

# 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*

**ON 5 METRES  
 RUSSIA'S RADIO  
 THE "PROMS."  
 CAUGHT OUT**

## RADIO NOTES & NEWS

**WAVES AND WITS  
 OUR EXPORTS  
 A UNIQUE RECITAL  
 FAMOUS FANS**

**Radio not Depressed.**

**COPPER** may "sag," oil may be inclined to "ease off," and railways may be irregular—as the financial jargon has it. But Radio is a miracle of steadiness, thanks to the public's insistence on getting £50 worth of ear joy per annum for ten shillings.

Recently the "trade" balloted for space and position in the R.M.A. Exhibitions in London, Manchester and Glasgow, and about £30,000 worth of space was booked. Not much "depression" there!

**A Five-Metre Puzzle.**

**D. R. C.** (Eastleigh, Hants), exploring the five-metre band, heard some Italian. Prolonged investigation showed that the stuff was the same as the Rome station was broadcasting. Was it a harmonic of Rome?

The good D. R. C. cannot believe that he heard a harmonic "when an actual broadcasting station cannot be heard over such a distance." But Rome is easy to pick up, my dear fellow. So why not one of its harmonics?

**Pot-pourri.**

**MR. LESLIE McMICHAEL**, of the famous radio firm, and stalwart of the old Wireless Society of London, who had a transmitting licence in 1911, has been made a full member of the Institution of Electrical Engineers.

Mullard valves are to accompany this year's Oxford University Arctic Expedition.

The Master House Builders' Association declares that radio has produced a demand for sound-proof semi-detached or small detached houses.

**Russia Plans Big Radio.**

**RUSSIA** is creditably reported to have planned a second "five years' plan" in which radio bulks large. Much too large.

Twenty-four million roubles have been earmarked for radio, and according to the "Journal Télégraphique" of Berne, the Caucasus alone is to be provided with nine new transmitters of 100 kw. each. So long as they do not "jam" Elsie and Doris Waters, and the Queen's Hall, I don't care half a rouble—or even half a vodka.

**He Might Have Discovered Radio.**

**W. E. IRISH**, born in England in 1843, died at Cleveland, Ohio, last April. Mr. Irish began to invent things at the age of six. He is credited with having found out how to telephone, over two years before Bell invented

### This Journal places the widest possible interpretation on the word **SERVICE**

- ❏ Not content with the collection and first publication of all the vital radio news, "Popular Wireless" is itself in the forefront of radio research and development.
- ❏ Only last month this journal organised tests from the Crystal Palace, London, which

### CREATED A

### WORLD'S RECORD

- ❏ Contrary to all accepted theory, the "P.W." 5-metre transmissions were picked up in Yorkshire, 200 miles away.
- ❏ And in this issue we tell of our further striking success in the first duplex working on ultra-short waves, between aeroplanes and amateur stations.
- ❏ In conjunction with one of the most important Corporations in the industry, "P.W." recently instigated

### THE FIRST CATHODE RAY TELEVISION FOR CONSTRUCTORS.

- ❏ This week we present yet a further striking development—No-Gap Tuning—and this, too, owes its origin to pioneer research work conducted by "Popular Wireless." (See page 493.)

his system, but failed to secure a patent before Bell.

His obituary notice in America states that at an early date he believed in the possibility of radio transmission of messages. History shows that quite a number of people were almost on the point of discovering a wireless system about the early-Marconi period.

**Next Queen's Hall "Prom." Session.**

**THE** next session of Promenade Concerts at the Queen's Hall will begin on August 12th and continue until October 7th, eight weeks of glorious music for every altitude of brow except the "low" or the "submerged."

This will be the thirty-ninth summer season under the baton of Sir Henry Wood, and the seventh under the auspices of the B.B.C. I am no musical highbrow. Written music to me is just so much *adagio*, etc, plus so many crows sitting on a five-barred gate. Nevertheless I earnestly conjure you to give Queen's Hall a trial; it's a fine experience.

No man has really lived in London unless he has been to a "Prom."!

**A Pioneer Returns.**

**LOVERS** of the drah-mah (or drawmah) ought to rejoice at the announcement that Mr. Archibald Haddon, the well-known theatrical journalist, is to return to the B.B.C. in September, as dramatic critic.

Mr. Haddon, in addition to his distinction as a critic, has the honour of being the world's first radio critic of the drama, having held that position in the dear, dead days at Savoy Hill, 1923-24.

**B.B.C. "Caught Out."**

**I** CANNOT resist this, though I do it in pure jocularity. The B.B.C. is always so correct, so omniscient, so right! Yet in one of its announcements to the Press about the June 28th item, "A Voyage to Lilliput," it says, "Mr. Sieveking has ample material for the making of his dramatisation of Gulliver's vicissitudes in Lilliput; for the author of the travels was one of the most fantastic characters of his age."

Shocking reasoning! Because Swift was very fantastic, Mr. Sieveking has ample material, etc. On these lines, because a rat-catcher has a cold in the nose, he is bound to be married to a sister of a beer-taster's labourer!

**"Controller, Output Division."**

**HERE** is a concentrated career of Colonel Alan G. C. Dawnay, C.B.E., D.S.O., M.A., the C.O.D. of the B.B.C. Age 44. Eton and Magdalen College, Oxford. Coldstream Guards, 1909.

France, Egypt, Palestine in Great War. After war, Deputy Chief Political Officer

(Continued on next page.)



# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

under Allenby in administration of Palestine and Syria. Passed Staff College (1919) and Imperial Defence College (1927); has commanded Oxford University O.T.C. and 1st Battalion Coldstream Guards. War Office as General Staff Officer.

After Colonel Dawnay has got into his stride we shall watch "the output" with keen interest.

## Radio versus Reading.

A WELL-KNOWN bookseller was telling me how bad his trade is and when I said that I thought that broadcasting would have stimulated his sales he jumped six inches into the air and bit "Lorna Doone" (in half calf).

He explained that radio had stimulated borrowing, but not buying, and that the municipal "penny libraries" are probably having a boom. He said, moreover, that "listening" is a counter-attraction to reading—and in this I agree with him, for I have not had a good, solid, session of reading since I was on holiday last year.



## "Kindness of a Power Company."

MY Note under this heading (June 10th) was misleading, owing to the fact that the source of my information did not state that before the Tottenham folk were charged a penny a week for the use of the electric mains for radio sets they were being supplied with power "for lighting purposes only."

The chief engineer of the North Metropolitan Electric Power Supply Company points out that the addition of a penny a week for the extra power taken by the radio set means that the consumer is being charged less than a penny a unit for it—which is pretty generous treatment, after all.

## Wireless Waves Weaken Wits?

WE can always rely on American professors for startling pronouncements.

According to a report from New York, a group of scientists have prophesied that if broadcasting stations go on increasing in power the effect of wireless waves will be the production of a world full of half-wits. All this, mark you, on the strength of experiments upon chickens, which are said to have proved that wireless waves injure living tissue. Why stop at "half-wits"? Why not say witless?

Sorry to set myself up against such august personages—but I could put up a case against their theory, on mathematical, electromagnetic, physiological and practical grounds.



## Our Radio Export Trade.

A GOOD-HUMOURED, but hard-hitting letter from W. A. A. (Toro, Uganda), deals with his unhappy experiences whilst trying to buy radio goods from a British firm.

This is not the only instance of the kind which Africa has brought to our notice, and I am afraid that either some firms do not like the trouble of sending goods abroad in return for advance cash or they are badly served by their employees. Only the sturdiest patriotism could suffer as W. A. A. has and not turn to American or Dutch radio firms.

## Why Its Small and Select.

NOW, is this "business"? Cash with order was sixpence short, so a fuse holder was sent minus a sixpenny lamp. To Uganda, mark you, where fuse lamps can be got around the corner at the chemist's or picked off bushes!

The sixpence was duly forwarded, but ten weeks later the bulb had not arrived. Testing the sixpence, perhaps!

Again, on another occasion four weeks elapsed between the receipt of a cheque and the despatch of the goods; one item supplied was an old model, and it was overcharged for! If this tale of horror

inches broad, and four and a half inches deep.

It belongs to Titania's Palace, that wonderful miniature filled with tiny works of art of almost every kind. Before the recital Sir N. R. Wilkinson, K.C.V.O., F.S.A., will speak.

## "Sweet Philomel."

ALIAS the common (or garden) nightingale. Well, the B.B.C. succeeded, at considerable expense, in broadcasting the over-rated piping of that bird, and now,

I hope, the Keats and Shelley brigade of cranks have done their worst.

Sceptical were the public that they were not being served with Blattner's Tinned Nightingale, that



the B.B.C. actually went to the trouble of certifying that the hallabaloos was "straight from the thicket."

The whole business is, to my mind, fooling. The sentiment about sweet Philomel exists only in the minds of the B.B.C.'s young men. The average man would be just as much charmed by the voice of a cow or a lamb.

## SHORT WAVES.

At Cheam a nightingale has been seen singing on the top of a wireless pole. The bird evidently has not yet quite grasped the principles of broadcasting.—"Punch."

"What is more pleasant than a Symphony Concert on the wireless during dinner?" asks a contemporary. The answer is: No Symphony Concert during dinner.

Wireless sets, it is stated, are often bought as furniture just to help fill a room. On the other hand, of course, they often help to empty one.

Lighthouse Keeper (referring to wireless): "Switch it off, Fred. I'd like to know what good they think we gets out of 'Ints on Gardening.'"—"Punch."

There is a broadcasting station in Canada operated entirely by one man. There is said to be real enthusiasm in the tones of the announcer as he introduces the comedian, the eloquentist, the singer, and the performer who plays the piano.

inspires the "trade" to investigate the methods of its export branches, W. A. A. will not have suffered in vain.

## Hollywood Looks Well Ahead.

I LEARN that in anticipation of the day when television becomes a household entertainment the Radio-Keith-Orpheum interests have planned the largest broadcasting studio in the world at Hollywood.

The theory underlying this venture is that when the home televisior is as common as the—er—Victrola, I believe they call gramophones over there—and the "frigi-daire," the demand for film "stars" will exceed that for the usual radio broadcast artistes.

## Unique Organ Recital.

DURING the Scottish Regional Children's Hour on July 3rd there will be a recital on what one would think is the smallest pipe organ in the world. This instrument is a reproduction of a modern organ and is complete in every detail, although it is only twelve inches high, nine

## Broadcasting in Norway.

THE Norwegian broadcasting system is to be reorganised and placed under the control of the Government this summer. One of the first steps to be taken is the erection of a modern station at Trondjhem, and I am glad to learn that a British firm has secured the order.

The new station will incorporate all the latest developments in broadcasting technique, and will be of 20 kw. power.

## Famous Fans.

MY request for further examples of famous radio "fans" has brought some excellent bits of fooling to light, for which I thank all those who contributed.

Here are a few of the best.

The man who was so domineering that he would stand no "resistance."

The professional strong man who could not make the "anode bend."

The high-brow who will not use "low tension."

The pacifist who will not use a "power valve."

The monarch who lost his "Joules" in the Wash.

The plumber who failed to stop a "grid leak."

And another of my own—the librarian who will not use "volume control" because it's "shop."





# Abolishing the Variable Condenser

**U**NIFORM selectivity and amplification; easier matching; more stability; simpler tuning circuits; greater compactness; and *no variable condensers* even for the most multi of multi-valve receivers—all are accomplished facts, according to the latest information.

### All Difficulties Overcome.

The road to these improvements was pointed out some months ago under the name of "permeability tuning," but there is a long journey between a clever idea and a commercial success. Now, however, we are assured that there are no practical difficulties that cannot be economically handled, and the variable condenser seems likely at last to be seriously challenged.

What is it all about? We have recently become used to iron cores in high-frequency tuning coils, made of "Ferrocort" and other similar preparations. We have understood that the core is used to increase the inductance without a corresponding increase in resistance (such as would happen if an air-core coil having more turns were used).

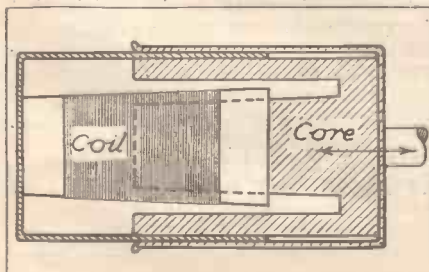
Therefore, if the inductance is large with the core in position, and small with it removed, any intermediate amount of inductance can be obtained by an intermediate position of the core. And as theoretically it does not matter whether the capacity or the inductance of the tuning circuit is varied, here is the basis of an alternative method. Practically, the capacity variation method is not by any means ideal, and the only reason why it has been universal for so long is that until now nobody has produced a really workable method of inductance variation.

### Condenser's Disadvantages.

Assuming for the moment that the practical difficulties of inductance tuning can be overcome, what are the advantages over condenser tuning?

The owner of even a single-circuit tuner—as in the once-popular "det. and 2 L.F."—knows from experience that at the lower

### THE PLUG AND SHELL

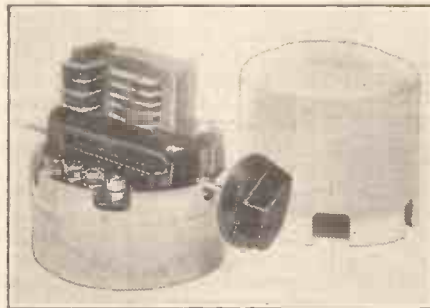


The coil is slightly tapered, and fits over a central plug of corresponding shape.

★.....★  
 Ever since broadcasting began, condenser-tuning has held the field, but at last this monopoly is challenged and a really workable method of inductance-variation has arrived.  
 In this absorbing and informative article the main advantages of the new method are clearly and convincingly described.  
 By **MARCUS G. SCROGGIE, B.Sc., A.M.I.E.E.**  
 ★.....★

end of the condenser scale the receiver is "lively" enough, but selectivity is poor; whereas at the top end, with the condenser all in, it is much easier to separate stations, but more difficult to get them strongly. In a set with several H.F. stages this inconsistency is even more noticeable; so much so that a number of devices have been used to combat it.

### IRON CORES FOR H.F.



One of the new Ferrocort coil units in which an "iron core" is used to increase inductance.

If we don't mind doing a little theory for a moment or two, we can take a look at the expression  $\frac{L}{rC}$ .  $L$  is the inductance of the tuning coil,  $r$  its high-frequency resistance, and  $C$  the capacity used to tune it.  $\frac{L}{rC}$  is often called the dynamic resistance (let us use  $R$  as an abbreviation) because a tuned circuit behaves just like a high-resistance  $R$  so far as tuned-in "signals" are concerned, although slow moving or steady currents, such as the valve feed current, see nothing more in it than quite a low resistance coil of wire.

### Uniform Selectivity.

If you get hold of a heavy car and try to wheel it backwards and forwards a foot or two, ten times a second, you will find it resists your attempt very successfully. But if somebody moves it slowly and steadily in one direction, he finds his task quite easy (provided the road is not uphill).

The curious thing is that the lower the resistance ( $r$ ) of the coil, the higher is  $R$ . Actually, we want a very high  $R$  in order to make the signals to which we have tuned set up as large a voltage as possible to be passed on to the next valve, and to let all others slip harmlessly through the coil.

The dynamic resistance thus affects both the sensitivity (extent to which the amplification of the valve is utilised) and the selectivity (power of discriminating against interference). So, to keep the sensitivity and selectivity uniform all over the scale it is necessary to keep  $R$  the same all the time.

### Varying Inductance.

Now suppose we use a variable condenser for tuning. As the condenser is moved to the high-wave end of the scale,  $C$  increases.  $L$  is, of course, the same all the time, but owing to various effects that depend on wavelength  $r$  decreases somewhat. But with ordinary air-core coils it doesn't decrease enough to compensate for the increased  $C$ , and so the dynamic resistance drops.

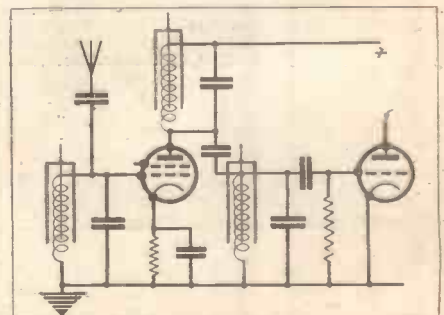
Now consider what happens if  $C$  is fixed, and tuning is worked by varying  $L$ . If  $R$  is to be kept constant all the time it is necessary for  $r$  to increase just as fast as  $L$ . If it does, then there will be uniformity of response all over the tuning scale. *Quod erat faciendum*, as they used to say thousands of years ago.

### Avoiding Losses.

If a solid lump of iron were used as a core to vary the inductance, it would behave as a short-circuited secondary winding, and so far from increasing the inductance would substantially reduce it, as well as increasing the resistance and so causing flat tuning. Even at very low frequencies it is necessary to prevent the short-circuiting effect by breaking up the iron into thin sheets with insulation between them to stop the circulating currents.

(Continued on next page.)

### VARIABLE COIL TUNING



Instead of using variable condensers, wavelength is adjusted by movements of the coils' cores.



## ABOLISHING THE VARIABLE CONDENSER

(Continued from previous page.)

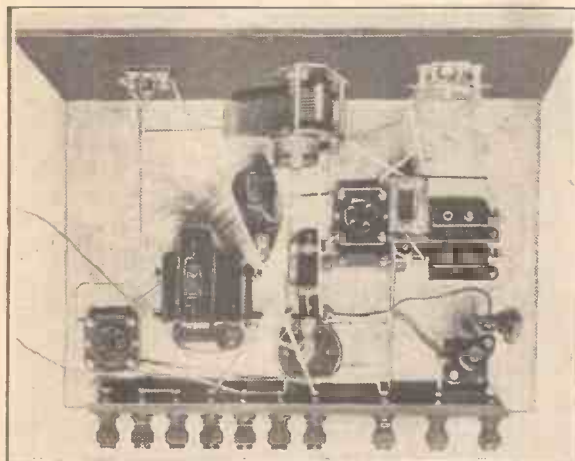
The higher the frequency the more the core must be sub-divided, so that at the very high radio frequencies it has been found necessary to use iron in the form of fine dust, each particle being insulated. By choosing the size of particle that is correct for the band of frequencies (or wavelengths), it is possible to keep  $\frac{L}{r}$  practically constant. For the medium waveband the right size of particle is one five-thousandth of an inch in diameter. It is possible to produce iron with a diameter of one twenty-five-thousandth of an inch, which is suitable for short-wave work. But the advantages of iron cores are perhaps not worth while much below 200 metres.

### Insulated Particles.

Unless the iron dust is tightly packed the permeability, or multiplying power of the core, is not enough to tune over the whole waveband. On the other hand, if it is compressed it tends to form the equivalent of a solid lump and so to defeat the object of powdering. So it has been necessary to find a special varnish capable of forming a thin film of insulation over each particle, without breaking down under the compression.

The result is a solid material that can be moulded into cores of any desired shape. The shape actually adopted is indicated in a diagram. The coil itself is about  $\frac{3}{4}$  in. in diameter, and slightly tapered; the core includes a central plug, also tapered to fit,

## INTERCHANGEABLE INDUCTANCES



In sets like this one—the famous “Magic” Three—the variable condenser altered the tuning, but different wavebands were available by interchangeable inductance coils.

and a cylindrical shell, so that when fully home it surrounds the coil.

The process of tuning consists, of course, in moving the core in or out along the axis of the coil (or vice versa). This is where difficulties suggest themselves. As the whole band of 200 to nearly 600 metres is covered by a movement of not very much more than an inch, a station goes completely in and out again in a movement of a hundredth of an inch.

So it is obvious that some ingenuity is required in the design of the tuning control to prevent backlash and jerkiness. Moreover, when one comes to gang a number of tuned circuits together, they must all be kept in step within at least a tenth of the tuning movement occupied by a station. That means keeping all the cores in place within a thousandth of an inch. It is claimed that this can easily be accomplished, and in designs that have been adopted in practice all the cores are mounted close together on a rigid plate.

Another possible difficulty in ganging is the extreme uniformity demanded of the core material. Here, again, it has been found possible to meet the requirements under actual manufacturing conditions, for the individuals in a batch of cores are consistent within half of one per cent; and as that, in itself, is not quite good enough for modern highly selective circuits, arrangements are made for grading the cores.

In other respects, the matching problem is simpler than it is in condenser tuning, where no fewer than three requirements have independently to be complied with—each coil must have exactly the same inductance, each bank of gang condenser must be matched everywhere over the scale, and the initial capacities (due to wiring, etc.) must be equalised by means of trimmers. If the inductances are not perfectly equal, it is of very little use trying to line them up by adjusting the trimmers, for the adjustment is different at different parts of the scale.

### Moderate Screening Required.

In the permeability system, to ensure perfect ganging it is not at all necessary for the inductances to be equal, or anything like it! That may sound rather startling, but it must be realised that the effect of moving the core is to change the inductance (whatever it may be) in a certain proportion, which has the effect of shifting the wavelength in a definite proportion. So that if the wavelength is corrected at any one point on the scale, by adjusting the capacity trimmer it is correct everywhere.

The capacity, therefore, takes the form of the usual single plate with screw-driver adjustment, but is rather larger than usual—about .00016 mfd.

This can be mounted inside the “pot” that screens the coil, so the whole tuned circuit is there and only two leads come out from it. In fact, only one lead is strictly necessary, the other being “earthed” to the cover.

Talking about the cover, as the coil within is exceptionally small and has few turns, and, moreover, spends most of its time more or less embraced by the core, the external field is much less than usual, which means that very moderate screening is enough to prevent undesirable coupling and instability. Another rather interesting point about the screen is that, contrary to usual practice, it actually extends the tuning range,

It is well known that, unless the screen is ridiculously large, the customary air-core coil is in every way made worse by its presence; the inductance is reduced, the self-capacity is increased and the resistance is increased. The self-capacity tends to reduce the tuning ratio, with a given variable condenser.

### Employing Correct Values.

But the outer part of the core of a permeability tuner screens the coil from the screen, by preventing the magnetic field from extending so far, and thereby removes the slight loss of inductance which the screen causes at the low-wave end. In this way the core has a subsidiary increasing

## USING IRON CORES



Nearly all receiving sets employ tuning condensers in conjunction with compact iron-cored coil units, in which provision is made for switching sections of the inductance to provide different wavebands.

effect on the inductance, besides the main effect of permeability.

It has been explained how it is possible for coils of differing inductance to be used in a ganged system without upsetting the matching. This peculiarity can be made useful, since the best inductance to use for tuning anode circuits is usually different from that which one would choose for the aerial circuit. One is, therefore, free to use the correct value for each stage in a permeability tuner. It is obvious, too, that band-pass filters are quite in order, and even oscillator circuits for superhets can be matched up with the others by exercising a little ingenuity.

### Fixed Reaction Possibilities.

It is hardly necessary to explain that the system effects a saving of space, for not only are the coils themselves very small and capable of being bunched closely together without coupling, but the variable condenser—usually the largest component in the set—is absent.

The coils themselves, made as described, are not startlingly more “low loss” than good air-core coils. But where it is desired to make do so, it is possible to use quite a large amount of fixed reaction without fear of oscillating at one end or going “dead” at the other, or both.





# The "NO-GAP" 3

By  
**G. V. DOWDING**  
Associate I.E.E.

**Y**EARs ago, in the very young days of radio we used to have great clumsy tapped inductances to cover the wavelengths we required—usually from some 400 to 4,000 metres, for there was no broadcasting then.

Later, after broadcasting began we used plug-in coils, changing the coils according to the wavelength of the station we required. Not a convenient method as viewed in the light of present-day practice, but quite efficacious, for we did not miss any station

## THE FIRST SET TO COVER ALL WAVELENGTHS FROM 160—2,000 METRES WITHOUT COIL CHANGING

many of these can you possibly hope to get on your two-band set? No matter what the set is, whether it has two or five valves; whether it is a "straight" or superhet design, you are missing a great deal of broadcast reception, *simply because you cannot cover the wavelengths of a large number of the stations that are there for the asking.*

The whole object of having a radio

the operation of the set that nothing was receivable below 220 metres, and nothing above

510. And it was by no means an old model!

Just look at a full list of European broadcasting stations and see how many you can never hope to receive on your present set, either because the receiver will not tune up to them, or because it will not allow you to go down far enough.

As was pointed out in POPULAR WIRELESS some time ago, the average range of wavelength control on the normal home-constructor set is most inadequate. Here are a few tested instances of wavelength coverage in sets which are typical of the whole state of affairs: 240 to 526, and 850 to 1,850; 225 to 509, and 900 to 1,800; and 175 to 486, and 950 to 2,000 metres.

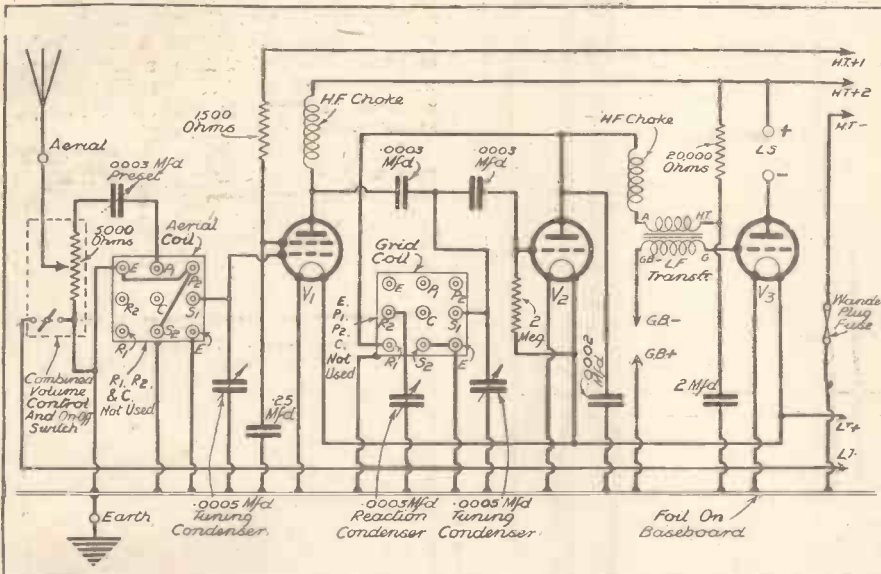
Not a particularly brilliant collection, are they? And the shortcoming is not all due to the specified range of the coils used. Much of the not-going-down-enough is due to added capacity in the circuit, and to high minimum capacity of condensers, while the lack of full high-wave range is often partly due to variable condensers that are not fully .0005-mfd., but fall a little short of that figure.

### Accepting a Challenge.

That there is no need for this state of affairs has been proved by the reply to POPULAR WIRELESS' criticism by Lewcos, long famous as coil manufacturers. This noted firm has wisely decided to take up our challenge, and to market this season

(Continued on next page.)

## ALL BROADCAST WAVES AT YOUR DISPOSAL



Although the receiver provides an unbroken sequence of wavelengths with a complete absence of the restrictions which have hitherto characterised dual-range designs, the circuit follows accepted and well-tried principles. A noteworthy refinement is the combined "on-off" switch and volume control, the latter being joined across the aerial input in accordance with the most modern practice. The constructional simplicity of the set can be seen from the photograph on the right.

merely because we could not "get his wavelength."

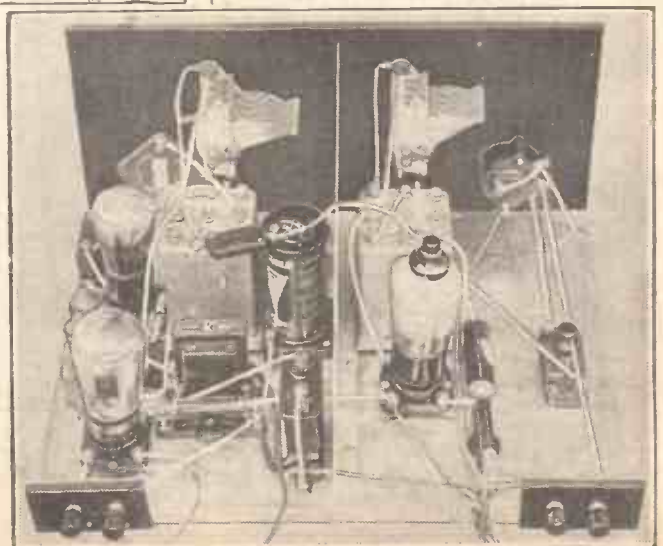
Time passed and the dual-range coil arrived, followed by several versions of it, with incorporated switching, and we were firmly bound down to two-band tuning with great gaps left on the European wavelength chart which we could not hope to cover.

The individual makes of the dual-range coils varied in their characteristics of course, some covering more wavelengths than others, but no matter what the coil, it inevitably missed quite a number of interesting stations.

There are roughly 220 broadcasters busily at work in Europe (excluding short-wave transmitters, of course), but how

receiver is to receive radio. And yet we are forcibly limited in the number of programmes we can pick up, not only by the sensitivity of our sets, which is to a great extent under our control after all, but by the inherent incapability of the average coil to cover the waveband properly.

We had a coil under test the other day that so restricted



## NO STATIONS LEFT OUT



# THE "NO-GAP" 3

(Continued from previous page.)

"no-gap" coils that will allow any home-made set to cover the whole gamut of wavelengths between 160 and 2,000 metres, thereby including every station in the European broadcasting list.

## THE VALVES WE RECOMMEND

Make	S.G.	Det.	Output
Cossor ..	220 S.G.	210 H.F.	P.M.202
Mullard ..	P.M.12	P.M.1 H.L.	P.M.202
Mazda ..	S.G.215	H.L.2	P.220
Marconi ..	S.22	H.L.2	L.P.2
Osram ..	S.22	H.L.2	L.P.2
Hivac ..	S.210	H.210	P.220
Eta ..	B.Y.6	B.Y.1815	B.W.604

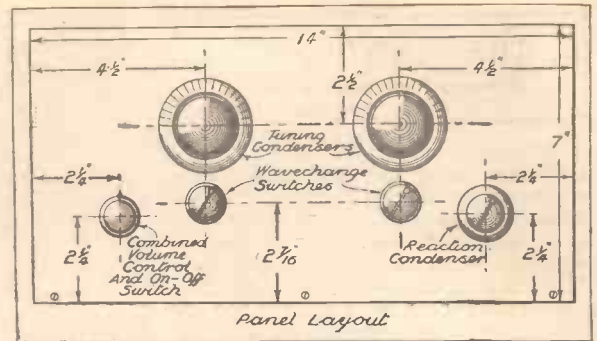
And naturally, as first advocates for the new tuning system POPULAR WIRELESS are the first to introduce the new coils to the public in the "No-gap" Three, a

simple set that will be the forerunner of a new era in receiver design.

