (25.53 m.); G S E, 11,865 kcs. (25.28 m.); G S F, 15,140 kcs. (19.82 m.); G S G, 17,770 kcs. (16.88 m.); G S H, 21,470 kcs. (13.97 m.).

The alternative frequencies in the 25- and 31-metre bands may be used at short notice.

G S D may be used in place of G S E and vice versa. G S B may be used in place of G S C and vice versa.

The call-sign signifies the frequency which is in use, e.g. G S C relates to 9,585 kcs. (31.30 m.).

The transmission schedule is as follows, but it must necessarily be altered from time to time, consequent upon changing seasonal conditions, and reception reports from Empire Station listeners overseas.

Zone.	Call-Sign	Wavelength (metres)	Times of Transmission G.M.T.
1. Australasia ..	G S D	25.53	09.30—11.30
	G S F	19.82	
	G S E	25.28	
2. India ..	G S F	19.82	13.30—15.30
	G S G	16.88	
	G S E	25.28	
3. South Africa ..	G S B	31.55	15.30—17.30
	G S D	25.53	
	G S G	16.88	
4. West Africa ..	G S B	31.55	18.00—22.30
	G S D	25.53	
	G S A	49.59	
5. Canada ..	G S A	49.59	23.00—01.00
	G S B	31.55	

(The above schedule is liable to change at short notice.)

Zone I times will be altered on June 11 to 04.30—06.30 G.M.T. for June and July, 05.15—07.15 G.M.T. for May and August, 06.00—08.00 G.M.T. for April and September, 07.00—09.00 G.M.T. for March and October, 07.30—09.30 G.M.T. for February and November and 08.00—10.00 G.M.T. for January and December.

At present it is proposed to use G S D and G S B during these transmission times.

(Continued on next page.)

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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

### CONNECTIONS FOR A GOOD L.F. AMPLIFIER.

L. J. S. (Gt. Yarmouth).—"Having most of the parts on hand, I should like to knock up an amplifier for pick-up work, for one L.F. valve and pentode output. I have the pentode output transformer (for P.M.22) and volume-control potentiometer, quarter megohm.

"Also L.F. transformer and the odds and ends such as case and terminal strip. I propose to put the transformers with their windings at right angles to each other, as I suppose this will be the best position to prevent feed-back from occurring.

"Please give the connections for using two L.T. terminals, three for H.T.+, and the G.B. wiring, to terminals."

As you suggest, it will be advisable to keep the two transformers spaced well apart, and with their cores at right-angles.

In all you will need thirteen terminals, viz.: H.T.-, H.T.+1, H.T.+2, H.T.+3, two L.S., L.T.+1, L.T.-, G.B.+1, G.B.-1, G.B.-2, and two input terminals.

The connections will be as follow:  
L.T.- terminal to one filament socket on each valve holder. L.T.+ to one side of switch (on/off)

### HOW IS YOUR SET GOING NOW?

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

Whatever your radio problem may be, remember that the Technical Queries Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scales of charges, can be obtained direct from the Technical Queries Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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

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

and other side of this switch to the remaining filament terminals on the valve holders.

H.T.- and G.B.+ terminals are joined together and to the L.T.- terminal.

The outer (end) terminals of the volume-control resistance are connected to the two input terminals, and one of these is also joined to the G.B.-1 terminal.

The slider of the volume control is joined to the grid terminal of the first valve holder.

The plate terminal of this valve holder is connected to the A terminal of the L.F. intervalve transformer. Its H.T.+ terminal goes to H.T.+1 terminal.

The G terminal of this transformer goes to the G terminal of the second valve holder; its G.B. terminal to the G.B.-2.

The loudspeaker terminals are joined to the two sides of the secondary of the pentode output transformer. The + terminal of this goes to the H.T.+3 terminal, and the remaining connection from the primary of the pentode output transformer is taken to the anode terminal of the pentode.

Finally the H.T.+2 terminal is connected to the priming grid of the pentode, usually via the "cathode" (centre) connection of a 5-pin valve holder, and this completes the wiring.

You will need a maximum of 150 volts on H.T.+3.

### AERIAL TERMINAL CONNECTION ON THE SHORT WAVES.

"Roxy" (Gt. Malvern).—"I have been struck with what a great difference it makes when I put the clip on the flex from the aerial terminal a bit lower down or a bit further round on the 4-turn plug-in coil.

"Not only in strength, etc., but in making the set seem easy to handle, this simple tapping appears to control even reaction

(partly), and it gives me a much greater selection of programmes to try for.

"As an experiment I put a .0001-mfd. between aerial and the A terminal, and this seems to help still further.

"Is there anything more I can try on these lines?"

There is plenty of scope for further experiment, as there are several distinct methods of connecting the aerial to the aerial coil, as well as degrees of each which can be tried to find which is best for the particular station you are receiving.

At present your clip on the grid coil gives you varying degrees of inductive coupling, by the auto-transformer method.

Another and often superior method of inductive coupling is to use a separate aerial coil of two turns or so, and if you like, a clip connection on this, to obtain still greater variation.

To convert your set all you need do is fix another coil holder near the grid coil, with the 2-turn coil in it so that they give you three coils side by side, instead of only the two as before.

### The New Wiring.

Connect that side of the present 4-turn coil which is joined to earth to one of the terminals on the new coil holder so that both these coils go to earth.

The other terminal on the new coil holder can be left blank if you decide to keep the aerial terminal flex and clip in action on it, instead of on the 4-turn coil, as before. Or you can obtain a similar effect by connecting the aerial terminal permanently to this non-earthed side of the coil holder, and then using different coils in the holder.

Yet a further variation can be made by fixing the new coil holder to the baseboard by one screw instead of two, in such a way that the coil holder can be swung out a little from the neighbouring coil when desired. The further out you swing it the looser is your coupling, and vice versa.

Finally, you can try condenser-controlled or capacity coupling.

For this you need a .0001 variable condenser (a pre-set will do admirably) in conjunction, with a new aerial terminal, which we will call A2. Connect as follows:

One side of the new variable condenser to A2, the new aerial terminal. The other side of this condenser to the grid-condenser end of the grid coil (the centre coil).

If inductive coupling then fails to give the results you require, change over the aerial-lead to A2, and adjust the variable condenser, which will give varying degrees of capacity coupling.

### THE CAUSE AND CURE OF CRACKLES.

T. G. H. (Swansea).—"We recently moved to Swansea from Ilfracombe, and one of the things that was most carefully packed was the wireless set and the three valves.

"It was standing aside in its packing for nearly three weeks, but I got it all out (having arranged for an outdoor aerial which is of roughly the same size as the Ilfracombe one) and carefully put the set in commission again.

"Since then it has been suffering badly from crackles. Please say how this can be cured."

We suspect your new aerial or earth. A brief test may be applied by disconnecting the aerial and earth leads, and if the noise then ceases it may fairly safely be assumed that the receiver is in order.

It is advisable to examine the lead-in wires, insulators, and the joint between the earth lead and water pipe or earth tube.

Interference caused by electrical apparatus is often similar to atmospheric background and may be picked up by the aerial or earth, or in an all-mains receiver come in through the mains wiring. It is often found that a really efficient earth connection, consisting of a larger earth tube in moist ground with a connecting lead not over seven or eight feet long is of very great help.

A long earth lead or a connection to a gas or water pipe, which is some considerable distance from the ground, is usually very ineffective, and in extreme cases no difference can be detected when this is disconnected from the receiver.

In cases where the interference may be coming via the mains apparatus of an all-electric receiver, it may be found that some form of H.F. filter in the mains leads is of assistance. With D.C. sets, two fixed condensers of .001- to 1-mfd. capacity and high-test voltage, may be connected in series across the mains leads, the centre point of the two condensers being connected to earth.

Special mains H.F. chokes are marketed by several manufacturers, and one of these may be connected in series with each mains lead, a 1-mfd. condenser being connected across the mains leads on the receiver side.

In general, where interference due to electrical apparatus is thought to be the cause of the trouble, we would suggest that you write to the B.B.C. giving details of the trouble, as the B.B.C. and the Post Office are doing everything possible to remedy this trouble.

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P.W. 20/5/33.

## MIRROR OF THE B.B.C.

(Continued from page 326.)

messages from people in remote places to their friends in England.

Miss Stops, who is a Women's Institute Organiser, is giving a talk in the Birmingham studio on Monday evening, May 29th, in the course of which she will deal with links of this kind between Midland people and the Colonies. No doubt she will refer to the autograph albums, of which she has several, filled with the names of women she met in the Colonies. These albums are eagerly scanned whenever she addresses a Women's Institute meeting.

## Summer Relays.

Summer relays from the Jephson Gardens, Leamington Spa, begin on Sunday afternoon, May 28th, with a concert of light music provided by the Coventry Hippodrome Orchestra, whose broadcasts from their home town have been pleasant features of the Midland Regional and National transmissions for some time.

Listeners always appreciate that little bit of sparkle associated with relays from holiday and health resorts.

## THE LINK BETWEEN

(Continued from page 342.)

I am now waiting for some bright spark to suggest that the B.B.C. use a cracked interval record.

## Mullard and "Class B."

Readers will no doubt be interested to learn that the Mullard "Class B" valve is now generally available.

It is known as the P.M.2B., and it is fitted with the new B.V.A. standard seven-pin base. The mutual conductance is approximately 2.2 m.a./volt, and it is capable of giving an undistorted output of 1½ watts with 120 anode volts.

Although I have not yet had an opportunity of trying one of these new Mullard valves, it is obvious from the characteristics that have been forwarded to me that it is every bit up to the standard upon which the Mullard reputation has been built up. That is good enough for me.

Incidentally, I notice that Mullard recommend the use of a P.M.2DX for the drive valve. For this valve to be working under ideal conditions, the use of an H.T. voltage of 120 is advised with a negative bias of 4.5 volts. The P.M.2DX anode current should then be somewhere in the neighbourhood of 1½ milliamps.

## Pentode Popularity.

The increasing popularity of pentodes prompts me to call attention to a particularly suitable output choke, which, so far as I know, is the only one of its kind available.

The Clarke's "Atlas" C.P.S. pentode output choke is provided with a terminal arrangement which permits of nine different ratios. I do not know of another choke with which the choice of so many ratios is possible.

As a matter of fact, the Atlas C.P.S. choke is a very good one. It has an inductance of 35 henries at 60 milliamps, which is a quite useful figure. The D.C. resistance is 385 ohms.

Fuller details are available in a leaflet which can be obtained through our postcard literature service. Incidentally, the other components in the popular Atlas range are described in the same (No. 35) brochure.

## A New Blue Spot Pick-up.

The British Blue Spot Company has recently announced the introduction of a new pick-up.

The Blue Spot Model 33—as it is called—has every appearance of being a really first class job, and at the price of 35s. complete it is worthy of serious consideration by all who are interested in the electrical reproduction of records.

I say that not without ample justification, for I have seen the frequency response curve of this new pick-up, and it is upon that that I base my remarks.

The Model 33 is equipped with a self-contained volume control, and to facilitate needle-changing the pick-up head is made to rotate. For those who are technically minded, the average output is one volt E.M.S. Descriptive literature can be obtained by quoting the appropriate number (No. 36) on a postcard.

HOW TO BUILD  
A 5-METRE RECEIVER

(Continued from page 328.)

Now for data. The two detector coils are each wound with five turns of No. 12 gauge bare copper wire, and are made by winding the wire on half-inch ebonite rod, letting it slide off, and pulling it out so that there is a spacing of about one diameter between turns. Don't use any supports whatever for these coils—simply attach the "outside ends" to the plate and grid terminals of the valve holder and the "middles" to the two connections on the .0001 reaction condenser. A glance at the circuit diagram will put you straight on this.

## Winding the Coils.

The adjustable condenser in series with the aerial should be a neutralising condenser—not a "pre-set"—and should generally be worked at a very small capacity indeed, unless a very small aerial is used.

The "super" valve is simply a straightforward oscillator. All it needs is coils! These were wound, originally, on a solid 1½ in. ebonite former with two deep slots turned in it. No. 36 or 38 gauge wire was used, and 1,000 turns were wound for the grid coil and 750 for reaction. Here, again, the outside ends go to grid and plate, and the "middles" to L.T. negative and H.T. positive respectively. The grid coil is shunted by a .002 fixed condenser.

I think I have said enough about the circuit arrangements to enable any keen short-wave fan to make a five-metre receiver that works. A few remarks about operation, however, are worth a deal of pity.

First of all, don't use more than about 60 volts of H.T. It isn't necessary. Remove the "super" valve altogether, and make sure that the detector is oscillating. There won't be much trouble about that if you've wound the coils in the right directions and wired them up decently.

Then put in the "super," and listen for the characteristic mushy hissing noise which indicates that it is working. You only hear this, by the way, when the detector is oscillating, and you should set the reaction condenser so that it is not oscillating too hard (although the setting is not at all critical).

## Tune Very Slowly.

Don't worry about what will appear to be a very loud background noise—as soon as you tune-in a signal of any strength, the noise disappears. A carrier-wave, without any modulation on it, will appear as a "hole" in the mush.

Tune round the band very slowly, listening to any slight diminution in the mush. A really weak station will only cut it down slightly, but you should be able to hear speech and music through the mush that remains.

Remember that though the 5-metre amateur band only extends from 5.005 to 5.35 metres, this is equal to a range of about 59,940 to 56,070 kilocycles. The band is thus nearly 4,000 kilocycles wide—in other words, it will accommodate eight times as many stations as the medium-wave broadcast band. So don't be too "twirly" with the dials!

Now turn back to page 327 and see what we want you to listen for.

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# TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

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

## Direction-Finding.

THOSE of my readers who are interested in wireless direction-finding apparatus should take an opportunity of looking at a Paper, read before the Institution of Electrical Engineers in March, which describes a radio compass developed at H.M. Signal School, Portsmouth.

This is a wireless direction-finder, free from "ambiguity," which has been developed for use in ships as well as on shore. In most forms of direction-finder it is usual to employ a figure-of-eight reception characteristic for taking the direction and afterwards to get rid of the ambiguity by a separate operation. This second operation increases the time required for taking a bearing and the main advantage of the new system is that the direction and sense are determined by a single operation.

The new instrument is easily used on shore, but special precautions are necessary when it is installed in a metal ship, owing to the effect of various parts of the ship and its rigging on the wireless wave.

## Deviation Corrections.

By suitable circuit arrangements the deviations that are experienced with the new instrument can be reduced to the same as would be obtained with the equivalent simple direction-finder in the same position, and methods for effecting the necessary corrections in the new system are discussed.

## WHAT IS A LEADING WIRELESS WEEKLY?

(See page 321 for a concise explanation)

The Paper includes some valuable observations on wireless direction-finding in general and should be read by those of you who take a serious interest in this important application of radio for naval and commercial purposes.

Another interesting Paper which I have just received is the British Radio Annual, published by the British Radio Institution (hailing, incidentally, from North Britain, the Secretary of the Institution being in Glasgow and the Editor in Edinburgh).

This contains a number of particularly interesting articles, rather of an advanced type, it is true, but containing valuable information on such subjects as the Electrical Condition of the Upper Atmosphere, Aerial Design, Selectivity in Broadcast Reception, Low-Frequency Amplification, The Output Stage of a Receiver, Sound-Film Reproduction and Operation, and Echo Sounding.

## The Grid Condenser.

It is surprising what a lot of people stick to one particular value of grid condenser and leak for the detector, without ever trying other values. As a matter of fact, in different conditions you will often find

that you can get better results by playing about with the values of the condenser and leak.

A very popular pair of values is .0003 mfd. for the condenser and 2 megohms for the leak, but some people use .0002 mfd. and 1 megohm, which naturally makes a difference to the quality.

If you use these lower values of grid leak and condenser you do not weaken the high notes to the same extent as with the larger values, whilst if you go still further and reduce to, say, .0001 mfd. for the condenser you will in some cases obtain still better quality.

## Try New Values.

It is quite interesting experimentally to try a few different condensers and grid leaks in the detector circuit and to see what effect these have on the quality and, incidentally, on the volume. Most experimenters have a few condensers on hand of suitable values so there need really be no expense involved in the trials.

## Volume

It is not commonly realised that the volume control has any effect on the selectivity. At first sight you would imagine that there could be no possible connection between the two. You would think that the selectivity was something to do with the high-frequency end of the set and the volume control something to do—as a rule—with the output.

Now, as a matter of fact, there is often a close connection between the two, and it happens for this reason. The volume control proper—if it is doing its job properly—does not discriminate between one part of the reproduction and another; in particular, it affects both the wanted and the unwanted signals in the same way.

If, however, we turn to the reaction as a volume control, this has a discriminating or selective effect, quite different from the ordinary volume control.

## A Property of Reaction

If the tuning is arranged so that the wanted station is properly tuned in, then the reaction will amplify the station which is tuned in to a much greater extent than nearby frequencies (radio frequencies, of course), with the result that the wanted transmissions will stand out more definitely from the unwanted ones.

The reaction, therefore, has the property of picking out to a large extent what you want from what you don't want. The ordinary volume control, on the other hand, has no such property.

Consequently, if you have your volume control set to full on, that is, for the loudest volume, and your reaction set to a low value, you may be getting plenty of interference from neighbouring radio frequencies, but if you set your volume control fairly low and then bring up the volume again with

(Continued on next page.)

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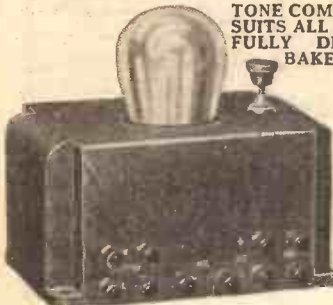
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**TECHNICAL NOTES**

(Continued from previous page.)

the reaction (assuming, as I say, that the wanted station is properly tuned) you can get back the wanted station to the original volume but with the interfering frequencies very much reduced by comparison.

**When Reaction is Preferable.**

It often pays, therefore, quite contrary to popular impression, to adjust your controls in the above-mentioned way, using a minimum of volume control and (within limits) a goodish amount of reaction. At any rate, if you are bothered with lack of selectivity in your receiver, this is a dodge worth remembering.

**Automatic Control.**

Talking about volume control, readers ask me from time to time about the use of "automatic" volume control. I mentioned this some time back, but in answer to various queries on this point I should say, as many of you know, that automatic volume control is achieved by the use of a special valve which is now available for the purpose. It is not absolutely essential to use this special valve, provided you have appropriate circuits for using ordinary valves. A special control valve, however, is simpler in practice.

Briefly, the way in which automatic volume control works is this. The control valve has the effect of controlling the high-frequency amplification in such a way that, when the incoming "signal" weakens, the high-frequency amplification of the receiver is automatically raised, whilst when the incoming "signal" strengthens, the H.F. amplification is automatically reduced.

**Variable Amplification.**

The whole business acts very much in the same way as a mechanical governor on an engine. I should also point out, before going any further that, just as with a mechanical governor, the extent of the variations with which the system can cope is limited.

It cannot, for instance, deal satisfactorily with enormous increases in incoming signal strength or with a drop to very nearly zero.

But with most foreign stations—and it is naturally with long-distance stations that this arrangement is most advantageous—the variations are within reasonable limits.

**"Signal" and Background.**

As you know perfectly well, with long-distance reception you almost invariably get plenty of "background," and this background may not have come from such a distance as the wanted transmission, consequently it may not rise and fall in the same way.

The result is that, if the amplification of the signal is increased (owing to the signal having weakened), the amplification of the background is also increased, but as the background has probably not weakened to the same extent as the signal, the result is that the signal is maintained at more or less a uniform strength, while the background is increased.

In the same way, if the signal increases in strength, and the amplification is thereby automatically reduced, the result is to keep the loudness of the signal about the same, but to depress the volume of the background.

The final or overall result as heard from the loudspeaker is a signal swaying not too seriously about its average value, with a background swaying in loudness much more noticeably.

**Screening Hints.**

In these days of screening and closely compact sets you have to be extremely careful about stray coupling effects. I have many a time come across sets which showed unmistakable signs of instability, notwithstanding a plentiful supply of screens of all sorts, when it was found that the screens were not doing their job properly.

Sometimes it may be that a screen is not effectively earthed, or there may be a leakage between a pair of tuning condensers. Another source of trouble is an unwanted

**LAST WEEK—**

"P.W." gave full details of the new "Catkin" Valves, together with a description of

**THE FIRST "CATKIN" SET**

Further particulars of the valves and a description of a special "Catkin" Mains Unit will appear

**NEXT WEEK**

coupling between a screened-grid valve and some other component. High-frequency chokes often cause trouble, and as a general rule it is better that these should be screened, as the large electro-magnetic field from a choke can cause a deal of trouble.

**Magnification and Stability.**

If you are out for large magnification, and you want to be certain of stability, it is just as well to screen the coils, too.

Even when you have fixed up all the necessary shields, it is most important to be certain that these are making proper electrical contact with earth or whatever the intended contact may be. You would think it was a perfectly simple matter to make a good electrical contact to a metallic object like a shield, but you would be surprised to know the number of cases of trouble I have actually come across which were traced to bad electrical contacts to shields and suchlike parts.

Some people string a number of shields together, and then make a single connection to earth, and it is in this arrangement that trouble so often creeps in.

If you have several parts, without a metal chassis, I think it is really worth the extra trouble to connect each separately to earth.