We stress the word simple, because the new "no-gap" coils are in no wise "stunt" coils, they are as simple to use as the ordinary restricted two-range inductances, and, of course, they are examples of the latest iron-core method of construction.

So keen, in fact, are Lewcos on the "no-gap" system that they are making all their 1933-34 coils on the principle, including superhet oscillator units, incorporating iron cores throughout. A very great advance in coil design.

The new coils are wound in three sections, and are of triple-range type, covering with three wave-change switch positions the following wavebands, using a .0005-mfd. tuning condenser: 160-450, 350-800, and 750-2,000 metres.



The three-range coils do not add a single extra knob to the panel, nor do they complicate the operation of the receiver in any way.

Thus there is not only a fully adequate tuning-range, but valuable overlap between the sections.

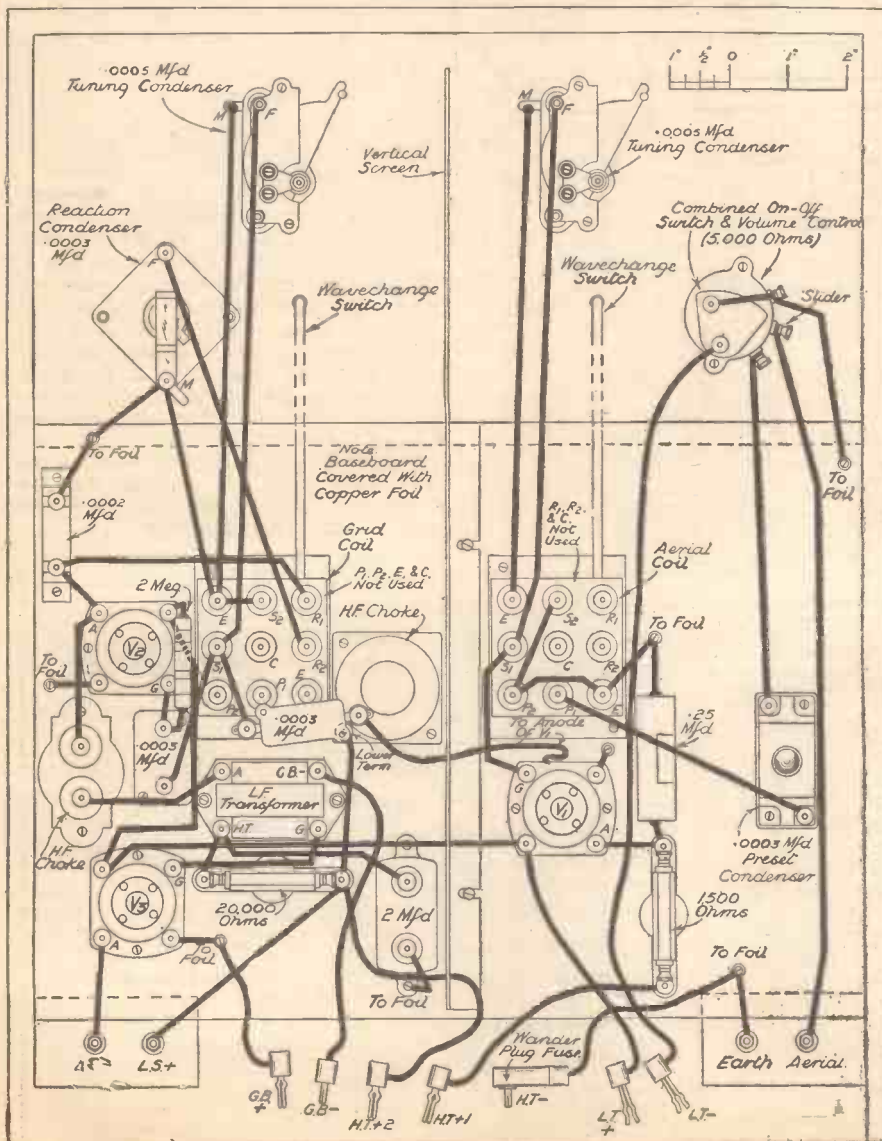
This is essential if a wide margin for set construction variations is to be obtained, and if ease of tuning at the lowest and highest wavelength is to be achieved. It must be borne in mind that below 8 degrees and during the top five degrees of a condenser station tuning is not always easy.

### A Useful Overlap.

"No-gap" coils overcome this by providing a useful overlap of wave ranges just where required. Below 170 there is nothing in the way of broadcast stations at the moment, so that there is no difficulty in tuning the first station in down there, while at the other end of the complete range we have 2,000 metres, well above Huizen, allowing another ample margin.

This margin at either end is more useful than might at first be thought, for it allows for the set builder using rather high-capacity wiring, and so shifting the minimum wavelength of his tuned circuits up a little, or of his employing tuning condensers

## IRON-CORED COILS—COMPREHENSIVE WAVE-RANGE



## USE THESE ACCESSORIES

- LOUDSPEAKER**.—R & A, Celestion, Rola, Marcomphone, Amphon, Blue Spot, H.M.V., Ferranti, Epoch, Atlas, G.E.C., Ormond.
- BATTERIES**.—H.T. 120 volts, Lissen, Pertrix, Siemens, Ever Ready, Ediswan, Drydex. G.B. to suit valves. Ediswan, Marcomphone, Lissen, etc. L.T. 2 volts. Exide, Block, Pertrix, Ediswan, Lissen, etc.
- MAINS UNIT** to give not less than 15 milliamps (2 tappings). Atlas, Ferranti, Ekco, R.L., Regentone, Heayberd.
- AERIAL AND EARTH EQUIPMENT**.—Electron "Superial"; Goltone "Akrite"; Radiophone "Receptur" downlead; Graham Farish "Filt" earthing device.

that are a bit below the rated capacity of .0005 mfd., when his top wavelength would be reduced.

Whatever you do, within reason, the "no-gap" tuning system will cover the full scale of wavebands, and the screened iron-cored inductances employed in its design spell efficiency and compactness.

We shall, of course, be constructing other (Continued on next page.)

The coils used represent the very latest development in design. They employ the new iron-core principle, and also the "no-gap" advantages so strongly advocated by "Popular Wireless" in the past.



# THE "NO-GAP" 3

(Continued from previous page.)

set designs using "no-gap" coils, but as an introduction to the public of the new system we have chosen a simple set, such as is used throughout the country in conjunction with ordinary dual-range coils.

The consequence is that should readers not wish to build the whole set, a straightforward screened-grid three, they will be able to convert their own sets to the new tuning method without any difficulty.

This first three-band broadcast receiver is designed on normal panel and baseboard lines, with two separately tuned circuits. These could be ganged if required, but for economy the two circuits are best, and they are very easy to operate.

### The Circuit.

Let us take the circuit bit by bit. First of all, there is the aerial input through a pre-set condenser to a primary winding on the first "no-gap" unit. A combined potentiometer and on-off switch is used as volume and main set control, the resistance being paralleled with the aerial coil to provide a control of input.

The secondary of the coil goes to the grid and filament of the screened-grid valve, and is tuned by an ordinary slow-motion .0005-mfd. variable condenser.

From the anode of the S.G. valve we go via a small condenser to the tuned grid of the detector, consisting of the secondary of a second Lewcos "no-gap" coil tuned by a .0005-mfd. condenser.

The anode H.T. supply for the S.G. valve is fed in the usual way through an H.F. choke. Alternately the screened-grid valve could be transformer-coupled to the detector, the coils having been designed with that in view should it be required, and

possessing three windings (primary, secondary, and reaction) in each unit.

The coils are switched by an internal rotary switch movement, which has three positions, which we will call "medium," "extended range," and "long."

The detector is transformer-coupled to the output valve, which is of the normal type, not "Class B" or anything of that nature.

Going back to the coils, which are the whole heart of the receiver, it may be noticed that the switching comes fairly

An important feature of the switch design is that the switch rod is grooved so that it can be inserted in only one way, automatically locking it from any chance of slip, and assuring that the three positions are correctly placed with relation to one another.

### Conveniently Mounted Terminals.

All the terminals are mounted on the top of the can, an innovation as far as canned coils are concerned, but one that greatly facilitates the manufacture of the coils, and simplifies the arrangement of the switch mechanism.

Furthermore, the terminals are so arranged that they come in a logical order, and so that a number of various types of circuits can be used with the coils. They do not in any way cramp the practical application of the inductances, a feature that might well be noted by certain other coil designers.

Of the utmost importance in this respect is the fact that the reaction winding is free at both ends, so that different systems of reaction control can be applied, while the unearthed aerial winding is another point that allows the maximum freedom in the use of the coils.

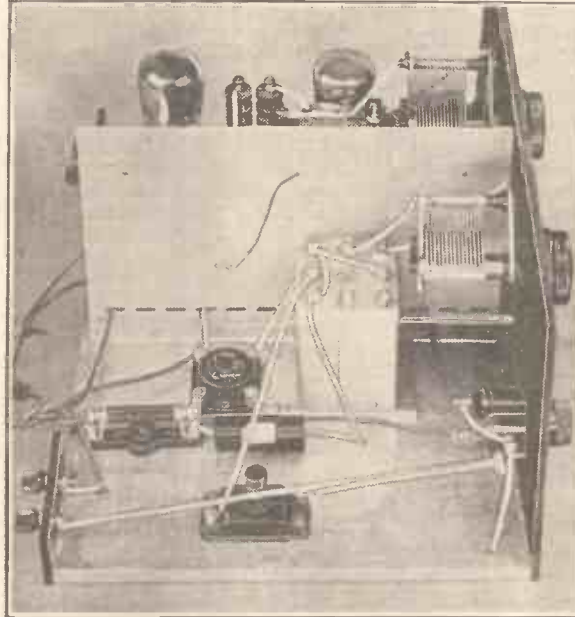
### Logical Markings.

The terminals are sensibly marked, the lettering being quite logical, the aerial winding is marked P1 and P2 (obviously denoting "primary"), the grid winding is S1 and S2 ("secondary"), and the reaction is just as obviously R1 and R2. Moreover, the high potential ends of each winding are the ones marked "1," and the low potential ends "2."

The coils will be available in a week or two's time, in either single form, or as two and three-ganged assemblies with a common wavechange switch.

But of this we shall have more to say next week when we complete the constructional detail of this, the very first set to use this type of tuning.

## FULL CONTROL OF INPUT



The combined volume control and "on-off" switch may be seen in the lower right-hand corner, and one of its connections goes direct to the coil on the baseboard below it. A control of this nature gives wide regulation without introducing distortion.

high up the coil circuit, though this is by no means large. This is to facilitate the use of the coils in either baseboard or chassis designs, pillars being supplied by the makers for under-chassis mounting, should it be desirable to have the tops of the coils protruding through the "baseboard" of the chassis.

## PARTS YOU WILL NEED FOR THE "NO-GAP" THREE

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.	Components.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Panel, 14 in. x 7 in.	Goltone	Peto-Scott, Becol	3 4-pin valve holders	Benjamin "Vibrolder"	Telsen, Lissen, W.B.
1 Baseboard, 14 in. x 10 in.	Peto-Scott	—	1 2-megohm grid leak with wire ends	Goltone	Ferranti, Graham Farish
1 Vertical screen, 10 in. x 6 in.	Magnum	—	1 20,000-ohm resistance and holder	Graham Farish "Ohmite"	Dubilier
2 Coil units	Lewcos Triple Range	—	1 1,500-ohm resistance and holder	Graham Farish "Ohmite"	Dubilier
2 .0005 tuning condensers	Utility "Mite" with vernier	Ormond, J.B.	1 5,000-ohm combined potentiometer and 2-pt. on-off switch	Bulgín V.S.29	—
1 .0003-mfd. reaction condenser	Graham Farish	Telsen, J.B., Ormond	4 Insulated terminals	Belling & Lee type "R"	Igranic, Eelex
1 .0003-mfd. pre-set condenser	Telsen	Goltone, Sovereign	2 Terminal strips, 2½ in. x 1½ in.	Goltone	Peto-Scott
1 .0003-mfd. fixed condenser	Dubilier 670	T.C.C., Telsen	4 Wander plugs	Igranic	Goltone, Belling & Lee
1 .0003-mfd. fixed condenser	T.C.C. type "S"	Telsen, Dubilier	1 Wander fuse	Belling & Lee	—
1 .0002-mfd. fixed condenser	Dubilier 623	Telsen, T.C.C.	2 Accumulator tags	Bulgín	—
1 .25-mfd. fixed condenser	T.C.C. type 250	Ferranti, Dubilier	1 Sheet copper foil, 14 in. x 10 in.	—	—
1 2-mfd. fixed condenser	Dubilier type "BB"	Telsen, Ferranti, T.C.C.	4 yds. insulated sleeving	Goltone	—
1 Binoocular H.F. choke	Igranic	Bulgín, Lissen, Telsen	5 yds. 18 S.W.G. tinned copper wire	Goltone	—
1 H.F. choke	Varley Multi-Cellular	Telsen, Goltone	Flex, screws, etc.	—	—
1 L.F. transformer	R.I. "Hypermite"	Igranic			



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



A weekly chat by our popular expert, dealing with many interesting aspects of current short-wave practice.

**S**HORT-WAVE listening is definitely not a pleasant pursuit during a heat-wave, especially when one's room faces South-West and receives the full force of the sun all the afternoon and evening. After four or five vain attempts, all made late at night, to achieve that coolness of mind which is so difficult to maintain with a hot body, I gave the heat-wave best.

Thanks to our wonderful climate, it may be snowing when you read these notes, but they will, at all events, serve to remind you that we *have* had a heat-wave this year.

## Resistance-Capacity Coupling.

I have just completed the final adjustments to my new chassis set, which uses a screened-grid detector, resistance-coupled to an L.F. stage, which is adjustable for the use of either pentode or triode. I find that my cardrums will not stand a pentode, although it is very useful for loudspeaker work. For headphone work the S.G. detector and an ordinary small-power valve give rather more volume than one usually associates with comfort.

Readers have probably gathered by now that I am strongly in favour of resistance coupling. With a screened-grid detector it is even a greater pleasure to handle, and this set has altered my ideas of what really smooth reaction can be. I find that 25 volts on the screen suits most of the S.G. valves of to-day very well—when used as detectors, of course—and for this reason I am now rather in favour of a fixed voltage on the screen, reaction being controlled by a .0001 variable condenser in the conventional "throttle-control" position.

## Good Reaction Control.

It has never been made particularly clear that there are two varieties of bad reaction control. Our old friend the "plop" is well known, and, luckily for us, easily remedied. But a worse form of trouble sets in when the reaction control "takes charge" of the wavelength. A slight final movement of the reaction condenser will then shift the tuning appreciably, and necessitate a further movement of the tuning control. Even after this the whole process may have to be repeated!

I have always found that resistance coupling gives a reaction control that has remarkably little effect upon the tuning. With the set I have just mentioned, it is possible to increase the setting of the reaction condenser from the actual point of oscillation right up to the "squealing point" without even altering the beat-note of a C.W. signal or steady carrier-wave.

Reaction controls that affect the wavelength may generally be traced to one of two things—bad layout and wiring, or an

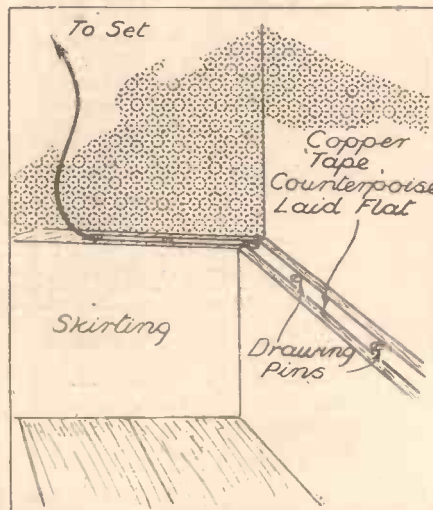
unsuitable H.F. choke. The former is the more usual. Just try a test of this kind on your own set and see whether it shows up well.

In some curious way this "signal-chasing" business on the reaction control is tied up with hand-capacity effects. You will never find a set that suffers from hand-capacity that has a really nice reaction control. The whole thing obviously comes down to instability, which cannot be tolerated anywhere in a short-wave set. If every short-wave fan would cut out that last sentence or copy it out in large letters and place it in a prominent position, there

## A COUNTERPOISE EARTH

**R**EADERS who have their short-wave sets installed in drawing-rooms probably like to keep things as tidy as possible. If an indoor aerial is used, as is probably the case, there is no trouble in hiding it round the picture-rail—an arrangement which, though not particularly efficient, does at least work.

## QUITE INCONSPICUOUS



When the aerial is run round the picture rail a good place for a counterpoise earth is along the wainscoting.

The problem of the earth-lead, which often becomes very long in such cases, is best solved by doing away with the direct earth and using a small "counterpoise." A very neat job may be made of this by using flat copper tape (such as we used to use for winding "low-loss" coils) and pinning it round the top edge of the skirting with drawing-pins (see sketch).

would be fewer grumbles in the short-wave world.

Remember that a set can be unstable without giving vent to audible hoots or howls; likewise remember that you are safe in putting down 90 per cent of short-wave detector troubles to instability; and, lastly, remember 90 per cent of the instability is caused by a bad layout and long, loopy wiring. And, with that little sermon over, I will proceed with the news.

The "Crystal Palace Brigade" have had another pleasant surprise, in the shape of the arrival of a belated report from Bradford on their 5-metre transmission. When the tests are repeated the word has gone round that "in official circles" 1,000 miles is not regarded as beyond the realms of possibility.

## Sending of Q.S.L. Cards.

Several Dutch amateur transmitters are anxious to co-operate next time, and have promised to occupy every high spot in Holland in their efforts to hear us.

Reports on the "H.A.C. Three-Valver" seem to indicate that it was a singularly snag-free set. Several people who built it, according to prophecy, became hon. members of the H.A.C. Club almost at once!

"H. T. L." (Gosport) is nearly one of these, but he still lacks an Australian. He sends me a letter in which he protests bitterly against short-wave stations (amateur and otherwise) who ask for reports and then haven't the common courtesy to reply to them, even with a Q.S.L. card.

Personally, I haven't a good word to say for an amateur who asks for reports and then doesn't Q.S.L. Some of the more active ones, I know, can neither spend the time nor money on answering the hundreds of unsolicited reports that they receive; but, after all, that is the other man's look-out.

I myself have given up sending Q.S.L. cards to stations that I work; but if they happen to send me a card it is always answered. It is my proud boast that every report card that comes into the house is answered the same day. So we're not all black sheep, "H. T. L."!

Atmospherics are not often troublesome below 100 metres, but once or twice lately I have found some of the weaker stations badly "hashed up" by them. Readers seem to agree, in the main, that they have been worse than usual this summer.

## Broadcast Interference.

"T. V. P." (Grimsby) is worried by another kind of interference, in the form of the North Regional programme re-radiated, apparently, from a neighbour's aerial. This trouble is very annoying and can be absolutely baffling.

I think it only happens, however, when the neighbour makes a habit of working his set in the "silent point," or right on the edge of oscillation. A little friendly argument with the neighbour is generally the most effective cure for troubles of this sort. I suggest that "T. V. P." asks to see his neighbour's transmitting licence!

Incidentally, I heard recently of a case of interference by a local short-wave transmitter. The plaintiff, an owner of one of these "super-hyper" broadcast receivers, seems to be justifiably annoyed. Quoth he: "I don't mind hearing you talking to G Six Blank Blank all over the Regional programme; but I *should* like to have my pick-up to myself!"





# Further Remarks on SPENDING LISTENERS' MONEY

BY THE  
VISCOUNTESS  
SNOWDEN  
J.P.

SOME weeks ago an article appeared in POPULAR WIRELESS over my name setting forth alternative ways in which the Government might spend the large sum of money wrongfully exacted each year from wireless listeners, and yet keep itself in tune with wireless needs and purposes.

Amongst other suggestions I made was one to build and maintain a National Opera and a National Theatre.

Only one criticism of this proposal has reached me, and that a very gentle one, from someone who thinks that my ideas are too "high-brow" (detested word!) for the British public.

### How Hungary Manages.

I think the taste of the British public is far too often under-estimated. My experience has always been that the best is good enough for most people when the best has been experienced, and that in these circumstances, the second-rate is despised and resented; but be that as it may, I imagine it would be even more difficult to persuade the Government to release money for light entertainment than to awaken its aspirations towards the possession of the cultural institutions I have indicated!

I have just returned from a visit to Hungary, a country once rich but since the war denuded of nearly three-quarters of its territory and three-fifths of its people. Although on account of its poverty Hungary has been obliged to reduce the amount of its State subsidy for Opera, it still contributes a sum equal to £40,000 a year for the upkeep of its elegant Opera House and the maintenance of an excellent Opera Company.

What it needs beyond the £40,000 annually is subscribed by the opera-loving members of the general public, who have formed themselves into an organisation known as the Friends of Opera.

### Spending a Million Pounds.

When I asked these Friends of Opera how they were able to do this in the sad circumstances of their present lives they proudly replied: "We have lost our lands and our money and we are now very poor; but we still have our culture, and this we are determined to preserve at all costs."

This is the sort of enlightenment and courage which shakes one's pride in one's own country and impels one to continue the struggle against any odds for these things of the mind and the spirit.

In this article, however, I should like to point out some of the ways in which that million pounds a year taken by the Government out of wireless licences might be used by the B.B.C. had the Corporation the spending of it. Readers may have other ways to suggest. These are some of mine.

I think the building of a beautiful and adequate concert hall for the broadcasting

of symphony concerts and choral work would not meet with any serious objection. In the end this would be a paying proposition.

The large studio at Broadcasting House is too small for symphony concerts, though it is admirably suited for chamber music and musical conferences. The Queen's Hall, which is often not large enough, costs a great deal in rents. The Albert Hall is too large for most occasions and is not intimate enough.

A final word by our eminent contributor on her suggestion to employ the licence revenue surplus to build a National Opera and a National Theatre.

What is wanted is a hall to seat about 4,000 people. The rents that would be saved would, in time, pay for the building, and the rents that could be charged for letting when the hall was not wanted by the Corporation could go towards its furnishing and upkeep.

I have strong views about the use of the B.B.C. Orchestra, and if I could have my



### MORE TALENT

With more money to spend, artistes of the standing of Miss Gracie Fields could appear in the programmes more often than at present.

way it would concentrate on symphony concerts proper and be entirely relieved of the Promenade Concerts.

The London Symphony Orchestra which, under Sir Hamilton Harty's baton may yet eclipse all other orchestras, might be invited to take charge of the Promenade Concerts. This would divide the work and employ two first-rate conductors.

If the B.B.C. is to maintain its present high level of competence and even improve

upon it, I would modestly suggest it should be relieved also of the hack programme-work involved in its division into four bands.

An orchestra of this quality should not play till it is stale to itself. It should have the necessary alternate practice and leisure.

It should not play music of second-rate or third-rate quality. It should not suffer too much the deadening effect of performance without visible audience.

### Free Concerts?

A new audience and a new venue are a tonic to the musical craftsman, and I venture to think that periodic visits to the principal provincial towns, the larger and better-known watering-places, and even foreign music centres, would be a stimulant to the orchestra and advantageous all round. But all this would cost much money.

I should like to see regular Promenade Concerts on the London model in the large provincial cities. The Hallé Orchestra and the Scottish National Orchestra might be asked to share with the London Symphony Orchestra and the London Philharmonic Orchestra these performances.

All this could be done if box-office considerations were not important, and I suggest this would be a good use for some part of the stolen million! It might even run to free concert programmes, which would, I am convinced, increase the number of concert-goers.

To set against these "high-brow" suggestions I would have the more talented variety artistes engaged more frequently. With more money to spend, artistes of the standing of Harry Lauder and Gracie Fields, to give only two examples out of many which might be cited, could appear in the programmes more often than at present; and the amount of inane and boring rubbish that drives unseen listeners to despair, despite the cheers that resound in the studio, might be gradually reduced and finally eliminated.

### Paying the Artistes.

I should like to see a minimum fee of five guineas for solo artistes established. A singer or player who is not worth five guineas is probably not worth listening to, and the pin-money principle ought not to be any part of the wage-policy of the B.B.C.

If there were plenty of money the B.B.C. could establish scholarships, or make money advances for a term of years to young people of artistic promise too poor to pay for their training.

These could be taught by the best masters at home and abroad on the understanding that, when success comes, they should hold themselves ready to broadcast when wanted, to the amount of money their training cost at the fees they are able to command as finished artistes. They would soon sing or play themselves free of this obligation.



THE MIRROR OF THE B.B.C.

By O. H. M.

## B.B.C. AND U.S. METHODS

The 1935 Enquiry—Sponsored Programmes—Wanted: Scottish Regional Director—West Regional Premiere—A "Bells" Feature.

THE B.B.C. has started a new practice which is described as "Grace Leave."

This means extended holidays for those engaged in constructive and original work, notably producers.

One of the first to benefit is Mr. Jack Watt, the very competent and successful dramatic producer whose work during the past three years or so has done as much as that of anyone else to enrich and broaden the programmes. It is understood that Mr. Roger Eckersley, the programme chief, will be included shortly in the Grace Leave list, and that he probably will decide to go to America on a sort of "busman's" holiday, during which he will take the opportunity of studying American programme methods.

It is high time the programme chiefs at Broadcasting House paid some attention to American broadcasting, which although inferior in many respects to British broadcasting, still has a good deal to teach us.

### The 1935 Enquiry.

Members of Parliament, some of whom attempted vainly last Spring to force a Parliamentary enquiry into the working of the B.B.C., have again been in serious consultation. If they are foiled in their attempt to have broadcasting raised on the Post Office vote this session, they will await the official enquiry of 1935 before disposing of their main ammunition.

This enquiry, by the way, will be the most searching and important of its kind ever held in this country.

### Sponsored Programmes.

The movement for sponsored programmes in Britain, quiescent for some months, is again reviving despite previous disappoint-

ment. The new angle is that the B.B.C. actually does about as much advertising as the American system, but without getting anything for it.

The constant acknowledgments of the origin of outside programmes, the incidental references to commercial commodities, and so on, tend to increase. Of course, nothing can be accomplished in the direction of charging

## THE PREMIER'S BROADCAST



Mr. Ramsay MacDonald on the President's dais at the New Geological Museum, where the World Economic Conference is being held, and whence the opening speech of His Majesty the King was recently broadcast. Note the partly-covered table-microphones and loudspeaker.

for these references until the Constitution and Licence of the B.B.C. are reviewed in 1935.

It is clear that a determined endeavour will be made to secure at least that degree of revision of the constitution which will enable competition to be set up in some form. And there is no doubt that while listeners generally might oppose the sponsored principle, they would welcome competition in the expectation of greater variety and more keenness.

struction. However, more about that later.

Meanwhile, I wonder how many of my readers are aware of the fact that it was Mr. Scott-Worthington who was responsible for the "Author's Kit" idea? To be able to tackle the construction of a set from "the parts that fit the blue print" is a very valuable aid to constructors, and to me it isn't in the least surprising that the scheme has caught on so remarkably.

After all, to start set-building with the knowledge that all the parts have been tested, and that they are exactly similar to those used in the original set, is, in my opinion, a great incentive to home construction, for the possibility of failure is almost completely removed.

### Mains Transformers and Chokes.

I have just received a brochure from Sound Sales, Ltd., in which is described their comprehensive range of mains transformers and chokes.

### Wanted: Scottish Regional Director.

The B.B.C. has been diligently searching for a successor to Mr. Cleghorn Thomson, who recently vacated the post of Scottish Regional Director.

At the time of writing, Mr. Moray MacLaren is carrying on temporarily. The situation is a curious one.

I hear most people are agreed that Mr. MacLaren would make the ideal successor to Mr. Thomson in ability, outlook and training; apparently, however, the fact that he is of the Roman Catholic religious persuasion makes a difference. I wonder if this is right.

### The West Regional.

The new West Regional transmitter at Washford had its official opening some weeks ago, but so far it has not received any special place in the programmes which it radiates from its unique type of "umbrella" aerial.

Perhaps it was thought that the station should first display reasonable intentions of working up to the high efficiency standards of the B.B.C. before making too much fuss of its existence, and it has certainly shown its ability to behave as a good transmitter should.

It is to have its own little bit of sugar on Wednesday, July 12th, when a light programme entitled "Hullo, Washford!" is to be broadcast. The show is by F. E. Robins, and the cast will include Elsie Eaves (soprano), William Worsley (baritone), and the Western Studio Orchestra.

### A "Bells" Feature.

Bells of various kinds will be the theme of the next Ernest Longstaffe revue to be given for

Regional listeners on Tuesday, July 4th, and repeated the following evening as part of the National programme.

Harry Hemsley, the famous child impersonator, and Ernest Butcher are in the cast, and the part of the former can readily be imagined when we state that the show starts with the bells which summon the youth of the world to school. Other kinds of bells follow, such as wedding bells, and finally a gathering at "The Bell."

## 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.

The range appears to include models for almost every conceivable purpose, and bearing in mind the excellence of the products, the prices strike me as being very reasonable indeed.

In view of the fact that interest in home constructed mains receivers is definitely on the increase, I propose to include this new Sound Sales brochure in the "P.W." postcard literature scheme. Just let me have the usual postcard, and I will see that a copy is forwarded to you. (No. 41.)

**The LINK BETWEEN**  
BY G. T. KELSEY  
Weekly Jottings of interest to buyers.

I WAS having a chat recently with Mr. W. Scott-Worthington, who, as most of you will know, is the enterprising chief of the Peto-Scott Co., Ltd.—and I was particularly intrigued with a new development that his company is shortly to bring out.

For reasons connected with patents I cannot pass on full details at the moment, but I can definitely promise that the scheme is likely to start a new era in chassis con-



# Mullard Class "B" amplification . . .

a low mean anode current over a representative period of broadcast

From the most powerful volume down to the faintest whispered word, the new Mullard Class "B" valve, the P.M.2B, takes an average H.T. current consumption of exceptionally low value over a representative period of broadcast. Thus, Mullard Class "B" amplification comes to give you battery performance comparable with that of an all-mains receiver, with no more drain on your H.T. battery than that taken by a small power valve.

So if you are seriously contemplating the incorporation of Class B amplification, we would be glad to assist you in any way, and would suggest you write to T.S.D. for any technical information you may require.

The P.M.2DX is the driver valve for the P.M.2B. Other valves to be used in the earlier stages of battery receivers are the P.M.12M, variable-mu H.F. amplifier (or P.M.12A Screened-Grid H.F. amplifier) and the P.M.1HJ detector.

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.E.M.



# Mullard

**THE · MASTER · VALVE**

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

Arks



# ECKERSLEY EXPLAINS-



"I want to read up wireless. What books shall I get?" The difficulties of dealing with this question and some truths about radio books are the subjects of this week's contribution by Our Radio Consultant-in-Chief.

I AM often asked by people, "What books on wireless should they buy?" They are "rather interested" in wireless—"I know nothing about it—purely as a hobby, you see," and want to "learn it up a bit."

So often was I asked this impossible question some years ago that I wrote two books, both attempting an explanation of wireless based on the analogies of common experience—the mass of a truck, the give of a spring, sound echoes, even the attraction of the female for the male.

The book was much too ingenious to be good, and the critics naturally wrote it down to the level of its most far-fetched analogy. The fact is, no one can write, and therefore not many can buy a book which explains wireless simply. Wireless is a rather advanced form of electrical engineering, and it is not easy to become a qualified electrical engineer on twopennyworth of home study.

## The Delight of Knowing.

"It's fun to be fooled, but it's nicer to know." I know that the readers of this journal agree with this. I know, because for three years I have been answering questions, and the questions show that the average questioner is genuinely thinking.

Therefore, I say to people this: The greatest amusement in the world, the dispeller of boredom, the inspiration of hope, is the proper exercise of the mind.

"A sluggish liver is a dangerous thing, but a sluggish mind is a menace to more than its possessor." (I throw off little things like this practically without effort.) The liver disciplined by exercise makes life worth living, a mind taking its possessor through the intricacies of the technical maze with a sure certainty of direction is nothing less than ecstasy.

## Fascination of Wireless.

There is nothing more fascinating than wireless as a hobby because experimenting is cheap and the apparatus which can be developed inexpensively in one's own home is quite outside the toy class. But I want to stress the fact that the more the experimenter knows, the more fascinating the hobby.

But not, at first, advanced books on wireless. At first books on elementary electricity and magnetism, but, so as to spur one on,

reading wireless books as well. The one will illuminate the other.

I cannot give you a list of books, but I am sure if you were to study the syllabus of a technical school or university you would see what books are recommended to-day.

Meanwhile, there are the popular books which help to stimulate imagination. I have already suggested that the books which attempt the impossible and try to make the explanations easy are not of much value. But there are other books of the popular class which I consider well worth while.

## A Story Well Told.

R. N. Vyvyan, for thirty years and more a member of the staff of Marconi's Wireless Telegraph Co., and during a long period engineer-in-chief to that company, has written just the type of book I would recommend to those who like to see their subject "all round."

Mr. Vyvyan's book is a history of the development in which the author has been intimately in touch. The account of Marconi's work during the early days, when ranges increased from yards to hundreds of yards, to tens and hundreds of miles, until at last those famous soft sibilants spanned the Atlantic.

## EARLY EXPERIMENTS



The history of radio from early experiments up till the present day is full of romance, and here you see an historic figure, Mr. G. S. Kemp, who was with Marconi when he received the first wireless signal that crossed the Atlantic.

That story is told with real insight and its reading should be an inspiration to younger generations. Mr. Vyvyan is telling the story of a young man's adventure—Marchese Marconi's adventure—and Mr. Vyvyan's adventure. Therefore, there is a

freshness in the telling which holds one's attention very strongly.

Later on the first fine careless rapture seems to die a little; why should it not when greed, vested interest, government jealousy and the rest seized upon wireless as bigger and better platform for their posturings?

The later history of wireless is an illuminating commentary upon moral values as they are casually accepted to-day—only the coming of broadcasting made a clean corner among some rather smelly debris. To-day, alas!—but that may seem too pessimistic to many of you. I hope it is!

## Books of Formulae.

On the purely wireless side, my standard text books consist mostly of those which give me formulae which one cannot obviously memorise. I have a Lefax book with first approximations for the calculation of inductance and capacity, and, given these two, wavelengths, a table for the conversion of powers and volts into db's and nepers, formulae for the characteristic impedance and attenuation factors of simple filters, and so on and so forth.

But I chiefly keep up with modern technique by reading our periodicals and, unique in its character throughout the world, the Proceedings of the Institution of Radio Engineers published, as you probably know, in America. This is the only journal which deals in the practice of radio engineering and gives both quality and diversity.

## An Engineer's Paper.

Our own proceedings of the I.E.E. is admirable in many ways, but is designed more for the radio research worker than the practising engineer. Papers by T. L. Eckersley, E. V. Appleton, and members of the Radio Research Board are admirably set out and fulfil a most worthy purpose—the practising engineer in a hurry may find them a little too academic.

It is necessary—no! essential—that they should exist because the research of to-day is the practice of to-morrow.

I cannot finish without mentioning a journal which I find admirable and which I think deserves recognition in that it does attempt to cater for the practising engineer. I refer to the Journal of the British Radio Society—published, I think in Edinburgh.

(Continued on page 511.)

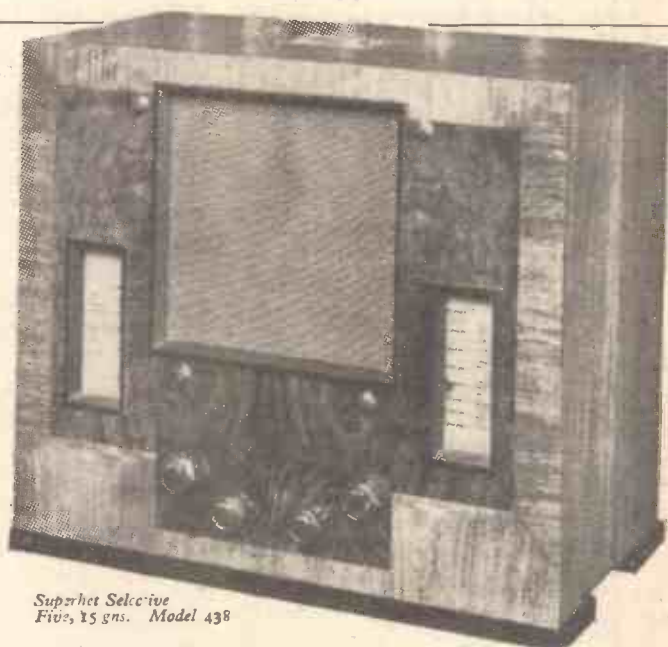




**WE PLANNED . . .**

**and NOW THE EXPERTS CONFIRM**

**WE PLANNED** to make a new Superhet Selective. Five powerful enough and sensitive enough to cope with every need of today's most experienced listener. We planned a receiver which should not only satisfy the keenest musical ear with "true-to-life" tone from an energised-field moving-coil speaker; but should sell at a price the average listener was able to pay—15 guineas. And before being put on the market it passed two searching tests—one at Prague, where the ether is more congested than anywhere else in Europe—one within sight of Brookman's Park, to prove its freedom from "second channel trouble"—both with flying colours!



*Superhet Selective  
Five, 15 gns. Model 438*

**AND NOW THE EXPERTS CONFIRM** that all these aims have been fully realised, as is proved by the following extracts from the "Wireless World":

**SENSITIVITY.** "The range on both long and medium waves is probably the maximum commercially obtainable with four stages. It is certainly equal to, if not slightly better than, that of any other Superheterodyne of its type so far tested."

**SELECTIVITY.** "Not a single station is lost on the medium waveband from second channel or image frequency interference."

**TONE** "... speech, natural and free from hollowness."

**VALUE** "... a first-class job which sets a new standard of value."

**15 GNS.**  
or by Hire Purchase

Hear this model at any "His Master's Voice" dealer—and see how completely the set lives up to the verdict of expert technical opinion.

**"His Master's Voice"**

**ALL - ELECTRIC RADIO RECEIVERS**

*The Gramophone Company, Ltd., 98-108, Clerkenwell Road, London, E.C.1.*



ON FIVE  
METRES!



The final check-over of the apparatus before the take-off. "Daily Herald" photo.

SHORT-WAVE enthusiasts listening on five metres during the afternoon of Sunday, June 18th, were amazed to hear prolonged conversations going on between two aeroplanes in mid-air, and between these planes and amateur stations on the ground.

It was the occasion of the first aeroplane transmissions in the POPULAR WIRELESS national five-metre tests, which were inaugurated so successfully by our Crystal Palace broadcasts on May 21st.

#### A Good Start.

The outstanding success of these aeroplane tests will go down as a milestone in the history of short-wave radio. They proved, in the face of the great scepticism

of many experts, that five metres is entirely suitable for plane-to-plane, and for plane-to-ground communication.

Shortly before two o'clock on Sunday, June 18th, two "Dragon" Moth machines roared across the aerodrome of Hillman's Airways at Romford, and climbed one after the other into the storm-disturbed atmosphere. Almost before the boundaries of the aerodrome were crossed, five-metre listeners as far away as Harrow were able to hear the operators calling one another, and to pick-up the replies, "Receiving you O.K."

The machines were twin-engined, and normally seated five passengers. In the one, with Mr. Clark and Mr. Briggs, both on the technical staff of POPULAR WIRELESS, was

# OUR AMATEUR ACHIEVEMENT

## GREAT SUCCESS OF THE WITH AMATEUR STATIONS

Mr. R. Jessop of G 6 J P. The other machine (chartered by the "Daily Herald") carried Mr. Douglas Walters and Mr. Walker.

The provision of the two highly efficient transmitters (which, incidentally, used ordinary Hellesen dry high-tension batteries) was in the hands of Mr. Walters (G 5 C-V). His call, and that of G 6 J P, were used throughout the tests, for which special experimental licences had to be obtained from the G.P.O.

#### Two-way Telephony:

Two-way or "Duplex" telephony working was employed, and the two storm-tossed machines maintained speech contact during practically the whole of the two-hour's flying, though often miles apart, and in spite of "bumpy" air conditions that made adjustments to the apparatus difficult at times. (Incidentally, the unusually bad air conditions were not relished too much by some of the members of the party!)

Two-way contacts, including duplex working, were made with amateur transmitters on the ground, while the planes were flying thousands of feet up. A typical extract from the flying-log of G 6 J P illustrates the keen interest which the tests engendered amongst the five-metre amateurs who got into touch with the planes:

14.55. G 2 J U replied: "Coming in at good strength." Started working duplex immediately with complete success.

G 2 J U told us that we were passing over his house, and said he would wave a tablecloth as a signal to the plane.

15.01. Continued working with G 2 J U with every success. He said our speech could be heard all over the house on loudspeaker with a slight background of engine noise. . . .

By A. S. C.

This enthralling aeroplane 5-metre amateur tests—forward in the u-waves and sim apparatus.

Extending the successful "Popular metre tests—wh Record for Great now proved once short waves pr reliable means cation for aeropl

Read how men journal, buffeted through heavy r metres withanoth the Home Counti kept up convers during these pio



"Dragon" Moth machine purposes of the tests of them flying st

HOW WE PROVED 5-METRE POSSIBILITIES FOR PLANE



# AIR-RADIO WIRELESS COMMUNICATION

## FIRST DUPLEX WORKING FROM AEROPLANES

RK & W. L. S.

account of the first transmissions to another great step in the evolution of ultra-short wave home-constructed

recent amazingly successful "Wireless" National 5-1 secured a World's Record for Britain—"P.W." has demonstrated for all that the ultra-radio a practical and low-power communication.

Members of the staff of this station, flying through storms and flying clouds, chatted on 5 metres from an aeroplane circling over London. And how both planes communicated with the ground during experiments.

W.  
ADS  
GAIN!



Machines were employed for the test and this picture shows one of the Uxbridge district.

This duplex working with amateurs on the ground was one of the outstanding events of the tests. Even at ten miles distance G 2 J U was coming through just as loudly, thus proving the practicability of five-metre communication with simple apparatus under difficult conditions.

### Very Low Power.

Other outstanding contacts were one-hundred-per-cent two-way contacts between the plane G 5 C V and the ground stations G 6 Y K and G 6 N F. The latter station is situated at Streatham and the contact was made when the machine was flying three or four miles north of Harrow, the distance covered thus getting

on for twenty miles. Which is, we believe, a new record for a hundred-per-cent plane-to-ground contact!

Reliable two-way contact was also made with G 6 C J. An amazing feature of the test was the relative simplicity of the apparatus used. The transmitting aerials were suspended along the inside of the cabins, and the power in both cases was only about five watts. In each case, the aerial employed two quarter-wave lengths of rubber-covered flex, fed by a feeder-line consisting of a quarter-wave length of ordinary twin flex.

The receivers were attached to the trailing aerials normally employed for 900-metre communication from the planes. Both these were unwound for only some fifteen feet.

### Engine Noises.

At times, reception seemed to be definitely better with the receivers disconnected from this trailing wire. Possibly the capacity of the unwound part was having an effect.

Those of you who have tried five-metre reception in a car with noisy ignition will



"Daily Herald" photo.

Seated comfortably in the plane's cabin, G 5 C V converses with the other machine engaged in the remarkable aerial-radio achievements described in these pages. The 5-metre apparatus used is clearly shown in the opposite photograph.

wonder whether we were affected at all by "Q R M" (interference) from this source. That it could not have been very bad is obvious from the fine results obtained during the tests.

No special ignition screening was provided, although the machines were equipped with 900-metre receivers. But, as you know, the long waves are far less susceptible to trouble of this nature.

Actually, the particular arrangement of the two aeroplane engines probably accounted largely for the fact that everything was not swamped by ignition interference. They are mounted on the lower wing a foot or two from either side of the cabins, and they are self-contained units, completely screened, as it happens, by their metal coverings. Incidentally, we under-

stand that the metal work of the machines is well bonded together.

### A Flying Commentary.

A very interesting item of the afternoon's proceedings which rounded off the tests in a most suitable manner was a descriptive broadcast by Mr. Walters from the "Daily Herald" machine, of their landing. The POPULAR WIRELESS aeroplane was down a little before the other, so we tuned in on the ground to G 5 C V.

"We are now coming in at about three thousand feet, to land," the running commentary (perhaps we should say, flying commentary) began.

Another remark was "I expect there will be a bit of a bump as we touch the ground"

(Continued on next page.)

## OUR AERIAL-RADIO ACHIEVEMENT

(Continued from previous page.)

(as a matter of fact, there was not even a small click, thanks to the perfect landing made by the pilot).

The broadcast while landing was heard perfectly clearly by G 6 Y K and G 6 N F, miles away in Shepherd's Bush and Streatham, until the machine was within a few feet from the ground. Such a result is of particular interest, since

way where others are bound to follow, and have shown that the modern comparatively bulky and heavy radio apparatus at present used in aviation may eventually be displaced by the compact and low-powered outfits that are the order of the day on five metres.

It is interesting to record that while we were up in the clouds fighting our way through storms, Mr. Campbell, of POPULAR WIRELESS, was on that famous boat the "Royal-Eagle." He had embarked at Tower Bridge for the Thanet Coast with a five-metre receiver, which he proceeded to work under the most arduous conditions of wind and rain on the upper deck of the vessel.

able, and it must have felt relieving to be in touch with each other and amateurs on solid earth by five-metre portable transmitters and receivers, when the planes were experiencing such terrific bumping from the stormy elements.

### A Unique Experience.

"It was a unique experience for my wife and I to talk to you in the planes via my five-metre transmitter at Harrow, and our duplex working with the G 6 J P plane and Mr. Briggs made the conversation much more interesting.

"Later, in contacting G 5 C V plane, I felt sorry for the others whom G 5 C V told me had succumbed to air sickness, and

## INSTALLING ONE OF THE AEROPLANE TRANSMITTERS AT ROMFORD



["Daily Herald" photo.]

Members of the "P.W." staff with "G 5 C V" and "G 6 J P" loading up the apparatus prior to the take-off from Romford. The metal casing covering one of the engines is on the wing to the left.

theoretically, at the end, the range should have been only a fraction of the distance, and the power at the time was a mere 4 watts.

Reports from readers who heard the final remarks, or any other parts of the tests, will be greatly welcomed by POPULAR WIRELESS.

### A Pioneer Triumph.

These tests have proved for the first time beyond all doubt that waves of five metres are entirely practicable for aeroplane-to-aeroplane, and for ground-to-aeroplane and aeroplane-to-ground communication. Once again POPULAR WIRELESS and radio amateurs have led the

For the benefit of those who are strangers to transmitting technique, we would add that "duplex" working refers to two-way telephony in which both transmitters and receivers are kept on the whole time. It is, in fact, possible for one speaker to break in on the remarks of the other and "cross-talk" just as on an ordinary telephone line.

Typical of the reports received is one from Mr. E. J. Pearcey (G 2 J U), from which we quote below some interesting extracts.

"Allow me to congratulate you on the enormous success of your five-metre tests on Sunday from two aeroplanes in flight.

"The achievement was indeed remark-

I wondered how G 5 C V managed to stick it out as he did the whole time, and to appear to be thoroughly enjoying it, too."

### Heard Planes at Romford.

"I heard G 6 J P shortly after the planes left Romford aerodrome. G 6 J P's signals were coming through at Harrow then at more than R 9, with excellent quality.

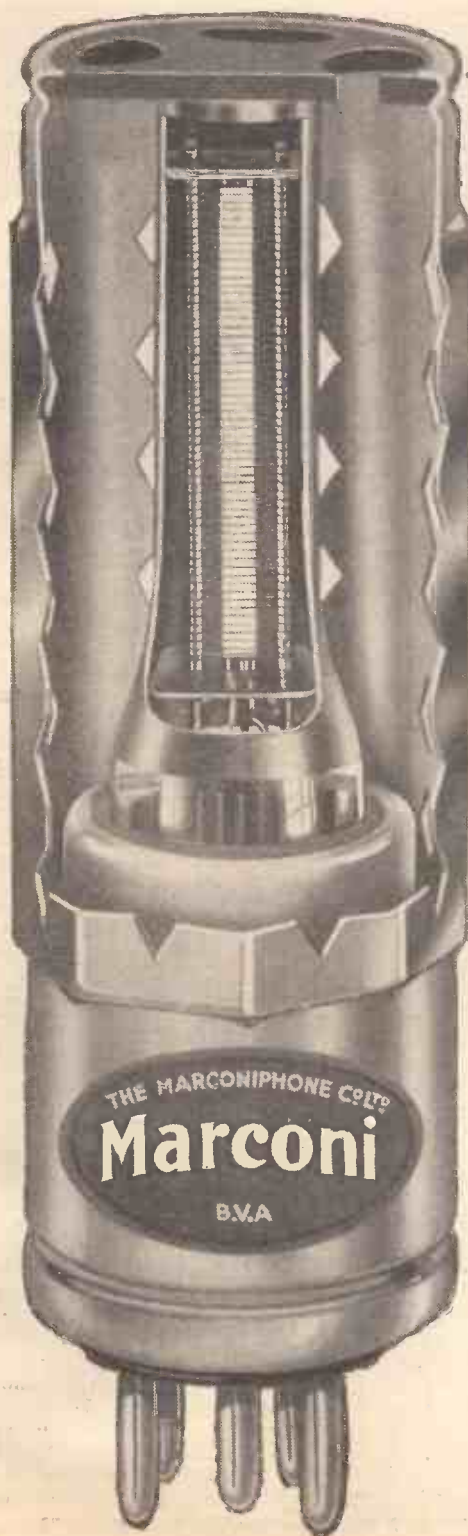
"I heard G 5 C V until 3.50 p.m., when he must have been very nearly home again at the Romford aerodrome."

Other reports bear similar convincing testimony to the ease and reliability of communication on five metres in this, the first British ultra-short-wave amateur-to-aircraft and plane-to-plane triumph.



# STABILITY

## *of valve performance at last*



'Stability' summarises in one word the chief superiorities of Marconi Catkin valves—their mechanical stability, both interior and exterior, renders them practically unbreakable—their constuctional stability guarantees uniformity of performance from one valve to another—their electrical stability eliminates microphonics, lengthens life and reduces hum.

Marconi Catkin valves, with their rigid, interlocked metal construction, eliminate at one stroke the weaknesses inherent in all glass valves—the instability of fragile bulbs—bent-wire electrode assemblies and many delicate welded joints. Yet with all these advantages they cost no more than ordinary glass valves!

*The types at present available are:—*

- \* VMS4 A.C. Variable-Mu S.G. - - - 19/-
- \* MS4B A.C. Screen Grid - - - 19/-
- \* MH4 A.C. General Purpose Triode - 13/6
- MPT4 A.C. Power Pentode - - - 20/-

\* With or without screening cover.

# MARCONI

## UNBREAKABLE

# CATKIN

## VALVES

*Write to the Marconiphone Company Ltd.  
210 Tottenham Court Road, London, W.1 for a  
folder describing these remarkable new valves.*



**T**HE special cabinet to house the television gear presented a new problem, for it necessitated designing something different from any type of cabinet hitherto constructed. The resultant cabinet is, however, both pleasing and sufficiently substantial to withstand the weight of the 700 volts H.T. contained in the tray at the bottom of the cabinet.

The framework for the cabinet may appear to be rather fragile, but when the necessary crosspieces and shelves are in position the cabinet as a whole is remarkably rigid.

The construction of the cabinet should be commenced by cutting the four pieces for the base; these are two pieces 6 in. x 18½ in. x 1 in., one piece 6 in. x 17½ in. x 1 in., and the remaining section, i.e. for the back, 2 in. x 17½ in. x 1 in.

To the inner face of each piece of wood nail a strip centrally 10 in. x 1½ in. x 1 in., with one edge in each case flush with the bottom edge of the above four pieces.

**Fixing the Feet.**

The lower baseboard of ¾-in. ply, on which the H.T. battery drawer rests, is now nailed to the four sides, resting on the pieces of wood already nailed to the side pieces. Details of the corners are shown on page 508.

Now fix the 3 in. x 3 in. or 3 in. x 4 in. brackets into position as shown, carrying this work out before the corner supports are fitted into position.

It may seem rather strange so early in the construction to fit the feet, but it must be borne in mind that the domed top prevents the cabinet from being turned on its end.

The feet are cut and shaped to the dimensions given and then fixed by means of 3-in. No. 8 countersunk wood screws to

\*.....\*

**This week we round off the description of the construction of the "Popular Wireless" Cathode Ray Television Viewer with details of the cabinet. This enables the various units to be combined into a neat and compact instrument.**

**By J. R. WHEATLEY.**

\*.....\*

the front and back of the main bottom framework, which is already complete.

The four corner supports are cut from 1 in. x 1 in. flush corner moulding—Handicrafts K343. Other suitable mouldings are

**SAFELY HOUSED**



The 120-volt batteries are placed on their sides in a special battery drawer, which carries terminals and a switch.

available from the above manufacturers, including an octagonal corner moulding. Having cut the four pieces to the correct length, they may now be fitted into the base framework already constructed. It is

not necessary to screw these corner supports into position; 2-in. oval nails are quite satisfactory.

Temporary pieces of wood must now be cut and fitted to the top of the four corner mouldings so as to keep the sides and front pieces the correct distances apart during the process of fitting the four crosspieces, which carry the top and middle shelves.

In the case of the top shelf, slightly wider and thicker wood is used than for the lower shelf, thus further strengthening the framework at the point where the corner supports are likely to buckle. These two pieces are 18½ in. x 4 in. x 1 in.

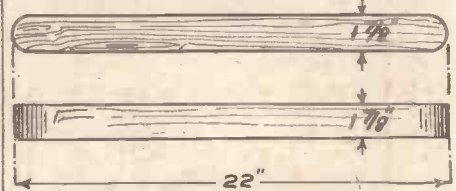
In the case of the lower shelf the side supports are arranged inside the corner supports so as to facilitate the removal of the rear half of this shelf which rests on these two supports.

**Making the Shelves.**

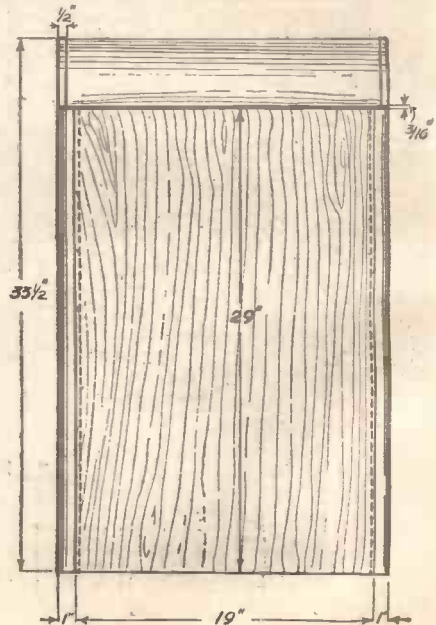
It is advisable at this stage to fix the side pieces for both shelves and also the ¾-in. plywood shelves temporarily into position.

*(Continued on page 508.)*

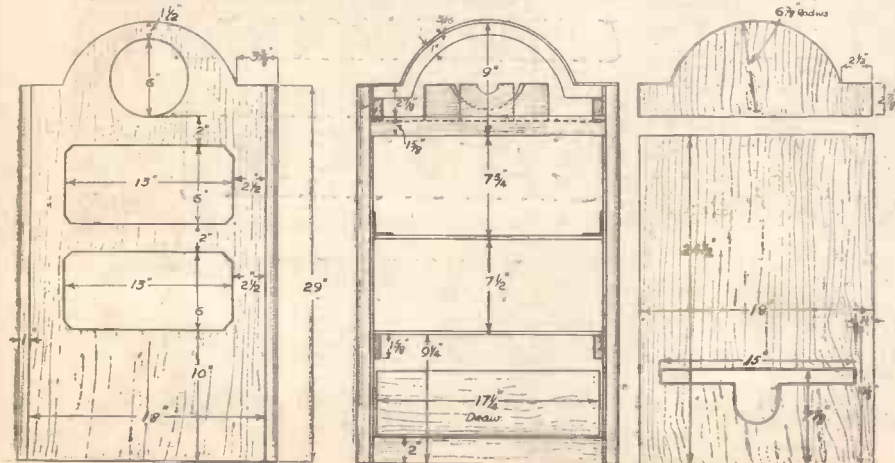
**DETAILS OF THE "FEET"**



Two plain "runners" are used instead of four separate feet.



**THE CABINET DRAWN FROM VARIOUS ASPECTS**

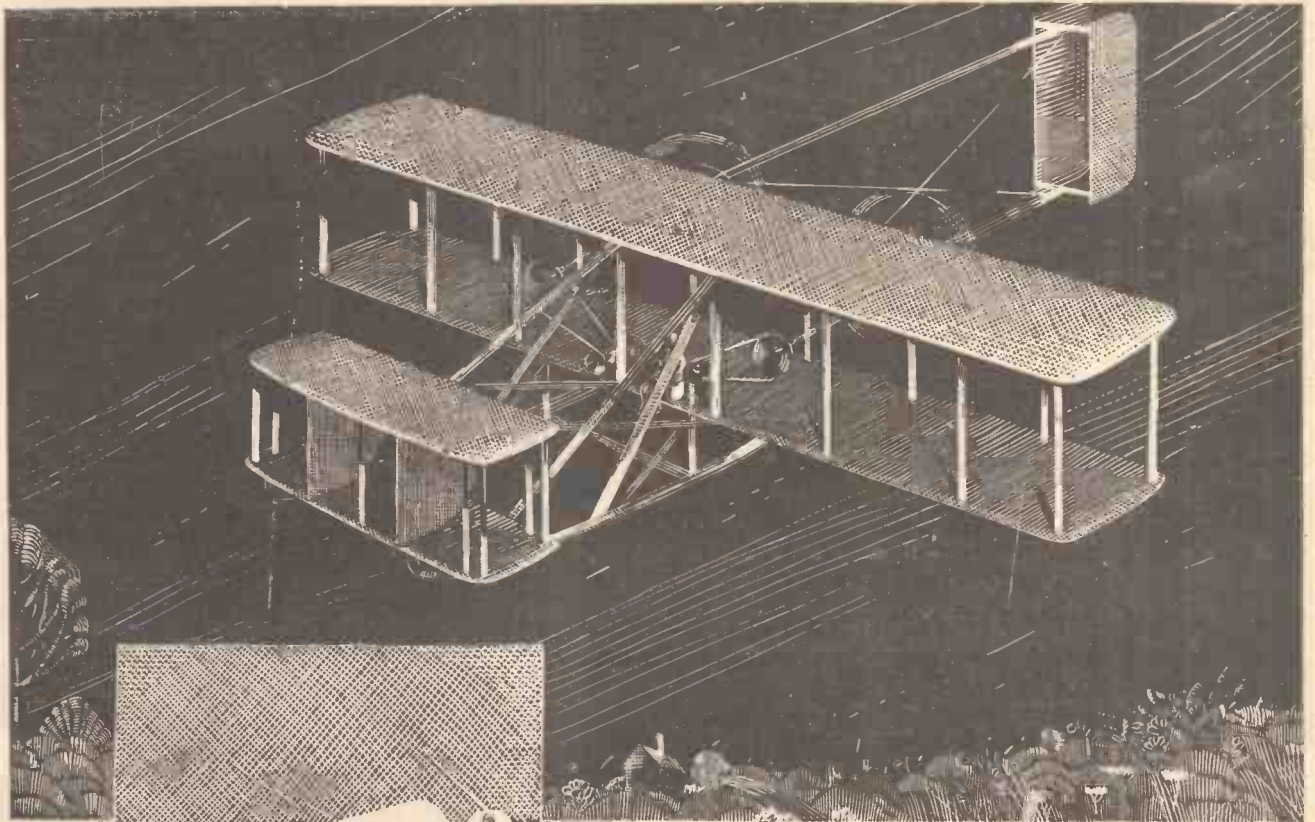


The diagrams above show all the main dimensions of the cabinet. From left to right, they are: the front, the interior disposition, the back pieces, and an elevation of the side.



# ORVILLE and WILBUR WRIGHT

30 years ago, Orville and Wilbur Wright made the first flight by Man in a "heavier than air" machine. Their triumph was the beginning of Man's conquest of the air. The whole history of aviation is an epic of sacrifice and triumph. Its tremendous advance is an example of what can be achieved by men who have faith in their beliefs and confidence in themselves. The advance of aviation is similar to the progress made by Dubilier over their 21 years of trading. Starting in a small way, unheralded and hardly known, they have, through sheer determination and perseverance, brought their products to a standard of efficiency and reliability that is the envy and admiration of the whole industry.



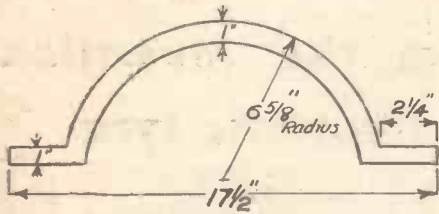
# DUBILIER

## CONDENSERS

DUBILIER CONDENSER CO. (1925) LTD. DUCON WORKS VICTORIA ROAD NORTH ACTON W.3

A Cabinet for  
THE C.R.T. VIEWER

(Continued from page 506.)



The top of the cabinet is provided with a domed piece, as indicated here, which covers the cathode-ray tube.