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# HOW TO MAKE AN ALL-PENTODE FOUR-VALVER

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# Popular Wireless

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No. 573.  
Vol. XXIII.  
May 27th,  
1933.

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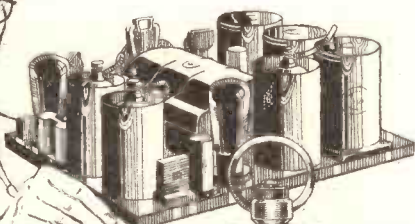
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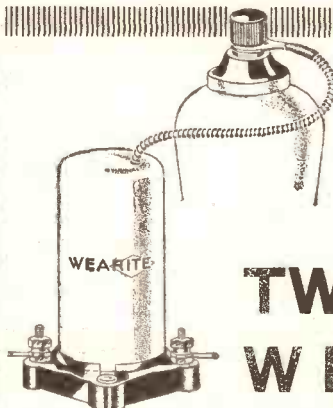


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# POPULAR WIRELESS

**THE FIRST AND FOREMOST RADIO WEEKLY.**  
 Scientific Adviser : Sir OLIVER LODGE, F.R.S. Chief Radio Consultant : P. P. ECKERSLEY, M.I.E.E.  
 Editor : N. F. EDWARDS.  
 Technical Editor : G. V. DDWDING, Associate I.E.E.  
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*The Paper that Made Wireless Popular*

**SOME DEFINITION!  
 MIXED NATIONALITY  
 POLICE TELEVISION  
 VIBRATION HEARING**

## RADIO NOTES & NEWS

**DIRECT ACTION  
 DOUG'S RADIO  
 THE ADVENTURER  
 SUPERLATIVES**

### Drama in Committee.

ONE of the British delegates to the recent Madrid Conference tells that the centenary of the invention of the Morse Code was solemnly honoured by the Conference. But on the next day a Spanish proposal to make certain changes in the Code came up for discussion; whereupon a delegate remarked that it was sad that they should honour Morse one day and try to destroy his work the next.

At this up rose a Spanish delegate, who in a fit of true Latin histrionics declared that if Morse could rise from the grave he would support the Spanish proposal. The proposal was adopted!

### A Few More "Howlers."

THE lady who from time to time has sent me genuine "howlers" which have been perpetrated in her school has recently undergone a serious operation, but is "sporty" enough to advise me from her sick-bed that a pupil of hers described electricity as "the name given to something which is nothing. It may be positive or not, and in America is used for ellercruting boot-leggers."

As a tailpiece, I may add for your delight that one boy referred to "no just cause or peppermint!"

### Car Radio.

RADIO for motor-cars has, I think, not yet been tackled, or taken, seriously in this country. But in America last year 143,000 car sets were sold, at a total price (at par) of about two million pounds sterling.

One of the last places on earth in which I should feel like "listening" is a motor-car. However, some people like their lives to be packed very tightly; some people either have no nerves or else have nerves like the wires of a power distribution plant. I understand that car radio in Britain is now to be "put on the map."

"Round the bend of the road" will prolong its popularity!

### A Bit of a Mixture.

EUGENE PINI, who broadcast recently with his Tango Orchestra, is shortly to take up duty at Ciro's, conducting the Lou Preager Dance Band. Pini (Italian) is of Scottish and French parentage; he

was born in Buenos Aires, was brought up in Scotland, and is a naturalised British subject.

His musical talent speaks for itself, but it would add charm to his biography if I could say truthfully that he is Dutch on his Aunt Tanta's side, with a touch of Greek-Copt, through great-uncle Benjamin, who descended from an Abyssinian Prince who married an Irish woman of Spanish blood which somehow was blended with the Incas! But I cannot.

### "P.W." PRE-EMINENT

As a source of exclusive radio information, "P.W." is unique, and an incomparable service is given to our readers.

For nearly eleven years "Popular Wireless" has maintained its position of pre-eminence, and proof of its unassailable lead is afforded by the following incontrovertible FACTS.

During the past two months "Popular Wireless" has given full details of:—

- (1) The First "Class B" Set;
- (2) the First Home-Constructor Automatic Radiogram;
- (3) the First Multi-Mu Pentode Set;
- (4) the First "Class B" Portable;
- (5) the First Double-Diode Triode Set;
- (7) The First Cold Valve Set;
- (8) The First All-Metal-Valve Set, and, as recently as last week,
- (9) The First Low Bias Variable-Mu Set.

### WATCH THIS LIST GROW!

### The Optimistic Constable.

CHIEF CONSTABLE F. T. TARRY, of Exeter, has won 30 guineas and a gold medal for an essay entitled, "Mechanisation as an aid to Police Duties," in the course of which he suggests a national police radio station controlled by Scotland Yard, with regional stations in provincial centres.

I made the same brilliant, obvious suggestions when I lectured before the Chief Constables' Conference in 1922. But let that pass.

I commend C.C. Tarry for his optimism in stating that the ultimate aim will be to

show a policeman on the Great West Road by television a picture of a thief wanted for stealing a car twenty minutes previously. The ultimate aim, I submit, is to prevent theft.

### News From Georgia.

A WELCOME letter from citizen J. Winton, of Atlanta, Georgia, U.S.A. tells of a new station, of 500 kw., to be built for WLW by R.C.A.-Victor, whose "reliable service" area will be about 5,000 miles. Nine months will see the job through.

Doubtless our fans will scoop in the glad news of WLW in due course. Meantime, I note J. W.'s cry of joy over the repeal of Prohibition. I hope that Georgia drank the health of King George V. But my hope is not a very vigorous plant, for I know that many 100-per-cent Americans don't take much stock in "the King business"—though their ladies love to be "presented."

### Danny "Makes Good."

THOUGH I am no lover of the Irish brogue I have a special place in my heart for fighters of Danny Malone's type. This twenty-two-years-old man left his Irish home two years ago to find work, shipped as a deck-hand, went to Australia, worked and wandered for eighteen months, finally landing in England, hungry but unbeaten.

He secured an audition by Mr. Basil Dean, who put him at once in touch with the B.B.C., who let him broadcast two songs. Recording for a gramophone company followed and now, one hopes, he is on the high road to success. Never say die!

### A Lucky Escape.

DR. D. H. STEWART, who is said to have originated the injection method of treating varicose veins, died recently in America. Years ago, as a result of experimenting on diphtheria anti-toxin he became deaf, but he learnt lip-reading and so carried on his practice.

He refused to give up his music, and when he played the piano he rested a strip of bamboo just above the keys and held the other end in his teeth, the sound waves reaching his brain via his teeth and skull.

(Continued on next page.)

# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

When radio became popular he designed a special loudspeaker with doors.

He used to pop his head inside and shut the doors. That he was never "gassed" is a miracle.

### Direct Action at Dorchester.

SOME tenants of the Dorchester Corporation Housing Committee have been attaching aerials to their chimney-pots, and although the borough surveyor asked that the wires should be removed, nothing happened except that the wires went on being employed. The surveyor was, therefore, told that if the wires were still there after 48 hours' notice, the Council would remove them and charge the tenants with the expenses.



Whilst I cannot agree that it is desirable to attach aerials to chimney-pots, surely the Council might allow them to be fastened to the brickwork in which the chimney-pots are fixed, thus effecting one of those compromises without which social life would be impossible.

### Glut of "H.A.C.'s" Expected.

I HOPE that W. L. S.'s "H.A.C." Short-Waver has brought balm and peace to the hundreds of our readers who live for short waves and who strive after a Haddock. W. L. S. will indeed have to create some new order of radio honour, for he has now made "H.A.C.'s" as easy to get as gnat-bites.

Perhaps he would like to negotiate for my rights in "Valve Barts!" Anything, rather than have all of you weeping for more continents to hear. Well, in case you missed it, the set was described in "P.W." for May 6th.

### Doug's Radio.

IN the film "Mr. Robinson Crusoe," Douglas Fairbanks creates a very efficient radio set, complete with conch-shell loudspeaker, on the strength of some valves ("toobes") taken from a native who was wearing them as ornaments. Very amusing to a radio man, especially the "close-up" of a battery contained in coconut-shells. But where did all the fine wire come from?



Still, I suppose that when we go to see "pictures" we leave our sense of realities at home with the unpaid bills!

### Radio Operators Can Rise.

MR. F. S. HAYBURN, Mayor of Chiswick and Brentford, has been appointed managing director of the Marconi International Marine Communication Company in succession to the late Mr. Kellaway. Mr. Hayburn is the third ex-wireless operator I have seen rise to be

managing director of a great wireless company, the others being Mr. E. T. Fisk of Amalgamated Wireless (Australasia) Ltd., and Mr. H. M. Short of the Canadian Marconi Company.

All honour to them. They have shown once again that the top of the tree is accessible from its lowest branches. By the way, the new President of the Western Union Telegraph Co. began life as a railway telegraphist.

### "P.W." Crashes Through Again!

WHEN, a few weeks since, I deplored the fact that I had not the sublime self-appreciation of certain "radio critics" who give us the impression that the B.B.C. always has its ear to the ground in order to hear what the critics expect it to do, I did not think that I should so soon

## SHORT WAVES.

Loudspeakers are now being constructed which resemble pictures, coal scuttles, clocks, vases and statuettes.

The trouble is that they still sound just like loudspeakers.—"Punch."

"It is reported that a man recently played on a grand piano for eighty-two hours. This must be a record," we read in an American paper.

As long as it's not a broadcast we don't very much mind.

A correspondent tells us that, as the overflow pipe from his cistern was always dripping, he has clamped on nine feet of piping, from the free end of which he leads a vertical string into his tubular earth, thus ensuring a perpetually moist "earth."

A most ingenious idea. We wish he could suggest some useful application for the damp smell in our cellar.

Sir Oliver Lodge describes the human eye as a radio receiver. Some ladies manage to do a good deal of broadcasting with it, too.

Inspector: "Have you taken out your wireless licence?"

Country Yokel: "Not me."

Inspector: "Oh! And why not?"

Country Yokel: "Because we're not connected to a wireless station; we're connected to the water-tap."

### THE LOUDSPEAKER.

A happy young daddy named Meaker,

Found his love getting weaker and weaker,

'Cause his new baby boy,

Who at first was a joy,

Decided to be a "loudspeaker."

be able to announce a staggering coup of my own. Nevertheless, such is the fact.

When those thrice-excellent "Kentucky Minstrels" gave their first show I complained that they had no "bones." One word from "P.W." was sufficient, as doubtless you observed when the second show was given early this month. The "bones" were duly provided!

### Making the Dumb Speak.

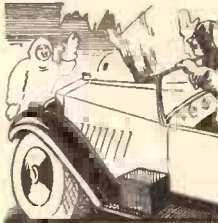
"VARIETY NEWS" says that the B.B.C., in refusing to broadcast the Royal "Variety" performance on May 27th achieved its most tragic error.

The B.B.C.'s excuse was that certain acts cannot be broadcast. To this our contemporary replies that the Derby, the Football Cup Final, and the Boat-race are "dumb" acts which are very successfully broadcast, and that it could mention ten men who could make a dumb act of any kind a living mental picture.

Perhaps the B.B.C. considered the privilege not to be worth £500, though. However, I think that the right man could help us over the "dumb" acts as interestingly as those who describe tennis matches!

### The Uncomfortable Adventurer.

MR. T. H. HARRISON, the twenty-one-years-old traveller, who recently broadcast a talk on exploration, is one of those useful persons who organises expeditions calculated to give their members the maximum of discomfort.



He organised the Oxford University Borneo Expedition and restarted the Wayfarers Club. He himself has taken his own tonic medicine

by travelling in out-of-the-way places, and he intends to go to the South Pacific in July, and hopes to motor the whole length of the U.S.A., including Alaska!

### Cure Worse than the Ill?

IN his Kelvin Lecture in April Sir Frank Smith stated that the only cure for "fading" on medium waves is to concentrate more energy into that part of the wave which propagates energy along the ground. He points out that this would reduce the scope of foreign listening on the medium band, but adds, "many listeners will agree that this is not too high a price to pay for the reduction of fading on home stations."

I am not at all sure that he is right, because for one thing I have yet to learn that anybody suffers badly from "fading" on home stations. Do we?

### An Avian Fan.

SCOURING as I do the depths and heights in search of information for these ever-hungry columns, I disdained not to explore the pages of a technical publication devoted to dicky-birds. Scarcely a promising claim to stake, you may think!



However, "Cage Birds" tells of the discovery of a bird radio gangster which terrorised the "fans" of Timav, Austria, by swooping down on loose parts and getting away with them as though they were so many worms. When

the Magpie was traced to its lair it was on the point of assembling the, "P.W." "Double D.T."!

### Superlatives.

THERE is a man who is so broadminded that he will not use grid bias. And there is another man who is so narrow-minded that he will not use amplifying valves.

Do you know of any other queer specimens of radio fans? If so, let me hear from you. No prizes.

ARIEL.

# THE 4-PEN-4

AN ENTIRELY NEW RECEIVER EMPLOYING PENTODE VALVES THROUGHOUT.  
UNPRECEDENTED STAGE GAIN MADE POSSIBLE BY NEW H.F. PENTODES.

**FOUR PENTODES!** Just consider it. We think nothing nowadays of pentode outputs, and even a couple of mains screened-grid stages, but a set with *four mains pentodes*, one after the other, has never been conceived before.

It is no stunt idea either. The set is an honest-to-goodness design, built to provide really colossal amplification with the utmost simplicity of handling. And it has succeeded.

Making use of two new types of valves, which will be available to the public for the first time on June 1st, the "Four-Pen-Four" provides a highly selective, ultra-powerful mains receiver for all A.C. mains owners who require plenty of mag. with heaps of D X. And the "Four-Pen-Four" surely answers to these requirements.

The valves which have made the receiver possible are the new Mullard V.P.4, of which two are employed, the new S.P.4, and the well-known Pen.4V. All are indirectly-heated pentodes of the 1 amp. variety, and capable of giving remarkable amplification.

For instance, the V.P.4, which is a variable- (or multi-) mu H.F. pentode, can be controlled by a simple resistance scheme so that it gives anything from a *negative "gain"* to an amplification of some hundreds. With two of these valves the possible amplification is a matter of some thousands! All this, as we said, is perfectly controllable, and by means of a simple variable resistance.

The negative "gain" is perhaps a little puzzling, but with the V.P.4 circuit arrangements can be made to obtain a very long grid base, so that the amplification of the valve can be gradually reduced from maximum down to zero.

**A Valuable Feature.**

At this point the feed from the aerial to the detector is not through any active amplifier but via the minute capacity of the valves, which are in their most unresponsive state, with practically no electron flow, and therefore no amplifying properties.

It can readily be seen, then, that the coupling between the aerial circuit and the succeeding tuned circuits is a matter of micro-microfarads, for the pentodes have very low internal capacity. Thus the result will be that the energy supplied to the detector will be less (much less in fact) than that present in the aerial circuit.

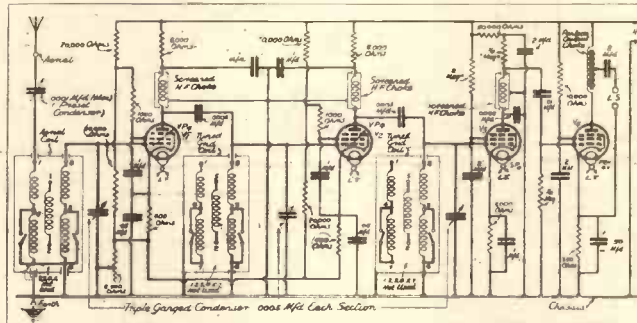
So we get what is called negative "gain,"

Designed and Described by **K. D. ROGERS**, Chief of the "P.W." Research Department.

and on close-up local stations this is very valuable. As a matter of fact, in all but extreme cases of proximity to the local not a sound of the programme is audible when the volume control is set at "minimum."

The third tuned circuit is applied direct between the grid of the detector and earth, the detector being operated on the bottom anode-bend principle, so that practically no damping is applied. As a matter of fact, little damping is present in any of the tuned circuits, though the first has, of course, the damping of the aerial-earth system across it. This is kept as low as possible, however, by the transformer coupling, and the small series aerial condenser. This small condenser incidentally is of the pre-set type and is readily adjustable.

**ANODE BEND AND R.C. COUPLING**



As will be seen from the above circuit, two multi-mu H.F. pentodes are employed, together with an anode-bend-rectifying H.F. pentode and a normal power pentode output valve.

Naturally with such low damping, the circuits are pretty sharp in their tuning, a somewhat unusual state of affairs for plain one-to-one ratio circuits, and the trimming of the gang condenser tuning them is commendably sharp.

**No Reaction Needed.**

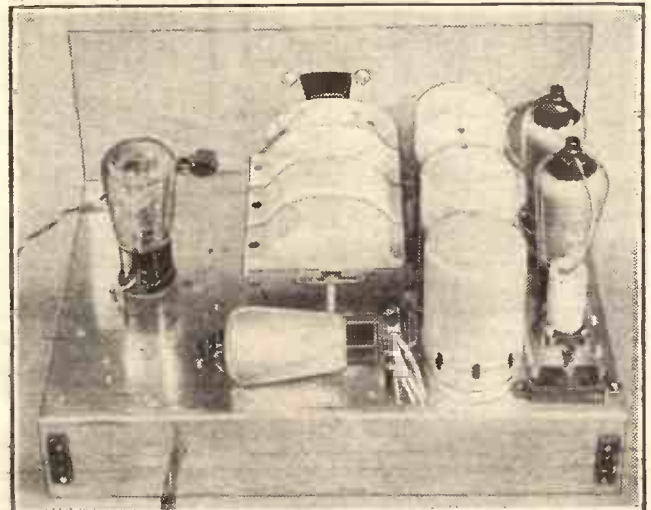
Low damping enables a sharp point of tune to be attained, with correspondingly high impedance—all in favour of high stage gain, though the peak is not so sharp as to have a bad side-band cutting effect.

Careful layout and screened wiring, of course, have to be employed, and the amplification is such that reaction

The volume variation from minimum to maximum is perfectly progressive, and exceptionally smooth, so that the complete control is obtained, making the receiver pleasingly docile in manipulation.

is completely unnecessary. It would only be attempting to "gild the lily" to apply regeneration to the detector, which itself

**A CLEAN-CHASSIS DESIGN**



On the right are the two H.F. valves, while in the foreground is the rectifying pentode.

**Shunt-Fed H.F.**

With high impedance valves like the V.P.4's, it is necessary that high anode impedances be used, and so a form of tuned-anode coupling has been adopted. Actually, perhaps, it should be called either "shunt-tuned anode" or "tuned-grid" coupling, for the tuning circuits are fed from the anodes of the respective valves via fixed condensers, the H.T. being taken to the anodes through H.F. chokes.

# THE "4-PEN-4"

(Continued from previous page.)

being an H.F. pentode (of the non-variable-mu type) is capable of providing a great degree of amplification.

This is further enhanced by the output valve—a power pentode of the usual type—which can pass some 2,500 milliwatts of undistorted power to the loudspeaker.

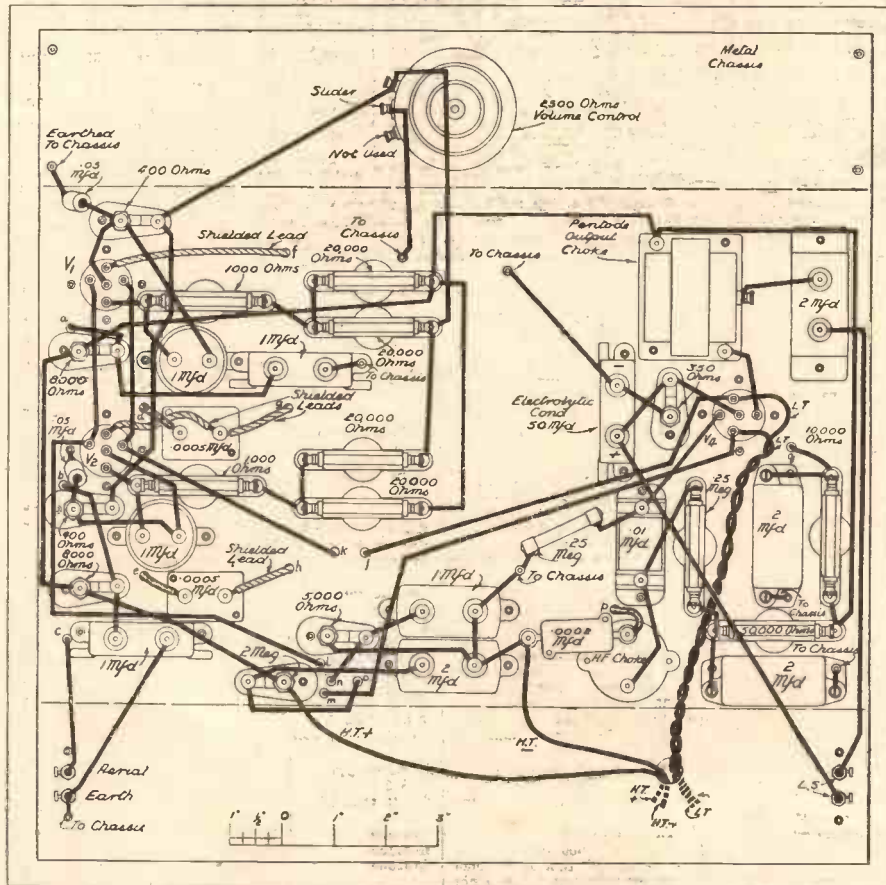
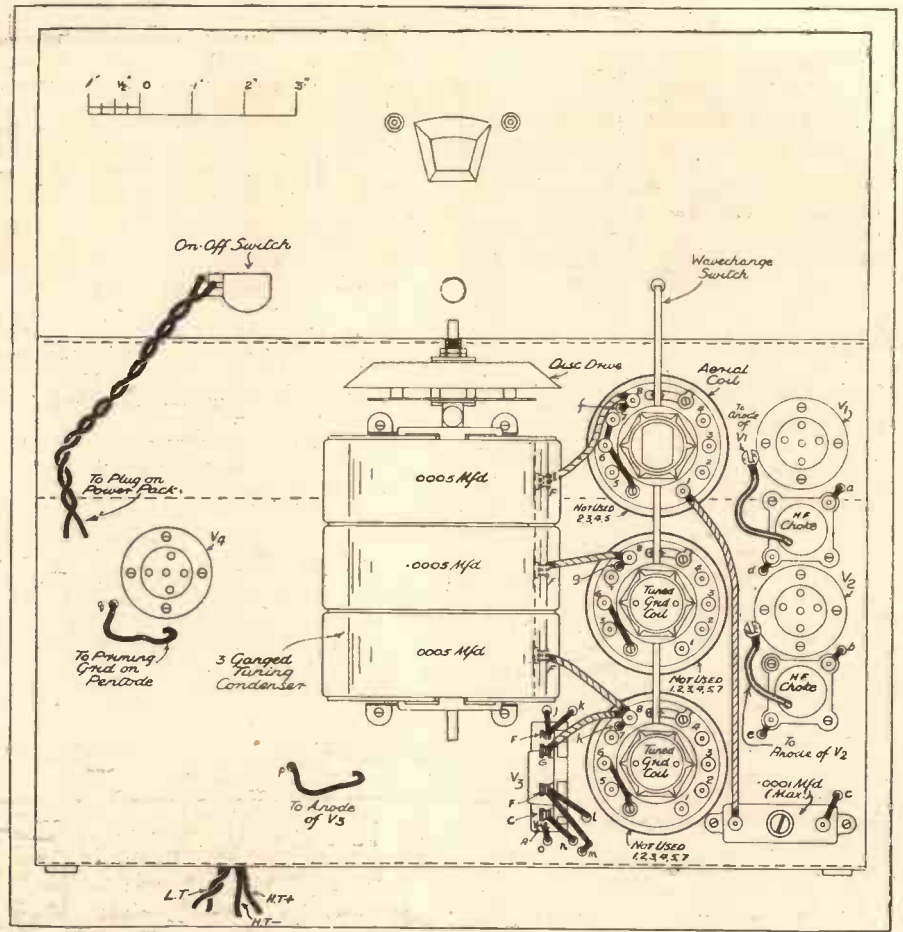
Resistance coupling is used on the low-frequency side so the frequency response is particularly good. The reproduction is excellently balanced, being brilliant without being blaring, and having a good proportion of really deep bass.

## A Chassis Design.

The "Four-Pen-Four" has been built as a chassis design, which greatly assists the screening and decoupling of the various circuits, and enables a particularly clean and well finished appearance to be given to the set. It is what can legitimately be described as a real he-man's job.

Following popular practice, we have catered for external power supply, the receiver being built to attach to any 250-volt, 60-milliamp H.T. supply, and to a 4- or 5-amp 4-volt L.T. source. A suitable source of power is the "Catkin" mains unit, which is being described in an early issue and which is listed in the accessory box for the "Four-Pen-Four."

This unit is particularly suitable because it incorporates a thermal delay switch, allowing the heaters of the receiver time to



The two wiring diagrams can be co-related very easily by means of the letters, which are placed against the points where leads pass through the metal chassis.

get hot before any H.T. potential is applied to the valves. Such a scheme obviates any static strain on either the set or the mains unit due to any rise in H.T. voltage above 250 volts while no anode current is being drawn by the valves.

In some cases of powerful mains units the "unloaded" H.T. potential sometimes rises 200 volts or more above the working voltage. This is liable to strain the insulation of wiring, condensers and so forth, and has been too often the reason for annoying component breakdowns.

Of the actual construction of the "Four-Pen-Four" little need be said. It is clearly shown in the diagrams and photographs, but we feel that we should advise all builders to test carefully for any short-circuiting between the chassis or other earthed parts of the set and non-earthed sections, before they connect up for the first test.

## Points to Note.

Care must be taken to ensure that all the sleeving-insulation is in order, and the wiring should be kept well clear of all earthed metalwork wherever possible.

All holes in the chassis should be smoothed off with a countersinking bit to obviate the possibility of sharp edges biting into the insulating sleeving of the wires running through the holes.

Resistance holders should be checked to see that no screw heads are in contact with the chassis—a piece of card under each will prevent this—and the Wearite H.F. chokes should be carefully mounted clear of any screws protruding from underneath.

We mention this latter point because we

(Continued on next page.)



THE Radio Industry seems to have adopted a new pass-word.

The word selected is "catch," and its utterance is usually followed by a glistening projectile, which, if one were to obey the injunction, would call for the trained eye and the supple limbs of a super test cricketer!

But they don't intend you to catch it anyway, for it is only when the glistening something has fallen to the ground with a resounding crack that the beam of sublime satisfaction spreads across the face of the "aggressor."

Yes, I suppose there is great temperamental relief in being able at last to sling a valve about without having to sweep the bits up afterwards! And Marconi and Osram call them "Catkins." After my recent experiences, I'm not at all sure that "missile" wouldn't have been a better word.

To be serious, while it is true that these amazing valves are phenomenally robust, I'm not at all sure that it is the makers' intention for quite such a literal interpretation to be put upon the word unbreakable. After all, they are scientific accessories, and the fact that you can drop them without harm is remarkable enough without having to prove it for the edification of others.



Weekly Jottings of Interest to Buyers.

I may be wrong, but I certainly do not intend to use mine for any purpose other than that for which they are designed.

Incidentally, while on the subject of "Catkins," it is opportune to mention that my radio literature waiting list is still open. Applications are pouring in, but if there

**OUR POSTCARD SERVICE**

Applications for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.

are any interested readers who have not yet applied, I advise them to do so without delay.

Just send me a postcard marked "Catkin literature," and indicate the address to which you would like it sent, and the moment the details are available for general distribution literature will be forwarded to you.

**News by Air.**

When the first details of these new valves were released to the general Press (after "P.W." had given the details!), Marconiphone, whose name is synonymous with enterprise, chartered a special aeroplane, and made an aerial tour of the country in order that the provincial daily and evening papers would be in full possession of the details on the same day.

Mr. C. Lynton Harris, the Marconiphone Press Representative, arranged for reporters to meet him at the various aerodromes included in the tour, and within a few hours of the general release printing machines all over the country were pouring out newspapers containing the story of the world's first unbreakable valve.

Special note to reporters in general: read "P.W." and you will get the news even quicker than by aeroplane!

(Continued on page 374.)

**THE GREAT "P.W." RADIO CONTEST!**

**ALL-CASH FIRST PRIZE!**

**£25 AND 50**

**WIRELESS "EXTRAS" For Runners-Up.**

The Consolation Prizes will all be very useful to set builders as they include: Loudspeakers—Ganged Condensers—Coil Units—"Class B" Transformers, etc.

This is the third week of our grand free competition—specially designed to interest every radio enthusiast. £25 cash awaits the winner, while there are fifty useful consolation prizes to be won as well.

All you have to do to enter is to solve six sets of easy puzzle-pictures—all of which denote the names of wireless stations at home and abroad. The first two sets have already appeared—but you can still obtain them if you ask your newsagent for the two previous issues of "P.W." (dated May 13th and 20th) in which they appear. Here you have this week's puzzles—the Third Set—to solve, each picture representing one station name. The answers are all quite easy to find, and as a further guide, all Set 3 solutions are contained in the short "key" list below—thus it is merely a matter of fitting the right stations to the right pictures.

Write the answers IN INK (and in BLOCK LETTERS) in the spaces provided; then cut out the picture-set and keep it with the other sets until next week, when we shall publish six more of these entertaining puzzles. Each set has its own "key" list, and in the Sixth and Final Week full sending-in directions will be given. The competition rules have already appeared and will be reprinted later.

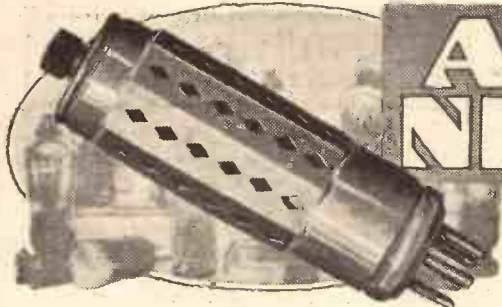
**"RADIO-PICS SET 3**

As for the purposes of the competition, wireless stations all over the world are being used, the following short guide list of names is given for reference with this week's pictures:

- DANZIG
- MILAN
- NEWCASTLE
- BEACON
- ANTWERP
- BORDEAUX
- BAY CITY
- DUBLIN
- SAN FRANCISCO
- BRUSSELS
- OSLO
- BERNE
- ADELAIDE
- WATERTOWN
- MUNICH

**PRIZES MUST BE WON—NOTHING TO PAY!**





# A GREAT NEW VALVE

# DEVELOPMENT

THE human appendix and the familiar glass-enclosed valve would appear at first sight to have about as much in common as chalk and cheese. Yet it is said—with what degree of authenticity we do not know—that it was from thoughts such as these that the inspiration for the new Marconi and Osram all-metal valves first arose.

Superficially, it sounds a tall story, and yet it isn't really so difficult to trace out the connection.

Why are we furnished with a purposeless appendage which may cause untold anguish even to the extent of endangering life? If honesty is the best policy the only reliable answer to that is that nobody definitely knows.

## INSIDE FACTS



The constructional features of the Marconi S.G. "Catkin" valve are clearly shown in this picture, where the anode and screen have been cut away to expose the interior.

associates the appendix with a tail!

### Why Glass Containers?

And why, up to now, has it been customary to make valves with a glass container? Again, the only answer is that it just happened in the process of evolution.

From the early discovery that an electronic stream could be obtained when certain electrodes were placed in a vacuum, there sprung to life an apparent similarity in the manufacturing processes involved between the then old-established electric lamp

Two weeks ago this journal published exclusive details of the latest thermionic tube development—the "Catkin" valve—and gave details for building the first "Catkin" set.

Below we give further details of this remarkable development, which inaugurates an all-metal-valve era of the greatest importance to set builders.

By The "P.W." RESEARCH DEPARTMENT.

and the new-born baby—the wireless valve. Both required a vacuum, and at the time when the valve was first invented, the electric lamp had been in existence long enough to prove that glass was a satisfactory material from which to make the envelope.

### Valves Were Likely to Break.

It was from these early beginnings that the structure of a wireless valve as we have known it for so many years took root. Years of scientific progress and ceaseless research have made the modern valve a very different thing from its prototype of the old bright-emitter days. Efficiency, economy and even electrode fragility—all have been the subject of intense research, and yet in the fundamental respect the association with the electric-lamp industry

## A CONTRAST IN DIMENSIONS



has never been severed.

If you had "dropped a valve in 1922 the chances are that it would have broken; if you had dropped a valve in 1932—ten years later—you would still have been lucky to have picked up anything but pieces.

So designers thought about the human appendix; they thought about the glass-enclosed valve, and now, again in the process of

## STRIKING G.P.O. TEST



This is the Osram "Catkin" valve which travelled by post from London to Aberdeen and back exactly as shown without any protective covering! On arrival it was plugged straight into a test receiver, where it behaved perfectly, there being no trace whatever of internal damage in transit, although the valve had received a buffeting sufficient to bend one of the pins.

evolution, a valve has emerged which you can drop with the certain knowledge that you cannot break it!

### Opens Up a New Era.

While it is true that this remarkable development opens up a new era of unlimited potentialities in the technique of valve construction, one has necessarily to pause in the wave of general enthusiasm to point out that it does not automatically render glass-enclosed valves obsolete.

Let us remember that whatever the potentialities of this new method of construction, all-metal valves are still in their infancy, and that in

(Continued on next page.)

The unbreakable receiving valve that is being examined is a descendant of the enormous transmitting valve, also shown here, of the Marconi C.A.T. water-cooled type, as used by the B.B.C. The big C.A.T. valve is nearly five feet in height, and needs about 1,500 horse-power for its operation.

## A GREAT NEW VALVE DEVELOPMENT

(Continued from previous page.)

consequence it will be many years before the glass-enclosed valve is entirely replaced.

All the same, one must give credit where credit is due, in this instance to the Research Departments of both Marconi and Osram. Truly, it is a remarkable development, and one that we have cause to welcome with unstinted enthusiasm.

### Better Radio Comes First.

The "P.W." motto is couched in the future tense. Convention means nothing to us if by a radical departure from standard practice the way is opened up to better radio. We had the pleasure of giving readers the very first news of these new valves, and we shall continue to follow with great interest the progress that is made simply because the prospect of better



#### NON - METALLISED.

To the left is a non-metallised Osram Catkin, the M.H.4, and in the picture to the right is an M.S.4B., which, in appearance, is exactly similar to the V.M.S.4.

radio in this case is far from being just a conjecture.

It seems unnecessary again to expound the constructional merits of the new "Catkin" valves, since the subject was comprehensively covered in our issue dated May 13th. The only information to be added to that original description is

that in the pentode finally standardised for production, the protective outer cover, which, in the case of the S.G. and detector types, can act as an efficient electrostatic screen, has been dispensed with.

### A Test By Post.

But where it is possible for us to amplify our original details is in respect of the claims that are made for these new valves—claims which, by virtue of the fact that they emanate from two firms of the highest possible standing, can be accepted without reserve.

The paramount claim is that the valves are phenomenally robust. The claim is authentic, and, moreover, we took steps to prove it. A "Catkin" valve devoid of any protective covering whatsoever was despatched by post to Aberdeen, from whence it was returned—again by post—to us. It functioned as perfectly after its post-office handling as it did before it left our hands! Short of a steam-roller, we could think of no more conclusive test.

### Uniformity of Production.

Then again, it is the claim of the manufacturers that the vastly improved mechanical principles of construction will lead to more uniform characteristics between valves of similar types. A careful examination of a dissected valve leaves no

room for doubt in this respect, and it is true to say that greater consistency among valves will ensure even greater consistency in set performance.

Two further claims that are advanced by the designers are: (1) complete freedom from microphonic troubles; and (2) smaller size, the importance of each of which will readily be appreciated.

It has long been known that freedom from the annoying fault known as microphony is entirely a matter of ensuring perfect electrode-rigidity. The fact that the phenomenon is completely absent with this new method of valve construction is adequate proof of the soundness of the new principles involved.



As regards size, the general tendencies in set design are all towards compactness, and the achieving of smaller overall dimensions. Here again the advantages of the "Catkin" constructional principles will be evident, especially in sets of the small console types, where size is a specially important consideration. And the further point—that the valves are virtu-

ally unbreakable—is also particularly advantageous in relation to mains transportables.

Undoubtedly, the advent of "Catkin" valves is a development of the highest importance, and there is no telling at this stage to where it will ultimately lead. For the time being, all-metal construction is confined to Marconi and Osram valves of the A.C. type, but as and when further developments are made readers may rest assured that the publication of details and practical designs will cut still another notch in "P.W.'s" Totem of "firsts." Meanwhile, our "hounds" are straining at their leashes!

### HOW BIG ARE THEY?



This is the first time that "P.W." has reproduced a picture of a tube of tooth-paste! But it certainly conveys a vivid idea of the size of the representative "Catkin" valve placed beside it.

## ROUND THE RECORDS

A Review of Recent Releases.

THE Bing Crosby fever in this country seems to be still spreading. In America, as the film "The Big Broadcast" would have us believe, "Bing" is the true soul-mate of every feminine heart, and apparently has far surpassed the vast popularity achieved by Amos and Andy. His film "The Big Broadcast" certainly seems to have stirred the British maiden, too.

### Deeper Tone.

But "Bing" on the screen, and on a record seems to be two similar but at the same time different persons. On Brunswick records his crooning assumes a deeper, fuller tone than on the screen—an improvement, I think. His recently released "Can You Spare a Dime," "Streets of Dreams," and "It's Within Your Power" should certainly be heard by all lovers of crooners.

Incidentally, the mountainous Kate Smith, another American radio favourite, has made an excellent record of the haunting "Moon Song." Also on Brunswick, with "Piccaninies' Heaven" on the other side.

Coming over to this side of the "pond" we have these same last two numbers recorded on Decca by Jack Hylton, while both he and Jack Payne have "fixed" "The Lord Mayor's Show," the former on Decca and the latter on Imperial.

I am not struck with Jack Payne's "Broken Rosary" on another Imperial, it is rather flatly rendered, and is inclined to be uninteresting. The Three Ginxs (Broadcast) are worth hearing in "I'm Young and Healthy," and Peggy Cochrane is worth attention in her piano medley from "The Kid From Spain," also a Broadcast record.

### Really Remarkable Effort.

The best military band recording I have heard for a long time is one that recently reached me from H.M.V. It is of a peculiar mixture, having a "Fanfare," "The National Anthem" and a couple of hymns on one side, with the "Boadicea" March on the other. It was played at the Leicester Band Festival and is a really remarkable effort. Don't miss it.

A new departure in recording has been made by Columbia in the miniature version of Bobby Howe's show, "He Wanted Adventure." It is a musical form of "Ambrose Applejohn's Adventures," and has been condensed on to four 12-inch records whereon the cast is not only heard in musical items, but the songs are interspersed with snappy dialogue. The records were made at a stage performance in the Palace Theatre, Manchester. K. D. R.



The non-metallised version of the Osram M.P.T.4, for use on A.C. mains.

# ECKERSLEY EXPLAINS-



PEOPLE do not understand enough about mains units. I am frequently asked to explain why, as the set wants to take more and more current, the voltage output from the mains unit falls. Obviously the mains themselves are all right and keep a constant voltage, then why not the mains unit?

You have got to look at it in general, like the diagram in next column.

My diagram is really the electrical equivalent of a mains unit. Across A B there is a constant voltage, but between A and C there is an impedance—mostly resistive—which makes the voltage between C and B less as the set takes more current.

### Specifying Mains Units.

When, therefore, specifying a mains unit, don't just say you want so and so many volts; say so and so many volts at so and so many milliamps., and then the designer of the mains unit will be able to satisfy you with this model or that.

This variable voltage with current doesn't matter very much if you have one set and one constant current into that set once and for all. But if you are experimenting, a mains unit is a bit of a curse and batteries are much the best.

But batteries have their disadvantages. If a mains unit is generously designed it should suffice and be in the end most economical.

It is as well to remember that valve rectifiers keep their voltage more constant with different power demands than do metal rectifiers. On the other hand, metal rectifiers last for ever and are superior, certainly, where the current and voltage, once set, are constant.

But, summing up, you cannot expect a rectifier to behave like a battery which gives, gallantly enough, a nearly constant voltage whatever the power demand up to the limit of the battery's capabilities.

There is no force—electric force—inside a closed conductor. Close yourself completely within a well conducting box and let amps. and volts and watts do their damndest outside, within you and your most sensitive measuring instruments are immune, still, silent and undisturbed.

### Screened or Metallised ?

Recognise this once and for all and you recognise all problems inherent in the term "screening."

I am asked by S. K. R. (Chelsea) if he substitutes a non-metallised valve for a metallised—the circuit being formerly stable when the metallised valve was used—will it be all right to screen the non-metallised?

There is no force within a closed conductor, and so far as screening is concerned

★.....★  
 "Close yourself completely within a well-conducting box," says our Radio Consultant-in-Chief in describing the fundamentals of screening. Other items with which he deals in his interesting style this week are, regulation in mains units and an encounter with a "P.W." reader in North Wales.  
 ★.....★

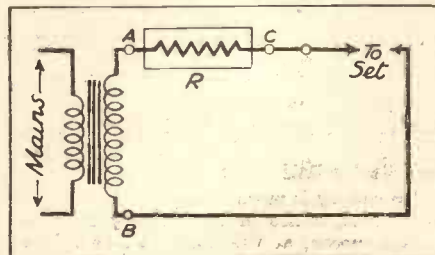
outside the valve an added complete tin can screen should be as efficient as metallisation of the glass.

But remember, screen as you may, the grid and anode circuits of a high-frequency valve are always capacity coupled in the valve itself. We talk of the "screened-grid valve," meaning that the anode and operating grid have a screen interposed between them and this screen, being earthed as regards alternating current, is supposed, by some, to stop any coupling between anode and grid.

### An Imperfect Screen.

But the screen has to have holes in it to let the electrons pass between filament and anode; and so it is not a complete screen because there is some electric force inside an only partly closed conductor.

### WHY VOLTAGE DROPS



This is what P. F. Eckersley terms the electrical equivalent of a mains unit. The more current drawn off, the bigger the voltage drop across resistance R and, consequently, the lower the unit's output voltage.

Thus, every screened-grid valve, while it has eliminated a large part of coupling between grid and anode circuits, has not eliminated it all.

So, when S. K. R. of Chelsea uses a screen for the outside of a new type valve, he is left with the inside coupling peeping through the holes in the screen.

Now the danger is that this coupling may vary with different types of valves because the coupling is the more dangerous the more the overall magnification.