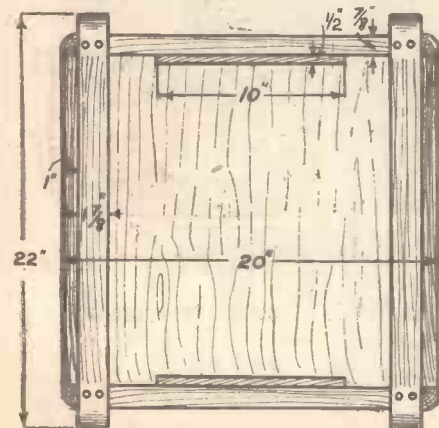
Each shelf should be made in two pieces so as to facilitate fitting and arranged that when the front half is level with the main part of the two front corner supports, and the back halves are flush with the main part of the rear corner supports, there is a gap between each section of the shelf of 1/2 in. or so. This allows for bringing leads down through each section of the cabinet to the section below or above.

Two brackets must now be fitted between the top shelf and the back corner supports in case the corner should pull away from the shelf supports and shelf.

The carrier for the cathode tube should now be constructed to the dimensions given, and it will be seen from the sketches that the front carrier is chamfered so as to give a good seating for the tube.

The two halves of the carrier are nailed to two strips of 3/8-in. ply ready for fixing to the underside of the final two topmost side supports of the framework; these pieces are 19 1/2 in. x 3 in. x 1 in. Actually

SEEN FROM BELOW



A "worm's-eye-view" diagram that shows the fitting of the "runners" and other important details.

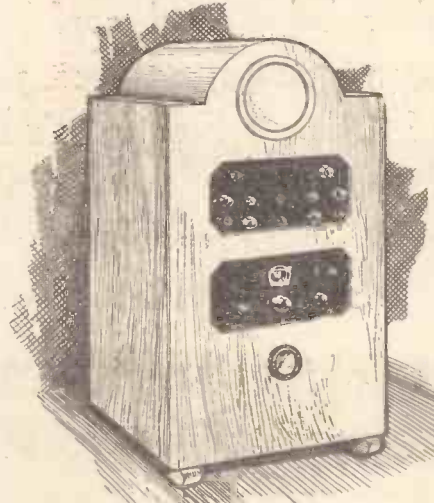
these two top pieces are arranged to come centrally inside the corner supports, but are not nailed between as in the case of the top shelf support.

The sections for the shelves should now be fitted into position—with the exception of the back half of the lower shelf which is to carry the accumulators.

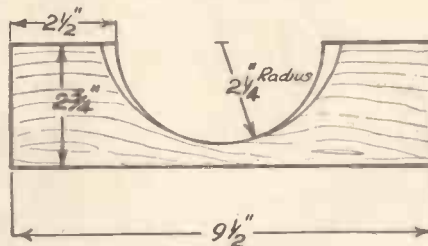
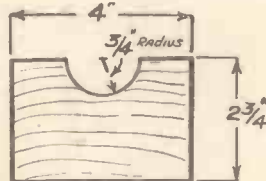
The next operation is to cut and fit the three bridge pieces which support the domed top of the cabinet, and it is essential that these are cut and fitted with great care if the dome is to be free from "bumps."

In the case of the centre arch it will be necessary to cut the top side supports so as to allow the bridge end to come flush with

HOW IT WILL LOOK



A sketch of the completed cabinet with the tube and the units in place.



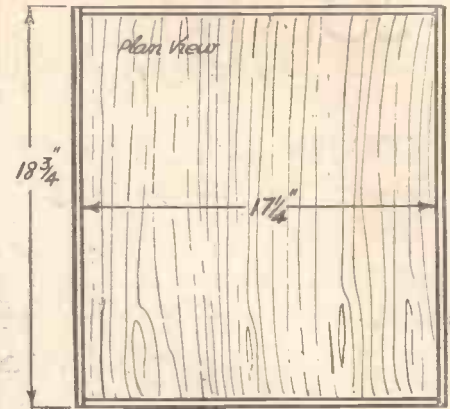
The tube itself rests upon two wooden supports cut out as above.

the top edge of these two supports. The back and front arch ends fit into the space left between the ends of the side supports and the edge of the corner moulding.

The skeleton framework should now be quite rigid, and must be examined to make quite sure that this is so; if not, then an extra nail or screw or another bracket will do the trick.

Until the arches are in position it is advisable not to remove the temporary pieces of wood referred to above; in any case the back piece should not be removed until the 18 in. x 2 in. x 3/4 in. strut is fitted between the two back corner supports and the brackets are in position.

CONSTRUCTION OF DRAWER



The size and construction of the battery drawer is illustrated in this diagram.

Now for the fitting of the actual dome, which consists of 1 1/2-m.m. birch bending ply, for it may be bent dry, obviating the need for steaming. The dome panel should be cut to the correct width, 20 1/2 in., and also to the correct length. Due, however, to slight errors, differences in the thickness of the wood, etc., the actual length has been purposely omitted. It can, however, be easily taken by means of a piece of string or a flexible steel rule. It would also be advisable to check the distance between the outside arches before cutting. The above material is quite easily cut with scissors or a razor blade, since it is only 1 1/2 m.m. thick.

Completing the Top.

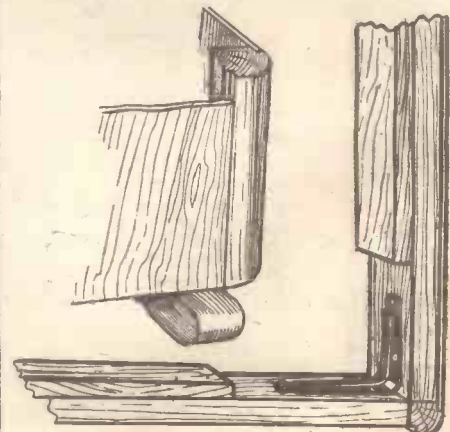
The ply is held in position by means of 1/2-in. veneer pins, although a little glue is an advantage. To make quite sure that there are no "bumps," the ply should first be nailed to the centre of the arches and then marked down to the base of the arches.

Two 1/2-in. wide strips of the above 1 1/2-m.m. ply are glued over the front and back edges to prevent splitting. Two top panels of 4-m.m. ply are now cut to fit between the edge of the dome and the extremity of the sides, i.e. including the rebate of the corner moulding. And do not forget to chamfer the edges of the panels where these meet the dome.

There are several types and classes of plywood which can be used for the front, sides and back; but whether this is faced

(Continued on page 511.)

JOINING THE CORNERS



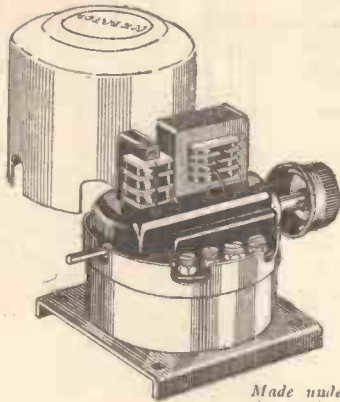
Metal brackets strengthen the corners while a moulding improves appearance where the sides join the front or back.



# COLVERN FERROCART COILS

COLVERN . . . . .  
always associated  
with all that is best  
in radio frequency  
coils.

FERROCART Coils  
are synonymous for  
outstanding select-  
ivity, compactness  
and efficiency.



Made under  
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the patentee,  
Hans Vogt.

TYPES F1 F2 F3

For single S.G.H.F. stage  
receivers

**37'6** per set.

Mounted on sub base with ganged wave change switches.

TYPES F10 F11 F12 F13

Suitable for 2 S.G.H.F. stage  
receivers

**50'-** per set.

**COLVERN LIMITED,**  
**ROMFORD, ESSEX**

London Wholesale Depot, 150, King's Cross Rd., W.C.1

# A

s startling in its  
effects as the invention  
of the pneumatic tyre

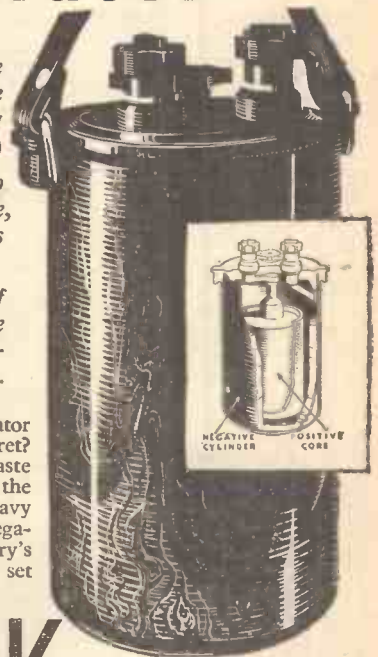


Suddenly, one day, motor-car speeds were doubled—  
pneumatic tyres had arrived, making comfortable  
speed possible at last. How people stared!  
To-day, in radio, double-capacity accumulators have  
arrived—a revolution no less far-reaching—

## the plate-less accumulator

- ① No bigger than the ordinary 40 a.h. type — yet each charge lasts twice as long (capacity 80 a.h.)
- ② Much longer life, too — no plates to buckle, nor can the plates disintegrate.
- ③ A lovely cylinder of coloured bakelite instead of a lumbering glass "box".

THE new accumulator means double value. The secret? No plates! Thus — no waste weight, no interference with the charging of the paste. No heavy casing needed, either—the negative electrode is itself the battery's container! Modernise your set with one to-day!



# BLOCK

plate-less  
accumulators

2. 80 AMP. 11'6<sup>D</sup>.  
v. HRS.

BLOCK BATTERIES LTD., ABBEY RD., BARKING, ESSEX.

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TAS/Bb.38.

Player's  
Please  
Everyone



## FROM THE TECHNICAL EDITOR'S NOTE BOOK

TESTED  
AND  
FOUND?

## CONCERNING SWITCHING

THE main title appearing on this page is not a misnomer. As a matter of fact, I keep quite a lot of notebooks, although there is only the one which deals specifically with components.

And on turning over its rather dog-eared leaves, some of which are disgracefully discoloured by acid spots and flux, I note that, on the whole, it is the gadget and the smaller aspects of the larger articles which claim the greatest amount of space.

But that is not surprising. A minor fault in an otherwise perfect article is relatively more important than a similar article badly designed and badly made throughout. The latter is dismissed at once. It is useless to waste time on it. On the other hand, the nearly-but-not-quite perfect component merits close attention, and any constructive criticism which one may be able to offer the manufacturer.

The same broad principle, the importance of the small thing, meets us at every turn. Indeed, it is curious how seriously it can influence us. It almost seems as though the human mind can react readily against major disturbances, disappointments, calamities and tragedies and yet be terribly buffeted by trivialities.

## Perfection in Detail.

In radio we constantly find ourselves worrying over minor discrepancies in sets at the same time that we are tolerating big shortcomings.

Maybe it is because, whereas we philosophically accept the greater as being quite inevitable, we are irritated beyond measure by the feeling that the lesser simply should not be.

For example, we might sigh rather regretfully if our purse would not run to the kind of speaker we consider our set deserved, but we should listen tolerantly to the pretty good (but not straight line) performance of the best instrument we could afford. Possibly we would even be proud of it.

But if the on-off or wave-change switch caused a bad crackling every time it was operated, and, perhaps, at other times as well, or if it acted stoddily and wearily, we'd be very annoyed.

And in that the switch must to many others be one of "the small things which matter," I here and now extend a very hearty welcome to the Bulgin Quick Make-and-Break Push-Pull type.

Here is a switch for lovers of mechanical ingenuity and advocates of efficiency to rhapsodise over.



An ingenious switch of the Q.M.B. type made by Bulgin.

Obviously, it is a switch which will carry a large current if necessary. But at 1s. 2d. the 2-point and 2s. the 3-point, it cannot be said that it carries a high price! Perfection in switches goes a long way towards removing the irritation caused by what we may call mechanical defects, and would often be welcome at almost any cost. Messrs. Bulgin deserve the thanks of all radio enthusiasts for making such perfection so economical.

## MODERN COMPONENT CASES

Bakelite is an entirely modern material. Even if it had been thought of during the last century, it is doubtful if it could have been made satisfactorily, for it is largely a machine product.

In its early stages it is a powder, and the moulding is accomplished by heat and great pressure. The result is a very strong substance having a beautifully smooth finish and first-class electrical properties.

Bakelite is, in fact, an almost perfect material for many radio purposes, particularly - it strongly resists temperature and other climatic variations.

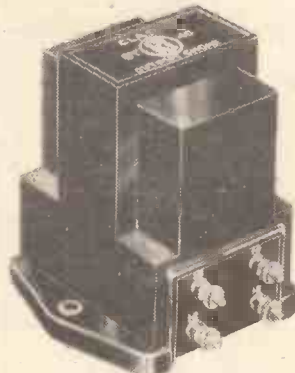
Among the best examples of bakelite moulding that I have encountered are those used by Radio Instruments, Ltd., for the casings of their components.

An R.I. moulding is distinctive for its flawless surface and knife-edge cleanness at all angles and edges.

Their latest type exhibits these qualities to exceptional advantage because of its modernistic, cubist design.

This one (it is illustrated on this page) is being employed for the R.I. multi-ratio "Class B" transformer, types D.Y.37 and D.Y.38, and for the R.I. "Class B" Output Choke D.Y.40, all of which were formerly supplied unshrouded.

It is a fitting casing for these modern and efficient components.



The R.I. "Class B" Output Choke in its handsome new case.

## A GOOD PICK-UP

I do not think any other radio device can be so hopelessly unsatisfactory as a pick-up. There are good ones, of course, but the bad ones are often so very bad; probably this is due to an absence of authoritative literature on the design of pick-ups, with the result that the lesser-informed manufacturers produce forlorn inventions of poorly conceived loudspeaker units.

As an ordinary listener who listens in regularly, I've come to regard a week's listening as being especially good if it contains a few out-of-the-ordinary items. The opening of the Monetary and Economic Conference at South Kensington was the sort of thing we don't often get. There was, first and foremost, the King's opening speech relayed to the world.

There is always something mighty—almost almighty—suggested to my mind by a relay to the world.

I have similar feelings when I listen to the King. And it is the same, to a less degree, perhaps, when I listen to other celebrities.

There may be something childish about these experiences of mine, although I don't know why I should call them childish. The fact remains, I have still a vivid sense of wonder.

The development of broadcasting, I am certain, has helped, particularly during the last few years,

## THE LISTENER'S NOTEBOOK

Frank comments on recent programmes, and on microphone personalities of the moment.

conversation between Maynard Keynes (in London) and Walter Lippmann (in New York). The subject-matter of their conversation was in itself sufficient reason for my wanting to hear them. But Keynes is a big name, and although I have heard him before over the air, I wanted to hear him again.

I recall with what excitement I tuned in to hear Mr. J. B. Priestley's first talk some weeks ago now. Although, as the weeks passed this excitement has diminished, I must confess that Mr. Priestley can still command my attention. I enjoyed his last talk

(Continued on next page.)



The type 33 Blue Spot Pick-up.

or 60 to the ounce, which ensures that the Pick-up will follow faithfully the heaviest modern electrical recording.

"The damping is designed and carried into execution in such a manner as to avoid minor resonance peaks, and being light will not cause undue record wear which in itself is a very important feature.

"The frequency response covers the whole musical scale from 30 to well over 4,000 cycles, giving brilliancy without needle scratch. This lack of surface noise is another excellent feature.

"The tracking is as near perfection as possible, the greatest deviation from a tangential path being only two degrees, and that on the extreme outside of a 12-inch record. The error on a 10-inch record never exceeds one and a half degrees.

"The self-contained volume control is wire wound, and must not be confused with a wire contact carbon resistance, and as a consequence will retain its accuracy indefinitely. It is so wound as to give equal steps of volume, and the whole movement is available for control purposes.

## Facts that Convince.

"The weight on the needle is correctly adjusted to give the best results and the Pick-up has been designed to use H.M.V. Loud Tone or Columbia 'Talkie' needles.

"The Pick-up head is made of non-resonating material while the movement itself is mounted on a substantial metal plate, ensuring permanent alignment of the movement and also screening it from disturbances due to an electric motor.

"The head also revolves to facilitate needle-changing and eliminates the risk of damage to records. Screened leads are provided, the screening being available for earthing purposes.

"Technical Details.—D.C. Resistance 2,900 ohms. Impedance at 1,000 cycles 15,000 ohms. Average output 1 volt R.M.S."

That, as you will have observed, contains more fact than eulogy and is, therefore, much more convincing than many publicity screeds we read nowadays.

The Blue Spot type 33 pick-up costs 35s. complete and is well worth that price. It is extremely well made and handsomely finished. Indeed, it is as handsome in appearance as it is attractive in its handling and performance.



## THE LISTENER'S NOTEBOOK

(Continued from previous page.)

on ordinary human happiness just as much as I did his first on human hatred.

By the way, here is something rather interesting. I tuned in a trifle late, i.e. about 9.22 p.m. (I am prone to do this sort of thing). Later in the evening, a friend of mine dropped in. He was returning from a function at which a number of literary people had been present (not in London, I may say).

To my question, "Who was there?" he mentioned, among others, Priestley's name. "Impossible!" I said. "For this is Priestley's night at Broadcasting House."

I inquired into this strange phenomenon and discovered that the announcer, in introducing the talk, regretted that Mr. Priestley was unable to be present in the studio to give his weekly talk, but that this was being reproduced from a record.

Apparently, I had unknowingly listened to a record. In other words I had been fooled. But the more I think of it, the more sure I am that there wasn't the smallest indication that I was listening to a record, and not Mr. Priestley.

Neither did the talk lose any of its appeal, nor the "ego" any of its excessiveness. I like Mr. Priestley's egotism, by the way. Some people don't.

I am interested to know whether the talk would have been as real to me had I known it was being reproduced from a record. It may have been, though I am inclined to think that if this sort of thing were regularly practised, it wouldn't. I like to hear personalities, especially when, if we hear them first-hand, such small imperfections as coughing are contributory factors to the talk.

Do you remember his Majesty's little cough in his broadcast message to the nation last Christmas?

Mr. James Agate recently apologised to us for his hoarse croak, and craved our indulgence, before his Edith Evans talk. I am sure he needn't have done so, for he didn't croak untidily.

Even if he did, providing the talk was easily audible, it would have been enhanced by the touch of realism added by the croak.

The opening ceremony of the new Compton organ at Broadcasting House was another unusual event. This new instrument will satisfy a much-needed want.

Lovers of organ music, especially those who differentiate between cathedral and cinema organs, will be particularly satisfied. Personally, I hope the organ will dispense cathedral music primarily, as cathedral organs, owing to their environment, are supposed to have failed as broadcast instruments.

Cinema music we have in plenty, and very good it is, for those who like it. And I do!

Obviously, appreciation or the reverse of any fare depends largely on the listener's mood at the time he hears it. Clearly, I wasn't in the mood for best appreciating Saki's witty epigrams with which he stuffed his pre-war comedy of manners, "The Watched Pot." Frankly, I was bored by those long stretches of conversation right at the beginning of the comedy.

The action seemed an eternity getting under way. From start to finish I fought against a strong desire to switch-off.

I confess with shame that I lost in the struggle, though I firmly believe that had I listened to the first of the broadcasts, beginning at 8 p.m., instead of the last, which began at 9.35 p.m., I would have listened to and enjoyed it all; 9.35—11 p.m. is rather late for a play of this sort.

## A CABINET FOR THE C.R.T. VIEWER

(Continued from page 508.)

ply or solid it is essential that the thickness should be only 4 m.m. otherwise the ply will not fit snugly into the grooves of the corner moulding.

Before actually cutting the front and sides make quite certain that your particular dimensions in regard to height and width agree with those given for the various parts, since only a slight difference in the making of the skeleton will have resulted in a different height or width for the panels.

The door of 4 m.m. ply at the rear of the cabinet is in two pieces, both of which are held in position by small leaf buttons. Hinges are hardly necessary.

The front and side panels are now fixed into position by means of 5/8-in. veneer pins. These pins are also used to fix the side and front panels to the various side, crosspieces, etc., thus preventing "bulging" at the centre of the panels.

The 5-in. high battery box should now be constructed from 3/4-in. plywood, and every care taken to ensure that this is well constructed, since this contains the nine 120-volt high-tension batteries.

Along the back of the case are fitted eight Belling & Lee type "B" terminals, and also a special double-pole tumbler switch (Crabtree type 3230), which controls the 700-volts H.T. to the cathode tube.

The battery box should be constructed and completed with the necessary batteries and packing pieces placed between the batteries to prevent them from moving.

The various terminals are arranged in pairs and leads taken to the appropriate battery tapping from these terminals, and in series with each negative terminal arrange a 60 m.a. fuse. This should be in the form of a Wanderfuse.

### Inserting the Tube.

The rear half of the lower shelf carrying the accumulators should be fitted with small fillets of wood so as to form stays for the accumulators.

At the same time arrange on the right-hand side of the board one of the new three gang Bulgin Q.M.B. switches (S.80B.). This ganged switch controls the two diodes and thyatrons' accumulators.

A 6-in. diameter 4-m.m. thick ply ring should be cut with an external diameter of 7 in., stained and polished, and after the cabinet has been completed glued into position with a narrow ring of black velvet underneath so as to form a surround for the cathode tube.

If on inserting the cathode tube from the front of the cabinet it is found that the tube does not sit securely in the carrier, glue a strip of thin felt on the inner face of the front carrier and, leaving one foot or so at either end, tie the felt over the top of the tube, and this will hold the tube firmly in position.

The receiver may now be placed on the lower shelf and fixed into position, and the "time-base" on the upper shelf, the accumulator shelf is placed in position, and also the high-tension battery box.

## ECKERSLEY EXPLAINS

(Continued from page 500.)

One of the best articles on the presentation of scientific papers I have ever read appeared in their last issue.

Lastly, and for those who perhaps do not want nor have the time for the mastery of the whole subject, let me recommend the study of our popular technical papers. Papers like POPULAR WIRELESS and "Modern Wireless" are doing really good work.

I have heard it said that I lose caste by writing popular technical journalism. That, of course, is just silly.

A man who, knowing a great deal, feels it beneath his dignity to try to help others to a greater enjoyment of their enthusiasms is just a conceited and, moreover, probably incompetent ass.

Read, then, the text books; plunge, in parallel, into advanced wireless books, surround the subject by an appreciation of its politics and history, keep up to date in terms of the journals of learned societies and of societies of practising engineers, flavour the whole by the absorption of the technical papers, and "you'll be an engineer, my son!"

# PILOT AUTHOR KITS

Exact to Specification

CASH—C.O.D.—H.P.

## NO-GAP THREE KIT "A"

SEND 8/6

Author's Kit of First Specified Parts, including ready-drilled panel, but less valves and cabinet. Cash or C.O.D., £4.14.0

ONLY Balance in 11 monthly payments of 8/6.

## ACCESSORIES

Set of Specified Valves .. .. £1.15.6  
2 Utility "Mite" 0005-mfd. condensers with vernier .. .. 13.0  
1 R.I. Hypermite L.F. Transformer .. .. 12.6

## THIS YEAR'S ECONOMY THREE KIT "A"

Delivered Carriage Paid on First Payment of 5/3

Author's Kit of First Specified Parts, including ready-drilled panel, but less Valves and Cabinet. CASH or C.O.D. Carriage Paid, £2/17/9.

Balance in 11 monthly payments of 5/3

Set of Specified Valves .. .. £1.12.3  
Peto-Scott Cabinet .. .. 15.0

## BRITAIN'S FINEST WALNUT RADIOGRAM CABINET



38 in. high, 22 in. wide, 15 1/2 in. deep. Speaker Compartment; 17 in. by 19 in. by 14 in.

YOURS FOR 8/3

### 1933 ADAPTAGRAM

Direct from Factory. NO MIDDLEMAN'S PROFITS. Built by master-craftsmen of the piano trade. Real inlaid walnut, mortised, tenoned, French polished. With motor-board ready to take your set, speaker and power equipment. Plain front or vigneted panels, 14 in. by 7 in., 16 in. by 7 in., 18 in. by 8 in. Baffle-board, 3/6 extra. SEND FOR LISTS.

As illustrated, Cash or C.O.D. Carriage 2/6 extra. Or 8/3 Deposit and 11 monthly payments of 5/3 (Carriage paid).

63/-

NO OAK OR MAHOGANY—NO EXTRA.

**LISSEN ALL-ELECTRIC SKYSCRAPER** 3. Complete with 4 Valves and Constructional Chart in sealed Lissen carton. Cash or O.O.D. Carriage Paid, £7/12/6. Balance in 11 monthly payments of 14/8.

Send 14/8 only

**BLUE SPOT P.M. "CLASS B" MOVING-COIL SPEAKER**, 29 P.M., "Class B" with Input Transformer. Cash or O.O.D. Price, £1/12/6. Carriage Paid. Balance in 6 monthly payments of 5/2.

Send 5/2 only

**BLUE SPOT UNIT AND CHASSIS**. Type 99 P.M. Including matched transformer. Cash Price, £2/19/6. Balance in 11 monthly payments of 5/6.

Send 5/6 only

**ROLA PERMANENT-MAGNET MOVING-COIL SPEAKER P.6**. With Universal tapped input transformer. Cash Price, £2/9/6. Carriage Paid. Balance in 11 monthly payments of 4/6.

Send 4/6 only

**NEW ROLA P.5 (P.M.14) "CLASS B" MOVING-COIL SPEAKER**. With "Class B" input transformer, £1/12/6. Carriage Paid. Balance in 6 monthly payments of 5/2.

Send 5/2 only

**ATLAS ELIMINATOR**. Type A.C.244. Three Tappings. S.G., Detector and Power Output, 120 volts at 20 m/A. Cash or C.O.D., £2/19/6. Carriage Paid. Balance in 11 monthly payments of 5/6.

Send 5/6 only

**GARRARD INDUCTION GRAMO-PHONE MOTOR**. For A.C. Mains. Model 202. Mounted on 12-inch nickel motor plate with fully automatic electric starting and stopping switch. Cash Price, £2/10/0. Carriage Paid. Balance in 11 monthly payments of 4/7.

Send 4/7 only

**IMPORTANT** Parts, Kits, Miscellaneous Components, Finished Receivers or Accessories for Cash, C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid.

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# RECEIVERS

# of RENOWN



## THE NEW MARCONIPHONE MODEL "272"

A remarkable addition to an already famous range.

THE confidence which the Marconiphone Company have in their products is strikingly displayed by their decision to release the first of the 1934 range of receivers almost three months ahead of the radio exhibition.

By the time the show comes along, it is obvious that this new addition to an already famous range will have to compete with instruments of appreciably later design—at least, that is how it would appear at first sight.

### Performance and Price.

But from our own practical tests we find it easy to understand the reason for the early release, for in three or even in six months' time it is a pretty safe conjecture that there will be few sets to equal and certainly none to better the new "272" at, or anywhere near, the price.

From every point of view it is an instrument that will add to the laurels which Marconiphone have already earned by their unbroken chain of successful designs, and we congratulate them.

The reader may well have cause to wonder from what angle this new set has succeeded in arousing the enthusiasm of a technical staff to whom the testing of commercial sets—and many of them fine sets, too—is an everyday occurrence.

### Has all the Advantages.

The answer is very straightforward, and it is simply that here at last is a genuine attempt at producing a superheterodyne, possessing all the advantages of this method of reception with none of the parasitical disadvantages, at a price which is virtually within the reach of all.

This time last year nobody would have had cause to jib at paying 15 guineas for a perfectly straightforward all-electric three, and whatever the merits of such a design, it is common knowledge that it had its limitations. Now, with the advent of the "272," for the same figure you can obtain a set which, from the points of view of sensitivity, selectivity and quality is likely to satisfy even the most hardened critic.

After all, from the point of view of entertainment, there is a very definite limit to sensitivity, and once that limit has been passed the background level becomes so predominant that distant stations cease to have any real programme value at all. To obtain anything approaching decent quality

under such circumstances, it is usually necessary to resort to the volume control, so where is the advantage of increased sensitivity?

## A PARAGON OF EFFICIENCY



There are few sets at, or anywhere near, the price to equal in performance the new Marconiphone model "272."

### TECHNICAL

**GENERAL SPECIFICATION.**—A self-contained table-model superheterodyne for A.C. mains operation, 200/250 volts, 50-60 cycles.

**CIRCUIT DETAILS.**—Constant-peak band-pass input preceding screen-grid combined oscillator and first detector. This first "mixer" valve is transformer-coupled to a variable-mu intermediate-frequency amplifier, which is followed by a power-grid second detector. Output from this valve is fed to triple compensated auto-transformer coupling to indirectly heated power pentode. Fifth valve is the rectifier.

**CONTROL ARRANGEMENTS.**—All operating controls are placed at front of instrument, and are, from left to right, volume, tone, main tuning,

### Directly Calibrated-Dial.

In the new Marconiphone "272" the balance between sensitivity, selectivity and quality approaches about as near to the ideal as any set we have yet tested. You are not fettered to the local stations, and you can ring the changes on any one of thirty, forty, or even fifty different programmes with the greatest of ease.

Supposing you had never seen the set, and that without the slightest technical knowledge you were suddenly called upon to operate it. You would find that when you turned the knob marked tuning, a knife-edged pointer would move horizontally across the illuminated wide vision scale, crossing in its path of travel both the names and wavelength settings of dozens of different stations—names that are representative of all that is best in European broadcasting.

### Operating Skill Unnecessary.

That is purely mechanical ingenuity, yet it dispenses entirely with the need for operating skill in order to achieve successful results. You just turn the pointer to the station you want and, to all intents and purposes, automatically the set does the rest! Could anybody possibly go wrong?

Of course, there is provision for volume control. The powers and distances of foreign stations vary so tremendously that such a control is absolutely indispensable, but here again the "272" possesses a high-light, for the volume control is distortionless. At whatever setting you put it, the quality remains unimpaired.

### "Pianos that ARE Pianos."

And it is quality! Quality as near to the real thing as we shall know it for a long time to come. Voices that are all but human—pianos that are pianos—orchestras with a richness of tone-colour that puts over the personality and motive of the composer—in a word, *atmosphere!*

Imagine the delight of hearing your favourite records under such ideal conditions. Yet, why not? Provision is made in the design for the permanent connection of a pick-up, and it is but the work of a moment to make the necessary change-over.

The set works remarkably efficiently when used in conjunction with a mains aerial, and as an earth is not necessary, complete portability is thus obtained.

That dispenses with the necessity for extension

leads, although, as a matter of interest, the design is complete to the extent of having provision for the connection of extra loudspeakers—an adaptation that is easily accomplished.

Summed up, the new Marconiphone "272" sets a standard which, consistent with the number of valves employed, it would be difficult to better.