So it could be quite possible to buy a new, unmetallised valve, screen it outside perfectly and get horrid instabilities with a circuit which was used with perfect success

with another metallised but lower magnification valve.

What I do say is, "Isn't wireless complicated?" But if you just read me carefully you will soon resolve its difficulties.

\* \* \*

I had a fine holiday adventure the other day in North Wales, due more to native misdirection than because Everest is in our blood.

### Winning Through.

We had an idea to take the car along a mountain road which my wife remembered from a ten-year-old experience. A perfectly good road, she remembered, but steep and some gates, and we swung into the 1 in 4 gradients and up and on.

Came a cross road and local advice. We opened gates and more gates. Well, we quite simply took a rather fat saloon car where no car had been before.

The road became grass grown and very, very narrow. Building boulder bridges—edging, as if "our inch of way were the wide roads profound;" nosing down 1 in 3 gradients at an angle of 30°, leaving a little bit of mudguard paint to decorate unfeeling granite boulders, we at last, happy, hot and definitely less frightened, put our tyres on to ordinary flints of the proper way, and behold, at last, a lonely farmhouse at the valley's end.

### A Friendly Welcome.

And then I was recognised! And by an enthusiastic reader of POPULAR WIRELESS and "Modern Wireless."

What a reception! And farmhouse tea! I found an aerial such as none of you will boast. I will not give dimensions for fear of jealous competition; but, of course, in these shielded valleys such a height is a necessity, not a convenience.

My kind informant told me he had made the "Eckersley" Three with the tuner, and that on the large aerial it has been grand.

But the lure of distance had got him, and he showed me many valves and many wires, and excellently done.

Good luck to him and luck to all of you. May you always find that subtle thrill that comes to me still when a new circuit, a new idea, or a new set is about to reveal itself. And may you always be ready to "try again" when results are below expectations.

THE MIRROR OF THE B.B.C.

By O.H.M.

## REORGANISATION SCHEMES

The Talks Department—On Derby Day—Mr. Baldwin's Speech—Trooping the Colour etc.

THE Governors of the B.B.C. are looking for someone to fill a big job at Broadcasting House—a job worth at least £5,000 a year.

I understand that it is part of the extensive schemes of reorganisation that are now being carried out behind the scenes, and that whoever is chosen to fill the post will be a really big noise in British broadcasting, in fact, nearly as big as Sir John Reith himself. For the moment I can say no more but after the next Board meeting (in the middle of June) there will be definite news. The names of one or two persons who might be suitable for the post were mentioned at the last Board meeting and Sir John has now been instructed to draw up a list of those whom he considers to be the most likely candidates. The final decision will in any case rest with the Governors.

Meanwhile, the reorganisation schemes are being very slowly pushed ahead and at Broadcasting House I find a good deal of dissatisfaction at the delay in announcing new appointments and dispelling the doubts of those whose jobs have yet to be reviewed.

### The Talks Department.

My advice to any listener interested in the internal politics of the B.B.C. is "Watch the Talks Department." There are likely to be some interesting rearrangements there very shortly, since under the reorganisation schemes the Talks Department is the next to be dealt with, and I understand that the Governors have already discussed the whole question of talks very thoroughly. Whatever happens, it will be necessary for the Talks Department to be enlarged.

### A "Derby Day" Operetta.

Derby Day is to have a place of its own in the broadcast programmes this year, when a radio version of A. P. Herbert's operetta "Derby Day," which was first produced at the Lyric Theatre, Hammer-smith, last year will be presented in the studio with Tessa Deane, Leslie French, and Bruce Anderson taking the parts they

played in the original cast. Places will also be found for several microphone favourites—Vivienne Chatterton, Roy Russell and George Baker among them, and the composer, Alfred Reynolds, will conduct.

### NO NEED TO SHOUT!



This parabolic reflector concentrates the sounds arising in its path on to the microphone, but extraneous sounds are largely eliminated. The principle has been successfully used for both outside broadcasts and the making of "talkies."

"Derby Day" is a typical British entertainment. The radio version has been abbreviated to occupy about an hour.

### Mr. Stanley Baldwin to Broadcast.

No county is more proud of its sons than is Worcestershire of Mr. Stanley Baldwin, whose speech, at the dinner which follows

the Assembly of the National Savings Association, at Malvern, is being relayed on Friday, June 9th. Mr. Baldwin will soon complete twenty-five years representation of the Bewdley Division in the House of Commons, for which he has sat during the whole of his Parliamentary career. Some years ago Mr. Baldwin was made the first honorary Freeman of Bewdley when the occasion was marked by a curious presentation.

It consisted of a cruet of horns, a cluster of black clay pipes burnt in a charcoal pit, an armful of besoms, a brass bell and a basket made of plaited strips of oak grown in the Forest of Wyne. All these gifts represented old local industries.

### Flotsam and Jetsam Again.

Saturday, May 27th, will bring another of the series of special programmes arranged by Mr. Flotsam and Mr. Jetsam, who, in addition to the "stuff" for which they are so deservedly famous, will share with Mr. S. Kneale Kelley the conducting of the B.B.C. Theatre Orchestra. "Our Hour," as the entertainment has been called, will include items by Olive Groves, Charles Hayes, the Carlyle Cousins, Nelson Jackson and Jean Harley and George Baker.

### Trooping the Colour.

The ceremony of Trooping the Colour, in celebration of the King's birthday, will be relayed from Horse Guards Parade to National listeners on Saturday, June 3rd. The broadcast includes a commentary by Major J. D. S. Bourne-May (formerly of the Coldstream Guards). The ceremony opens with the arrival of the Royal Procession and the Royal Salute. The King inspects the troops, after which the massed bands and drums of the Brigade of Guards play a slow march, countermarch, halt, and a quick march. A drummer beats the Drummers' Call, and the escort marches up to the Colour, the bands and drums playing the "British Grenadiers." The Sergeant-Major receives the Colour and hands it to the Ensign for the Colour. The escort salutes the Colour by presenting arms, the bands and drums playing "God Save the King." Colour and escort march down the line of Guards, and the whole parade marches past the King in slow time, then in quick time, and finally forms up in line and gives the Royal Salute. The Household Cavalry marches off. The King places himself at the head of the King's Guard

(Continued on page 373.)

WHAT a time the musically-minded have been getting, with Brahms, Wagner, and Strauss in keenest rivalry for patrons! It certainly has been necessary to use judgment, as performances have clashed more than once. Perhaps listeners effected a compromise and did a bit of listening to all.

Recent programmes have also been interesting because of more newcomers. Especially do we welcome Hal Swain and his dance band.

I don't know why they announced it "dance band," by the way, when I listened he didn't play a single number that one could dance to, and every number seemed to be by way of contrast to the preceding one. There were comedy numbers, saxophone solos and Rachmaninoff's Prelude.

There was also a songster who really sings, or talks his song à la Ronald Frankau. And very good he is, too! Altogether a good combination offering good entertainment, but *not* dance music.

Then there was Nina Mae McKinney,

## THE LISTENER'S NOTEBOOK

A critical review of recent broadcasting events.

the sensational coloured singer. Though I enjoyed the 15 minutes she was at the "mike," broadcasting isn't an ideal medium for her. She has to be seen for the best enjoyment of her turn.

Anona Winn includes in her repertoire a sort of number Nina McKinney does. I noticed that Anona's effort seemed to please the studio audience more than it did me.

Nor must we forget Danny Malone. We've heard so much of his sensational rise to fame, that we've wanted the opportunity of judging for ourselves whether such a success was justified or no. Well, we've heard

him, and there's little doubt that we shall want to hear him again.

I think Elsie and Doris Waters would be well-advised to stick to their Gert and Daisy episodes, and to draw their B.B.C. artistes' wives stunt to a dignified close. These are played out. The Mrs. A. J. Alan affair was dull, and it was unnecessarily long, too.

Bobbie Comber, of course, is an ideal compeère, because he keeps the variety hour going with an amazing amount of vigour. I don't know whether he has to submit his copy to the artistes for their approval. Personally, if I were one of his victims, I would like the opportunity to blue-

pencil a thing or two. But it's all good fun!

By the way, I was surprised to hear Anona Winn say that the whispering species of singer was the creation of radio. Perhaps she's right, but I would have thought that although radio has undoubtedly encouraged it, radio was not responsible for launching it in the first case.

One couldn't doubt the sincerity of the announcer's tribute to the late Mr. J. C. Stobart. Religious services, the weekly epilogue, appeals, and children's hour are significant features of every week's radio fare. Eliminate them, and it would be a different programme, and a poorer one.

It is these items that help to give B.B.C. programmes their peculiar character. And Mr. J. C. Stobart was responsible for them all, as well as the Grand Good Night on New Year's Eve.

(Continued on page 374.)



**MORE POWER IN THE EARLY STAGES, THAT'S THE IDEA**



**OH! MORE POWER IN THE EARLY STAGES—I SEE THE IDEA**

FROM THE TECHNICAL EDITOR'S NOTE BOOK



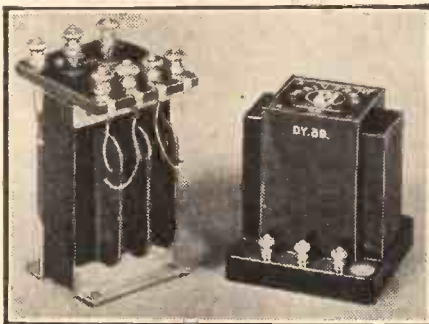
“CLASS B” COMPONENTS.

WE have naturally got a very warm corner in our hearts for any firm sufficiently enterprising to be first with any new development.

And I think R.I. can justifiably claim to have led the way in the production of Quiescent Push-Pull components. Therefore, they were extremely well placed when Q.P.P. developed into “Class B.” So well placed, indeed, that they were ready with a quantity of immensely valuable practical data on the subject which they at once made available to the public in the form of an excellently illustrated brochure packed with useful “Class B” information. For this we owe them both our congratulations and thanks.

Needless to say, the R.I. “Class B” components are of an outstanding character.

Their “Class B” Output Choke eliminates the necessity of a special output transformer for the system. It provides a number of ratios enabling the various “Class B” valves to be closely matched with any ordinary loudspeaker.



The R.I. Output Coupling “Class B” Choke and, right, the R.I. “Driver-mu” Input Transformer.

Careful balancing of the windings ensures that no D.C. passes to the loudspeaker so that it is unnecessary to use a condenser.

It has a high inductance and low D.C. resistance, and is, in fact, a first-class production.

The R.I. “Class B” input transformer bears the very apt name of the “Driver-mu,” and types are made for exactly suiting any of the different types of Driver Valve or “Class B” Output Valve.

As with all R.I. apparatus it is exceptionally well made and is compact and neat in appearance.

From our tests it is obvious that the two secondary windings have been most accurately balanced, and that the other design requirements of a completely efficient component of this kind have been generously observed.

Lastly, and this is of especial interest, the prices of both the above first-class products are distinctively competitive.



The Ferranti Anode Feed Unit.

NEW ATLAS TRANSFORMER.

I will admit to a prejudice in favour of Clarke's Atlas Type PF1 transformer, because, plainly on its carton, it says “Ratio 1 to 4.” For years I have pleaded with manufacturers to give their transformer ratios in this commonsense, logical manner.

And now gradually they are doing so. “Ratio 1 to 4” at once indicates a 1 to 4 “step-up.” 4 to 1, the still more usual method is an apt example of “putting the cart before the horse.”

But, as it happens, there is no need for any “prejudice in favour” to make it necessary for me to say I consider the Atlas P.F.1 L.F. transformer is worthy of every constructor's close consideration, for apart from all question of description, it is an excellent proposition.

Selling at only 5s. 6d., it has a primary inductance, according to my measurements, of well over 90 henries on a low voltage A.C. test, which would obviously indicate that the makers are conservative in their rating claim.

The construction, too, is good, and I particularly like the obliquely mounted terminals at the base which make for easy wiring.



The Atlas P.F.1 Transformer.

THE LISSEN POWER PACK.

The construction of a mains receiver becomes as simple as that of a battery set if a commercial power pack is employed, for this merely replaces the batteries.

It is in effect an H.T. mains unit and a 4-volt A.C. heater supply combined in the one compact assembly. The Lissen Power Pack is particularly

MAKING THE AERIAL ACCESSIBLE.

WHEN erecting an aerial, it is usual to fix the pulley at the top of the mast while the mast is still on the ground.

The usual procedure is to attach to one end of a piece of rope an insulator, then thread the rope through the pulley. When the mast is up the aerial is fastened to the insulator and the free end of the rope pulled until the aerial is elevated.

The rope is then made fast to a cleat on the mast.

Later on the aerial breaks, whereupon it is discovered that matters may only be remedied either by climbing the mast or by the laborious process of lowering it again.

If, however, the rope is threaded through the pulley and, before fixing the insulator, the two free ends tied together, what is

compact and is neatly and safely enclosed in a strong metal case.

It has three H.T. tappings, one each for a detector and an S.G. valve, and a power tap capable of providing 30 milliamps at 180 volts.

There is also a terminal marked “M.A.” which connects to a fixed condenser, the other terminal of this joining the mains input system.



This is the Lissen Power Pack.

This enables the mains to be used as an aerial, and thus safely and conveniently permits the constructor to enjoy a facility hitherto almost solely confined to commercial sets.

The Lissen Power Pack works admirably. The H.T. smoothing is good, and there is effective voltage regulation. It is, indeed, in every way up to the high standard that has been set and consistently maintained for Lissen manufactures.

AN ANODE FEED UNIT.

So famous are Ferranti for certain specific types of radio apparatus, that I believe it is not as generally realised as it should be that this noted concern manufactures a wide range of components such as various resistances, fixed condensers, grid leaks, variable condensers, and so on.

Among these is an Anode Feed Unit which should have a strong appeal for constructors. It comprises a resistance and a fixed condenser combined in the one compact and convenient unit.

The condenser has a capacity of 2 mfd. and is tested at 750 volts D.C. The wire-wound resistance is of the 25 watt type and has any value up to 30,000 ohms in accordance with individual requirements.

It is, of course, taken from the standard and comprehensive Ferranti Type W range, which includes no less than seventeen different values. Clips are provided on the unit for its immediate accommodation or removal.

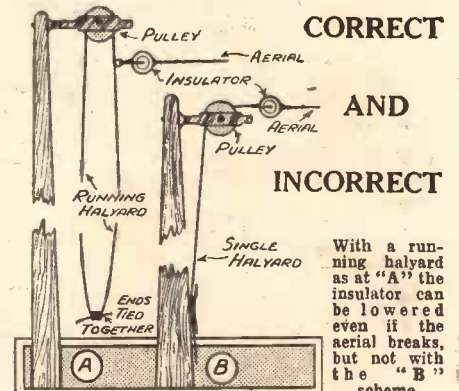
This resistance, it should be noted, is wound in sections, and has been specially designed for anode feed circuits.

The unit complete costs 7s., or without resistance, 4s. 3d.

Very robustly constructed, its reliability and adaptability render it a component which we can fully recommend; and not its least important advantage is that its values maintain an extreme closeness to specification.

known as a “running halyard” is formed.

The insulator is fastened as shown at A in the sketch. When the aerial breaks it is a simple matter to haul down the



With a running halyard as at “A” the insulator can be lowered even if the aerial breaks, but not with the “B” scheme.

pulley and refit or repair.

The usually adopted but incorrect method is shown at B.

# RECOMMENDED WRINKLES

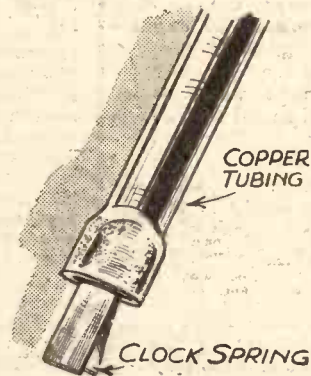
## A SCREW STARTER

AT different times many suggestions have been made to ease the difficulty of starting screws in inaccessible places.

The simple tool here suggested is so easy to construct that it should find a place in every wireless kit.

All that is required is a six-inch length of 1/4-inch copper tubing and a short length of broken clock spring.

Half an inch at one end of the tube is flattened slightly to allow the clock spring to be inserted then the opening is closed on the spring definitely by a snurt blow from a hammer on the end of the tube.



Copper tubing is easy to flatten with a hammer if the end is placed on a metal block. The clock spring is firmly gripped and affords a useful means of holding screws in awkward positions.

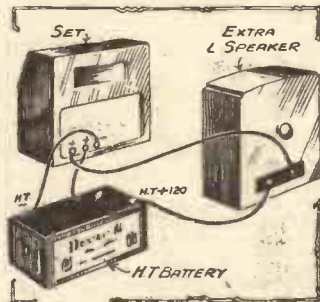
The tube should rest on a block of metal while being struck. The spring must, of course, be inserted so that its natural spring causes it to bow out. It is then sprung into the slot on the screw and holds it safely until started in its hole.

## THAT EXTRA LOUDSPEAKER

HERE is a wrinkle for connecting an extra loudspeaker to a battery—or eliminator—driven set which has no provision for connecting one without dismantling the set.

Take out the H.T. plug which goes to the maximum voltage of battery or eliminator. Connect this plug to one side of extra speaker and connect other side of speaker to H.T. maximum tapping.

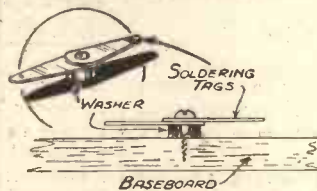
This idea works very well and permits working two speakers off same set.



An additional speaker is connected in the anode of the output valve by this means and will, of course, be in series with your original speaker.

## TERMINAL SUBSTITUTES

WHEN dispensing with terminals in the construction of a set (the reason is usually one of cost) it will probably be found that several wires have to be joined at one point.



This sketch shows how soldering tags can be used in place of terminals. The tags can be soldered to the wires before screwing down, if desired.

To do so, screw two small soldering tags to the baseboard, separating board and tags by a metal washer of suitable size. The washer raises the tags from the board and facilitates soldering.

The number of tags can be increased, if found necessary, but two can accommodate quite a number of connections.

## DISTILLED WATER

READERS who charge their accumulators with a trickle charger can keep the acid to the required level by making distilled water in the following manner.

## ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical idea. Each week £1 ls. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

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

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

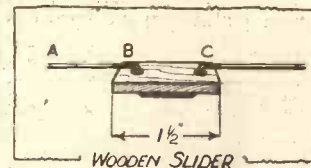
The best Wrinkle last week was sent by Mr. G. W. Higgins, "Brooklyn," Hayes Lane, Alderley Edge, Cheshire, to whom a guinea is being awarded.

## A WIRE MEASURER

SOME constructors experience difficulty in estimating the length of wire required in point to point wiring on a set.

To such, I would suggest the making of this little measurer. A suitable length of string is taken and a wooden slider made from a piece of three-ply, one and a half inches long, about half an inch wide and drilled with a hole at either end. This is slid along the string until the distance A to B represents the distance between the two points that are to be wired.

The full length of wire can now be cut as indicated by the distance A to C.

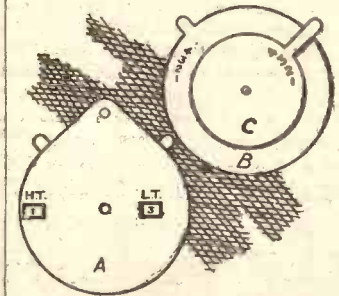


A piece of plywood drilled with two holes, and a length of string, are all that you need for accurate wire measurement.

The length of the wooden slider, 1 1/2 inches, is the exact length required for making the loop at each end. This gauge can be used with equal advantage for measuring the distances when wiring is being performed in the more professional "parallel" system.

## BATTERY INDICATOR

THE continued use of the hydrometer means that care has to be taken not to spill any acid on clothes or carpets. It is not a pleasant device to use.



Three cardboard discs, cut as shown, will provide a means of checking the accumulator's lasting-power, as well as obviating the necessity for using the hydrometer.

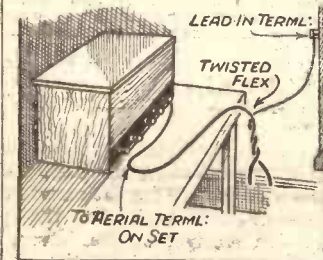
Therefore, I made up the indicator shown from three cardboard discs. It reduces the necessity to use the hydrometer, to the minimum.

The top disc is shaped as shown at A. It has two windows cut to correspond with the figures marked on the two discs shown at B and C. The discs B and C have tabs for turning them to position, and the three discs are fastened together with a snap fastener in the centre.

By using the indicator after each broadcast, the number of hours used on H.T. and L.T. is seen at a glance. Thus, it is only necessary to use the hydrometer on rare occasions.

## REDUCING VOLUME

WHERE small fixed or pre-set condensers with a minimum value of less than .0002 are not readily available, an easy method of decreasing the input of the powerful local transmitter—or even of achieving increased selectivity—is within the reach of every listener.



This scheme will regulate volume in proportion to the length of twisted flex used.

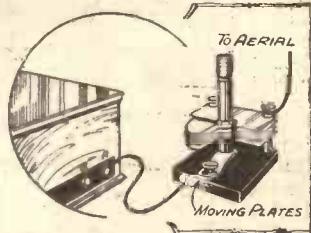
Instead of taking the aerial lead-in directly to the aerial terminal on the receiver, insert a piece of flex, twisted but not joined at the end, between these points as in the sketch.