### SPECIFICATION

and four-position switch giving medium waves, long waves, "gram" and off positions. Tuning scale, consists of ingenious wide vision illuminated scale, which is traversed by vertical knife-edge moving horizontally over both station names and wavelengths.

**SPECIAL FEATURES.**—(1) High selectivity; (2) absence of second channel interference; (3) provision for mains aerial; (4) distortionless volume control; (5) tone-control device, and (6) provision for permanent connection of pick-up.

**PRICE.**—15 guineas.

**MAKERS.**—The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1.



# 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 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

### NEW WAVELENGTHS FOR BRITISH STATIONS.

Many readers have enquired how the deliberations of the Lucerne Conference will affect British wavelengths, so the following authoritative details obtained from the B.B.C. will be of special interest.

After five weeks' deliberations a wavelength plan for European broadcasting stations has now been accepted by a large majority of countries. The new "Plan de Lucerne" is embodied in a Convention which has been signed by twenty-seven countries.

(The delegates of seven countries—Finland, Greece, Holland, Hungary, Lithuania, Poland, and Sweden—have not signed the Convention, but it is anticipated that they will in fact adopt the wavelengths allocated to them.)

Since the last wavelength plan was drawn up at Prague in 1929, a large number of countries have started broadcasting. Their inclusion in the new plan has necessitated sacrifices, chiefly in the quality of the waves allotted to the older stations.

As far as Great Britain is concerned, the number of waves available will be the same, but in general the wavelengths are slightly lower than formerly.

Several of them, also, will have to be shared with distant countries. The actual wavelengths allotted to Great Britain are as follows:

KILOCYCLES PER SECOND	METRES
200	1,500
668	449.1
767	391.1
804	373.1
877	342.1
977	307.1
1013	296.2
1050	285.7
1122	267.4
1149	261.1
1474	203.5

The plan will come into force on January 15, 1934, and in due course a further statement will be issued as to the exact use to which the wavelengths allotted to Great Britain will be put.

### CURING HUM ON A MAINS SET BY EXTERNAL ALTERATIONS.

H. D. D. (Edgware, Middlesex).—"In an unguarded moment I bought one of those cheap American sets, and although it is not the utter snip that I thought it was, it is really not a bad bit of work. But the trouble is a bit of hum all the time.

"Do you think there is any simple way of tackling this without extra expense, and

without interfering with the internals? (The latter would be hopeless, as it is one of those bijou sets, too small to hold a screwdriver properly.)

"I say 'extra' expense advisedly, because I have a half-dozen condensers, of various capacities from .0001 to 1 mfd., and also an old choke and transformer that has got an intact secondary, which I thought might do for a choke. Any hopes?"

If the set has separate H.T. supply to the different valves, and the detector's H.T. can be reached externally, there is no reason why you should not try a little extra decoupling with the components you have on hand. It is quite likely that such a modification will remove the hum.

The idea is to break into the lead that supplies the detector, inserting the L.F. choke (or transformer secondary acting as a choke) at that point. Then join one side of a large fixed condenser to the set-side of the L.F. choke in question, and the other side of the condenser to earth on the set (or to the H.T. negative terminal, or other earthed point).

This will, very often completely remove every trace of a hum.

### CATHODE-RAY TELEVISION: HOW IT WORKS.

J. M. (W. Ealing, London, W.).—"I find the present series of articles on Television by means of the Cathode-Ray system extremely interesting. But I hope you will 'expand' the explanations, so that even those not versed in the subject will be able to follow what is meant by the terms used.

"For instance, 'scanning.' In my own mind I think of this as equivalent to the running of the film in a talkie.

"It seems to be an optical trick of putting on picture after picture, so quickly changing one for the next that the actual change itself is invisible; and all that is noticeable is the one scene, apparently constant, which forms the bulk of the picture; and (additional to the main picture background) any little variations in successive pictures, which will always 'stand out' as movement on the otherwise stationary effect.

"I hope you will see what I mean by that description, because I want to ask a further question (or, rather, series of questions).

"(a) Is this whole operation comprehensively called the scanning?"

"(b) Is the 'vertical scanning' from top to bottom all the time, or sometimes from bottom to top? And is one line a 'vertical scan,' or the thirty lines that go to one complete operation?"

"(c) On page 374 it says: 'It now remains to move the beam a definite distance to the left.' Does this mean that the horizontal scan always takes place from the right of the screen when looking at the screen?"

Your simile of the running of a talkie film is a good one to illustrate the term "scanning."

As you say, there is the main (stationary, because constantly repeated) picture as a background, the

(Continued on page 514.)

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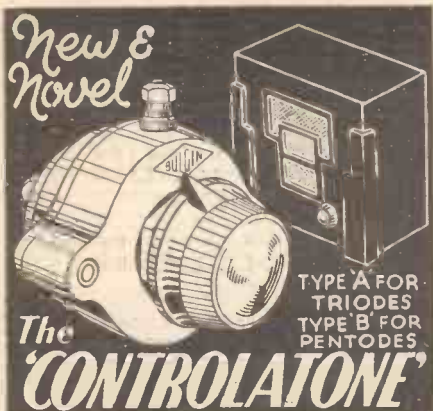
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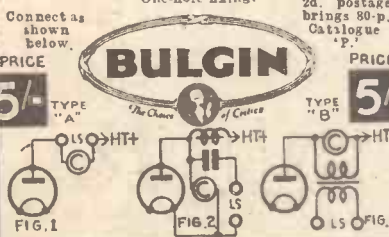




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**RADIOTORIAL**  
**QUESTIONS AND ANSWERS**

(Continued from page 513.)

small section of this which may be altering at the time the picture is transmitted being shown up as a movement, by means of slight differences in the successive pictures. But, whilst in a film successive pictures are complete, in television each picture must be "built-up" sectionally, from strips. And the whole complicated operation is called the scanning.

Regarding (b), this may vary with different systems, but the direction is always the same in any given picture being transmitted—i.e. always from top to bottom, or else always from bottom to top. In the television viewer now being described in "P.W." the picture is scanned vertically from bottom to top all the time.

The one complete vertical scanning of the picture in thirty vertical sections is generally and best referred to as "a complete vertical scan." So the vertical scanning of only one line of this thirty can be termed the vertical scan of a "section," or of a "slice." (In fact, the term "vertical slice" is most often used by those handling the cathode-ray television viewer, because it most succinctly expresses the operation.)

Regarding (c), the answer is yes. The operation must always be in the same direction in any given instance, and in this particular system it is always from the right (of the screen) to the left.

**THE ADVANTAGES OF AN S.G. STAGE FOR SHORT-WAVE SETS.**

T. L. (Bargoed).—"Is there any advantage in using an S.G. valve in front of the detector for short-wave reception? If so, I should be glad if you will furnish me with the description of the wiring for such an arrangement, or say where this can be obtained."

The advantages were aptly summed up by our short-wave expert, W. L. S., when he said recently that the finest preventive against threshold howl and hand-capacity effects is a stage of S.G.

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.

It does still more, in that it cures two other troubles, for which there is no other cure—dead spots from the aerial, and wobbly signals from a swinging aerial.

The S.G. stage is, in fact the perfect decoupler of the aerial from the set. Signals come through it but undesirable effects do not.

You will find a three-valve set, incorporating an S.G. stage with the foregoing advantages, described in "P.W." dated May 6th, 1933, under the title "The H.A.C. Short-Waver."

**ADDING AN R.C. STAGE TO A ONE-VALVE.**

T. D. C. (Shorncliff).—"My first venture into short waves has proved so interesting that I wish to launch out into the two-valve stage. At present I am using only one valve, with plug-in coils, and 'phones. The batteries are O.K. to stand up to another valve, so I want you to give me in words the alterations for an R.C. stage of L.F."

"The set is laid out on a baseboard, and at present the plate circuit wiring is as follows:

"Plate terminal of the valve holder to one side of the reaction coil holder, which on the other side is joined to the reaction condenser fixed plates and to the H.F. choke.

"One 'phone terminal goes to the H.T. +, and the other to the other side of H.F. choke, and across the 'phones there is a .001-mfd. condenser.

"I have in hand several good resistances, fixed condensers, etc. (list enclosed), and also good output choke which I should like to include, if it is advisable to have choke-coupling of loudspeaker on a short-wave set.

"If you will select appropriate values for resistances, condensers, etc., and give wiring in words, I can go straight ahead. But if new components are necessary or advisable, I don't mind running to them on your recommendation.

"The valve in use at the moment for detector is an H.L.2, and I thought of using either L.P.2 or P.220 for power valve, as I have both these on hand.

"Or do you prefer a pentode? (I would

rather not run this if it can be avoided, owing to the greater drain on the H.T.)"

The alterations are quite easy, and your components, valves and so forth are perfectly suitable to the purpose you have in mind. We should use either the L.P.2 or P.220, in preference to the pentode, as they are well able to give good magnification in the circuit we have in mind, and there is far less likelihood of very weak signals being lost in "background noise."

The alterations to your wiring will be the following: First, take away the 'phone terminals and 'phone condenser .001 mfd., and thus leave H.T. + and one end of the short-wave H.F. choke free.

Place the components where the wiring will be short and direct, and finish off the incomplete plate circuit wiring to leave the connections as detailed below:

That side of choke which formerly went to 'phones to a 70,000-ohms resistance and to a .002-mfd. fixed condenser.

Other side of 70,000-ohms resistance to one side of a 2-mfd. fixed condenser, and to one side of a 25,000-ohm resistance (fixed). Other side of this resistance to H.T. + terminal and to one end of output choke.

The remaining side of the 2-mfd. fixed condenser goes to the H.T. negative terminal, which takes also a connection to one of the new "output" terminals.

Connect the grid terminal of the new valve holder to the remaining terminal of the .002-mfd. fixed condenser, and one side of a 1-meg. grid leak. The other side of this must go to a G.B. - terminal. The corresponding G.B. + terminal will, of course, be connected to H.T. negative wiring.

The L.T. terminals of the valve holder will need to be joined in parallel with the corresponding terminals on the detector valve holder.

The plate terminal of the output valve holder must be connected to the remaining terminal of the output choke, and also to one side of a 2-mfd. fixed condenser. The other terminal of this will go to the remaining "output" terminal (to which loudspeaker or 'phones will be joined). This completes the necessary alterations.

**MILLIAMMETER CONNECTIONS.**

J. S. (Chichester).—"Does it hurt a milliammeter to be connected round the wrong way for a moment?"

"I am a bit nervous of altering the position of mine; but, trying it out the other night in an attempt to find out if the plate current of the L.F. amplifying stage was O.K., I joined up the + on meter to plate of the valve, and on touching the other (-) terminal with H.T. lead, I got a flick further over towards the zero mark, instead of a reading on the scale.

"This drew my attention to the fact that + on the meter was not next to + on the H.T. battery, and I altered round, when everything seemed O.K.

"So far as I can tell from comparison, the instrument is still in perfect condition, but I should like to know if it is likely to have suffered any damage.

"Also, when the meter is placed in the H.T. negative lead, instead of in the positive, as sometimes recommended, how can I remember the correct connections for it?"

"I always have to think hard, and then, in nervousness, go and connect up wrongly, as in the instance above. Is there a rule for remembering easily how the meter connections should go, whether it is put in the positive or the negative H.T. lead?"

First, as to the accidental connection of the - of meter to + of battery. This has apparently done no harm at all; but, of course, you must be careful not to do it again, as even the most robust milliammeter objects to being connected the wrong way round.

It is easy to remember the correct connections if you always think of the set with all components, valve, etc., as constituting a "resistance" in series with which the milliammeter will be connected across the H.T. battery.

Remember that the milliammeter terminals are marked to denote to which side of the battery they should be connected.

And if you think of the set, with its variously marked terminals, as being a resistance, you will soon realise that it does not matter whether the milliammeter is joined between the + of battery and this "resistance" (i.e. in H.T. + lead) or between the - of H.T. battery, and the set (i.e. in H.T. - lead), so long as the + of the instrument is kept towards + on the battery.

This, obviously, entails keeping - to -. And the rule holds good whether the milliammeter is in either lead between battery and set or inside the set itself. It is then merely equivalent to "tapping in" at some point in the resistance, keeping + towards +, and - towards - as before.



# TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

## Overloading.

WHEN you are using a pick-up with a power valve output stage which will not take more than a relatively small voltage up to say, 10 volts, there is a danger of the power valve being overloaded. It is well to remember that even a moderate pick-up will give an output of perhaps  $\frac{1}{2}$  volt, whilst a good pick-up will give an output of considerably over a volt.

When you bear in mind the very great amplification or voltage multiplication which takes place in a good amplifier you will see that this  $\frac{1}{2}$  volt or 1 volt may be turned into anything from 20 to 30 volts, sometimes a good deal more.

It is, therefore, important to fit a potentiometer so as to regulate the input voltage to the first amplifying stage (that is, the detector turned amplifier). The bias used need only be quite small, of the order of 1 volt, whilst the potentiometer should have a maximum resistance of, say, 50,000 ohms.

Some people use a higher maximum resistance than this, but, personally, I never think it necessary because in the majority of cases you will find that only a comparatively small part of this resistance is actually used.

## Output Voltage.

I should mention with regard to a pick-up that the voltage output from the pick-up depends upon a variety of conditions; it depends obviously upon the type of needle which you use, and also upon the type of record and even upon the individual passage. Indeed, it is largely by the variation of the voltage output (apart from question of audio-frequency) that the variations in loudness in the record are brought forth.

As regards the needle, you know well that you put in a "loud" needle for the specific object of getting a louder reproduction than with a "soft" needle, and this can only achieve its object by reason of the fact that when the loud needle is used the same pick-up gives a greater voltage output in the same conditions.

It is a debatable point whether the volume regulation should be made at the first stage, that is, at the pick-up itself, or whether it should be put in at the later stage in the amplifier. Many people believe that the best results are obtained by controlling the volume at the fountain head as it were, that is, directly at the pick-up.

## Lead-in Dodge.

A reader sends me a letter this week about a simple dodge which he has used for passing the lead-in from an outside aerial through the window or for passing over the earth lead to an outside earth. As you know, if you use a fairly stout wire passed over the window ledge the window will not shut down properly on it, which is a nuisance.

The little dodge that my correspondent mentions is this. He takes a number of fine

insulated wires, so small in diameter that one of them does not interfere with the shutting of the window, and he places a row of these, parallel to one another, spaced at about half an inch apart. He then lays a strip of insulating tape across the lot and tacks this down carefully at points intermediate between each pair of wires.

The inner ends of the wires are then soldered together and the same with the outer ends of the wires. If this is the earth lead, the combined outer ends of the wires are joined, of course, to the lead running into the earth, and at the inner ends connection is made to the earth terminal of the set.

It amounts, in fact, to spreading out the individual wires of one cable so that they lie flat instead of being bunched together when they go under the window. A similar result can be obtained by using a piece of thin copper foil or indeed any metal foil, which can be secured under the window frame in the same way.

## Atmospheric Absorption.

Since wireless waves travel at something like 186,000 miles a second they will take about three minutes to reach Mars. It has been estimated that the greatest loss in the energy of the signals will take place when passing through the atmospheres of the two planets, assuming Mars to have an atmosphere. Out in space, or "free ether," as it is sometimes called, the radio signals should rip along with very little attenuation.

It has been suggested that for a test in sending messages to Mars a spot on the earth should be chosen for the transmitter that makes Mars appear directly overhead at the time. This means that the radio signals have the least distance to travel through our atmosphere, whilst we might perhaps hope that the Martian would be equally smart and put his receiver at a point which makes the earth appear directly overhead to him.

## The Traffic Cop.

I do not know how many of you have tried a radio set in the car—I mean, having it actually working while the car is running, as distinct from taking it out into the country to use on a picnic, or so on. If you have not tried it, you ought to do so. It certainly relieves the monotony of a long journey, and the only question is whether it is apt to distract the attention of the driver from his job.

At any rate, it is very nice for the passengers in the car and the driver has to learn to turn a deaf ear to it when necessary. If the bobby stops you for failing to obey a signal you might plead that you were listening to "Waltzes from Vienna," or something like that; but I don't suppose that will get you very far.

## Shields.

I have often noticed that people don't realise the difference between an electrostatic shield or screen and one which is intended to keep in stray electro-magnetic effects.

Most ordinary screens are, of course, of the electrostatic variety and are intended to screen electrical effects. For practical purposes almost any thin metallic or other good conducting sheet will do for this purpose, which is the reason why aluminium is so generally employed.

(Continued on next page.)

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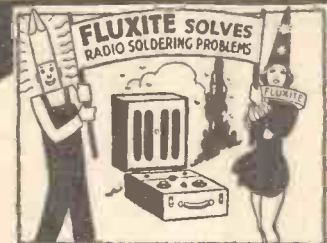
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## TECHNICAL NOTES

(Continued from previous page.)

Some people, however, use aluminium sheet for electro-magnetic shielding, such as the screening of a choke or transformer, or even a mains unit. In so far as this shields any stray electrostatic effect, it is, of course, quite all right, but it is practically useless for shielding stray electro-magnetic effects. Stray electro-magnetism is much more difficult to screen than the stray electrical effect.

### Magnetic Strays.

For this purpose you want a magnetic material and this also should be much thicker than a corresponding metal sheet for electrostatic shielding. Ordinary iron sheet will serve the purpose and, for want of anything better, even so-called "tin-plate" will do. But you get a much better shielding effect by using several sheets together, instead of a single one.

This is an important point of difference. For electrostatic shielding, providing the electrical resistance of the sheet of aluminium is low enough, there is no point in using more than one sheet, but for electro-magnetic shielding there is a definite advantage in using several sheets instead of one thin sheet. Of course, a single thick sheet is better than a single thin one, but several thin sheets are better than a thick sheet of equivalent thickness.

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### A Queer Effect.

You will sometimes find with a mains set that although you get good reception on distant or weak stations you will get an annoying loud hum on nearby or powerful stations. You may get hum from various causes, but if the hum differentiates, as it were, between loud and weak signals, it is probably due to an interference between the signal and the ripple left over in the D.C. current delivered by the unit in the set.

It can be generally got over by connecting a pair of condensers in series with one another across the leads to the anodes of the rectifying valve, if such is used, the centre point of the two condensers being connected to earth. Instead of two separate condensers a three-terminal double condenser may be used, the centre terminal being earthed. These condensers should have a value of about one-tenth of a microfarad each.

### Watch the Condensers.

You might also try connecting a pair of condensers in the same way across the mains input leads to the unit in the set, or even across the main input leads to the set. In such a case the condensers may be of a smaller value, say .01 microfarad each. The insulation of the condensers should be of good quality, as any short circuit in them means a short of the mains to earth.

### Multi-Mu.

Now that the multi-mu valve has become so popular, and is still increasing in popularity, many people hesitate about buying or making a set employing this type of valve because they are afraid that it will in turn be superseded in a very short time. I have actually heard people say that the day of the ordinary screen-grid valve is already over. Personally, I think this is a great mistake because the screen-grid valve fills, and will continue to fill, a place which cannot be altogether taken by the variable-mu. Screen-grid valves, for instance, may quite well take a permanent place in super-heterodyne receivers.

### The S.G. Type.

It is interesting to speculate on the possible uses of a valve of the screen-grid type—although necessarily modified in design—for the purposes of low-frequency amplification and, as you know, the screen-grid valve may be used as a detector; I said something about the use of the screen-grid detector in these Notes some little time back.

Several readers have asked me from time to time why the screen-grid type should be confined to high-frequency amplification and the pentode valve to low-frequency amplification and that to the output stage.

### A Question of Development.

In point of fact, there is no fundamental reason why these valves should be confined to these particular purposes, and it seems to me to be purely a question of development, which you must admit is pretty rapid in radio matters.

Before long I have no doubt we shall see something of the screen-grid type adapted for low-frequency amplification, and already the pentode is being used for high-frequency work. As a matter of fact, readers will remember that the first multi-mu H.F. pentode receiver was fully described recently in POPULAR WIRELESS.

### Compact Layout.

If you compare the layout of a modern set with that of a set built say seven or eight years ago (if you can lay your hands on such) you are bound to be impressed with the extraordinary compactness which has been introduced into set design and layout during these recent years. It is truly amazing the way different components, which at one time would have been thought to interfere hopelessly with one another, can be put together literally like sardines in a tin.

But if you are building up your set you want to be extremely careful not to overdo this passion for compactness. The first and foremost essential in the set is efficiency in working and, if compactness interferes with efficiency, cut out the compactness, just as they say, if business interferes with pleasure, cut out the business.

### Watch the H.F. End.

The importance of spacing and layout is generally much greater at the high-frequency end of the set, where H.F. components and conductors must be properly positioned and screened. Bear in mind that screens are always to be regarded as "absorbers," and the very fact that you use a screen means that there is energy to be absorbed, and consequently that losses will be sustained, so if you can spare a little extra space it is all in the interests of efficiency.



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## RADIO NOTES & NEWS

**OPEN CONFESSION  
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**Sleep, Pretty Listener, Sleep!**

**MAJOR GLADSTONE MURRAY**, speaking of his recent visit to America, is reported to have said of American broadcasting that it has "a certain briskness of presentation." Yes! Split seconds and "Hello, folks!" Major Murray also states that he was able to emphasise the "sense of repose" created by the British system of announcing.

I had not noticed the sense of repose, but if it is there it is superfluous, because some of the programmes produce all the somnolence we require!

**The Biggest Ever.**

**HIS MAJESTY'S** address of welcome to the Economic Conference was transmitted by landline telephone to every European country.

It was radiated over these islands (including Bardsey and Canvey). It was projected by beam radio to Canada, S. Africa, S. America, India, Egypt and Japan. Australia and New Zealand got a broadcast of a gramophone record of the speech, and in the U.S.A. two hundred stations spread it over that country. The biggest thing done in radio, I should say.

**Special Concert for Short-Wavers.**

**MR. LESLIE W. ORTON**, Hon. President of the Anglo-American Radio and Television Society, tells me that on July 2nd Radio Normandie broadcast a concert dedicated to that society and the International DX-ers' Alliance.

This event was scheduled for 1 a.m. to 1.39 a.m., and if any of you were tempted to stay up and listen to it will you kindly send a report on your reception to Mr. Orton, Kingsthorpe, Willowbank, Uxbridge?

**Secret of 49 Metres.**

**MR. ORTON** has let me into a secret concerning the reception of stations on 49 metres, a wavelength which frightens a lot of people. His discovery is that 5 a.m. is the most favourable time, and he recommends W—3 X A U, 2 X E, and 8 X K as the best to try for.

Naturally, no amateur with human thimble in his veins—I nearly wrote vanes!—would dream of leaving his bed at 5 a.m. All one has to do is bring the telephones within reach of the bed, wake up, and switch on to America. (I wouldn't do it myself unless well paid for the job!)

**B.B.C. to Foster the Museum Habit.**

**IT** is good to visit museums occasionally. Sometimes when I am feeling unduly bumptious I take a *dekk* at the British Museum mummies, and come out in a proper, humble, state of mind.

Therefore I am glad that the B.B.C. is doing a lot this summer, by its "talks," to interest the public in museums. It is really

\*-----\*

**Absolutely  
 THE FIRST SET  
 TO USE THE NEW  
 PERMEABILITY  
 TUNING**

is described in this number of  
 "Popular Wireless"! (Page 528).  
 Read all about this astonishing  
 innovation in tuning methods.

\* \* \*

Long-heralded in the Technical  
 Press, Permeability Tuning has  
 hitherto been universally regarded  
 as an interesting **POSSIBILITY**—

\* \* \*

But now the first design is ex-  
 clusively presented by "Popular  
 Wireless," and Permeability  
 Tuning is an

**ACCOMPLISHED FACT**

\*-----\*

amazing what some of these severe-looking institutions have tucked away in their glass cases.

Sixty-two museums are co-operating with the B.B.C. to make this effort a success.

**Remote Control.**

**ANYONE** desiring circumstantial evidence that man has a destiny nobler than merely to rub along more or less precariously on this infinitesimal speck of the universe might do worse than consider the most striking bit of impudence which humans have perpetrated this year.

I refer to the opening of the Century of Progress Exposition in Chicago recently by means of light received from the star *Arcturus*, which is about forty "light years" distant from earth.

**A Long Long Trail.**

**SOME** of the light from our remote friend *Arcturus*, which has been travelling to us at 186,000 miles per second since the year before the Tower Bridge was opened, without breaking its journey, was concentrated by a large telescope and allowed to fall on a photo-electric cell—possibly a selenium cell—and by this agency operated mechanism which switched on the illuminations of the grounds and buildings amidst the acclamations of the crowds. Interesting things, photo-electric cells! Ever played with one?

**London Goes to Ireland.**

**ON** July 18th the Belfast station will broadcast a very unusual event—namely, the visit of the Lord Mayor of London to Londonderry for the purpose of declaring the new bridge over the River Foyle open. For the first time a Lord Mayor of London will visit Ireland in state, complete with Sheriffs and gold coach, and the reason is to be found about 300 years ago, when Londonderry was first formed as a county and was presented to the Corporation of London for administration.

**A Query Answered.**

**IN** reply to Mr. Self's letter in our issue of June 17th, Mr. E. Tarplee, of Stratford House, Linden Road, Gloucester, states that in the U.S.A. someone publishes a monthly called "What's on the Air." Mr. Tarplee offers to lend Mr. Self the March (1931) copy, so that the address of the publisher, price, etc., may be noted. Mr. T. claims to be one of my "Valve Baronets" and he certainly acts like one of that noble order.

I trust that if Mr. S. takes advantage of his offer he will return the magazine like the gentleman that he is. Many thanks also to others who have written helpfully on this subject.

**New Book on Wireless.**

**MR. R. N. VYVYAN**, late Engineer-in-Chief of the Marconi Company, has just published a book, "Wireless Over Thirty Years," much of its contents being written from first-hand knowledge, for the author was with Marconi's for thirty-two years.

*(Continued on next page.)*



# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

Every phase of radio history is dealt with in language which the general reader can understand, many amusing and interesting incidents are described and a lot of "secret history" is revealed.

I recommend this book because its writer devoted his professional life to wireless and knows what he is writing about, because it is an admirable résumé of the development of wireless in every branch, and because it contains a frank, useful chapter on "Wireless as a Career."

## The Voice of Democracy.

**W**OULD you believe it? In the U.S.A., according to the American Radio Relay League, some 30,000 amateur radio transmitters are at work. In 1932 over a million messages were handled by this huge private system, involving the skilled labours of over twenty thousand operators.

One wonders what all those messages amounted to—all told! In the language of Shakespeare, translated by Will Rogers—"Woids, woids, woids!"

## Open Confession.

**A** KINDLY correspondent asks how I came to be connected with radio.

The merest matter of chance, my dear old "P.W." chap! Dragged from a scientific calling into a ghastly semi-family business connected with insurance, I developed chronic cat—catarrhh—er—a perpetual code id der dose. Life was just a series of wet hankies!

Some brilliant doctor said, "Go to a warmer climate." So I went to India, Malaya, China and so forth, doing radio.

Escaped from Spain to join in the Great War doings. No time for colds since 1918.

## Notes on the "Duke."

**DUKE** ELLINGTON, whose first names are Edward Kennedy, is a thirty-years' old negro, born in Washington, U.S.A. He was trained as a commercial artist, but (unfortunately, I think) preferred music, and so eventually became a composer and conductor. Judging from what I heard last month when his band broadcast, he no longer prefers music, but something which, as he remarked, was "forged from the very white heat of our sorrows. . . ."

It is all a matter of taste, I suppose, but as an heir of Handel, Mozart, and Schubert, and a contemporary of Delius and Elgar, I cannot be bothered with the tom-tom and Uncle Tom hullabaloo of negroes.

## A Remarkable Conversion.

**A**ND nothing to do with Gypsy Smith or the Salvation Army, though I honour them both. No, I refer to an article in that brighter and breezier and better-every-month magazine, the "Wireless Constructor" (July).

If the idea of converting your ordinary "broadcast" receiver cheaply and simply

into a short-wave superhet, appeals to you, here is the mag. for your money—if sixpence is money and not petty cash. The same number describes a Victor King "Double Pentode Three" and contains an article by John Scott-Taggart, entitled "What is Electricity?" which alone is worth more than the cost of the whole book.

## Too Broadminded.

**I** THINK that Mr. Rivera, the Mexican artist who was painting some of the walls inside the New York Rockefeller Centre ("Radio City"), asked a little too much tolerance of his millionaire patron when he included a portrait of Lenin. He was very politely asked to substitute the features of an unknown man; he refused, and was paid off on the spot.

I admire his "cheek" but not his obstinacy, for it was a business deal—and "the customer is always right."



## SHORT WAVES

A wedding party has listened to a gramophone record of a kiss of an absent relative. Little elaboration of this idea would be necessary to enable those who yearn for affection to turn on the loud-kisser.—"Punch."

"Portable sets are coming in," we read in a contemporary.

We always thought they were the kind that were taken out.

Orpheus of old could make a tree or a stone move with his music.

But there are quite a few wireless sets to-day that have made whole families move.

America is discarding the use of the word "loudspeaker" in favour of the word "enunciator."

We understand that the term "loudspeaker" is being reserved for domestic uses only.

1st Wireless Fan: I got South America last night.

2nd Wireless Fan: Really? Did you hear anything interesting?

1st Wireless Fan: Well, I couldn't quite make it all out, but I think it was a regatta on the Amazon.

## B.B.C.-AUSTIC.

The Fed-up Second at Boxing Match (to waltzing warriors): Hoi! Shall I switch on Henry Hall?—"The Sketch."

## Jubbo Continues.

**I** AM now definitely decided that the name of my puzzling correspondent is Jubbo; Tubbs and Fubbs out of the running. And yet—can it be? I should hate to believe so!

In my Notes for May 20th I narrowed down the complaint to his loudspeaker, eliminating the piano-tuner, etc. But I see now that the piano-tuner was not so irrelevant as I had supposed, because Mr. Jubbo's complaint is that his loud-



speaker is flat. Influence of the piano-tuner at once obvious.

If I were Mr. J. I should discount the tuner's criticism, for his kind are notoriously dogmatic and hypercritical. They would cock a supercilious ear at Gabriel's horn on the Day of Judgment.

## "Coal Causes Crackles"

**T**HIS subject continues to cause correspondence to collect here. E.W.A. (Grays) suspects collusion between the "earth" lead and the stove. E.H.J. (Bolton) goes all scientific and propounds this theory: The red-hot cinders are covered with a layer of partly-ionised carbon monoxide and carbon dioxide, which are electrically conductive. "Consequently small thermo-electric currents are set up, with the poker as one electrode and the hot gases as the other. When poker and cinders touch, small sparks pass, and the resultant H.F. impulses are passed via the stream of hot gases to the hot-water system and thence to 'earth' lead and set."