The amount the flex is twisted of length will regulate volume or selectivity since it acts as a condenser with a very low capacity.

Make quite sure that the ends of the flex do not touch.

## SHORT WAVE AERIALS

THE difficulty often encountered, when operating a short-wave receiver on a normal or big aerial, can be overcome by using the following method of coupling the aerial.

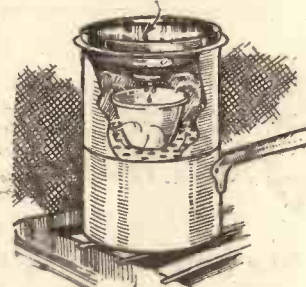


Difficulty due to the damping of an ordinary "broadcast" aerial, which is frequently experienced when used for short-wave reception, can be overcome by using a "neut" type condenser.

Connect aerial to one terminal of a neutrodyne condenser. Aerial terminal of set connected to the other terminal of neutrodyne condenser.

By suitable adjustment of the condenser the damping effect of the aerial may be lessened, so improving reaction control. Decreasing the capacity removes the aerial "load."

## COLD WATER.



For your accumulator distilled water which is free from all impurities is desirable, and sufficient to keep the cells "topped" can be distilled as above.

In the top section of an ordinary household "steamer" place a basin inverted the lid of the "steamer" and fill with cold water.

In the bottom pan water is converted into steam which passes through to the top section and is condensed by the cold lid.

The drops of distilled water drip off the handle of the lid and are collected in the basin.

All parts of the apparatus must, of course, be quite clean.

**T**ELEVISION as a phenomenon is no new thing. It has been the subject of press talk for many years now, but, unfortunately, comparatively little has been accomplished practically to justify the picturesque claims that have been made.

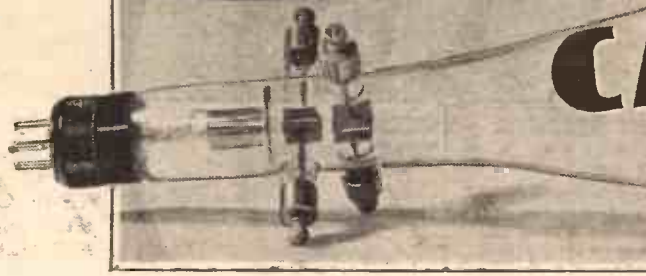
The views of POPULAR WIRELESS on the subject are too well known to require reiteration here, and our scepticism of the possibilities of the mechanical methods of transmission and reception have frequently been expressed.

#### The System of the Future.

In our opinion television progress has been seriously hampered, both at the transmitting and the receiving ends, by the various limits placed upon it by the use of mechanical scanning, and though a certain amount of progress has been made with unwieldy mechanical devices, we feel that it is not from them that the final perfected form will emerge.

The development of the cathode ray oscillograph, however, in which Ediswan

## P.W. PRESENTS



mination points very clearly to the former as the solution to the many problems that beset experimenters in television, especially radio television.

In the mechanical receiving systems scanning is carried out by rotating discs or mirror drums, the synchronising depending on the accurate speed control of a comparatively cumbersome and unresponsive electric motor, while the variation of the light source that is to supply the image is a matter of the rapid control of a comparatively insensitive glow-lamp by means of a powerful amplifier delivering heavy impulses.

#### A Double Duty.

In the cathode ray system the tube is in itself the scanning device and source of illumination, and the control of a stream of electrons is a far easier task than the variation of the speed of a motor, and the modulation of a discharge lamp.

Other great advantages in

favour of the cathode ray method of reception rapidly appear as it is more closely examined, one of the most important being the fact that it is applicable to any television transmission (as long as it is of the "intensity variation" type which is universally used to-day) without any but the most trivial alterations to the receiving circuit.

Such adaptability is impossible with the mechanical method, with its elaborate synchronising and scanning systems, while the ridiculously small input required from the receiver to the cathode tube compares very favourably with the thousands of milliwatts needed for the mechanical viewer.

#### Small Input Needed.

As a matter of fact, the cathode ray television viewer which we introduce to you is but a matter of a few volts from a set; it is a voltage-operated device.

### BRILLIANT PICTURES



The Chief of the "P.W." Research Department, Mr. K. D. Rogers, examining one of the new Ediswan Cathode Ray Television Tubes, used during his experiments. Synchronisation is under complete and accurate control, and its adjustment is the work of only a moment.

have taken a large part, has offered a complete break-away from mechanics, at least in the reception of television, and, after a considerable amount of research on the subject, we are convinced that the electronic method of picture formation will definitely constitute the basis for the perfected television receiver of the future, and the details we are about to give will enable readers to go straight ahead on the right lines with the reception of television broadcasts.

The complete controllability and negligible inertia of the free electron contrasted against the rigid stubbornness of the mechanical scanning device, with its sluggish variation of the source of illu-



### REMARKABLY SIMPLE TO SYNCHRONISE

# THE FIRST OF A SERIES OF ARTICLES



# CATHODE RAY TELEVISION

For  
Constructors

## PRACTICAL—INEXPENSIVE

Always in the forefront of radio progress, "P.W." presents a Cathode Ray Television Viewer, which is as simple to assemble as an ordinary wireless set. This practical and inexpensive instrument has been developed by the "P.W." Research Department and is now offered as a constructive contribution to the development of the science of Television. As we have frequently stated, Television has hitherto been hampered by numerous limitations in both transmission and reception. But we are confident that the Cathode Ray Television Viewer, which we are now introducing to our readers, constitutes a sound basis for the complete and final solution of the problems in so far as reception is concerned. At the transmitting end much remains to be done, but the "P.W." Cathode Ray Viewer is adaptable to various systems of transmission, and will enable the constructor to take immediate advantage of any forthcoming improvements in these.

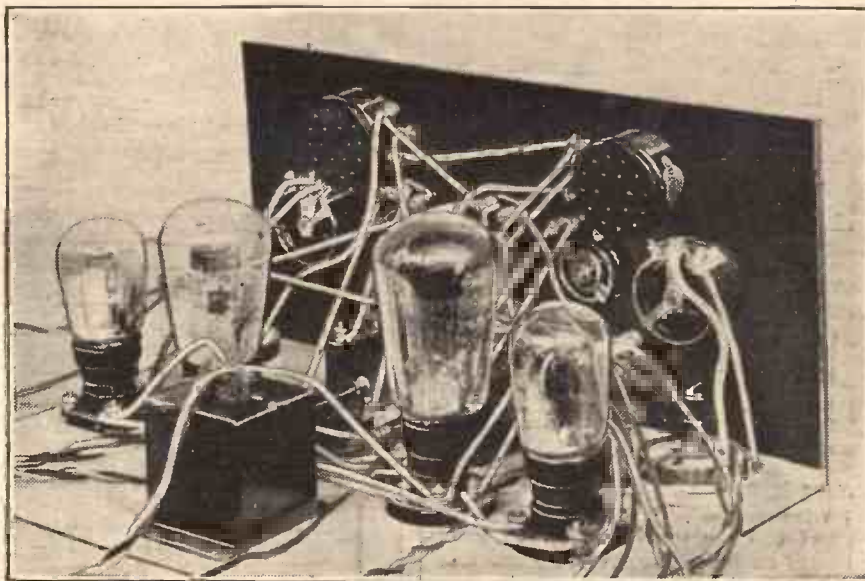
such, hardly consumes any power at all.

The result is that a three- or four-valve set of the economy-battery-operated type is ample for the full modulation of the television viewer, in consequence of which the whole receiving outfit is as simple to build as an ordinary radio set.

But let us start at the beginning so that you may see exactly how the cathode ray television receiver operates, and can judge for yourself how very, very simple the whole thing is.

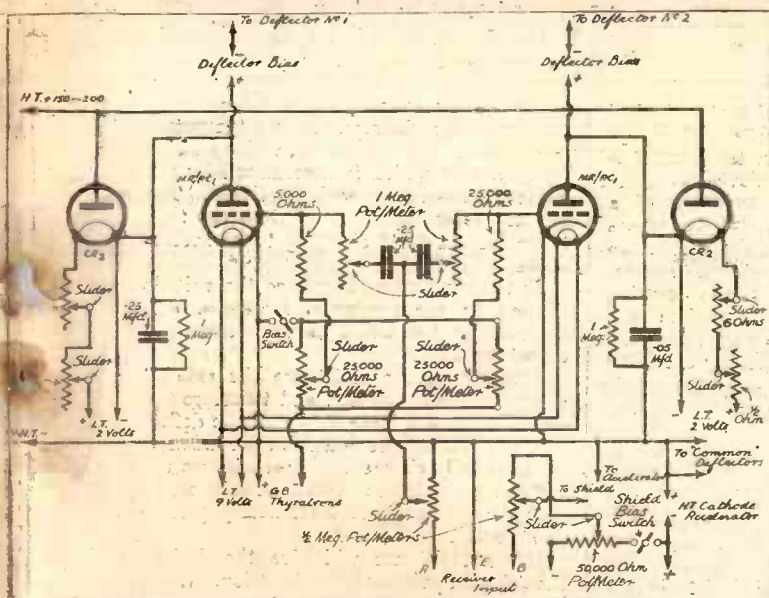
We must make it clear, however, that the system of reception that we are going to describe in this and subsequent articles, while not perfect, is yet a very efficient step towards our goal, and will undoubtedly provide the

## NO COMPLICATED MECHANISM



As will be seen from this general view of the apparatus and the diagram to the left, stark simplicity characterises this ingenious method of television reception. Instead of using moving mechanism, the electron stream has been harnessed to provide a bright moving image of the events transmitted from the studio. This image is of such clarity that from six to a dozen people can comfortably watch the reception, there being no need to crowd round the screen at all.

## A UNIVERSAL SCANNING SYSTEM



final solution to the problems of television reception.

It provides truly excellent results, though these results are necessarily restricted by the shortcomings of the transmissions at present available, at any rate in this country, which shortcomings include the limitation of the modulation frequency band due to the congested state of the ether on the wavelength bands now used.

### Adaptability.

With short-wave broadcasts the frequency band trans-

mitted could be very much wider, and consequently greater definition could be transmitted, with more rapid scanning. This would result in very much clearer and more detailed pictures, but should this change be made to-morrow the cathode ray receiver could be instantly adapted to the new conditions. The mechanical device would be useless until it had been redesigned and rebuilt. Even then it would be doubtful if it would be of much use, for the rate of mechanical scanning is restricted by purely mechanical limits of inertia, bulk, and centrifugal force.

The cathode ray has no such limits, and its lively beam can be scanned at incredible speeds, by the mere turn of a knob, or by the same means reduced to the regular time pulsations of a clock's pendulum.

During the experiments undertaken by

the "P.W." Research Department in cathode ray reception, the Edison tube has been taken as a basis of research, and Messrs. Edison-Swan have worked closely in collaboration with us in the design of cathode ray tubes to suit the various experiments carried out, and a great deal of our undoubted success must therefore be attributed to them.

### Can be Confidently Recommended.

The final tube, which is illustrated, is the result of much experiment and experience, and can be confidently recommended to readers who wish to carry out television reception of their own.

The fundamental operation of the cathode ray tube is fairly well known: how the electrons given off from the cathode are accelerated by means of a positively charged anode and how they shoot through a hole

(Continued on next page.)

ARTICLES ON HOW TO BUILD A TELEVISION VIEWER

# CATHODE RAY TELEVISION FOR CONSTRUCTORS

(Continued from previous page.)

in that anode, race up the tube and impinge on a specially prepared phosphorescent screen. At the point of impact a spot of light (of a greenish blue colour) appears.

In order to get the electrons to keep together and form a focused beam a metal shield is placed round the cathode, forming a cylinder, and this is supplied with a negative bias (relative to the cathode). This has the effect of repelling the electrons,

## SWINGING THE BEAM

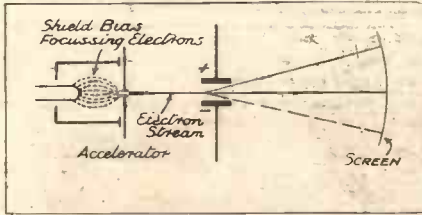


Fig. 1. Showing how the Cathode Ray is focused and deflected by applied voltages to shield and deflectors.

and so forcing them to bunch together, instead of spreading out, as they would if allowed to come off the cathode uncontrolled.

Thus they shoot through the anode, or accelerator, in the form of a closely knit beam. The result on the screen is a brilliant round spot of light.

### Tracing Patterns With Beam.

So far so good. The next thing is to control this beam so that it shall trace patterns on the screen, our ultimate aim to be a picture.

If we place a couple of metal plates on either side of the beam, as shown in Fig. 1., we can, by applying a potential across the plates, deflect the beam either in one direction or the other. The electrons are attracted by the positively charged

## THE NEXT STEP

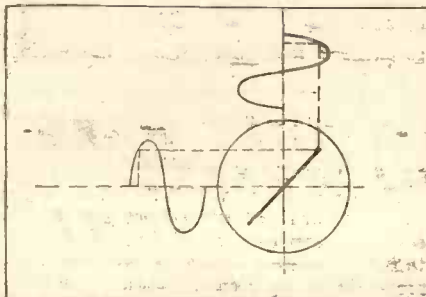


Fig. 2. With two more deflectors at right angles to those in Fig. 1, the scanning of the beam can be tilted as desired. The figure shows the effect of A.C. potentials on both pairs of deflectors.

plate (it is positive in regard to the opposite plate) and repelled by the negative plate.

The beam therefore bends upwards (see Fig. 1). If we reverse the potentials on the deflectors the beam is bent downwards (see dotted line). In practice the potentials of the deflectors are relative not only to one

another, but to the accelerator, but that we need not go into at this juncture.

We have been able then to deflect the beam in one direction, and if we were to apply a varying potential to the two deflectors we could make the beam travel rapidly enough to trace a luminous line on the screen.

This could be termed "scanning" the beam in one direction. For television, however, we have to scan in two directions, to correspond with the scanning applied at the transmitting end. The exact whys and wherefores of this we need not go into here.

### Two Sets Of Deflectors.

Obviously we cannot do that with the two deflector plates in our possession at the moment; we need two more. These are placed at right angles to the first two, and slightly further down the tube.

Now, by the same rules of the game, we can with the new plates make the beam traverse the screen in a line which is at right angles to the first. That is done by applying potentials to the second pair of deflectors.

If we apply potentials to the four plates, the potentials being arranged across pairs, we can trace all sorts of patterns with the beam. For instance, pure A.C. potentials applied together, in phase as in Fig. 2, would produce a line of travel of the beam that is 45 degrees to the axis of the deflectors.

So we see that we have a great deal of scope as to the movability of the electron

## A SIMPLE TIME-BASE

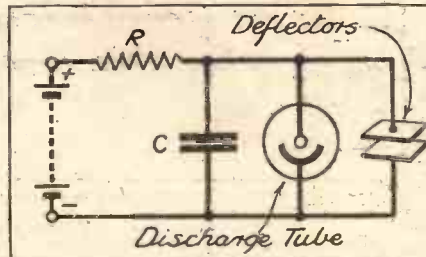


Fig. 3. The fundamental circuit of a time-base for scanning.

beam, and we can now devise a method of making that beam scan the screen in the same way as the television transmitter is scanning the object being televised.

This scanning consists basically of a series of vertical traverses carried out across the object in thirty strips, so to speak. In other words, the cathode beam has to travel down the picture thirty times, forming thirty separate lines, to complete one scanning of the picture. (We are taking the Baird system of transmission for our basis of experiment.)

### Thirty Vertical Lines.

Thus the beam has to go down the screen, return, and go down again a little further on until it has done so thirty times. On top of this it has to carry out this procedure at the rate of twelve and a half times per second.

How is this to be accomplished? In the first place, let us consider the vertical scanning alone, leaving the question of moving the traversing to the left for each scan, as we shall have to do in order to get a picture.

The vertical traverse of the beam must be carried out at a definite rate, which must be constant. Moreover, its return to the beginning for the commencement of the next traverse must be instantaneous and

## SAW-TEETH SCANNING

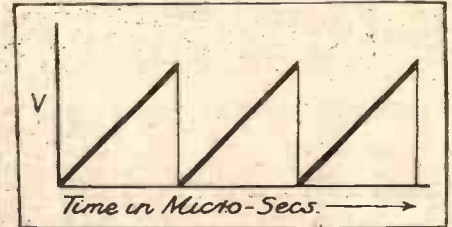


Fig. 4. Steady charge of the condenser in a time-base causes the beam to travel as shown by the heavy lines above. The thin vertical lines denote the instantaneous return of the beam on the removal of potential across the deflectors.

not visible. It must apparently be unidirectional.

Now, referring back to Fig. 2, we must note that the scanning of the beam is not carried out at a steady rate. At the tops and feet of the curves denoting applied deflector potentials the beam slows down and becomes stationary for a fraction of a second. The point of fastest travel is where the curve crosses the axis, that is half way across the line traced on the screen of the cathode ray tube.

We must arrange for the purposes of television that the speed of the beam in its straight line traversing is constant. This is done by what is known as a "time base." Theoretically, in its simplest form, this consists of the application of a steadily increasing potential across the deflector plates concerned, so that the bias of the plates is constantly increased; (We actually work with a system that decreases a statically applied negative bias relative to the accelerator rather than one that increases a positive bias, but that is a practical refinement and does not alter the theory.)

### Linear Increase Needed.

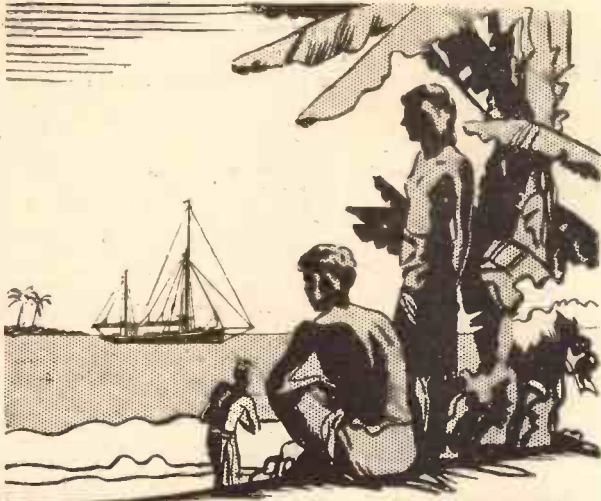
The circuit shown in Fig. 3 would apply the increasing voltage, only it would not be quite a linear increase. The deflectors are joined across the applied potential in series with a resistance. Across the potential is also a large condenser, which charges up at a rate which is determined by the value of the resistance and the voltage. The size of the condenser determines the time taken for complete charging to be accomplished.

As the condenser charges so the voltage applied to the deflectors increases, and accordingly the beam moves across (or down) the tube.

Actually with a resistance the rate of charge of the condenser, and therefore the rate of potential increase across the deflectors, gradually slows down as the condenser becomes fully charged. In practice we use a diode valve instead of the resistance, so that the rate shall be more nearly perfect in linearity.

But a resistance will give the desired effect for the purpose of explanation. When the condenser is charged the potential across the plates is at maximum and the beam stops its travel. We have completed a line on the screen at a definite rate.

(Continued on page 374.)



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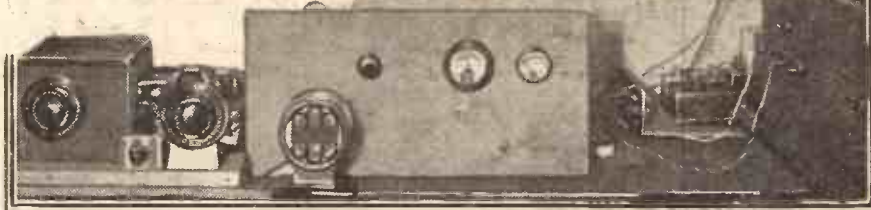
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# Short-Wave Notes *By* W.L.S.



A weekly chat by our popular expert, dealing with many interesting aspects of current short-wave practice.

BY the time you read these notes, the Crystal Palace experiment will be all over. As soon as possible I want to analyse the results and get ready for the next tests. Suffice it to say, at the moment, that the interest being taken in 5-metre work this year is simply tremendous, and that the said "C.P." experiment has given an added stimulus to it.

I want to clear up this "amateur transmission" business this week, once and for all, particularly in view of recent correspondence that has reached me. I don't usually take the slightest notice of anonymous letters, but one has reached me this time that seems to call for comment. Our correspondent signs himself "For the General Good," and I think we may say that his motives are good, however mistaken his ideas may be.

### Short-Wave Development.

This gentleman gives me a sound "wiggling" for "continually pushing amateur transmission before readers." He says, further, that I am "creating an unhealthy curiosity amongst readers," as if amateur transmission is one of the seven deadly sins.

Let us deal with the first accusation. I

suppose I mention amateur transmission in about one article in every five or six that I write. Why not? I am an amateur transmitter myself, and so are most of my friends, and I am enormously enthusiastic about it (although I've been doing it long enough to know better).

There is no getting away from the fact that the amateur transmitter was originally responsible for the development of short waves. I am convinced that without his work we should still know nothing, or very little, about them.

Very well; now for Stage No. 2—the development of ultra-short waves. Who but the amateur is doing anything towards the development of the 5-metre band, for instance?

### The Reason.

Who is going to carry on in future, when all the present amateurs are dead and gone, unless there is a continual growth in the fraternity of "hams"?