At this point I ask Dr. Roberts to give us his explanation—lest we burst.

## Ye Olde English Shoppe.

**L**AST year I reported with gusto that I had seen "Ye Old Wireless Shoppe" on a sign, and I have now discovered another charmingly anachronistic radio showroom at Amesbury.

An old English raftered room, fitted with an old English gas (or electric) fire, and adorned with an old English photograph of Marconi, is graced by an old English maiden, aged about eighteen. An old English loudspeaker stands on the mantelshelf, and old English radio sets, "Mark 1933," are displayed here and there. All that is lacking is a set to which Queen Elizabeth listened!



## Summer Sundays.

**I** HEAR disquieting rumours about future Sunday programmes during the summer, to the effect that there will be no alternative programmes. Can this be part of a plot to get us to join the unco' guid? Sometimes I wish that I could wake up and find jolly old Priestley the boss of the B.B.C.

In these days of broadmindedness it ought to be realised that Saturday and Sunday should be the great days of broadcasting, in the interests of the toiling millions to whom the week-end is an oasis in a desert. Does the B.B.C. really want us to turn into a nation of foreign-listening super-hettters?

## "P.W." Knocks Spots Off.

**J.** W.C. (Hanwell, W.) hands us a testimonial for our "H.A.C." Short Waver. He has been building short-wave sets since 1926, and has purchased a £34 S.W. set from a firm well known for its S.W. sets, yet he swears by the "H.A.C.," which he says "knocks spots off it."

Praise indeed! He gets Australia! Is that not good enough for anybody?





# FOR YOUR CAR: The TRAVELVOX

HOW often it happens that a not-to-be-missed sports commentary or similar tit-bit is broadcast on a cloudless and sunny Saturday afternoon when common-sense (not to mention one's family) dictates that a run down to the coast in the car is the obvious order for the day!

### Combined Pleasures.

The summer months have always been considered to be the "dead" months, as far as wireless listening is concerned. Long, light evenings, outdoor pastimes and weekends spent in the family car are attractions that urge the most enthusiastic of us to abandon the radio set, so that every moment of our all too brief English summer can be fully enjoyed.

In an effort to grapple with such crises as these, I tackled a problem of fitting a really satisfactory receiver to my car which would enable all the passengers to listen in comfort while indulging in the estimable pleasure of *being driven to the sea.*

The last phrase is important as well as cynical!

The "Travelvox"—which is the outcome of my efforts—functions equally well when the car is in motion as when it is at a standstill, and therefore completely fulfils the *desideratum* I have mentioned.

### Practical Points.

In this way the "Travelvox" supersedes the best of portables because, although we can listen to the programmes on the portable, we must certainly bring the car to a halt and switch off the engine, or the interference from the ignition system will ruin the reproduction.

So much for the more evident advantages of travelling the "Travelvox" way.

Here is a highly-efficient receiver which can be built into practically any car. The set itself is installed under the body of the car out of everybody's way, and is tuned from the dashboard, so that the programme can instantly be changed at will by the driver.

Designed and Described by  
**BERNARD BARNARD.**

Now let me deal with some of the more practical points.

Probably the most important is that the "Travelvox" can be fitted to any make of car.

As you will see from the heading photograph, my own car is no "juggernaut"; it is, in fact, a seven-horse-power baby car,

and I experienced no difficulty in installing the set within its somewhat limited confines without in any way interfering with the passenger accommodation.

### Remote Tuning Control.

The receiver measures 13 in. x 9 in. x 8 in. overall, and, in my case, I was able to stow it away under the rear seat, together with the batteries, and with the exception of the tuning dial and reaction knob on the dashboard and the speaker, there is no visible indication of the existence of the set.

The tuning control is worked from the dashboard by means of a Bowden cable (diagrams will be given next week); it is best to keep this as short as possible, both from the view-point of expense and ease of control, so that, if you find a convenient position for the set near to the dashboard, it is advisable to make use of it.

The two biggest difficulties which I had to contend with when designing the "Travelvox" were the overcoming of interference from the ignition system and obtaining sufficient sensitivity to enable good results to be obtained on the necessarily inefficient aerial arrangement.

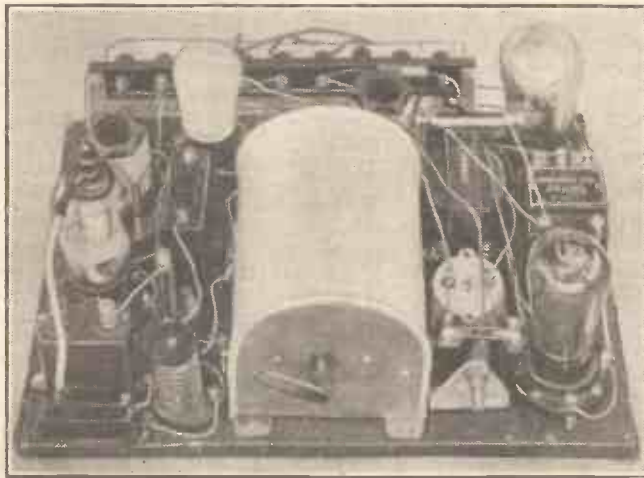
### Earthed to Chassis.

With regard to the suppression of interference, I shall deal with this matter in a further article next week, and it will not offer any serious difficulty to the constructor.

The aerial arrangement is poor because the metal structure of the car is used to "earth" the receiver. This means that the effective height of the aerial is measured by the average distance between the aerial wire

(Continued on next page.)

## ALMOST READY FOR THE ROAD



Virtually all the work has been completed, and the set is shown ready for the strong metal cover which is to enclose and protect it whilst on the road.

## YOUR GUIDE TO THE COMPONENTS FOR THE "TRAVELVOX"

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 Wooden baseboard, 13 in. x 9 in. x 1/2 in.	—	—	1 H.F. choke [former	Bulgin	Telsen
1 Sheet of tin for screening box 1 yd. square.	—	—	1 1:3 intervalve L.F. trans-	Igranit	Telsen
1 Twin-gang .0005 variable condenser (less drive)	Polar baby 2-gang	Utility, J.B.	1 "Class B" input trans-former	Varley	Benjamin, R.I., Wearits
1 .0003-mfd. differential reaction condenser	Telsen	Polar, Lotus	1 Miniature tumbler switch	Bulgin	—
1 .0003-mfd. fixed condenser	Dubilier	T.C.C., Telsen, Lissen	3 4-pin anti-microphonic valveholders	W.B.	Telsen, Lotus
1 .0003-mfd. fixed condenser	Lissen	T.C.C., Telsen, Dubilier	1 7-pin valveholder	Ferranti	—
1 2-mfd. fixed condenser	Telsen	Dubilier, Lissen, T.C.C.	1 Geared drive	Ormondi "Mid-get"	—
1 2-mfd. fixed condenser	Dubilier	Lissen, T.C.C., Telsen	1 10,000-ohm variable resistance	Lewcos	Igranit
1 .006-mfd. fixed condenser	Dubilier	Telsen	1 Terminal strip	—	—
1 30,000-ohm resistor	Graham Farish	Dubilier	9 Terminals	Belling Lee	—
1 60,000-ohm resistor, with holder	Graham Farish	—	Suitable length Bowden 3mm. cable (see text)	—	—
1 2-megohm resistor	Dubilier	Lissen, Graham Farish	Wire, flex, screws, etc.	—	—
2 Unscreened coils	Lissentype LN5314	—	Loudspeaker	Rola special "Class B"	Celestion, Epoch, R. & A. ("Class B" types)
1 H.F. choke	Wearits	Telsen			

## THE "TRAVELVOX"

(Continued from previous page.)

and any metal parts of the car that are close to it.

Because of this, I have had to resort to many dodges to enhance the sensitivity of the set.

### Testing the Set.

Look at the circuit diagram you will see that four valves are employed.

A screened-grid H.F. stage, followed by a leaky-grid detector, driver valve, and "Class B" output.

## "TRAVELVOX" VALVES

Make	S.G.	Detector	Driver	Class "B" Output
Mullard	P.M.12	P.M.1H.L.	P.M.2A.	P.M.2B.
Cossor	220S.G.	210H.F.	220P.A.	240B.
Mazda	S.G.215	H.L.2	P.220	P.D.220
Marconi	S.22	H.L.210	L.P.2	—
Osram	S.22	H.L.210	L.P.2	—
Eta	B.Y.6	B.Y.2020	B.W.1304	—
Hivac	S.G.210	H.L.210	—	—
Ferranti	—	—	—	H.P.2

No provision has been made for long-wave reception.

The omission was made for two very good reasons.

Firstly, it is desirable where remote control is concerned to keep the number of controls down to the irreducible minimum; and, secondly, the receiver would be very insensitive on the long band when operating on such a very inefficient aerial.

The baseboard layout is important.

The arrangement shown in the illustrations allows a certain amount of inter-stage

coupling and inherent reaction, and should be closely copied.

In regard to this, it is important to mention that when you have finished wiring the set and are ready to test out, you should not couple it up to an ordinary aerial.

On anything like a full-sized aerial the set will oscillate uncontrollably and be extremely unselective.

To test out the set, it is only necessary to join about 4 ft. of flex to the aerial terminal and connect the earth terminal to the metal sheet that covers the bottom of the baseboard.

This will give a fairly close replica of working conditions, and will enable you to gang up the two condensers and make any other adjustments that may be necessary.

Under these circumstances, the operation of the receiver will be normal if all is well from the constructional point of view. Full volume from the local station will be obtained with very little reaction.

Incidentally, the ganging will be fairly critical under these conditions; and it is, of course, very important that the two tuned circuits are accurately ganged. Tune in to a fairly weak signal and manoeuvre the trimmer nearest the front until maximum strength is obtained.

### Arranging the Aerial.

You may now fix on the metal cover, which completely screens the receiver.

This metal cover can be made up from sheet tin (the dimensions will be given next week), or a strong metal-lined wooden box can be substituted, if desired. Complete screening is necessary in order to prevent interference pick-up by the set itself.

The storing of batteries should not present any difficulty; a normal capacity H.T. battery can be used, since the receiver is very economical, and a small unspillable 2-volt accumulator will supply the filament needs.

With regard to the aerial and earth system, a saloon car with a fabric body will permit of a fairly efficient aerial wire being run round the roof of the car. I have found that a "Pix" invisible aerial gives excellent results under these conditions, and has the additional advantage of being inconspicuous.

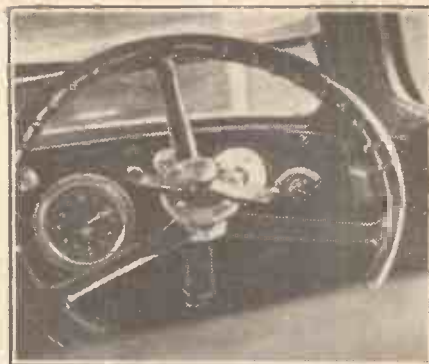
With a metal body, however, it will be found that the screening effect of the body panels renders such an arrangement impossible, and, as in the case of my car, some other device must be resorted to.

I have used two lengths of insulated aerial wire slung between the front and rear axle, properly insulated at both ends and allowed to hang loose so as to clear the metal parts under the car.

### Good Joints Required.

The set is earthed to the car chassis, and the last of the conditions which may be described as unusual and which call for

## DASHBOARD TUNING



By means of Bowden wire control the tuning is adjustable from the dashboard, and a tuning dial for this is seen just to the right of the steering column. A little further along is a variable resistance, the regulation of which enables the amount of reaction to be under instant control.

precautions is the excessive amount of vibration to which the receiver will be subjected.

Anti-microphonic valve holders are used wherever possible, in order to protect the valves.

It is most important that all joints are well made and very tight; if you are good at soldering, it is a good plan to solder all connections.

Next week full constructional diagrams will be given, together with instructions for fitting and operating the set.

## SHORTS IN SCREENED WIRING

An easily-overlooked source of trouble, but one which is simply remedied.

METAL braided sleeving, whether copper or iron, requires careful handling. Although the insulated sleeving is reasonably tough, it is fairly easily pierced by strands of the braiding under certain circumstances.

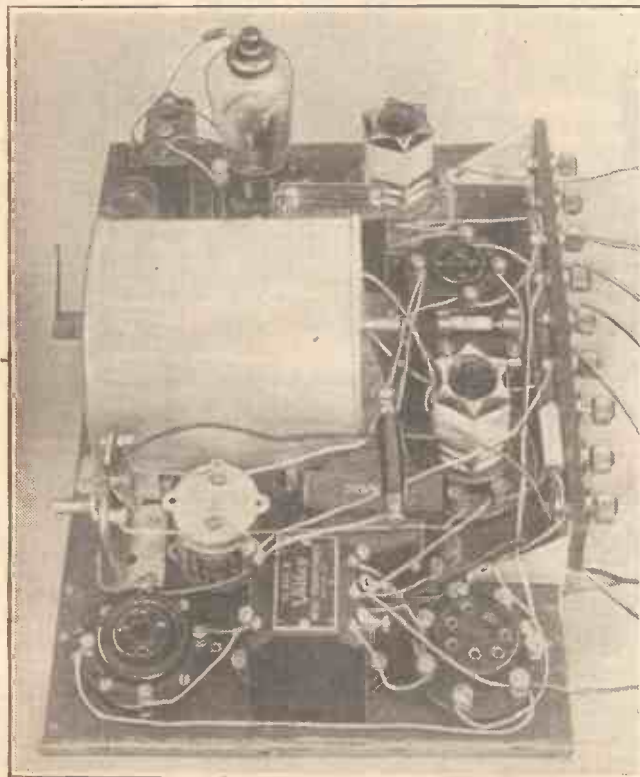
### A POINT TO WATCH



If the braiding is frayed there is always a danger of a short occurring, owing to accidental contact with one of the "whiskers."

It is advisable therefore to make quite sure when using this type of screened wire that the braiding is quite free to move along the insulated part, and that the outer casing is free from "whiskers." Always test for the possibility of a short before connecting up.

## A BASEBOARD CLOSE-UP



Nearly all the wiring is clearly visible. In the next article a full wiring diagram will be given, and it will be found that for all its novel features the set is very easy to build and install.





**W**ELCOME to a new step along the road of technical progress. So far our valves have brought "in one content, anode, grid and filament"; but the boundaries of the vacuum have been fragile glass.

Now the Marconi and G.E.C. laboratories have produced Catkin valves and nearly all the glass has gone—the outside of the containing vessel is made of metal.

I have a particularly sentimental regard for Catkin, because his father was Cat—C.A.T. gave the classification of the big water-cooled transmitting valves costing, sometimes, more than one hundred pounds each, of which we use, at once, fives and tens in the big broadcasting stations.

These water-cooled valves are nearly all metal and the receiving valves follow that example. The termination "kin" is obvious, because one C.A.T. is equal in volume to hundreds of C.A.T.kins.

The ordinary user will want to know what particular advantage it is to substitute metal for glass. Of course, the first advantage is an increased rigidity and a less liability to breakage.

**Sent Uncovered by Post.**

I understand a label was tied on to one of the new valves, and it was sent naked—except for its label—all the way to Aberdeen and all the way back again. No harm had come to it—it behaved electrically after its journey just as it had behaved before.

It might be whispered, however, that if it had been put loose in a box and so hidden from a sorter's sight, no one would have suspected fragility. But I doubt if a glass valve would have survived—rather fun to try!

Of course, there is some glass in the construction; Catkin has a glass neck, in fact, where the metal outer case is ingeniously sealed to the base.

But the valve, thanks to its construction, has, besides mechanical, certain electrical advantages. It does not give out to the loudspeaker the "pong" sound when struck by something hard; it adapts itself more easily to modern circuit design than do many other types.

**Value of Unbreakability.**

But wireless experimenters are not interested in all this "gup"; they will want to know exactly how these new valves will adapt themselves to modern circuit design, and if results will be materially improved by the use of such valves.

A wireless experimenter will at any rate appreciate the value of unbreakability.

(This one will! "Clumsy hands I have, when dawn breaks through my slumbers"—to tune of "Pale hands I love—")

The perfect valve with a perfect circuit does this:—

1. It has a zero input impedance;
2. It magnifies infinitely (if necessary), and its magnification is controllable

7. It is very small;
8. It has a perfect vacuum inside it;
9. It does not "pong."

Expanding this specification and referring it to Catkin, it must be realised that—1. is a very important point. Many people are led to believe that if negative is applied to the grid of a valve and if the signal voltage peak is less than the amount of negative so applied, then, because no current flows between grid and any other electrode, there is no waste of signal.

While all this is true up to a point, a valve has interelectrode capacity. Suppose this is one million-millionth of a Farad, nevertheless this is an impedance,

at a frequency of a million cycles, of 150,000 ohms (or johms!).

**Causing Miller Effect.**

This may be quite a big drag on the signal, not only as sheer capacity effect as such, but due to interelectrode voltage inductions which are magnified in the valve and cause what is known as Miller effect.

Now Catkin scores in having a lower effective interelectrode capacity than most valves, and so is more suitable than other valves for work where high frequencies and high-impedance grid input or anode output circuits are used.

2. The effective magnification of a Catkin type may be higher than the glass valves for reasons implicit in 1. A valve will not magnify without an associated circuit, the impedance of such a circuit must, to realise the theoretical magnification of the valve, be infinite.

**Produces Better Screening.**

But sometimes, if high-impedance external circuits are realised in practice the interelectrode valve capacity causes oscillation to be set up, however much the circuits themselves are isolated by screening. So that less interelectrode capacity means that higher impedance circuits may be used without fear of oscillation. Also, the all-metal anode produces better screening than even metallisation.

3. All valves are as good or as bad in this respect, irrespective of glass or metal containers.

4. Obviously, the anode being in contact with air it cools more easily than if shut up in a glass container, and so Catkin scores.

5. Catkin ought not to be used like this but it scores if used as a gentle missile!

6. Well—!

7. Quite well, thank you!

8. It is easier to make and keep a vacuum in a metal valve—one up to Catkin again.

9. Catkin "pongs" less.

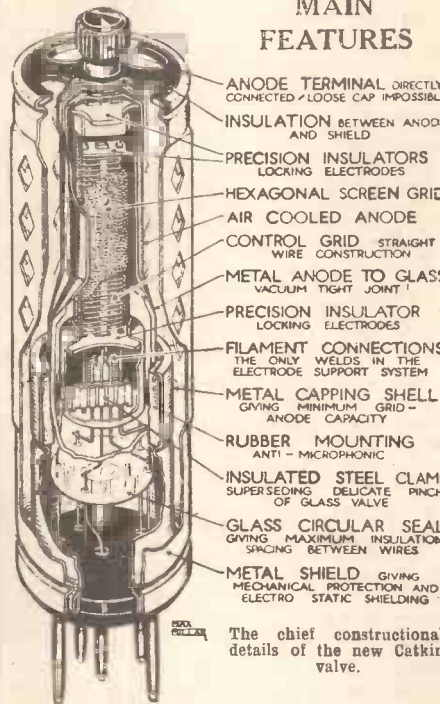
Ever since "P.W." published the first details of the Catkin valves, and the first set to employ them, readers have wondered how this radio development will affect future design, and their new receivers.

This authoritative summary of "Catkin" advantages by our Chief Radio Consultant is therefore a specially interesting and timely contribution.

without variation of its "distortion" characteristics;

3. It repeats in exact but magnified counterpart on its anode what is applied to its grid;
4. It functions without aid from any power from any outside source—or let

**MAIN FEATURES**



The chief constructional details of the new Catkin valve.

us not be quite silly, and say that it has a high-power efficiency;

5. It can be used as a missile without detriment to its electrical performance after functioning satisfactorily as a missile;
6. It costs nothing;



THE MIRROR OF THE B.B.C. By O. H. M.

## THE PROGRAMME BOARD

Henry Hall for America—More Changes—Tighter Discipline, etc.

IT is some years now since the Programme Board of the B.B.C. was dissolved. This was a committee of heads of programme departments which met weekly to plan programmes.

There was also the Control Board, a weekly meeting of heads of branches responsible for the day-to-day work of the business. Both have disappeared and have not been replaced.

Apparently about the only survival of the committee period is the Music Committee, which consists of members of the Music Department and manages to carry on. The reason for these changes is the cause of a good deal of speculation at Broadcasting House. Consultation appears to have yielded to direct order. Also the Board of Governors probably intervenes more than formerly. But, on the whole, the B.B.C. tends to become more an absolute dictatorship, paying less and less regard to opinion either inside or outside.

If the underlying judgment and principles are sound, this is probably the most efficient form of administration, but it is a form about which the average Britisher has misgivings.

Henry Hall for America.

Henry Hall has at last arranged to take a much-needed holiday. He is going to the United States in the autumn, and probably will be guest-conductor for some of the most famous American dance bands.

More Changes.

The appointment of Col. Dawney to be joint controller with Admiral Sir Charles Cappendale, which takes effect on October 1st, will be accompanied by a number of other important changes in the B.B.C. staff.

The feeling of the Governors is that it would be a good thing to import a generous dose of new blood, fading out several of those who have been in the service since the early days. There is also the idea that the B.B.C. is now free from all outside danger, and can afford to take a more definitely aggressive attitude against the entertainment industry.

It will be interesting to observe the development of the new attitude.

"The Buggins Family" Again.

Mabel Constanduros and Michael Hogan, in other words the "Buggins Family," are to be responsible for a programme called "Small Advertisements," which is to be broadcast to National and Regional listeners on Tuesday and Wednesday, July 11th and 12th respectively.

The idea of the programme is based upon

the adventurous experiences of a couple who place a "small ad." in a newspaper and receive two theatre tickets in return. Music for the show has been written by Ronald Hill.

Tighter Discipline.

The appointment of Mr. B. E. Nicolls as Director of Internal Administration has put greater emphasis on staff discipline at Broadcasting House. Punctuality is enforced strictly.

It is understood also that Mr. Nicolls contemplates a general overhauling of staff to ascertain if there are any not able to justify their jobs.

Summer Features in Scotland.

Scottish Broadcasting House is doing its best to maintain a summery atmosphere in its Regional programmes, and further relays in a regular series of broadcasts from seaside resorts will be heard from the Winter Gardens, Rothesay, on Friday, July 21st, and from Popplewell's production, "Gaiety Whirl," at Ayr, on the following evening.

The next week's programmes will include another broadcast of the annual Fair Holiday of a Glasgow family, under the title of "Doon the Watter."

## "ANOTHER SPOT OF BOTHER"



Clapham and Dwyer (on the right, Clapham standing) watch Tommy Handley taking a putt in a new style during a recent round of golf at Halifax.

Another Royal Broadcast.

It is hoped to broadcast the King's speech when he opens the new graving dock at Southampton on Wednesday, July 26th. A preliminary descriptive commentary of the scene will be given by Mr. Howard Marshall as part of the National programme.

The Hallé Society.

My recent note upon the successful negotiations between the B.B.C. and the Hallé Society has brought great satisfaction to the North, where for some time there has been considerable misapprehension as to what was likely to happen in musical circles.

Unfortunately most old-established and even long-cherished associations are appalled by new ideas, new principles, the changing times, if you like, and the North, with its love of and reputation for good music, has, quite frankly, been none too

(Continued on page 536.)

## THE LISTENER'S NOTEBOOK

Frank comments on recent programmes, and on microphone personalities of the moment.

IN the heyday of the old variety theatre and music-hall I used to think that certain artistes earned their money easily. And now, in the heyday of wireless variety, I still think the same.

I have in mind those single turns—both vocal and instrumental—which must have the theatre orchestra to support them. Without this support the turn would scarcely be worth listening to.

I was reminded of this in a variety hour recently. A girl whistled, and the orchestra under Kneale Kelley played to the whistling. It was beautiful playing, too, and the girl was applauded enthusiastically at the end. I hope some of the applause was meant for Kneale Kelley. We often tend to forget the magnitude of an orchestra's contribution to a turn.

It's the same with that other neglected individual who, sitting "at the piano," isn't always in the limelight.

Henri Leoni ought really to be a comedian with a name like his. When I first saw him billed to appear in a variety programme I thought it was just one of Leonard Henry's little jokes. No! Henri Leoni is certainly not Leonard Henry, but a really good tenor with a passion for little French love songs which he sings quite well.

He doesn't rely on an orchestral accompaniment to get his songs over, by the way. He's entirely self-supporting.

If you are fond of listening to an impersonator, tune in to the "White Coons" whenever they are on. Somebody in the small cast impersonates Norman Long, Flotsam and Jetsam, the Hulbert Bros. and the Buggins Family to the T.

I can't help feeling how superior the male members of the cast are to the rest. But a concert party, I suppose, is no concert party without the ladies.

We've heard a lot lately about what constitutes an ideal summer evening's programme. A number of suggestions has already been made, but, personally, I want nothing better than that recent evening's programme, beginning with a one-hour play dealing with real people and their too possible lives, followed by the news, J. B. Priestley on correspondence and, more particularly, correspondents, after which we had an hour of old-fashioned rhythms played by the B.B.C. Theatre Orchestra under Stanford Robinson.

Here was variety to perfection, each turn being a perfect exposition of its type. And what normal man wants more than this at a sitting?

Had the sitting begun with the Foundations at 6.30 p.m., I defy anyone to be in a proper mental state to enjoy the late evening items. Actually, I did have a dip at the Regional, because I wanted to hear that new organ make its bow as a new broadcaster. I wasn't impressed, however.

I'm afraid Joseph Jongen's sonata was more responsible for the impression I got than the organ itself. This sonata was an unfortunate choice for a début performance, I thought. Too much noise and too little music! But contemporary music concerts are partial to this sort of stuff. Witness in the same concert Bax's XVth Century Carol, "Of a Rose I Sing," sung by the Wireless Chorus. Not noise exactly here, but the weirdest harmonies, a taste for which can only be acquired.

One thing, however, struck me during the organ recital. Are we going to be able to listen to this instrument without having to be constantly regulating our sets?

The volume of sound at times was too terrific for anything. It had to be cut down. But at other times, when softer music was being played, another readjustment was necessary for this to be heard.

I believe that in orchestral concerts the heavier instruments are as far removed from the mike as possible. Is a similar effect possible with an organ?

Has Jack Payne given up those full-blooded choruses of his? Most of the numbers these days are solos of one sort or another. And how dreary they are, too! And when they are not dreary they are tuneless. Butcher boys won't have learnt anything new to whistle from Jack's fourteenth visit to Broadcasting House.

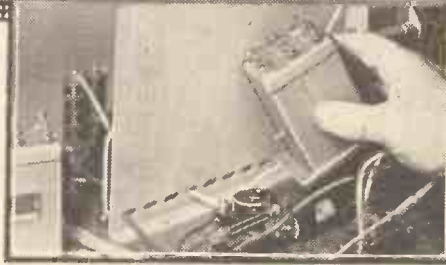
(Continued on page 536.)



# THE "NO-GAP" THREE IN ACTION

## HOW TO USE

### THE FIRST SET TO COVER ALL WAVELENGTHS FROM 160—2,000 METRES WITHOUT A BREAK



Last week we gave details and constructional diagrams of the first receiver to employ the new "No-gap" continuous-range coils. On this page you will find further information about this outstandingly modern set, and some notes on its operation.

By the "P.W." RESEARCH DEPARTMENT.

**C**ONTINUING our description of the first all-station receiver, using the new "No-gap" coils, we have to consider the actual construction of the set, and its operation.

Last week full details of the new Lewcos "No-gap" coils used in this set were given, and the undoubted advantages accruing from their use were discussed, it having been shown how greatly the station-getting properties of any set were enhanced by the new tuning system.

#### Easy Baseboard Construction.

The "No-gap" Three covers *all* wavelengths between 160 and 2,000 metres—that is it goes below and above the end stations on the official European broadcasting list. It does this by means of a three-way wavechange switch, enabling tuning to be carried out by an ordinary .0005-mfd. variable condenser, and bringing *all* wavelengths well inside the condenser scale. There are no "outside edge" responses that can only just be tuned in at, say, half a degree, or right on the upper limit of the dial.

Ordinary slow-motion condensers have been used in the design of the "No-gap" Three, the whole set being built on easy baseboard lines. As usual, the baseboard is covered with copper foil, which is used as a convenient earthing point for certain of the connections.

The two Lewcos coils are arranged so that the switch rods protrude through the panel just below the variable condenser tuning dials. They are a little higher than normal coil switches, because the Lewcos coils are built differently to facilitate chassis mounting if required.

A pre-set selectivity condenser control is used in the primary circuit of the first coil, and this can be set to give the desired degree of selectivity over whatever waveband is desirable. If desired, it can conveniently be mounted on the panel so that continuous control is achieved without the need for opening the lid of the cabinet. That, of course, is just a matter of personal taste.

#### Three-step Wavechange.

The circuit is the usual S.G., Det. and L.F. with shunt-fed tuned grid detector, and in practice it forms a very simple receiver to build. All the coil terminals are on the tops of the units, making them easily accessible.

The wiring diagram published last week gives full details for drilling and layout, so there is no need to go into the matter any

closer, as there are no snags whatever in the construction of the receiver.

The operation of the set is quite normal, in that tuning and reaction are carried out in the usual way, but it will seem peculiar at first that there are three positions instead of two for the wavechange switches.

Naturally the result is that the tuning is carried out in steps from 160 to 2,000 metres, the first being 160–450 metres, the second 350–850, and the third 750–2,000 metres. This results in certain wavelengths being duplicated, so that there is never any need to use the variable condenser below about 8 degrees, or within five degrees of the top of the scale. As explained last week, this is an important feature, for it greatly simplifies the tuning.

on the dials, of course, and at first you may be disconcerted at finding, say, London National higher up the scale than it is on two-band sets, but this slight variation from the present recognised state of reception will soon be regarded as quite normal.

#### Getting Fresh Programmes.

The "No-gap" Three will give a great deal of added pleasure in the fresh stations it will enable you to hear owing to its extended wave range, and the facility with which every wavelength can be covered from below the very lowest to above the highest broadcasting station is a most striking achievement.

As was mentioned before, high minimum capacity is one of the greatest causes of failure to "get down" on radio receivers, and many a good station has been lost because of this. Sometimes the trouble is mainly due to the design of the variable condenser in use, especially if it is of the ganged type; sometimes it is due to inefficient wiring—causing stray capacity. More often it is a combination of the two.

Whatever the immediate reason, however, the result can be disastrous, as correspondence from set constructors who have used inefficiently designed apparatus shows. "Why cannot I get lower than 240 metres?" is a typical complaint in such cases, and we have to tell the poor constructor that he must scrap quite a lot of his set, get certain new parts, perhaps alter the layout, and then re-wire.