The head of a huge commercial concern—once told me that the amateurs would *always* go on doing things that the commercials would allow to pass unattempted, simply because the motive behind amateur work is enthusiasm—not monetary gain. As I once said in these notes, it will always be an amateur who succeeds in achieving the impossible, simply because he hasn't enough technical knowledge to realise that it is impossible!

### Difficult to Obtain.

But our anonymous correspondent need not worry. The result of my little "boosts" of the amateur transmitter will never end, as he seems to imagine, in the acquisition of a transmitting licence by every reader of "P.W." Transmitting licences don't grow on trees, and one has to satisfy the G.P.O. about one's technical qualifications before one can aspire to transmission.

The fact remains, however, that what is healthy for the game is a continual influx of new blood and new ideas. The "hams" themselves are not so selfish that they try to keep newcomers out; on the contrary, the newcomers would be the first to admit that the attitude towards them is invariably friendly and helpful.

Why, then, should anyone not connected with this branch of radio try to lay down the law and keep it select? It beats me.

### Not a Nuisance!

In any case, the statement that the amateur transmitter makes a nuisance of himself is miles from the truth. I guarantee that three broadcast listeners out of four have never heard one, and that two out of those three have never heard of one.

Incidentally, I must correct a recent statement of mine on this sore subject. I am told that a fee of 10s. is now charged for an "artificial aerial" licence.

"B. W. F.", an overseas reader of "P.W.", at present residing in the Home Country, asks a few pointed questions. I will set them forth as concisely as possible.

(1). Why do so many manufacturers supply slow-motion dials with knobs of tapered shape—the very worst from the point of view of a comfortable grip?

### A Problem.

(2). Why do so many commercial sets have the tuning controls on the front, when tuning is much more comfortable, in some cases, when the knobs are at the side, with only the "indicators" in front?

(3). Why does no one publish a really up-to-date list of short-wave stations?

Well, "B. W. F.", my answers to the first two are respectively "I don't know," and "I can't imagine." To question (3) I have

devoted considerable thought, and I have decided that I want a week's notice of that question! Of course, it is an awful problem to keep up-to-date if one sticks to "official" news only.

On the other hand, if one published a regular list, and added to it all the stations reported by readers, without official confirmation, it would hardly be accurate. (And this isn't a reflection on the veracity of readers, but more on the stations that keep bobbing up and disappearing again.)

"V. I. E." (Liverpool) would like to meet "R. C. W." of the same town. Unfortunately I didn't keep "R. C. W.'s" letter and therefore haven't his address. If said "R. C. W." would write to "V. I. E." (c/o me) his letter shall be forwarded.

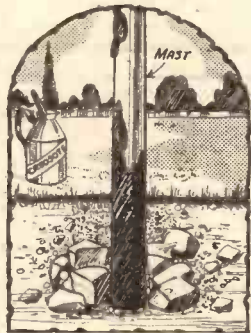
## "COAL-HOLE SHACK"



A reader sends this interesting photograph of his short-wave installation in a converted coal "cellar," which he has christened "COAL-HOLE SHACK."

## PRESERVING AN AERIAL MAST

DURING the erection of an outdoor aerial it is common practice to bury the pole or mast about two feet into the ground to strengthen it against wind and any strain caused by the tautness of the aerial wire.



### A GOOD COATING

Creosote is a good protective against rot, and at least the base of the mast should be treated with it.

In the majority of instances, where the mast is a wooden one, insufficient precaution is taken against weather conditions; and in this respect it is always advisable to cover the mast with a coating of creosote or paint, especially that portion buried in the damp earth.

# RECEIVERS of RENOWN

IN the general interest of its readers, and of the radio industry as a whole, "P.W." has for long enough been opposed to the convention—and it is nothing but a convention—which decrees that new models of commercial receivers should only be produced at "Show" time.

We have ventilated every aspect of the question, and so far as we have been able to determine, this "seasonal" tendency possesses the solitary advantage of Olympia "window-dressing." There can be no doubt that it does tend to make the Show more interesting than it might otherwise be. But what of that?

### An Example to Others.

Considered from the point of view of the industry as a whole, the practice is fraught with disadvantages. It creates production "peaks," it causes unemployment during the summer months, it gives rise to the entirely erroneous idea that radio is seasonal and, from the point of view of the public, the release of so many new models at once results—as it is bound to result—in confusion.

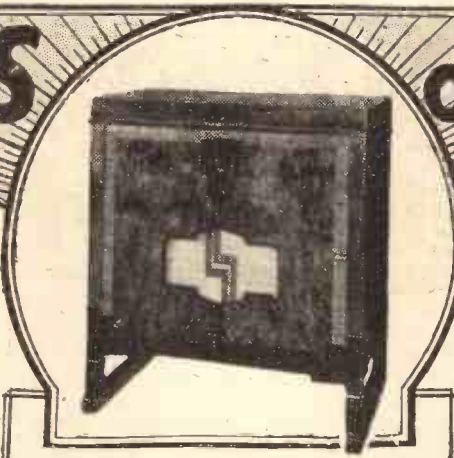
The astonishing part about it is that a great many of the manufacturers are entirely in agreement with us! But just because it is convention—well, it is gratifying to know that at least one famous organisation has seen fit to adopt the bold course.

Not believing that the autumn is the only, or necessarily the best, time at which to introduce new models, H.M.V. has just come out with a new "Superhet Autoradiogram." And may we say right away that if this is an example of what can be done by leisurely concentration upon the design and production of one instrument instead of the usual feverish activities which become necessary for the production of a whole range of instruments by a given date, then it is an example which others would do well to follow.

### Beyond Criticism.

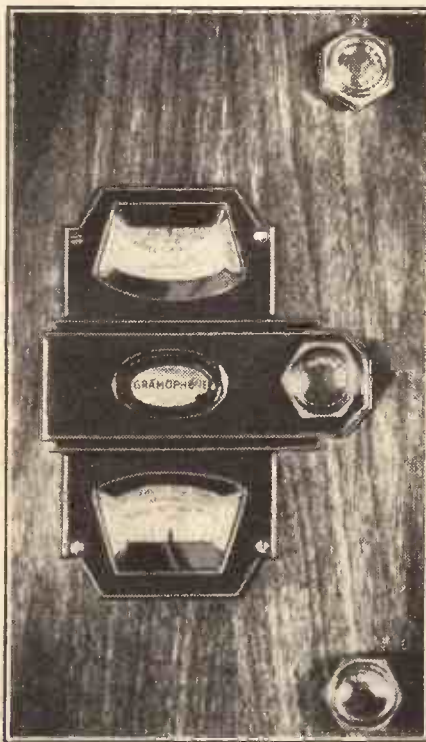
The new H.M.V. "Superhet Autoradiogram" Seven is a superb instrument. From the pleasing compromise between modernism and traditional craftsmanship in the design of the cabinet to the excellence of the design electrically, the instrument is flawless.

What an advertisement for radio and for the electrical reproduction of records: What a milestone in the march of scientific progress! What a feather in the already well-bedecked cap of H.M.V.!



THE NEW H.M.V. SUPERHET  
AUTORADIOGRAM SEVEN

### THE SIMPLE CONTROLS



All the controls, with the exception of the volume control, are conveniently located on the motor-board.

To attempt to compare it with known standards would be an impossibility, for it is true to say that from every point of view this magnificent instrument gives results that are equalled by few and excelled by none. Examine it carefully, read the technical specification, *hear* it, if you can,

and then try, as we have done, to pick holes in it—try to find a single point upon which criticism can justifiably be levelled.

Only then will the full significance of our eulogy be apparent. Frankly, it cannot be done! Try from whatever angle you like—appearance, design, results, general utility—you will be forced to the only conclusion possible, and that is simply that criticism based on all known standards is impossible.

Take, for instance, the design of the radio chassis alone. Where else in all the world can you find a design that will give better results consistent with the number of valves employed? As good—well, one or two, perhaps, but better? Definitely not.

### The Vital Test.

Infinite programme variety, razor-edge selectivity, amazing ease of operation amounting almost to automatic action—these are the virtues of the "Superhet Autoradiogram" Seven—these are the features that count. Claims based upon practice and not theory. That is the vital test—results!

And think, too, of all the little refinements that are to be found in the design—refinements which may make all the difference between good and indifferent results. Such things as tone control, provision for the connection of a remote volume control, calibration of the tuning scales in both wavelength and station order, to mention just a few of them. Perhaps to the reader they sound comparatively unimportant points, yet to us they are overwhelming evidence of the thorough way in which the design has been tackled.

### Not Easily Forgotten.

On the radio performance alone, one is left with the impression that the instrument is worth every penny of the money charged for it. Yet the price includes not only a superb radio instrument, but the very latest type of automatic record-changer!

We feel that it is quite unnecessary to enter into the merits of automatic record changing, for to be absolutely frank it is one of those joys that has to be experienced to be appreciated to the full. In a word, it's uncanny!

We could go on in this vein for hours, for an experience with the "Superhet Autoradiogram" Seven is not easily forgotten, and is productive of an almost endless train of thought. But where is the need?

## TECHNICAL SPECIFICATION

**GENERAL SPECIFICATION.**—All-electric seven-valve superheterodyne with latest type of automatic record-changing mechanism, the whole built into a particularly handsome console-type cabinet.

**CIRCUIT DETAILS.**—The seven valves, one of which is the mains rectifier, are arranged in the following circuit sequence: H.F. amplifier, oscillator, first detector, intermediate frequency amplifier, second detector and power output. The latest type of magnetically coupled band-pass circuit which precedes the

first H.F. amplifier is coupled to aerial by means of small pre-set condenser, enabling instrument to be adjusted for use under any aerial conditions.

**CONTROL ARRANGEMENTS.**—All controls, with exception of main volume control, are conveniently situated on motor-board. Sections of the separate circular medium and long-wave scales are visible through neat escutcheon plates, and between is situated fixed plate marked "gramophone" (see picture). Only appropriate scale is illuminated, depending

upon position of combined on-off, wave-change and gramophone switch (top knob in picture). Knob to right of fixed plate marked "gramophone" is main tuning control. Lower knob in picture is tone control. Volume control at front of instrument works on both radio and gramophone. Set gives undistorted output of 2½ watts.

**PRICE.**—55 guineas.

**MAKERS.**—The Gramophone Co., Ltd., 363/7, Oxford Street, London, W.1.

# RECENT VALVE DEVELOPMENTS

IT is not so much of completely new valves that I want to write here, though there are some new "tubes" that have recently been placed on the market, it is the new uses to which many of the well-tried and popular valves can be put that concerns this page.

The development that most tickled the general public was probably quiescent push-pull, with its attractive double benefit—saving of H.T., and increase of output power.

This brought a much-maligned valve into further prominence. I refer to the pentode, which has been the subject of more discussion and argument than any valve since broadcasting began.

## Quite Large Currents.

But whether for or against, we had to admit that the pentode was a somewhat greedy valve, though its powers of amplification and its power output could not be denied. The smaller pentodes, like the P.M.22A., Pen.220, P.T.2, and so on, are less hungry for H.T., and they give a surprising output for a small grid-voltage input. Large valves, such as the Mullard P.M.22, Mazda Pen.220A., Cossor 220.P.T., took quite large anode currents, and so were not looked on with favour by dry battery users.

Quiescent push-pull altered things in this respect, and so we experienced a revision of interest in the large, steep-slope pentodes. It was almost like having new valves to have a new system of using old ones (even if that system was first thought of in 1915 though never generally used or advocated).

## Steep Slope Valves.

Following close on the heels of quiescent push-pull came the grid-current form of push-pull, generally referred to as "Class B" amplification.

This can be carried out with suitable transformers with ordinary triode output valves, but it is better obtained with special double push-pull valves, in which the two grids and anodes are enclosed in one "bottle." The various valve concerns are busily engaged in developing these valves, two models of which (Cossor and Mullard) give in a three-valve amplifier a total quiescent anode current of about 7 milliamps or less at 120-volts H.T., with a peak maximum output of about 2,000 milliwatts.

Naturally, the anode current goes well up at this figure, for one cannot get output watts without putting any power into the valve. The big point is that the average anode current consumption is pretty economical.

Double diode mains valves for full-wave

The new ways in which valves can be used, as well as the development of special "tubes" for the new schemes, are outlined for readers in this review.

By K. D. ROGERS.

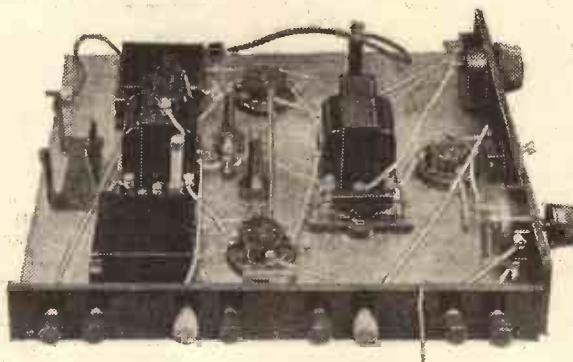
rectification or for automatic volume controlling have been developed, while the use of a separate valve for automatic volume control of large mains sets has long been used.

The double diodes incorporate a triode section so that the valve will amplify L.F. as well as rectify, while I believe D.D. Tetrodes and Pentodes are "in the offing."

H.F. pentodes, giving greater stage gain than the popular S.G. valve, are on the point of release to the anticipating public, and this week we publish a set using three of these remarkable valves.

Both mains and battery valves are being improved from time to time, and as an

## PUSH-PULL FOR PENTODES



Pentode valves show up to great advantage in Quiescent Push-Pull amplifiers, an example of which is illustrated here.

example I may draw attention to the Micromesh 2-volt output valve which has recently appeared—the P.B.1.

This is a valve with a slope of 4 milliamps per volt, having an amplification factor of 16 and an A.C. resistance of 4,000 ohms. It is an excellent output valve, being economical with H.T. (it requires 11 milliamps at 150, with 4.5-volts bias, and 7 milliamps at 125, with the same bias).

The fact that the bias cannot be altered though the anode potential drops 25 volts, gives a good idea of the steepness of the slope of the valve's curve. At 100 volts the bias has dropped 1.5 volts, being then 3 volts, and the anode current is 6 milliamps.

Though not a valve, I must mention the Ediswan D.L.S.1 thermal delay switch for mains sets. It looks like a valve, and fits into a standard valve holder, and is certainly unbeaten as a satisfactory means of controlling the switching on and off of the H.T. of a mains unit.

## The Very Latest.

Being in a vacuum the contacts of the Ediswan thermal delay switch cannot arc, so that the switching is wonderfully silent.

Finally we cannot let this brief retrospect conclude without reference to the valves that have created more excitement than any for a long time.

I refer to the Marconi and Osram "Catkin" range of A.C. valves. These have just been introduced to the public, and it will be remembered that full details and a set for the valves were first given in "P.W." a fortnight ago.

This week further details of the valves are provided on another page, so there is no need for me to go into intimate description of them. I can, however, say that I have had some on test for some time now, and can definitely express my delight not only at their structural rigidity but their general mechanical and electrical efficiency.

So far only four "Catkin" types are available, but I understand that others will follow in due course, and I for one am eagerly awaiting their debut.

## Special Variable-mu.

Another recent arrival to our laboratory (it will be released to the public on June 1st, I believe) was the Mullard short grid-base variable-mu S.G. battery valve. It was used, with the new Mullard "Class B" valve (P.M.2B.), in a set last week, and those who read the details given will have realised the value of the valve to the full.

For the benefit of the others let me explain that the valve is designed to give the full volume control that is normally obtainable from a variable-mu valve of the best type, with a variation of grid bias of only 6 volts.

This means that a bias battery of 6 volts is all that is required for the full controlling of the valve, a very different thing from the 16 volts that is usually required for battery variable-mu valves when close to the local station.

As a matter of fact, except when close to the station the average variable-mu valve can be used with only 9-volts bias, but in the same circumstances the Mullard P.M.12 M. needs but 4½ volts. This makes it ideal for use with "Class B" sets where the 4½-volts battery is quite sufficient for the bias of the driver valve.

# RADIO SIMPLIFIED

# A PRACTICAL OUTLINE FOR BEGINNERS

**T**HE beginner who has tentatively examined wireless textbooks is often repelled to find they abound in the particularly uninteresting-looking squares and criss-cross lines which are known as graphs. It is the purpose of this article to show that such graphs are by no means so dull or difficult as they might appear at first.

The idea behind them is anything but dull, for obviously a graph should be graphic—vivid, lifelike, and illuminating.

And actually it does get near to attaining this desirable end when viewed with an understanding eye. For a graph can give you, at one glance, the

to one scale. If you look across the page from it you see its relationship to a different scale. And thus by its journey across the squares it links the two scales together, at all their values, simultaneously.

Our first curve (left) merely shows the general idea; but the

about either the current or voltage at any desired point. Not only does the 6 volts, for instance, indicate that 60 milliamp. would flow, but any fraction of voltage ( $6\frac{1}{2}$ , or  $6\frac{1}{4}$ , or  $6\frac{3}{4}$ ) can instantly be related to its own fractional current by employing suitable scales.

It tells the eye what the figures should tell the brain.

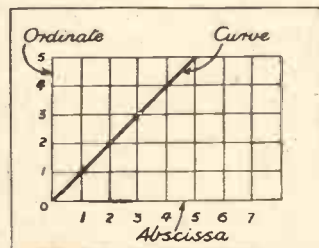
We have seen that, once drawn, a curve will visually relate all the values in any given scale to another scale. And that its shape will indicate the sort of relationship existing—straight-line for proportional variations, humps or bends for inequalities, etc.



## Working Limits.

It can also clearly define working limits. For instance, on the typical 200-volt valve curve shown on this page we see that there will be a straight or proportional relationship between grid volts and anode current over a considerable portion of the curve but below a certain value this relationship no longer holds good.

When using the valve in question as an amplifier we expect it to give faithful anode current variations in response to altered grid voltages. And where the curve is straight this will be achieved, for equal increases in negative grid volts will result in equal anode current



Terms met with in connection with graphs are explained below. Note that the "curve" may be straight!

whole tendency and truth behind a mass of meaningless figures.

The graphs used for wireless are usually of a straightforward and simple type, as shown on this page.

The horizontal axis or base is sometimes referred to as the abscissa, and the vertical as the ordinate. From these are drawn at regular intervals the thinner lines which form the square background upon which the curve itself is drawn.

It is this latter, traversing the squares and relating the measurements on the two axes, that tells the whole story.

## What the Curve Shows.

The curve (which, incidentally, may be dead straight, though it more often has a bend or humps) generally starts near the bottom left-hand corner of the graph. In its progress across the squares it cuts the vertical lines which are extensions of the bottom scale, and also, of course, it cuts the horizontal lines that carry the upright scale across the page.

Thus the curve "belongs" to two worlds. If you look down the page from it, you relate it

second one (right) is in practical form, relating current to voltage, in a given instance. It shows how voltage affects current when the resistance of the circuit is 100 ohms.

We can measure, or prove by Ohm's Law, that if two volts are applied to such a circuit the current flow would be exactly 20 milliamp. Our curve indicates this by cutting through the 20-milliamp. line and the 2-volt line at the point where they cross. Similarly, at 4, 6, and 8 volts we should have currents of 40, 60, and 80 milliamp. respectively.

The first advantage of such a curve is already evident. It shows how all the values on one scale to which it refers are related to the other scale. Thus, from the simple graph to which we have referred we can get instantaneous information

Our curve is a complete Ohm's Law for the 100-ohms resistance circuit for which it was drawn.

It saves all the working out, for with a rule or straight-edge of any kind it graphically shows how any particular voltage in which you are interested is related to current, or vice-versa.

## Proportional Relationship.

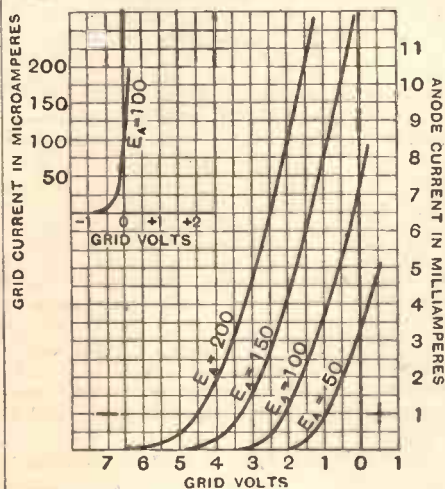
More important still, the very shape of the curve speaks volumes. Our straight line, for instance, shows that there is a straight relationship concerned. Double the volts and you double the current, halve the volts and you halve the current, etc. One factor (volts) is directly proportional to the other (current).

And obviously, if one factor happened to be curiously related to the other, we might expect the curve to be curious, too—not a straight line, but a peaky, humpy line, with any unexpected tendencies betraying themselves to the eye at once. Which is exactly what the curve will do.

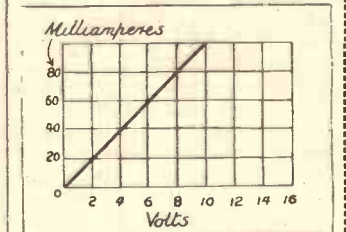
That is why it is so popular with the authors of textbooks. In one vivid streak across the page it epitomises a whole mass of measurements and figuring.

By a set of curves we can epitomise on one diagram the whole action of a valve under the conditions covered by the scales.

## A "FAMILY OF CURVES"



By a set of curves we can epitomise on one diagram the whole action of a valve under the conditions covered by the scales.



A practical graph showing the relation between volts and milliamperes in a circuit having 100-ohm resistance.

decreases. But when we get "off the straight" we get smaller decreases; the response is not proportional, and distortion is therefore introduced.

Thus in the shape of the curve we get correct working limits clearly depicted. By placing several curves (what is called a "family of curves") on the one pair of scales we can amass our information so that one graph can epitomise the whole action of the valve under the conditions covered by the scales.

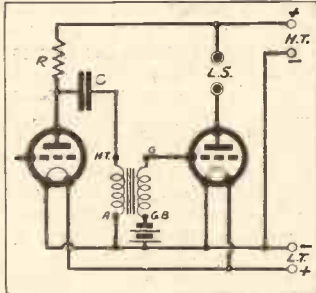
As we said at the beginning of this article, graphs are by no means so dull or difficult as they might appear.

Every constructor should familiarise himself with graphs of different types because in all radio work their use will be found of the utmost value.

Special Beginners' Supplement—Page 2

**PARALLEL FEED L.F.** coupling is the direct outcome of the use of high-permeability cores for transformers.

During the past few years a great deal of research has been carried out with regard to magnetic permeability, and it has been found that certain



The connections for straightforward parallel feeding, to keep direct current out of the transformer's primary, are illustrated here.

alloys—usually containing a percentage of nickel—are much superior to iron in this respect.

These alloys have several advantages when applied to low-frequency transformers. For instance, fewer primary turns are necessary in order to produce a given inductance than is the case when the core is of iron. Secondly, a small alloy core will give the same effect as a larger iron core.

**Economy of Space.**

These factors enable the makers to turn out a good quality component at a moderate price, while at the same time reducing the physical dimensions of the instrument and thus economising in space.

So far so good. But, these special alloys, although possessing extraordinary high permeability, are particularly susceptible to steady currents of a few milliamps.

**THE SAME OBJECT**

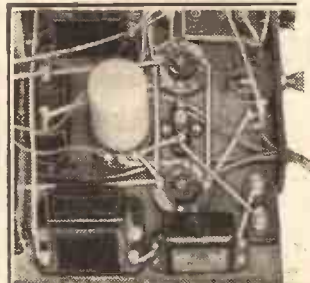


Parallel feeding does much the same for the interval filter transformer as an output filter does for the loudspeaker, i.e. prevents saturation of the magnetised iron.

**THE ADVANTAGES OF PARALLEL FEEDING**

Now when a transformer is joined directly in the anode circuit of a valve there is always a steady current from the H.T. supply flowing through the primary winding, which is, of course, in series between the H.T. and the anode of the valve. The effect of this current, in the case of many transformers with alloy cores, is to reduce the permeability and therefore the working inductance of the primary winding.

This is just what the transformer maker wishes to avoid, because a high primary inductance is essential if good quality reproduction is to be achieved.



The Benjamin Trans-Feeda is a complete parallel-feed coupling unit. It is contained in a screen, and looks very much like a canned coil.

To overcome this, transformers of this type are frequently parallel fed. The procedure is a simple one.

A resistance having a value of 10,000-30,000 ohms is joined in series between the anode of the valve and H.T. +.

In other words, it takes the place of the transformer primary and permits (a) the steady anode current to flow through the valve - H.T. circuit, and (b) the voltages due to the incoming speech or music to be applied to the grid circuit of the following valve in the same way as a resistance-capacity-coupled stage.

**Value of Resistance.**

The value of the resistance depends upon the impedance of the valve in whose anode circuit it is connected.

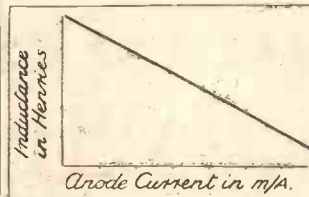
Between the valve anode and the transformer there is a coupling condenser which acts as a barrier to the steady current from the H.T. supply but permits the speech or music impulses to be transferred to the transformer winding.

The transformer is connected in the grid circuit of the follow-

ing valve and within the limits of uniform response the stage gain is equal to the voltage generated across the anode resistance, multiplied by the voltage ratio of the transformer.

The parallel-feed scheme is much the same as R.C. coupling except for the fact that the grid leak is replaced by the transformer, with a correspondingly greater magnification.

**EFFECT OF CURRENT**



The curve illustrates in a most striking manner how the inductance of a transformer's primary winding falls with increase of the direct current flowing through it.

Since there is no D.C. flowing in the primary winding the inductance will be the "zero D.C." value for that particular transformer and therefore it will give its maximum results from the standpoint of reproduction.

**Quality at Low Cost.**

Actually some of the alloys are more effective when a very small steady current is applied to the winding, but it is inadvisable to experiment in this direction except on the makers' recommendation, in order to achieve a perhaps inappreciable increase in efficiency.

There is no doubt that parallel feed properly carried out does enable excellent quality to be obtained at a low cost.

Moreover a choice of ratios is rendered available by adopting different methods of connecting the transformer in circuit.

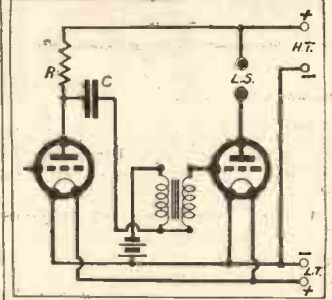
That is to say, when the instrument is joined in the conventional manner the step-up ratio will be that of the primary to secondary turns.

If the secondary has three times as many turns as the primary the ratio will be 1 : 3.

But by using auto-coupling, viz., joining the primary and secondary windings in series the ratio can be either (N) + 1 or (N) - 1, where N equals the normal primary to secondary turns ratio.

Thus, if the primary and secondary are joined in series so that one winding assists the other the effective ratio will be (N) + 1, or 1 : 4 in the case of the example already given.

Alternatively the two windings can be connected so that they



By means of these auto-transformer connections a higher or lower ratio is obtainable from the transformer.

oppose each other and the ratio then becomes (N) - 1 (i.e. 1 : 2 in the above example).

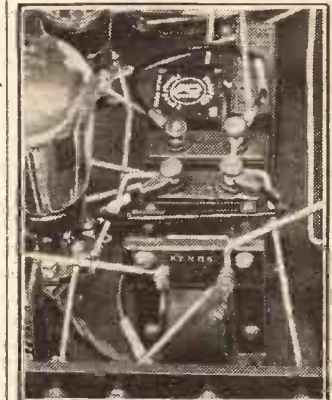
It is generally advisable to aim at straight-line amplification over the musical frequency range with an ordinary parallel-feed transformer, but the capacity of the coupling condenser can be chosen so as to increase the bass response.

**A "Bass Hump."**

The transformer will then amplify certain of the low notes to a greater extent than the remainder of the frequency range, but against this is the possibility of "motor-boating" occurring should the L.F. circuits be insufficiently decoupled.

Although the deliberate production of a "bass hump" may be desirable in some instances to counteract loudspeaker deficiencies it is far safer to adhere to the makers' recommendations as regards values and to apply any corrections that may be required elsewhere in the amplifying chain.

**A GOOD MIDGET**



Though very small in size, the R.I. Parafeed transformer is most effective with parallel feed, for which it is specially designed.

**NEXT WEEK:**

**MORE ABOUT PARALLEL FEEDING and MAKING TUNING CURVES.**



Kit Criticisms

# THE PILOT "GUARDIAN" Q.P.P. FOUR

By Mr. Peter Simple

SEVERAL weeks ago Messrs. Peto-Scott sent me for test a kit of parts for a new quiescent push-pull receiver. Determined to give the kit a thorough test under normal conditions, I built it up and connected it in place of my standard home receiver.

The fact that I am still using the "Guardian" Q.P.P. Four for my own entertainment every evening is, I think, sufficient proof of the success of this attempt to give the benefits of Q.P.P. to the home constructor.

There is no need here to stress the value of quiescent push-pull amplification. Its advantages are already well known to every constructor who has to depend upon dry H.T. batteries to work his receiver.

### High-Tension Economy.

At the same time there is no doubt that the Q.P.P. system, as now developed, is going to simplify the task of those who design receivers in kit form for the home constructor. From the earliest times the biggest problem radio engineers had to contend with was the question of H.T. supply. There is comparatively little difficulty in designing a receiver which will give a big range of stations and plenty of volume; and theoretically there is everything to be said for getting all this volume from a generous dry battery supply.

In practice, however, such a course is ruinously expensive for the average listener and must be ruled off the books at once.

Consequently kit manufacturers have been obliged to confine their activities primarily to designing three-valve receivers of various types and making them just as efficient as the demands of economy would allow.

And now Q.P.P. has come along and changed all that. No longer must super output be regretfully denied to home constructors because a super power valve has a nasty habit of taking as much as 22 milliamps.

### Mains-Receiver Results.

I do not know what the designers of the "Guardian" kit estimate the total consumption to be, but I do know that I myself have been getting results which my neighbours can only attribute to an all-mains receiver with a total average consumption of some 18 milliamps. And this is for a full-throated reproduction which I should never have dreamed of a month or two ago with a battery receiver.

So all praise to Messrs. Peto-Scott for this new boon to the hard hit constructor to whom a shilling means every bit of twelve pence!

The construction of the "Guardian" kit presents no difficulties to those who are used to the usual S.G. detector and L.F. circuit, for the Q.P.P. output really

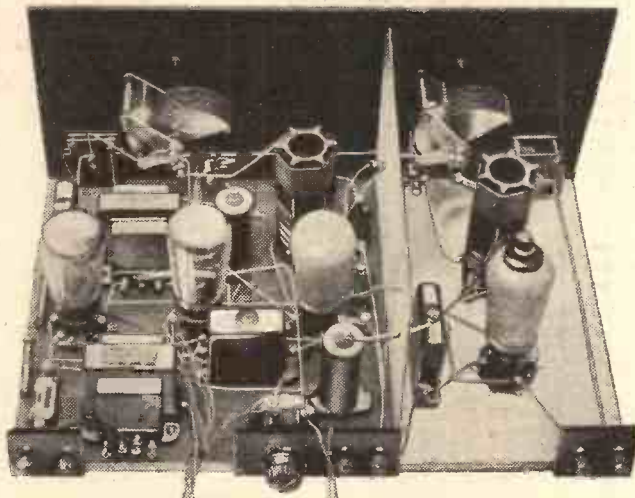
necessitates nothing more than an extra valve holder. The transformer and output choke (although in this case designed specially for quiescent push-pull) are components which would be found in almost every receiver. And if there were any difficulty in construction, the very explicit chart and blueprint which is supplied with every kit would soon put that right.

### Good Selectivity.

A fully screened H.F. stage, with series aerial condenser; detector with differential anode condenser; and pentode output—that is the "Guardian."

Naturally in operation one pays special attention to the output for which the "Guardian" was designed. But for myself I was immediately struck by the ease of tuning and the opportunities for extreme selectivity. My collection of worth-while foreign stations has increased considerably since I installed the receiver. Just one small example—only a night or two ago I listened with the greatest pleasure to the

### PARTICULARLY NEAT LAYOUT



A behind-the-panel view of the "Guardian" shows how the employment of Q.P.P. amplification adds nothing to the work of building or wiring. The knob on the centre terminal strip controls the bias for the matched pentodes.

programme from Bolzano, the 1-kw. transmitter in the north of Italy! And that without the slightest murmur from Stuttgart or Scottish Regional.

### Excellent Quality.

But at the same time, although I should have praised the "Guardian" for its selectivity had it been an ordinary receiver, I must reserve my commendation for the reproduction which is even better than I hoped it would be. I have tried all types of speaker, from my gallant 100 U Blue Spot to an expensive moving coil, and there is no doubt that the "Guardian" is something out of the ordinary.

Those who look for ganged wave-changing and single knob tuning will be disappointed; those who make it a habit to plug H.T. and grid bias tappings anywhere and hope for the best are not going to get any more than they deserve; but those who want real quality listening under all conditions are going to hail the "Guardian" as the best investment they ever made.

### "As Easy as Pie."

Just one final word for those who are, perhaps, rather afraid of Q.P.P. when they read about "matching pentodes" and potentiometer controlled bias. This matching business is "as easy as pie" when you have given one glance at the detailed instructions on the constructional chart, and the little trouble which is needed in the matter of bias lends added zest to listening.

So, then, you battery users, stop envying the results of your friends with their mains receivers. Peto-Scott, by their initiative, have made it possible for everyone to enjoy the advantages of Q.P.P. at once—the rest is up to you.

### REPLIES FROM READERS

Letters of interest evoked by correspondence recently published in "P.W."

#### USING TELEVISION RECORDS.

The Editor, POPULAR WIRELESS.

Dear Sir,—A letter in your issue of May 13th from G. Tucker, Esq., of Bushey Heath, Herts, has been read with interest. Unfortunately, Mr. Tucker's idea is by no means original. For some months I have been using a gramophone record upon which has been recorded pictures of persons.

At the present moment—for your correspondent's information—satisfactory pictures are not obtainable by this method, owing to the extraordinary technical difficulties met with in the actual recording. The records that are obtainable, however, are of great help for experiments with methods of synchronisation.

This society will be happy to give Mr. Tucker any information that he may desire.

Yours faithfully,  
H. MONTAGU SMITH, F.T.S.,  
Hon. Sec. Western England  
Television and Scientific  
Society.

Eden House, Eden Grove,  
Filton, Bristol, 7.

#### COAL CAUSES CRACKLE.

The Editor POPULAR WIRELESS.

Dear Sirs,—With reference to Mr. H. Turner's article, "Coal Causes Crackles," published in "P.W.," May 13th, 1933, the following may be of interest:—

When my receiver (Six-valve superhet) is tuned to 12 or 13 metres, loud crackles can be caused in the speaker by touching the coal in the fireplace with a poker, but only by touching the red-hot portions of coal.

This phenomena is only noticed on the wave-lengths mentioned, nothing being heard on the rest of the short-wave band or on the "broadcast bands."

The receiver is at least seven feet from the fireplace. Any explanation of this curious effect would naturally be welcome.

Your faithfully,

L. H. LUSCOMBE.

75, Mayfield Road  
Hornsey.

# RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos.



Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

## QUESTIONS AND ANSWERS

### SELECTIVE CRYSTAL SET FOR MEDIUM WAVES.

M. A. T. (Denny).—"Could you give me the connection in words for the 'S' crystal set, which does not go up to long waves? Also number of turns, size of tube, etc.?"

You can obtain full details of the Type "S" crystal set from the B.B.C., but it is so easy to build that the following may be sufficient for your guidance.

The coil is wound on a 3½ in. diameter tube 3 in. long, and consists of 36 turns of No. 20 D.C.C. It is tapped for a clip connection at the 12th, 16th, 20th, 24th, 28th, and 32nd turns.

The connections for the complete set are as follows: Aerial lead to one side of crystal detector, and to flex which carries the clip for the coil tappings. Other side of crystal detector to one 'phone terminal and to one side of a '0003-mfd. fixed condenser.

Remaining 'phone terminal and remaining '0003 terminal to earth terminal and to that end of coil winding which is near the 32nd tapping (i.e. 36th turn of coil), and also to the moving vanes of the tuning condenser.

The fixed vanes of the tuning condenser are now joined to the other end of the coil winding, which completes the connections.

In use you merely try various settings of the aerial flex clip until you discover the tapping point which gives the best all-round results for both the necessary strength and selectivity, and thereafter you select the desired programme (Regional or National) by altering the tuning condenser adjustment.

### WHY DID THE PLATE CURRENT DROP?

"CHARLES FIRST" (Canterbury).—"I am writing to you about a point which I have never seen mentioned in 'P.W.', but one which seems to me to be of great interest.

"First, I wish to make it clear that there is nothing working wrong in any way, so it is not really advice I am asking, but just an explanation. So, having made that clear, I will now explain why the set ('Fireside Console') is altered a little from the published description.

"I recently had a very good milliammeter given to me, and this is now wired in between the 45,000-ohm resistance and the H.T.+2 lead, which formerly connected the resistance to H.F. and output chokes, etc. The idea was to get very sharp tuning accuracy by watching the drop in plate current when a station is tuned in exactly.

"This has proved very interesting and a great help in getting identifications of the great number of stations tuned in on this set. But with the idea of experimenting I fixed up a new indoor aerial over the week-end (the other was indoor type), and this has had an unexpected effect.

"Formerly the maximum drop in plate current after the most careful tuning in was 4 divisions on the scale. But since the new aerial has been fixed (although it is very much like the one that preceded it, and uses the same wire) I get a drop in plate current of nearly 6 divisions.

"Reception seems stronger and I get less clicking interference with the new aerial, which is spaced out from the wall instead of running along the picture rail. But I do not understand why a change of aerial should alter the milliammeter connected in the plate of the detector to a lower reading when a station is tuned in."

You have hit upon a very interesting effect. By connecting the milliammeter as described, in the detector's plate circuit you are, in effect, using that valve as a valve-voltmeter. (This subject was dealt with recently in the "Eckersley Explains" page.)

In such circumstances the drop in plate current will be a measure of the strength of the station; and so if by getting a new aerial arrangement you find

### "P.W." PANELS. No. 124. KÖNIGS WUSTERHAUSEN.

The famous German long-wave station, now known as "Deutschlandsender," works on a wavelength of 1,635 metres.

Until recently it was a relay of Berlin, but its promotion under the Hitler régime has given it a new national significance, and now its programmes are often specially planned.

Königs Wusterhausen is sometimes called "Zeesen" (from the adjoining village), but its announcements are now given as "Deutschlandsender." The power is 60 kilowatts.

that you secure a greater anode current drop than formerly, you can be sure that your detector is now handling a bigger input.

In other words, you can measure the relative efficiency of different aerials, couplings, S.G. valves, etc., by noting the detector plate current drop, on a given station.

In this case you altered the aerial and got a greatly increased drop in plate current at the detector when tuned accurately, which proves that the efficiency of your present aerial is now greatly in advance of the former arrangement.

### LONG LEADS FROM A VOLUME CONTROL.

R. J. H. W. (Combe Martin, Devonshire).—"In connection with the volume control of a variable-mu S.G., Det. and transformer-coupled low-frequency set, I should appreciate some hints on re-wiring.

"At present the set is working first class, but except on the new Watchet programmes (Oh, what a station!) we seem to get a lot of fading, and this means frequent readjustments of the variable-mu's potentiometer, which is a bit of a bore.

"So I want to arrange the potentiometer on a flex lead of not more than about 12 ft. in length, bringing the leads out through the small hole in the panel where the potentiometer is now fixed. I understand there is no particular objection to this from the electrical point of view because the V.C. potentiometer is decoupled by resistance and fixed condenser in my set.

"But I cannot see how to wire, because in addition to the fixed resistance and condenser for decoupling there is a 3-point switch involved which cuts off the potentiometer from L.T.—when the set is off.

"Please explain what is necessary to carry out the suggested alteration."

We do not quite understand your difficulty, because if the grid-biasing potentiometer is well

decoupled there will be no re-wiring to do, except of course, to lengthen the present connections to the desired degree.

Presumably the present arrangement is that the slider of the potentiometer goes to the decoupling resistance, whilst one end of it is joined to the on-off switch and the other end of it to G.B.—All these connections are correct for the new arrangement, but the difference will lie in the fact that the three actual leads to the potentiometer will be of flex instead of stiff wire.

In other words, what you have to do is merely to remove the potentiometer from the panel and re-wire it exactly as before, but using the long flex leads instead of the old connections.

### THE "P.W." "AIRSPRITE" TWO.

S. C. C. (Henley-on-Thames).—"What number of 'P.W.' was it gave how to make the 'Airsprite' Two, and where do I write, and how much?"

The "Airsprite" Two was described in "P.W." No. 560 (February 25th) issue. Any back number of "P.W." which is still in print can be obtained from The Amalgamated Press Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4. Price 4d. per copy.

### INTER-VALVE COUPLING FOR BETTER SELECTIVITY.

J. J. (Bridgwater).—"Since the new West Regional started up I have had to modify my ideas about the selectivity of my set. It simply is not good enough.

"In looking it over, however, I find that the dual-range coil unit which is placed between the detector and the S.G. is now wired so that the lead from the anode terminal on the S.G. goes to the grid condenser and fixed vanes of tuning condenser ('0005), thus giving 'full' coupling. Why can't I use the separate aerial winding for this? It is at present doing nothing.

"The switching for long waves will throw in the extra aerial coils required for that wave-band, and presumably reaction will be just as effective as under the present arrangement. I am itching to try it if you will give the word 'go.'"

It should be perfectly satisfactory, and will certainly make an enormous difference to the sharpness of tuning available, so we should go ahead and try it.

### GOOD RESULTS ON POOR AERIALS.

L. P. P. (Chislehurst).—"Being compelled by my business to keep moving to different towns in the Midlands and South of England (Continued on next page.)"

### HOW IS YOUR SET GOING NOW?

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

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

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

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

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

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

I do not get as much opportunity for wireless as I should like, but I have been keen on it for four or five years, and have built several sets, including the good old 'Magic.'

"I have been asked to recommend a set for use in a badly screened neighbourhood, where the aerial will have to run just above some galvanised iron roofs of sheds. My own good reception of the 'Magic' makes me inclined to a set like this: Det. and 2 L.F., unless you think S.G., Det. and L.F. would be better.