#### No Need to Worry.

With the "No-gap" coils the question of minimum capacity does not come seriously into the picture. Not that a high minimum is desirable or even to be tolerated if it can be avoided; but there is no need with the Lewcos coils to worry about it to the same extent as with ordinary inductances, for one is certain to be able to "get well down" and to make sure of the lowest wave stations that are listed in the European broadcast tables.

At the top end of the medium range, too, the benefit of the new coils is felt, for with them we are assured of adequate wavelength coverage, even if the tuning condenser is a bit short in its maximum capacity. With many "ordinary" coils the top limit is very low when a "short-capacity" condenser is used. The Lewcos "No-gap" coils obviate this trouble by the overlap of wavelengths between the three ranges, so that we are assured of covering *all* the wavelengths throughout the whole gamut.

## WHERE THE RANGE COMES FROM



The unique Lewcos triple-range coils used in the "No-gap" Three are the outcome of these, which are two of the experimental types made during the development work. The production coils are not quite so tall, and the wavechange spindles come through higher up.

The London Regional, and a few stations round about his wavelength, will, of course, be found on both the bottom and middle range of the coils, the last overlapping being provided to allow for added minimum capacity in the wiring of the set, and also for the possibility of the tuning condensers being a bit below their rated value.

Apart from the unusual wavechanging the set is perfectly normal in operation. The pre-set condenser is set to give the desired degree of selectivity, while the slight tuning effect it has on the primary can often be put to good use in the reception of distant transmissions.

#### Stations Easy to Find.

The tuning of the "No-gap" coils is not critical, and no fears need be entertained that stations will be difficult to find. They will tune in at somewhat unusual readings



## FROM THE TECHNICAL EDITOR'S NOTE BOOK



## AN INEXPENSIVE TRANSFORMER

WE recently received for test an L.F. transformer from the Rawwood Electrical Co., of Preston New Road, Blackpool. This transformer is available in two ratios, 1 to 3 and 1 to 5. It is said to have a core of patently-treated silicon iron, and to be specially adapted for parallel-feed circuits.

In the direct connection in detector anode circuits the current must not exceed 5 milliamperes.

The component is small in size and is neatly enclosed by a well-moulded bakelite case. The terminals, which are plainly marked, are at the base. By the way, the marking is done at the top, so that it is easy to see when the transformer is mounted in the set. A good point that.

The price is 4s. 11d., and at this figure the Rawwood transformer merits the attention of constructors.

We tested it first in a parallel feed circuit and under these conditions it gave a very good performance, a performance out of proportion with its price.

In the direct connection it was still good, and provided an excellent illustration of the superiority of present-day radio values as compared with those of a few years ago.



The Rawwood L.F. Transformer.

The illustration of the superiority of present-day radio values as compared with those of a few years ago.

## NEW ELECTROLYTIC CONDENSERS

I was wondering when it was going to happen; and at last it has. And it is to T.C.C. I must pay my tribute as being the first firm to make (or, at least, to send me samples) of electrolytic condensers made to look like ordinary paper or mica types.

Of course, they are of the dry variety that will be obvious from the photo which shows that the two larger ones have feet for either horizontal or vertical mounting.

But I am not so pleased about the familiarity of



The T.C.C. Electrolytic Condensers.

general form adopted by these T.C.C. electrolytics as by the provision of normal terminals.

We have had rather a surfeit of one-terminal (or even tag) can types and packs, with wires stringing from them.

These are all very nice for many jobs, but we constructors and experimenters do like terminals, don't we?

To see a group of these new T.C.C.'s lying on the bench gives one the impression that they are a bunch of "common or garden"  $\frac{1}{2}$  and 1 mfd.

Whereas, in fact, each represents no less than 50 mfd. Of course, their familiarity of appearance must not lead you to suppose that they can be used as freely as ordinary condensers.

It is still necessary to connect them up the right way round and to keep the ratio of D.C. to A.C. across them fairly high.

However, they have many useful applications, especially in A.C. units and sets.

We have already employed these new T.C.C. condensers with complete success in several sets and in special laboratory apparatus. We find their leakage currents to be low and their general efficiency to be high.

## THE NEW IRON-CORED COILS

One of the most important radio developments of this year, perhaps the most important, is the introduction of the iron-cored tuning coil.

It is not in principle a new idea. For years it has been more or less generally realised that it would be highly advantageous if the winding of a tuning coil could be decreased in dimensions by the insertion of an iron core without introducing eddy current losses in the core.

The object of a core is, of course, to increase the inductances of the coil for a given size of winding and so increase its efficiency.

But there would have been no gain had not special methods of constructing the core been invented. These take the form of finely subdividing a special iron and treating it so that the small particles are insulated from each other.

Such is the success that has been achieved that a greater efficiency than can be obtained with large "low-loss" air coils is obtained with tiny constructions not much larger than small thimbles.

Well to the fore in this new development are our old friends Varley, who recently sent me a 3-gang model of their Ni-core coils as they style their iron-core types.

By the way, they inform me that they, Varley, as long ago as in 1926, produced some Constant Inductance Chokes, with powdered iron cores and,

## ULTRA-SHORT-WAVE TESTS IN YORKSHIRE

What the amateurs are doing in the North of England on 5 metres.

READERS of POPULAR WIRELESS have read of the amateur activities in the London area on ultra-short waves, and of the transmissions from the Crystal Palace in particular; news now comes of a remarkable outburst of enthusiasm in Yorkshire. Probably no provincial area could beat the Bradford district as a centre of short-wave activity just now. Transmissions on 5-metres wavelength and thereabouts are in progress almost daily.

Mr. J. H. Bateman (G6BX), of Queensbury, near Bradford, was the pioneer. The following amateur transmitters are now working on this fascinating waveband:

## Stations to Listen For.

G6BX, Mr. J. H. Bateman, Queensbury, Bradford.  
G6KU, Mr. C. A. Sharpe, Great Horton, Bradford.  
G5ZI, Mr. J. R. Tennessee, Thornbury, Bradford.  
G5VC, Mr. H. Longstaffe, Bank Street, Bradford.  
G5SZ, Mr. J. W. Riddiough, Tramere Park, Guiseley.  
G5HB, Mr. H. Bittcliffe, Great Horton, Bradford.  
G5XK, Mr. W. Sykes, Bradfield, Huddersfield.  
G6PL, Mr. F. Popplewell, Heckmondwike.  
G6AZ, Mr. E. English, Horsforth, Leeds.  
G2VO, Mr. A. Holmes, Conisley, Keighley.

These call-signs will be useful to listeners in Yorkshire who construct ultra-short wave sets and succeed in picking up the local transmissions. What can be done in that way is illustrated by the extra-

ordinarily, that it was the research of these chokes which proved the technique of the air-gap in chokes with laminated cores.

The Varley Ni-core Coils are to be marketed as Aerial and Tuned Grid (with reaction) and H.F. Intervalve Transformer with reaction at 10s. 6d. each, or in the neat and compact 3-gang assembly at 33s. There are self-contained waveband switches in each instance.



A Three-ganged Unit of the new Varley Ni-core Coils.

And it is interesting to note that the switch gear in any one of these coils, though by no means abnormally large, is by far the largest part of the assembly. That will give you a good idea of the smallness of these wonderful iron-cored coils.

We have been able to test the Ni-cores very thoroughly, and there can be no doubt at all as to their superiority. Both in point of selectivity and of power their effectiveness is at once apparent even in a simple test.

If there are any air-cored coils at all used in radio receiver tuning circuits this time a year or two hence, I shall be surprised. Certainly it will not be because these Varleys, for example, have failed to prove their claims if air is not displaced!

## "METOCEL" SCREENED AERIAL LEAD

Although they do not intend to cease manufacturing their successful "Golton" Bakelite Multiple Shell type Metal Screened Air-spaced Aerial Lead, Messrs. Ward and Goldstone have recently introduced a new type for sale at the popular price of 8d. per foot.

This is "Metocel," which is also a highly effective material.

It comprises a cellular rubber core, with a central hole for the wire, covered first with metal and then a protective fabric. This last is made with two finishes: (1) a polished glaze for inside use, and (2) a tough weatherproofing for outside use.

"Metocel" has the low self-capacity of only 20.1 micro-microfarads per foot.

It is also adequately flexible and has great physical strength.

When "Metocel" is used no lead-in tube is necessary.

ordinary achievement of Mr. Popplewell (G6PL), who received the Crystal Palace transmissions at Heckmondwike, thus establishing a world's long-distance record for ultra-short wave reception.

Working with each other the Yorkshire amateurs have succeeded in covering distances of from 10 to 20 miles, but of course the hilly nature of the district introduces many complications. A great amount of experimental work in connection with aerial design has been carried out, and methods have been devised of erecting the aerial at a high vantage point and using transmission lines of almost unlimited length.

## Radio on a Tramcar.

The Bradford Experimental Radio Society, which is behind all this activity, organised a field day on June 17th, when some interesting results were obtained on 5 metres. The members carrying portable receivers assembled first at Mr. Bateman's station, at Queensbury, and after tuning their sets to his transmission on G6BX they set off in various directions through the streets and over the adjoining moors to test the radiation. One party took to a tramcar and received the transmission on the top deck while the vehicle was in motion for a distance of over two miles from Queensbury. The country is of a rugged character in this neighbourhood, and several cases of reception being cut off by intervening hills were reported. For these tests the transmitter employed a power of 10 watts. Afterwards the field parties returned to G6BX, when a low-powered transmitter using 6 of a watt was tested.

Regular schedules are carried out every Sunday afternoon and every Monday, Thursday and Friday.

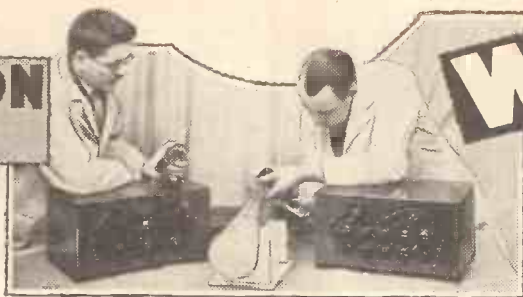
Many receiving stations are operating and different types of circuit have been tried. General opinion, however, favours the super-regeneration receiver using a separate valve as quencher. The superhet has been tried but dropped in favour of super-regeneration. The majority of receivers have been built in portable form.

L. W. B.



# P.W.'s TELEVISION VIEWER

By K. D. ROGERS,  
Chief of the "P.W."  
Research Department.



# WHAT OTHERS SAY

I SUPPOSE it was inevitable that the publication of details of the POPULAR WIRELESS Cathode Ray Television Viewer should attract a great deal of attention, not only of readers but of the various sections of the lay and technical press.

It was the first thing of its kind ever done, and the detailed description of an easy-to-build non-mechanical television receiving outfit was a step forward in radio that could hardly go unnoticed, or for that matter uncriticised.

### Tribute to the Experimenter.

The criticism has come from one quarter, and it has been carried out by behind-the-back whisperings of the vaguest character. I have already referred to it in these columns, and a complete answer for the benefit of those who may have heard it (it has not been published!) is being made in a following issue of "P.W." by our radio consultant, Dr. J. H. T. Roberts.

Apart from that piece of information I do not intend to devote further space to the subject; it is in itself too trivial a matter, but to the uninitiated, and untechnical mind, such as whence it sprung, it might give rise to completely erroneous presumptions. Hence Dr. Roberts' article on the subject.

Now let us turn to what has been said openly about our Cathode Ray Television Viewer. I have already quoted from Garry Allighan's report of a demonstration of the system in the "Evening Standard," but for the sake of those who did not see it, here is a brief excerpt in which he describes it as bringing for the first time "practical television reception within reach of every amateur experimenter in the country. It is to the amateur experimenter that the country should look for the ultimate triumph of television, as it was the amateur experimenters who were responsible for modern practical radio.

### Informed Opinion.

"The secret of good reception of television has now been discovered, but television has yet several years to go before it will have reached the same stage of perfection as radio."

As can be seen, Garry Allighan, who moves closer in radio circles than most radio critics and press correspondents, shares with us the firm conviction that the future success of television rests with the cathode ray method of reception, and he makes no bones about appraising the demonstration of it that he was given.

At this point I must in all fairness bring before the radio curtain Mr. T. Price of the Ediswan Valve Research Department, who has collaborated with us very closely in our tests, and to whom is due the Special Ediswan T. tube used in the viewer. He,

Our Cathode Ray Television scheme was such a big step forward in the science of television that it has attracted great attention from radio firms and the Press. This article deals with reports that have been published and with letters received from readers.

and the company he represents, must share the laurels that have been scattered forth.

Here is another report, this time from our technical contemporary, "The Wireless World," who describe the system as a "most promising method of reception," and hail it as ideal for the home-constructor. Follows the main portion of the report:

"Up to the present time most amateur constructors have been deterred from embarking on the reception of television by purely mechanical difficulties. Rotating mirror drums and similar devices, which must be run accurately in step, can hardly be set up in the home workshop.

### Lay and Technical Approval.

"The cathode ray system of reception has the advantage that there are absolutely no mechanical moving parts; the images are formed by controlling electrically the movements of a ray directed from the cathode on to the flattened end of the tube which forms a fluorescent screen. Synchronism is similarly ensured by electrical means.



### DEALING WITH OUR TELEVISION POST

We thank the many readers who have written to us in connection with our Cathode-Ray Television Viewer. Mr. Rogers is here seen dealing with a batch of these letters.

"Many technical workers consider that the perfected television apparatus of the future will employ a cathode ray tube; indeed, this opinion was expressed by the late Captain Swinton as long ago as 1908 . . .

It will be good news for British amateurs who are interested in this most promising method of reception to hear that the Ediswan Company have now

introduced a special tube for television purposes. Apart from this tube, practically no components other than those used in ordinary radio practice are needed for setting up a practical television receiver, which, as it requires a very small input, may be fed from any ordinary set."

The "Bournemouth Times" devoted two long columns to a description of the system, referring their readers to POPULAR WIRELESS for further details, and again hailing it as the keystone to perfect television. Here are two typical extracts:

"I have no hesitation in saying that this new television development is not only going to revolutionise the whole question of 'radio pictures' in this country, but will also prove the starting point for all future research in this direction.

### Demand for Demonstrations.

"I have been able to make a full examination of the apparatus and to see it in operation. Nobody claims it to be perfect, but it is thoroughly practicable and, most important of all, it is working along lines which allow for almost unending development.

"The picture, though small, is exceptionally clear and the operation is simplicity itself." (The picture measures 10 x 4 cms.

—K. D. R.) Since the commencement of our description of the "P.W." television viewer a large number of members of the radio trade have inquired for further details and for demonstrations, which have been kindly given them by Mr. Price, who has rigged up a demonstration outfit at his laboratory in Ponders End.

Members of our contemporaries' staffs have been along to see it, and everyone has expressed himself most interested, while the general consensus of opinion tallies with that of the press, whose reports we give above.

Trade Visit.  
Mr. Joseph, Managing Director of Radio Instruments, recently called specially to see me, to gain further information, and since that date has been given a demonstration at which he was extremely interested.

In fact, so much has the attention of the public and the trade been drawn to cathode ray television reception that both Mr. Price and myself have been kept pretty

(Continued on page 538.)



# WHY DO TELEGRAPH WIRES HUM?

By J. W. POPE, B.Sc. Eng., A.M.I.E.E.

In his Radio Notes and News recently, our popular contributor "Ariel" raised the interesting question that is the subject of this contribution. Numerous suggestions have been put forward from time to time in explanation of the phenomena, including the amusing one that it is the electric currents flowing in the wires! Mr. Pope's theories are very interesting, particularly in view of their being based on sound scientific principles. As a matter of fact they offer the most satisfactory explanation that we have met with.

I THINK the first point to raise concerning "Ariel's" query is whether there ever is an entirely still and windless day. Wire is an excellent transmitter of sound, and even if a disturbance is generated many poles away from the listener, the very stillness would make the transmitted vibrations noticeable. How does the disturbance start? There are two probable causes, each contributing its part.

## Forced and Sympathetic Vibrations.

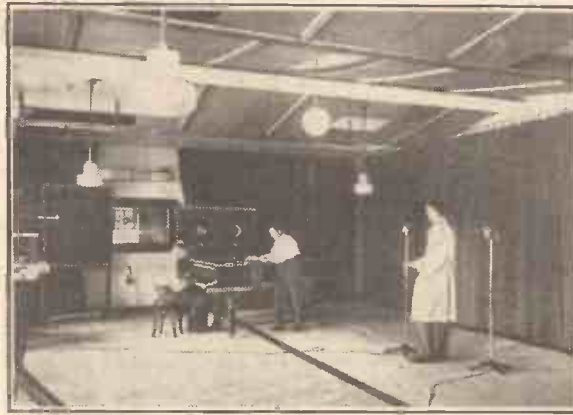
If we may assume as above, that there never is absolute calm over an area covering the span of, say, half a dozen poles, the amount of wire exposed to any one span is enormous and would probably collect enough energy to cause quite a considerable humming. This is a case of forced vibration. Once started, it would be transmitted

along the wires, probably receiving further energy on its way.

The second probability is especially interesting as being the counterpart in sound of the reception of wireless waves. Each wire in a span will have a definite period of vibration. If even a very faint note of the right frequency is present, the wire will respond quite strongly in the same way as a tuned set responding to a wireless transmission. This is a case of sympathetic vibration or resonance.

Actually a whole host of faint inaudible vibrations are always present in the atmosphere. They are demonstrated by the

## "SOUNDS" THAT ARE INAUDIBLE



"The 'boominess' and echoing of an empty room demonstrate in the same way the presence of tones not usually audible." These are an important factor in studio design, and special apparatus as seen above is often used for their measurement.

"noise of the sea" heard in a shell, a case of compound resonance. The Helmholtz resonator is a practical application of this principle. It consists of a hollow spherical vessel with an opening in one side. It has a definite musical frequency and will respond strongly to a very faint note of the right pitch. A set of resonators covering a suitable range is mounted and used for analysing the components of a musical note. Every resonator corresponding to a harmonic in the note will respond and thus pick out the components.

The "boominess" and echoing of an empty room demonstrate in the same way the presence of tones not usually audible. Such inaudible vibrations probably exist everywhere in sufficient quantity to be detected by a sensitive compound resonator like our span of multiple wires; and again, we have to consider not only one span but sounds transmitted over considerable distances, both by conductivity and by successive resonances between one span and the next.

## Making a Subway Resonate.

The sensitivity of this sympathetic vibration can be illustrated excellently in any subway or tunnel if there are not too many people about to damp the oscillations. It is very easy to find the fundamental note of the tunnel, and if this is hummed under the breath, practically inaudibly, the whole tunnel will resonate loudly and appear to be filled with sound without any definite source.

Personally, I consider resonance, probably contributed to a great extent up the poles from the ground, to be the major cause of the wires humming, with forced vibration from air waves picked up some spans away as a very likely secondary agent. Even if these causes are not accepted as final, I think they have sufficient weight to arouse an interesting discussion.

## THE "AIRSPRITE" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—I wonder how many of your readers took advantage of constructing the "Airsprite" Two? Well, I did and the results were better than any three-valve set I have ever built. A.T.B. is the big advantage in this simple set. I would like to point out I stuck to the components laid down in "P.W."

I made the modification to the dif. reaction cond., which was also shown in "P.W." When I tested the set the stations simply rolled in on both medium and long-wave bands, all at speaker strength.

This set will work any speaker. I tried five, one of them an old horn speaker, one of the first made. I assure you it woke this old chap up and he spoke quite well.

I bought the components from a dealer who stocks no junk, only the best of components—all best makers.

No one wants a better set than the above; it gives me all that is wanted—volume, tone, and selectivity. Wishing "P.W." all the best of luck.

Yours faithfully,  
F. ARMSTRONG.

London, S.W.8.

## A NEW RADIO SYMBOL.

The Editor, POPULAR WIRELESS.

Dear Sir,—The universal application of dust-core radio-frequency inductances seems to call for standardised representation.

In the development of Nucleon tuning coils, I have found it convenient to utilise a symbol

## WHAT READERS THINK

"Airsprite" Satisfaction—A Plea for Standardisation—Mains Units for Short-Wave Sets—A.T.B.

consisting of a broken or dotted line, instead of the usual full line normally used for an iron-core coil.

I am suggesting that this convention be adopted, and I believe a number of radio workers are already utilising my suggestion.

The use of a broken line is actually symbolical of the exact nature of the core, and it therefore appears to be a very appropriate symbol. As inductances with ordinary iron cores are frequently shunted by a variable or fixed condenser, and as both dust-core and air-core coils are used together, the need for differentiation seems to be very desirable.

It is to be hoped that the suggested symbol will be recognised by the standardisation committees, to whom the suggestion is being communicated.

Yours faithfully,  
PAUL D. TYERS.

Watford, Herts.

ED. NOTE.—It is interesting to note that before we had received Mr. Tyers letter we had already instructed our draughtsman to employ a broken line to indicate dust cores in tuning inductances.

## SHORT WAVES AND MAINS UNITS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to G. E. Cocker's letter in a recent issue of POPULAR WIRELESS, concerning short waves and eliminators, I cannot understand why he gets trouble from hum, as my own eliminator never gives any trouble in this respect.

The set is the Telsen Triple Three, entirely un-screened, the eliminator is home-built, and un-screened, the components being mounted on a piece of board and mounted underneath the baseboard of the set, and wired up with rubber-covered cable to a double-pole switch, which switches the mains current and the low-tension current.

No special smoothing circuit is employed, and a 4-mfd. condenser and a 1,500-ohm resistance are across the output of the rectifier. Oscillation is perfectly smooth on all wavelengths from 12 to 2,000 metres, the voltage is 120 volts, current 30 milliamps.

E. J. WALKER.

Standon, near Ware, Herts.

## A. T. B. IN YORKSHIRE.

The Editor, POPULAR WIRELESS.

Dear Sir,—A few belated words of praise for your "A. T. B.," which does all you claim it to do, and helps to make radio worth while. Not being able to buy the parts to build your "Airsprite," I collected all my parts together and utilised as many parts as I could from the "Airsprite," and results are a real good high-powered receiver, together with most of the "Airsprite's" good points thrown in.

Yours faithfully,  
FRANK HEELS.

Doncaster.





"S-sh-outside at eight"

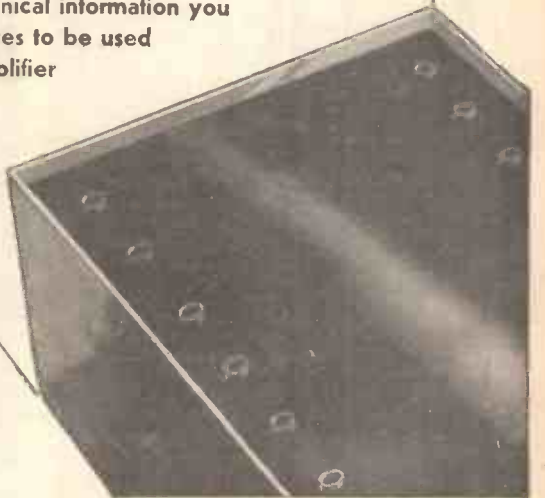
**—the Actor's voice drops—and H.T. consumption drops with it**

Yes, there's where the new Mullard Class "B" valve, the P.M.2B, saves your batteries. "And H.T. consumption drops with it." That's just it—when the voice drops—when the signal becomes weaker, the P.M.2B uses less current. And thus, over a representative period of broadcast, the P.M.2B takes an average H.T. current consumption of exceptionally low value, giving battery reception comparable with that of an efficient all-mains receiver, with no more drain on the H.T. battery than that taken by a small power-valve.

So if you are seriously contemplating the incorporation of Class "B" amplification, we would be glad to assist you in any way, and would suggest you write to T.S.D. for any technical information you may require. The P.M.2DX is the driver valve for the P.M.2B. Other valves to be used in the earlier stages of Battery sets are the P.M.12M, variable-mu H.F. amplifier (or P.M.12A Screened Grid H.F. amplifier) and the P.M.1HL detector.

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. G.K.M.

**CLASS "B" AMPLIFICATION**  
**Mullard**  
**THE · MASTER · VALVE**



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



**E**VERY radio receiving development of note during the past year has been given its first "send-off" by POPULAR WIRELESS. "Class B," the "Cold Valve," Double-Diode Triode and Pentode Valves, Catkin Valves, Multi-mu H.F. Pentodes, No-gap Coils—all made their first appearance in sets described by this journal.

Indeed, it is now accepted as traditional that POPULAR WIRELESS should be the medium for "first releases."

**Success At Last.**

And so it was quite inevitable that it should be POPULAR WIRELESS that was given the honour of introducing the first practical expression of the most amazing radio invention of recent times.

We refer to Permeability Tuning. For years this revolutionary principle has been one of the front-line subjects of experiment and investigation in every radio research laboratory in the world.

It has been a philosopher's stone of wireless. There is



# "THE NEW PERMEABILITY"

★.....  
**AN AMAZING INVENTION**

For some time past the Wireless world has shown an astonishingly novel method of tuning, which has aroused widespread interest, and now "Permeability Tuning," of its contemporaries, is able to announce to the world its first commercial possession.

Consequently, after some weeks' delay, the details of this important invention can be used to best advantage in every radio set.

Although Permeability Tuning is now being made public for another few weeks, readers are learning in advance all about the principle of the new method, and the results to be obtained, by special "P.W." Permeability Tuning Units, which are being sold exclusively in our laboratory. Thus our readers will be in a position to obtain "P.W." for details of how to use this important method of tuning.

★.....

straightforward tuning operations it no longer holds a monopoly.

With Permeability Tuning, station selection can be efficiently accomplished with

one component instead of two. That is a three-fold economy. There is a saving of space, wiring and manufacturing processes.

It is a remarkably simple scheme. In essentials a Permeability Tuner is merely an iron-cored coil whose inductance (and therefore tuning) is varied by varying the position of the core.

Technically the method is an extremely satisfactory one, because it enables a most consistent evenness of selectivity and sensitivity to be obtained throughout the whole waveband covered.

The losses in the iron core are reduced

to negligible proportions by making this core of finely divided iron. And it will be obvious to all that the efficiency of the scheme is that of the new iron-cored coils plus the greater efficiency contributed by its freedom from capacity disabilities.

Why then, it may well be asked, has it been so long languishing in the laboratory

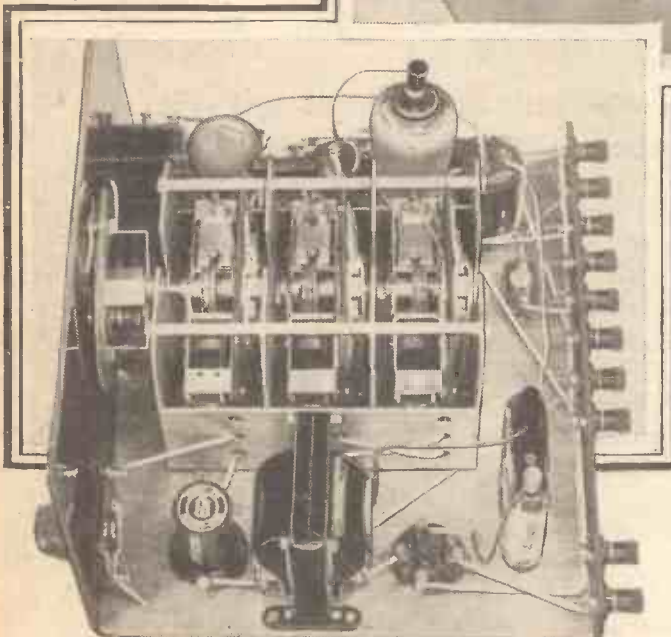
And now, at long last, that barrier has been broken down. Permeability Tuning has emerged from the laboratory as a perfected and practical commercial proposition.

**Great Step Forward.**

At this early stage it is quite impossible to predict its effect on the future of wireless. But that it is destined to mould the future technique of set design in no small measure is certain.

The variable condenser has had a long, unchallenged run, but it is now faced by a formidable rival. Nevertheless, we do not anticipate that it will become obsolete or even obsolescent for a long time, if ever.

There are still many important tasks for the variable condenser to do, although for

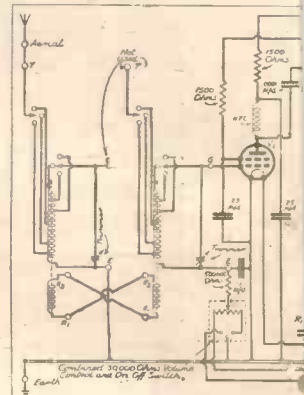


**NO WAVECHANGING NECESSARY**

Besides rendering the variable tuning condenser quite unnecessary, the Varley Permeability Tuning Unit enables the wavechange switching to be entirely abolished. In fact, all the wavelength coverage is automatically concentrated in this wonderful new device.

not an inventor or technician in America, Britain, France, Germany or elsewhere who does not realise its merits and advantages, but hitherto there always remained what seemed to be an impassable barrier between its theory and its practice.

**UNIQUE WAVELENGTH CONTROL**



The single-knob control adjusts the wavelength. The separate switches are shown in this diagram.



# "Nu-Tu"

## THE FIRST SET TO USE PERMEABILITY TUNING

### PERFORMANCE PERFECTED

... has made references to a new and improved. Theoretical articles have aroused interest in "Wireless," a long way in advance of those that its technicians have in their special Permeability Tuner.

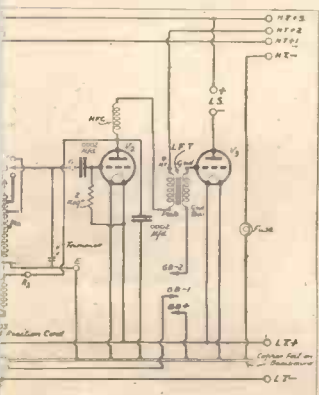
... experiment, we are able to divulge full details to our readers and to show how the Tuner operates.

... will not be generally available to the masses of "P.W." now have the chance of seeing the tuning principle involved, of appreciating the reading about the "Nu-Tu"—the Receiver, constructed and tested when the Tuners are released for sale. We immediately refer to this issue of the magazine to direct a set incorporating this vitally

if it is so satisfactory a principle and apparently so simple to apply?

The question is easily answered. Without the special pulverised iron the whole thing would be quite hopeless. With the best of the so-called "low-loss" irons, even in laminations, the H.F. losses would be terrific.

### WAVELENGTH ADJUSTMENT



... tuning of the three circuits, although theoretical diagram, for the sake of clarity.

to alter the inductance sufficiently to give a good enough wave-range.

So the experiment of supplementing the core by a cover which slid over the coil simultaneously with the core movement was tried.

Even that, however, did not do the trick. And it remained for Varley completely to



stations at good loudspeaker strength are receivable under practically any conditions.