"It would be worked by a semi-invalid, who, having a lot of time on his hands, would like to get foreigners. If this can be done with a 'three' working under bad aerial conditions, which is the best circuit, one with S.G. valve, or 'Magic' type?"

For poor aerial conditions we prefer the S.G. type, and there should be no difficulty in getting a good selection of alternatives even if the aerial is screened by surrounding buildings.

As an example of the good reception which may be attained in such circumstances, we quote below a letter to the Editor from a Dorsetshire reader of "P.W." who is working an S.G., Det., L.F. set under conditions such as you describe. Writing from Wareham, J. C. says:

The Editor, POPULAR WIRELESS.

Dear Sir,—About four months ago I built the "Apex" S.G. Three. I have nothing but praise for the "Apex," and it must be an exceedingly powerful and selective set that will make me scrap it.

I can get at least twelve long-wave stations: Paris, Daventry, Eiffel Tower, Luxembourg, Warsaw and Huizen, come in without any reaction at all, at a strength to fill a decent-sized room. Altogether I have logged forty-five stations in all that are really worth listening to.

I have a 60-ft. aerial, which is badly screened on all sides by high buildings, and telephone wires, etc., and right underneath, and not more than six feet away, is a long galvanised iron roof. The shortest earth I can possibly get is about 18-ft. long to a water-pipe, so I think you must agree I get wonderful results considering these conditions.

I have tried a few well-known four-valve sets on my same aerial, but they do not bring in the stations as well. There is one thing I should very much like to try with this wonderful set, and that is to give it a good testing out on a really efficient aerial and earth, and I think the results with same would be very much better.

I thank you very much indeed for giving me and other wireless constructors a good set.

Wishing "P.W." every success. J. C.

## MIRROR OF THE B.B.C.

(Continued from page 358.)

and the Guards march off to Buckingham Palace headed by the Massed Bands, Drums and Pipes.

### Items Worth Hearing.

Elizabeth Bergner, the well-known cinema actress, is to play the part of Hedvig in the microphone version of "The Wild Duck," which the B.B.C. will broadcast to National listeners on Wednesday, May 31st, and to Regional listeners on Friday, June 2nd. Leon Quartermaine will be Hjalmar. As befits this great Ibsen play, the rest of the cast has been carefully chosen. Harcourt Williams will be heard as Old Ekdal, J. Hubert Leslie (Pattersen), Arthur Goulet (Jensen), Mary Sheridan (Mrs. Sorky), Felix Aylmer (Old Werle), Guy Pelham Boulton (Gregore Werle), Alexander Sarner (Dr. Rellig), Sybil Arundale (Gina Ekdal), and Frank Denton, Frank Arlton, Edward Craven and Jack Carlton (guests). Val Gielgud will be the producer.

### Organ Broadcasts.

The first broadcast from Leicester Cathedral for six years will be heard by Midland Regional listeners during the

month of June, when the Venerable Archdeacon F. B. Macnutt will conduct a religious service. During this long interval the organ has been removed to the West End of the Cathedral, so that the choir now sings from behind the congregation. Archdeacon Macnutt, who has been at Leicester since 1918, served in France and Flanders for three years as a Chaplain during the War, previous to which he was for ten years Canon Residentiary of Southwark Cathedral. He edited a collection of seventeen essays by Chaplains on active service, under the title of "The Church in the Furnace." While at Cambridge he won his Blue for athletics.

### Whit-Monday Programmes.

"The Society Six and Their Pianist" is the name of a concert party, the members of which are Verne Morgan (producer), Lee Breton (comedienne), Betty Pugh (soprano), Victor Stephenson (baritone), Wallace Newcombe (light comedian), Patricia Perry and Betty Moore (dancers), and Billy Pettengell (pianist), to be heard in an hour's programme, relayed from the Jephson Gardens, Leamington Spa, on Saturday, June 10th. From now until the end of the season the weekly broadcasts from Leamington will alternate between band concerts and concert party entertainers.

Tom Heyes, who is giving his first broadcast as part of the Midland Regional Whit-Monday holiday programmes on June 5th, learned the cornet when nine years of age, which is not so astonishing when one knows that his father, Harry Heyes, is bandmaster of the Metropolitan Works Band at Birmingham. Tom is still only sixteen, but four years ago he played principal solo for the Royal Nantlle Band in the North Wales Championship at Caernarvon. Another cornetist, Charles Baker, will also be heard in the Midland programmes of the same day.

### The Tourist Trophy Race.

Every summer the North Regional microphone makes several trips to the Isle of Man. It will be there on Monday, June 12th, to assist Mr. Graham Walker in the broadcasting of an eye-witness account of the Junior Tourist Trophy Race, and again on Friday, June 16th, when three commentators will describe the race for the Senior Tourist Trophy. Opportunity will be taken to keep the microphone on the island for another day in order to provide a relay of a variety entertainment from the Coliseum at Douglas.

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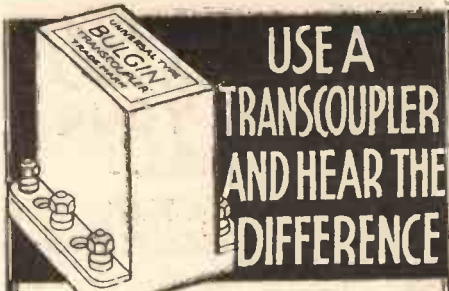


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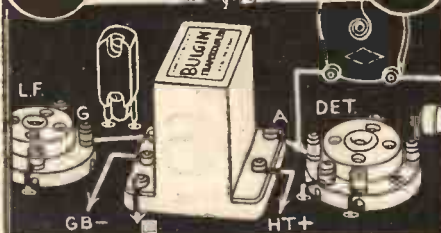
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**CATHODE RAY TELEVISION  
FOR CONSTRUCTORS**

(Continued from page 364.)

Now we have to get back to the beginning and do the traversing again. But we have to return unseen!

**Use of Discharge Tubes.**

The way this is accomplished is one of the prettiest schemes devised. Across the condenser in Fig. 3 we connect a discharge tube, which will suddenly discharge when a certain potential is applied across it. In practice this is arranged by using a discharge tube with a grid control (a thyatron), but the two-electrode tube shown in Fig. 3 illustrates the fundamental idea.

At a certain potential, that is when the beam has reached a certain spot, the discharge tube (filled with mercury vapour) flashes over. The condenser is discharged, and the voltage across the deflector plates is lost. The beam has returned to the start of the line at incredible speed, invisibly.

Immediately the potential begins to rise again due to the condenser commencing to recharge, and we have the same sequence repeated.

**Shown as a Graph.**

The result in graph form is that of Fig. 4 where the slow charging is shown plotted against time and voltage rise, and the instantaneous return due to discharge of

**THE "CATKIN" MAINS UNIT**

Owing to unavoidable pressure on our space it was found impossible to include the description of the "P.W." "Catkin" Mains Unit this week. This will appear in the immediate future.

the mercury vapour lamp is shown as a thin vertical line.

We have achieved a series of uni-directional scanning, the first step towards true television reception.

It now remains to move the beam a definite distance to the left as each line is completed. This is done by a similar time-base operating at a slower frequency across the second pair of deflectors (i.e. at right angles to the first pair), twelve and a half per second being the time for horizontal scanning for this time-base.

As the vertical scanning is carried out at a rate of thirty-times for each one of the horizontal scans, we have a total rate for the vertical scanning of twelve and half times thirty; or 375 times per second.

Thus we have two time-bases in operation simultaneously, one operating with a discharge rate of twelve and a half and the other a rate of 375 times per second. This gives us the correct scanning pattern for the Baird television transmissions.

**More Details Next Week.**

As a guide to the simplicity of the control device we give a complete circuit diagram and photographs on a previous page. The cathode ray tube and the radio receiver are omitted, and are connected where shown on the diagram, about which we shall have more to say next week when we further discuss the practical application of the system, and the question of the modulation of the cathode tube to provide variations of light intensity on the screen.

**THE LINK BETWEEN**

(Continued from page 354.)

**Voltage Regulation and "Class B."**

To obtain completely satisfactory results from "Class B," when using a mains unit, it is essential that the voltage output from the unit should be reasonably constant.

With many ordinary units, the voltage output is not constant, and if they are to be used with ordinary sets imperfect voltage regulation does not matter, because the current is reasonably constant. But with "Class B" it is very different, and the constantly fluctuating current demands are likely seriously to affect the voltage output.

With a view to overcoming the difficulty, Messrs. Heayberd have just produced a special "Class B" mains unit, in which use is made of the Cosors Neon Stabiliser Tube.

This latest development of Cosors has a self-adjusting action, and irrespective of what current is taken from the unit, the voltage remains constant.

Readers who would care to learn more about Messrs. Heayberd's special "Class B" mains unit, which is available for A.C. or D.C. supplies, can do so through the medium of "P.W.'s" postcard literature service. A special leaflet will be sent to all those making application in the (No. 37).

**For Experimenters.**

For those who are of an experimental turn of mind, there is endless scope for originality with a microphone button.

The Scientific Supply Stores (Wireless), Ltd., who are responsible for a very reasonably-priced microphone button, have just published a booklet on the subject, and a most interesting effort it is, too.

It deals very comprehensively with all the ordinary applications of a microphone button (and a few extraordinary ones as well!), and practical diagrams are included on almost every page.

A copy of this interesting booklet, "The Wonders of The Microphone," as it is called, can be obtained free of charge by all those purchasing a microphone button, price 3s. 6d. Others desirous of obtaining a copy can do so by forwarding a postal order or stamps to the value of 6d.

The address to which applications should be sent is The Scientific Supply Stores (Wireless), Ltd., (Dept. "P.W."), 126, Newington Causeway, Elephant and Castle, London.

**The New "272."**

As we go to press we learn with considerable interest that an entirely new receiver has just been released by the Marconiphone Co. Ltd. The new "272" as it is called is a particularly interesting design, and a test report will appear in "P.W." at an early date.

**THE LISTENER'S NOTEBOOK**

(Continued from page 358.)

It is easy to see then what the announcer meant when he said that Mr. Stohart was active at a time "when the character of the B.B.C. was being moulded." He certainly has left an indelible impress on that character.

Did you like "Stardust and Sawdust"? I did, because it had what it claimed to have, viz. the stamp of reality.

The idea of a sentimental boy and sentimental girl who loved one another wasn't original enough to merit any praise, but the way the story was told, yes, every time. The play was rather ambitious. I thought, with its six different scenes, all requiring their own special atmosphere.

It was a triumph for the Effects Department, for they succeeded in giving us a real circus, a real fair, and a perfectly tip-top circus band. The crowds were especially realistic and they were well-controlled. The authors obviously knew their subject.

There are definite indications of the policy to keep Saturday evening programmes light. A programme of musical comedy numbers seems to me to be as near the ideal as we could wish, especially if Olive Groves and George Baker are commissioned to do the singing.

I am reluctant to talk so soon again of Mr. St. John Ervine and his Theatre Talk; but once more he has disappointed me. Despite a number of good plays on in London at the present time, we had to hear him (instead of reading him) wax furious over the cherrilite-eating section of a theatre audience. His history of the frozen face and the stiff upper-lip in respect to the theatre audience is certainly very amusing and entertaining, but what about the theatre, i.e. the play and the players?

To give only two minutes of his allotted time to the consideration of a few plays is in itself a cause of annoyance to theatre-loving listeners, but to be able to say about Mr. Owen Nares nothing more than that "he is a good actor" is just ludicrous. Listeners know this already.

**Beautiful  
Summer  
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# TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

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

## Automatic Bias.

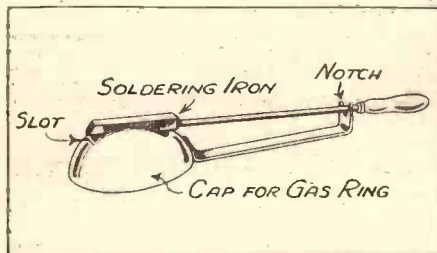
A POINT about which I am often asked is so-called automatic grid bias. Many readers have asked me whether this is really automatic and whether there is anything gained by its use, with a mains set or a battery set.

The grid bias obtained in the way in question is automatic all right, but it cannot really be said that anything is gained very much in any other way, because it depends upon the tapping-off of a portion of the high-tension voltage and to that extent the voltage available for high-tension purposes is reduced. When the method is applied to battery sets, as it has been by many manufacturers, it makes for much neater wiring.

## That Soldering Gadget.

A number of readers have asked me about the soldering iron heater which I referred to in these Notes. This is shown roughly in the sketch herewith. The cap or cowl will be seen at the left, and this rests over the gas-ring on the stove. There is a metal extension about 5½ ins. long riveted on to it, and having a turned-up end with a notch in which the handle of

## A USEFUL HEATER



The ingenious gadget to which Dr. Roberts makes reference on this page.

the soldering iron rests whilst the "bit" of the iron lies in the slot in the top of the cap.

In this way the hot gas from the entire ring passes up through the slot and plays upon the soldering iron.

## New B.B.C. Station.

Experiments have now started from the new dual-programme high-power station at Washford Cross, Watchet, in Somerset, to be known as the West Regional Transmitter.

The service area of the station may be taken as the region within a radius of approximately 70 miles of Watchet (which, incidentally, is about mid-way between Minehead and Weston-super-Mare). The range is necessarily an average distance, as it depends on the nature of the country over which the wireless waves have to travel.

The range of seventy miles is about the maximum to which a consistently reliable service can be given from any high-power transmitter working on an ordinary broadcast wavelength such as 309.9 metres, the wave used by the West Regional transmitter. At the same time it should be

remembered that reception will be possible after dark over a much larger area, but some unavoidable fading will be experienced outside the service area defined above.

## Two Low-Powered Transmitters.

The service to this region has in the past been provided by two lower-power transmitters situated in the main centres of population. These transmitters, although providing a satisfactory service within a few miles of each, could not provide a service free from interference over the whole region.

Furthermore, only one programme could normally be provided for those listeners whose apparatus was not sensitive enough to receive the long-wave National programme transmitter Daventry 5 X X.

## Rationing Wavelengths.

Since the old system of distribution was originally put into operation there has been a rapid increase in the number of transmitters on the Continent, and interference between transmitters in England and those abroad became serious.

Some international agreement had obviously to be reached or chaos would have resulted, and the B.B.C. obtained for its own exclusive use nine different wavelengths between 200 and 500 metres and one wavelength of 1,554 metres.

In view of this "rationing" of wavelengths it is necessary to economise in their use, and one of the best ways of economy has been found to be the use of high power, notwithstanding the extra capital outlay by the B.B.C. which it entails.

The new system of distribution was known as the Regional Scheme, principally because it consists of high-power stations which are capable of serving large regions rather than particular towns.

## Two High-Power Transmitters.

The new station consists of two entirely separate high-power medium-wave transmitters designed to work on separate wavelengths of 309.9 metres and 261.6 metres, so that two programmes can be radiated simultaneously.

The programme radiated on the 309.9 wavelength will be known as the West Regional programme, and will contain material which is of particular interest to the Welsh and West Country people; there will be a proportion of programmes in the Welsh language.

This programme will be contrasted with the National programme, which will be radiated by the second transmitter on a wavelength of 261.6 metres and by Daventry 5 X X on 1,554 metres.

## Receiving the Regionals.

To obtain the full service from the new station it will be necessary for listeners' apparatus to be capable of covering the two medium wavelengths already mentioned; but as one of these wavelengths

(Continued on next page.)

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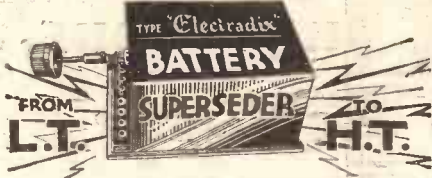
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## TECHNICAL NOTES

(Continued from previous page.)

is already in use by Cardiff and the other is near to that of Swansea, very little difficulty is likely to be experienced in this direction.

Listeners who have been taking their service from the Cardiff transmitter will not need to make any alteration to the tuning range of their receivers in order to receive the West Regional transmitter, but it will be necessary for them later on to make sure that their receivers will tune down to 261.6 metres in order to receive the National programme transmission from the West Regional station.

On the other hand, listeners to Swansea will probably find that their receivers will tune to 309.9 metres without alteration.

### Preliminary Transmissions.

The National transmitter will not be introduced until listeners have had an opportunity to receive the Regional transmitter satisfactorily. The preliminary transmissions, which will be announced beforehand and carried out in accordance with a schedule, are intended solely to help any listeners who may be in difficulty in receiving the new station.

They are not intended to test the new transmitters, as all the transmitter testing

\*-----\*

**NEXT WEEK**

**"P.W's." SPECIAL BIRTHDAY NUMBER**

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**Wednesday. Threepence.**

\*-----\*

will have been already done before the publicly announced preliminary transmissions commence.

### A Useful B.B.C. Booklet.

I have not the space to deal with this matter any further at the moment, but the B.B.C. have prepared a little booklet of some 32 pages entitled "Receiving The West Regional Transmitter," which is specially for the purpose of assisting any listeners within range of the new station who may find themselves in any temporary difficulty. This little booklet is very well worth having, quite apart from its application to this particular new station.

It gives all manner of very useful technical and general hints on tuning range; reception outside regional areas; tuning down to 310 metres; what to do if you cannot erect an outdoor aerial; constructional details of a one-valve set; and so on.

In addition, there are full instructions for the building of a single-circuit crystal receiver, a coupled-circuit receiver of the same type and other receivers, and also instructions for adding a stage of low-frequency amplification to a valve set which receives the West Regional transmission but does not give sufficient volume.

### Where To Get It.

This booklet is well illustrated and should prove very useful indeed to all listeners, particularly, of course, those within the

region of the new transmitter. The booklet can be obtained from the British Broadcasting Corporation, Broadcasting House, Portland Place, London, and is free and post free. I advise all my readers to get a copy.

### Gramophone Stops.

I have a letter from a London reader, who is in the gramophone and radio business, with reference to my remarks a week or two back on automatic stops for gramophones.

He gives one or two hints which I think may be useful to readers in case the automatic brake does not function properly. In many types of brake you will find under the turntable a small bent-up arm fixed to the main spindle of the motor and generally carrying a rubber buffer at the end. My correspondent says he is often asked what purpose this serves as it appears on a casual inspection to be useless.

The action of the automatic stop may be clearly seen by removing the turntable and then running the motor. If you push the trip lever very lightly towards the centre of the record, as though this were being done by the tone-arm, you will notice that the trip lever is "trying" to operate but is prevented from doing so by the little arm on the spindle, referred to above, which kicks it back at each revolution.

It is only when the trip lever is allowed to come back a little (as it does when swung back by the eccentric groove) that the arm on the spindle misses the trip lever for one revolution and so permits it to trip.

### Hints on Adjusting.

If it happens that this type of automatic stop does not function properly, the stop may be adjusted by carrying out the above-mentioned test and noticing whether the little arm does, in fact, knock back the trip lever each time it comes round. If it does not, then the screw at the end of the trip lever may be brought forward a little, thus causing it to strike.

### Colour Radio.

A new "colour" radio has been introduced by the General Electric Company in America which embodies what is described as a combination of colour and musical tone. This colour radio uses a double-action tone control so that the high and low notes are controlled independently of each other.

There are two knobs, with a rainbow-coloured path of light between them. This rainbow arch on the left, representing the bass register, with a dark blue colour, merges gradually through red to a golden yellow colour on the right, indicating the treble.

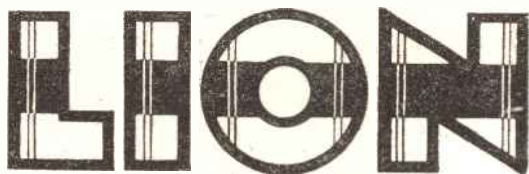
As the left knob is turned and the bass notes diminish, the amount of blue light visible in the colour strip is correspondingly reduced. In the same way if the right knob is turned and the treble notes are reduced, the amount of yellow light is reduced.

In addition to the illuminated dial, calibrated in kilocycles, there is another graduated dial against which the shadow of a meter-needle is thrown. To tune a station into perfect resonance the tuning is adjusted until the needle moves the maximum distance to the right.

The volume control is also in the form of a visual indicator, a point of light moving across a colour path.

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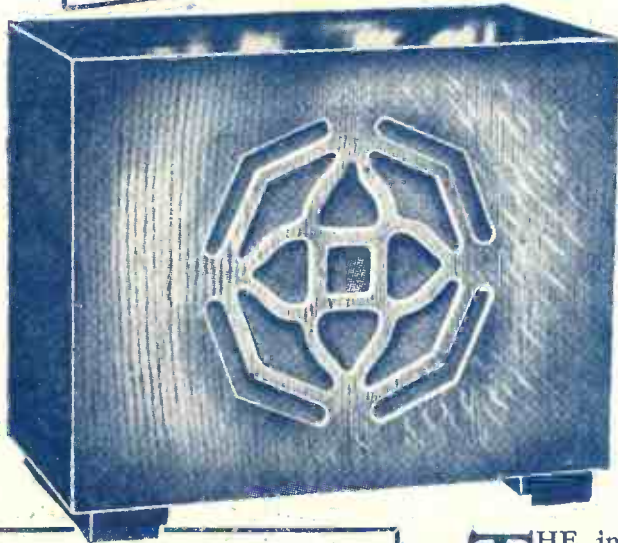
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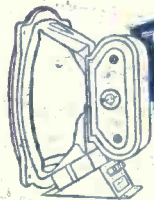
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