And it will be agreed that the set does illustrate the advantages of Permeability Tuning very clearly, for it is not smothered by a mass of other things.

The Permeability Tuner is the very heart, core and foundation of the instrument.

### "P.W.'s" Pre-eminence.

Now a few words about the components. First of all, the Permeability Tuner itself.

We don't suppose this will be on the market for some weeks, but when, in due course, it is, "P.W." readers will already

overcome the defect by employing an ingenious automatic switching scheme.

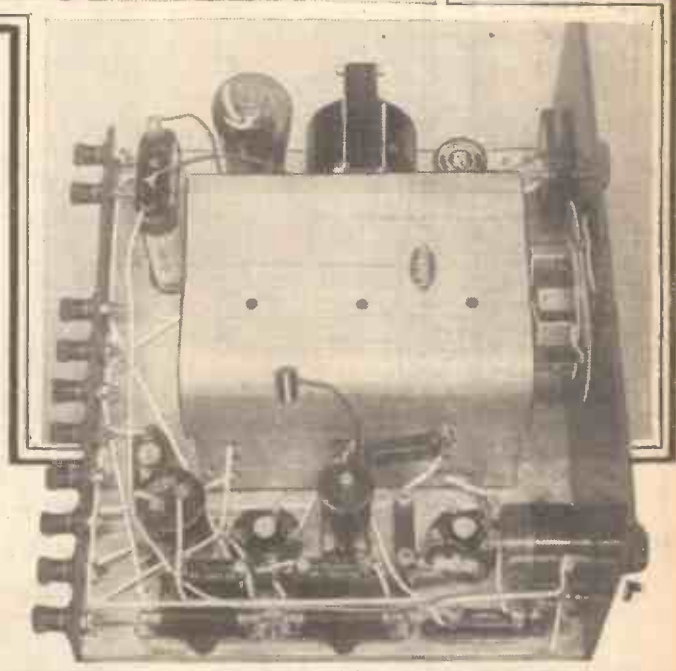
This enables the full waveband easily to be covered and constitutes the final link in the chain.

### An Epoch-Making Set.

With the very first model of this entirely new device in our hands, we ourselves were faced with the problem of designing what is destined to be a historic piece of radio apparatus—absolutely the first set to employ Permeability Tuning.

After considerable thought we decided that it was fitting that this memorable receiver should be that extremely popular arrangement of three valves, an S.G. followed by a detector and one stage of L.F.

The efficiency of its H.F. circuit, due to the new method, is such that a number of



### REMARKABLE SIMPLICITY OF CONSTRUCTION

As all the elements of three tuned circuits, complete with wavechanging, are concentrated and combined in one compact Tuner, the consequent valuable simplification of wiring and connections will immediately be apparent.

have before them practical details for its use. We make it a point always to be first with sets using new apparatus of a worthwhile nature, so that POPULAR WIRELESS (Continued on next page.)

# THE "NU-TU"

(Continued from previous page.)

constructor readers can be "first away" with brand new developments.

Our motto is, "If there is progress, POPULAR WIRELESS readers must be the first to benefit from it."

And we believe all will agree that we live up to that motto!

## Revolutionary Departure.

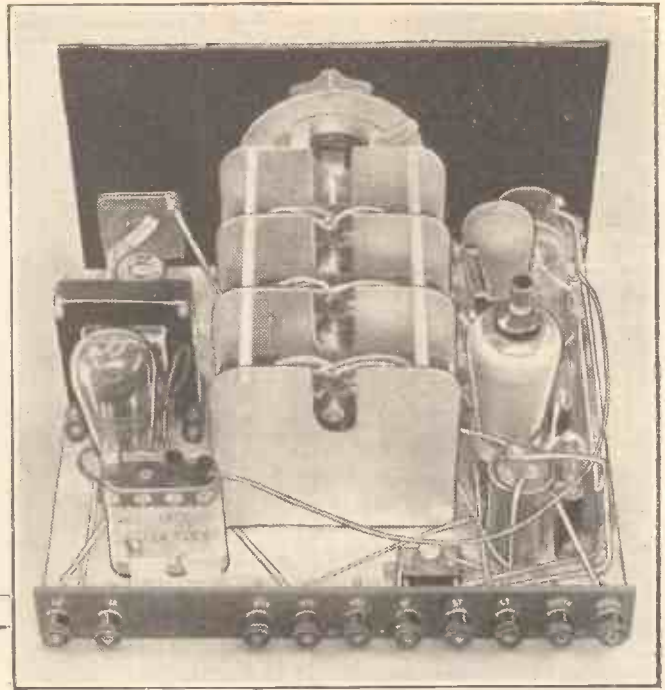
In the present instance, the "Nu-Tu" is a quite revolutionary departure from conventional practice, and those who eventually build it will all enjoy a unique experience.

When these words appear first in print there will be no other sets using Permeability Tuning in the whole of the world except one

or two experimental outfits, so POPULAR WIRELESS readers who assemble "Nu-Tu's" will rank as true pioneers.

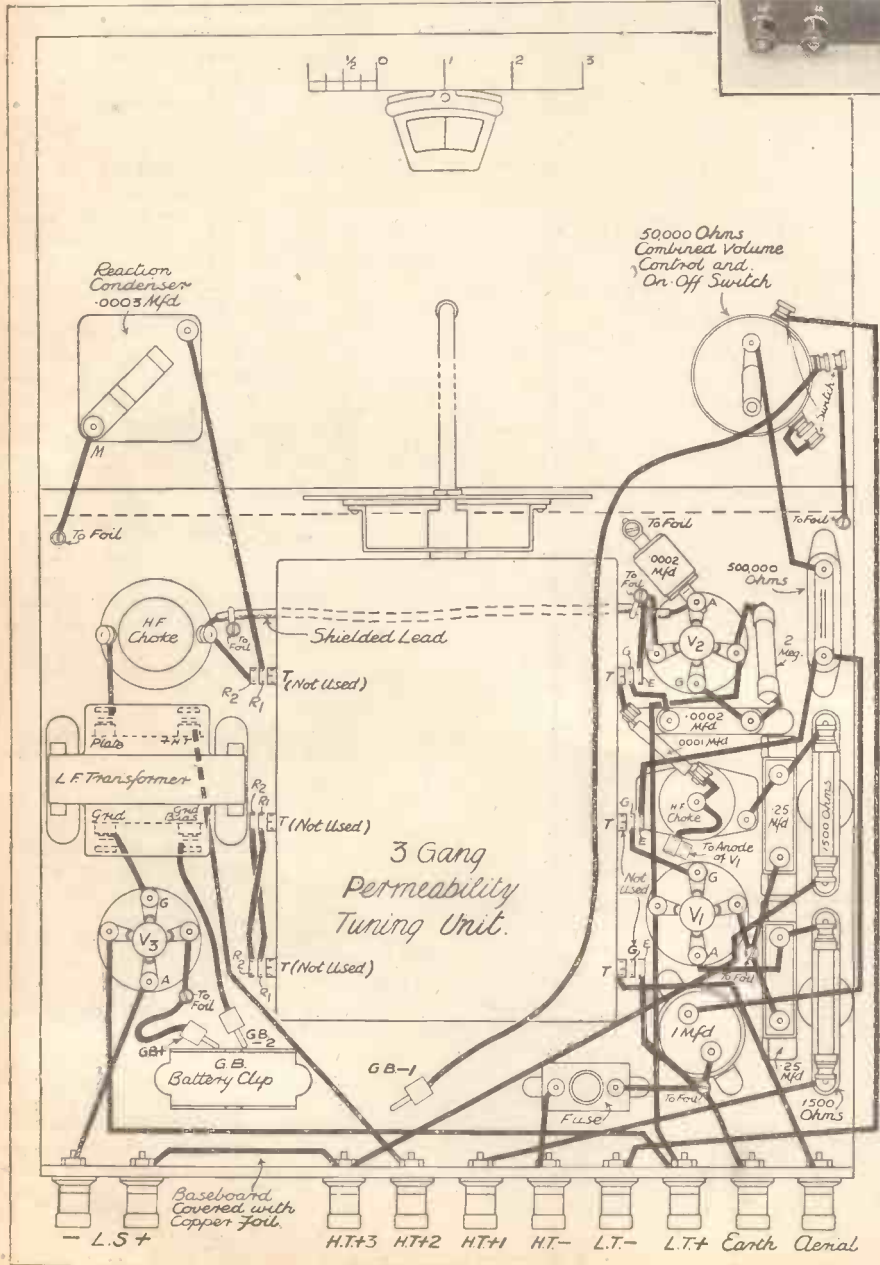
But perhaps that is hardly the word, because it suggests that the principle is an untested one, whereas, in fact, it has been given an exhaustive series of tests of both laboratory and practical natures.

Rather let us say they will be missionaries of a new movement, for Permeability Tuning is going to grow and grow in popularity.



An unusual note is struck by the appearance of the set in this photo, because no coils are visible and the tuning unit rather resembles the ordinary gang condenser, thus making it appear at first sight as if the set were incomplete.

## THE NEW METHOD IN PRACTICE



And whether "Nu-Tu" builders like it or not, all their friends and acquaintances will want to see the new idea at close quarters. Anyway, we cannot visualise any constructor not being only too eager to exhibit something entirely original.

But when the tuners are available we hope everyone will refer closely to our photos and diagrams and not hastily incorporate them in hurriedly modified existing sets. In view of its unusual simplicity you might think our design could be altered without affecting the results much.

So it could, but, and this is the point, only by a skilled set designer. And they pay skilled set designers four-figure salaries for doing nothing else but design sets, remember!

## In Advance of All Others.

There is nothing magic about a set layout, once the circuit of a set has been devised (as either a highly creative or a basely imitative job!) and the general form of the receiver fixed upon, the component arrangement follows as craftsmanship (specialised, if you like) pure and simple.

Certain rules and laws of a fairly arbitrary nature have to be observed, and it is only if you are well versed in them that you can safely juggle the parts about without detriment to the results.

We are not publishing a list of parts, as usual, because until Permeability Tuners are generally available there is no point in doing so.

In our next article on the "Nu-Tu", which will appear next week, a more detailed technical description of the design and layout of this new receiver will be given, together with practical operating information.

The reduction of the number of connections by the special tuning unit lowers the chances of trouble due to stray couplings between wires carrying H.F., and permits compact design without the introduction of constructional difficulties.





# How they heard us

# ON FIVE METRES

## A WORLD'S RECORD

was established by P.W.'s 5-metre transmissions from the Crystal Palace, when results were achieved that were "proven by the scientists to be quite impossible!"

Read all about them in this intensely interesting summary of the reports

By W. L. S.

As a final echo of our 5-metre tests on May 21st, I have been asked to draw up a somewhat compressed analysis of the logs we have received. This has been no mean task, owing to the habit of enthusiastic listeners to send in a five-page letter full of closely-written details, in preference to a concise log of bald facts.

### The "Impossible" Accomplished.

Much as we appreciate the trouble taken by the long-winded ones, we do wish that in future they would end their remarks by a short tabulated log of what they actually heard, minus the "frills"!

The accompanying sketch-map shows the places from which the reports came, together with the reported signal-strengths. Most of the reports from within a 16-mile radius have been left out. They were very valuable, but, after all, we knew that anyone within 16 or 20 miles was bound to get us well.

First, in order of distance, comes the report from Mr. Sharp, G 6 K U, at Bradford, Yorks. The distance is roughly 200 miles, and is definitely a world's record for five-metre work on land! It is, as a matter of cold fact, proven by the scientists to be quite impossible that Mr. Sharp could have heard us. What matters to us is that he did!

### Freak Fading.

Mr. Popplewell, G 6 P L, at Heckmondwike, comes in second with a distance only a few miles less. It is remarkable that at both these points, situated quite close together, we were only heard for half an hour or so in the morning, after which signals apparently faded right out. It must be regarded as a freak, but it is a very interesting freak, nevertheless.

The aeroplane in which Mr. Douglas Walters (G 5 C V) was listening for us reached a distance of about 130 miles, and his farthest position was at the point shown on the sketch-map. At this distance and at a height of 10,000 feet, we were reported as "R 9 plus," from which we may assume that we were practically as strong there as we were within a mile or so.

It was unfortunate that the plane had to turn back for petrol, as G 5 C V told us that he felt certain that we should be good for twice the distance.

### Reception in a Car.

Next come three reports from the Leicester Chapter of the I.S.W.C., but from the details given it is clear that they heard some other transmission which they assumed was coming from us. (We have

not yet been able to find out who the other fellow was!)

The reports from Dunstable, made by G 2 K B, are rather interesting, as he tells us that strength varied from R 2 to R 8 according to the height of the ground on which the receiver was located. He also reports that signals were equally strong from both our N.W. and S.W. positions on the tower.

Two local transmitters, G 5 I S and G 6 C W, drove out to Inkpen Beacon, Oxfordshire, and "immediately received G 6 Q B at R 4." G 5 I S's account of reception in the car on the way out makes

### In a Screened Locality.

Probably the most interesting report of those that remain is that from Mr. F. W. Ellenger of Winchester, who heard us in the evening at R 4-3. This was the first 5-metre signal that he had ever heard! And this was not up on the hills, but in a fairly badly screened locality.

G 6 L K at Cranleigh, Surrey, is an interesting case of reception that should not have been possible. Cranleigh is comparatively low down behind Leith Hill and Pitch Hill—on the far side of ground that rises to nearly 1,000 feet. Yet at Cranleigh our signals were received all day without any difficulty at all.

### Kite Aerials Tried.

G 2 N H received us at Hindhead during the morning, and thereafter listened at South Harting, where he proceeded to fly kite aerials 80 feet high! But we understand that the kite aerials failed to "do their stuff," as the signals were just as strong on a small 16-foot affair.

G 5 J Z of Heathfield, Sussex, received us well at Nutley, on the far side of Ashdown Forest. This is another case of "non-optical" reception, for one certainly cannot see the Crystal Palace from Nutley. He reports that our Morse signals could be heard 100 feet from the 'phones.

One other interesting item remains. When one of our receivers was on the East side of the tower, listening for possible signals from Holland, we received a transmission of gramophone records, with no announcements. This could not be heard at any point except on the East side.

It has since been established fairly definitely that this transmission came from G 5 M I at Ipswich, who was so fed-up at not having heard us that he left his gramophone running in the faint hope that we might hear him.

### Valuable Reports.

In conclusion, I have been asked to thank all those who took the trouble to send us reports, without which the tests would not have been of much use. It has been impossible to mention them all, but they have all been acknowledged, and the keenness of those who kept watch for us was much appreciated.

## PICKING UP THE CRYSTAL PALACE



The localities from which reports were received.

interesting reading. Signals were audible practically all the way to Hounslow, after which they were not heard again until their destination was reached. Nothing was heard at Maidenhead, Reading or Newbury on the way out, but as soon as the high ground was reached they were there again.

It is interesting to note that although G 5 I S, with the small aerial in his car, could not receive us on the hill out of Newbury, a fixed station, G 2 G G, of the same town, was able to receive us at R 5 at exactly the same time. This shows up the advantage of a high aerial.

## SHORT-WAVE NOTES

All the interesting news and views of current short-wave practice.

**C**ONDITIONS, at the time of writing, can only be described as "patchy."

Sometimes the 49-metre stations are very good late at night, and on other nights they are poor compared with the 25- and 19- metre groups. One can seldom depend upon reception conditions from one night to another at this time of year, and local thunderstorms introduce further complications in the shape of atmospheric.

J. B. M. (Glasgow) has been keeping me posted during his holidays with "paper-weights" and postcards. The "paper-weights," J. B. M., are being used to hold down your own letters, among others, when sudden gusts blow through the window of my den.

### Holiday Thoughts.

My correspondent N. H., from Malmo, sends me details of a very nice-looking job in the shape of a D.C. version of the "H.A.C." Three-Valver. He says it is easily the best S.G. short-waver he has yet come across, particularly as regards stability and selectivity. Congrats., N. H.; your chassis D.C. set looks really professional.

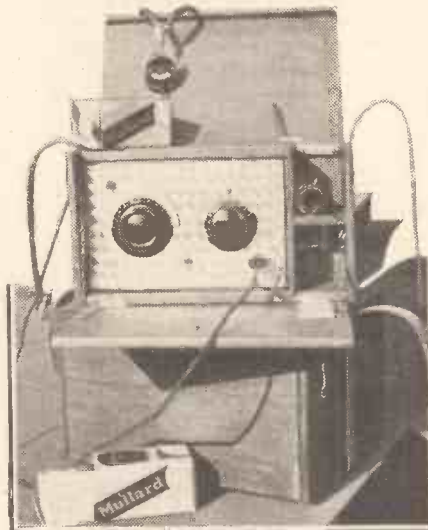
I have not had many entries for the Whitsun listening competition, probably because I gave it only one casual mention during the excitement of the Crystal Palace tests. I hope to publish the results next week.

Will several readers who are puzzled by

"ham language" and several radio abbreviations please note that an article on this subject is in the hands of the Editor, and will appear when space permits? "Radio-ese" is not a difficult language to learn, but it certainly can be puzzling to the novice, and I have, therefore, dealt with all the terms that I can think of that are likely to cause trouble in this direction.

I suppose we are all thinking of holiday-making by now, either in retrospect or with a feeling of pleasant anticipation. I hope to make quite a round tour in July, accompanied by the faithful "Buzz," who will be asked to do his stuff at most of the places at which I call.

### A SLEDGE RECEIVER



One of the special short-wave receivers which will be used in conjunction with two short-wave transmitters by an Oxford University expedition into the Arctic. The outfits are for carrying on sledges.

Rumour has it that 5-metre work will also play a small part in my "busman's holiday."

This 5-metre business is getting too exciting for words. Aeroplanes, boats, cars, towers, hills are all being exploited. Who is going to be the first to work duplex from an aeroplane to a submarine on 5 metres?

### Our Important Discoveries.

And who was the anonymous gentleman who wrote to me thus wise: "If 5 metres is what you call an optical wave, why don't you use a telescope in series with the earth lead to improve reception? You can direct it on the stations you are listening for, and save many valves in the receiver." Quite!

What we have found out about 5 metres, though, amounts to this. First, with a good "starting-off" location, signals may be made to cover 150 miles or so, using at the transmitter an absurdly small input. Secondly, 'plane-to-'plane and 'plane-to-ground communication is 100 per cent reliable, again with "fly-power" transmitters of the most minute dimensions. Thirdly, reception in a moving car is simplicity itself, provided that the ignition system is reasonably quiet.

### Hopes for the Future.

In my own car I can receive quite weak stations on 5 metres while driving about in thick traffic. My own ignition system is absolutely unscreened, but happens to be extremely quiet on 5 metres. Other people's cars, as they pass, worry me much more.

I am hoping that this summer will see the raising of the 5-metre long-distance record to quite a substantial figure. It stands now at the 200-mile mark, but who knows what is possible with properly designed gear and well-organised tests?



## The LINK BETWEEN

BY G. T. KELSEY

Weekly jottings of interest to buyers

### An "Electric Shock."

**T**O Ferranti's goes the credit for having produced what I prefer to regard as a new type of "electric shock"! But that is only because my bed and I are such good pals that we refuse to countenance any sort of "rude awakening."

Actually, it's a most ingenious idea, and although not strictly radio, I feel justified in referring to it; first, because I believe that there will be a number of readers to whom it will be of interest, and secondly because it marks still another milestone in the progressive history of Ferranti's.

I believe I am correct in saying that Ferranti's were the first firm to produce synchronous clocks in this country. Now they have gone one better and have designed a fully automatic electric alarm clock, the

first models of which will be available within the course of a week or so.

Once set, the alarm will go off day after day at the same time, but only once during the twenty-four hours.

Concerning the alarm itself, to use Ferranti's own words, "It is of the buzzer type, giving a gentle but compelling awakening as distinct from the strident, nerve-racking type so commonly provided with ordinary alarm clocks."

Perhaps on the strength of that my remarks about "rude awakenings" are wholly unjustified. At any rate, I take my hat off to them for their ingenuity!

### Attention to Detail.

Mullards are in the limelight again this week with an improved form of anode terminal for screened-grid valves.

Hitherto the terminal has been secured to the glass bulb by means of a cement joint between the insulating dome and the glass. But in order not to destroy the insulating properties of the "dome," it has only been possible up to now to use a low-temperature cement which has not been ideal from the point of view of strength.

In order to obtain greater rigidity at this point, the Mullard Company is now producing a terminal in which the metal portion is separate from the insulating cap.

In the new arrangement, it is the metal portion that is secured with cement to the

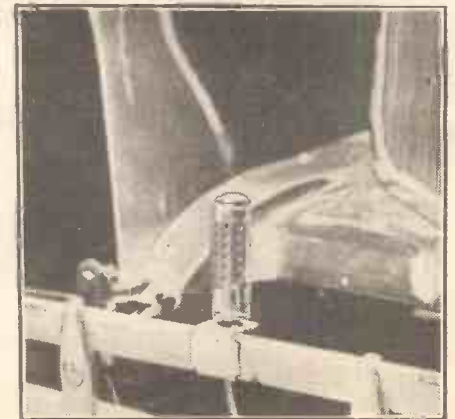
top of the bulb, after which the insulating dome is slipped into position and the top of the metal portion turned over like an eyelet to prevent removal of the cap.

With the new scheme, the question of the setting temperature does not enter into it, and a much firmer joint is possible.

At first the new terminal is only to be standardised on Mullard indirectly-heated

(Continued on page 536.)

### "CATKIN" VALVE MASCOT



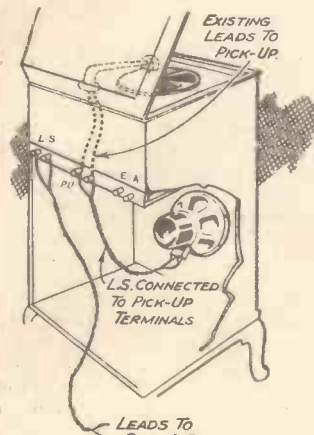
The nickel-plated "Catkin" valve case is fitted inside with a green electric bulb, and is used as a car mascot by Mr. J. H. Williams, Managing Director of the Marconiophone Company.



# RECOMMENDED WRINKLES

## LOUDSPEAKER MICROPHONE.

THE method now employed to use a second loudspeaker as microphone, can be greatly simplified and without the necessity of disturbing internal wiring, which many object to, in addition, much more fun can be got out of the following:



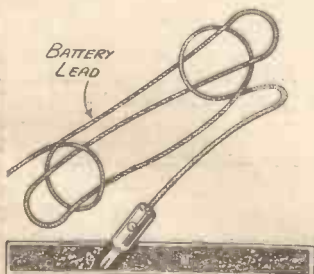
Changing over the loudspeaker's connections.

Modern sets are either radio-grams or have pick-up terminals, and all that is necessary is to disconnect the set's loudspeaker leads and couple them up additionally to the pick-up terminals, the second loudspeaker leads to set's L.S. terminals, and speaker taken to the room to be used. When records are being played it is great fun to be able to sing with them or add effects without interfering in any way with tone or quality; or circuit can be used simply as a microphone.

## SHORTENING LEADS.

TO shorten battery or loudspeaker leads without cutting, or the use of rubber bands, as shown in No. 557 POPULAR WIRELESS.

Loop wire on itself to required



The wire is simply looped as shown, and does not have to be cut.

length, and make half-hitch as shown above at each end. The greater the pull at the ends, the tighter the loops become.

## A TIP WORTH POUNDS.

I HAVE neither a creation nor a sketch to submit, but my tip surpasses fifty per cent of the drawings and ideas already published. It contains a story, but can be summed up in the phrase, *Repair your own set.*

Here is the story. In every town, there have sprung up, like mushrooms, supposed "wireless experts."

When your set goes "phut," as most sets do once in a while, you call in the "expert." He first looks wise, then opens his case and produces various gadgets, including a voltmeter, (which he always places in some conspicuous position, to impress you.

After switching your set on and off, he often looks inside. Then after a few weird facial expressions, and a grunt or two, his conscious and subconscious mind invariably declare unanimsously that the set will require to be taken away. He says that he cannot just state off-hand whether you will require a new valve or two, or if a transformer has "burned itself out," but when he gets your set into his "workroom," he will soon find out. The curtain falls on Act One.

### A Regular Visitor.

Act Two is in camera. The third act restores your set to its accustomed place in the corner or on the side-board. It is working.

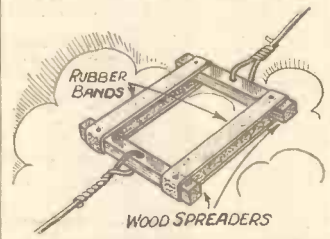
The "expert" charges you for the price of only one valve, and only one transformer. He has a wife and six kiddies to feed, but only takes the paltry sum of five shillings for his work. Previous to your calling in the

P.S.—The above is not an advert., but a true story.

ED. NOTE.—We think our contributor's unhappy experiences have made him rather too sweeping in his condemnation of the "experts," some of whom are very skilled.

## TEMPORARY INSULATORS.

MANY times when a temporary aerial is to be tried it is a nuisance to have to run out and buy insulators. Here is a makeshift that



Only materials likely to be handy are used.

will serve the purpose well, besides being somewhat flexible.

Cut two hardwood sticks about 4 in.

## 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 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 in the June 24th issue was sent by Mr. L. J. Gorton, The Orchards, Musworth, Gloucestershire, to whom a guinea has been awarded.

"expert," your set had worked for about two years. It now ceases to function periodically once a fortnight. He therefore becomes a regular visitor.

After many weary fortnights you take the notion to open the lid of your set. Lo and behold, everything looks different. All the nice neat things you had in your set are not there.

You then look at the back of your speaker, which was marked Blue Spot, Celestion, or B.T.H., whichever the case may be, and find that it, too, is changed. In fact, your whole outfit is now just one pile of cheap junk.

It gradually dawns on you, that all those original nice things neatly stamped Mullard, R.I., T.C.C., Polar, Colvern, Blue Spot, etc., have gone to feed the wife and six kiddies.

After one or perhaps two or more sleepless nights you ask a friend in to see your set.

He is a keen amateur, and has taken up the hobby of wireless for the love of it. You only point to your set, which once cost ten pounds, and ask him to state its value. He looks it over, and tells you that it might sell at about fifteen shillings. That's that.

You ask him very humbly at the front door, when he is departing what wireless paper he gets. He promptly tells you POPULAR WIRELESS. After one more sleepless night, you decide that your friend hasn't any more brains than yourself, and that if he knows so much about wireless, there is nothing to hinder you from learning.

The drama ends in your taking a trip to the newsagent's and ordering POPULAR WIRELESS, then you live happy ever afterwards.

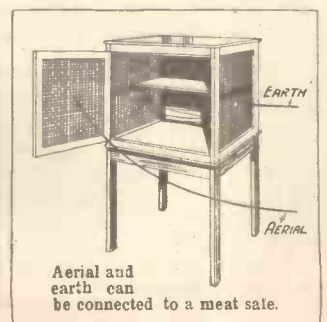
long and 1 in. square, and soak them in melted candle wax. Drill a small hole in the centre of each one.

Then get a section of a motor-car inner tube, and cut two 1-in. sections to form wide rubber bands. Nail them to the sticks with broad-headed nails, as shown in the sketch.

Fasten the aerial to one stick and the halyard to the other.

## A "SAFE" IDEA.

I TOOK my radio-gram to a friend's house the other day, and at first was disappointed to learn that he had scrapped his aerial and earth, but after a careful survey of his house I finally decided on using his food safe as a



Aerial and earth can be connected to a meat safe.

miniature "counterpoise" arrangement which I did with great success as follows.

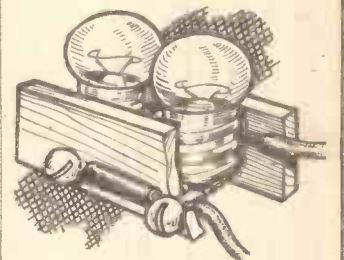
Fasten the aerial wire by means of a nut and bolt to the perforated door, and the earth wire to one of the sides, you will find that selectivity can be varied by moving the door to and from the earth side.

## IDLE ACCUMULATORS.

WHEN a set isn't being used for a time, the accumulator can be kept healthy by a spell of duty each day lighting two or more flashlamp bulbs. Doubtless, too, this light can be put to some purpose.

Those who haven't fittings or mechanical resources can fix up the lamps very simply with two strips of wood—1 in. or more (thick, 1/2 in. or more wide, and long enough to accommodate the required number of bulbs.

The lamps, together with the bared end of one flex lead (which is laid alongside them for contact), are clamped between the strips of wood by means



Two bulbs are clamped together with wood and wired in parallel.

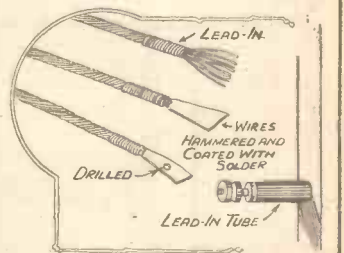
of ordinary screws. One screw is enough if there are only two bulbs.

The end of the second flex lead is connected under the head of a smaller screw passing immediately underneath the first lamp. The lamp is afterwards eased down until its nipple firmly touches the screw.

The second flex is then taken along to each succeeding lamp and bared for similar screw connections.

## AN EFFICIENT AERIAL CONNECTION.

IT is often found difficult to make a good connection between an aerial of copper wire and the lead-in tube, as the bunch of wires is not easily secured under a small nut.



The difficulty of clamping stranded aerial wire under the lead-in tube terminal is overcome once and for all by the application of solder, so making a solid metal connecting "tag."

If, however, each strand is cleaned for about two inches at the end of the wire and the whole bunch is hammered together and coated with solder as shown in the diagram, and a hole drilled through the part which has been soldered, the result is a piece of metal which may be fixed neatly and securely to the tube.



# 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

### CAN THE CATHODE RAY BE SEEN?

P. R. F. (Gateshead-on-Tyne).—"Two little points which have intrigued me in the Television articles now appearing weekly in 'P.W.' are set out below, and I think they would be of interest to many if answered in your columns.

"(1) What is the actual deposit on the end of the tube which is activated by the striking of the ray upon it?

"(2) Is the ray itself visible inside the tube as it traverses it from one end to the other? (Naturally, I do not mean visible through the screen, when viewed end on as in reception, but is it visible if one looks 'behind the screen,' as it were, into the space, say, half-way along the tube?)"

(1) The deposit is calcium tungstate, sprayed on the inside of the tube.

(2) Normally, no. But in certain circumstances a faint glow is visible inside the tube as the electron stream returns from the screen to the accelerator. When it occurs, this effect is, of course, invisible from the front, because that end of the tube is carrying the picture that is caused by the impinging of the controlled ray on the fluorescent screen.

### IMPROVING THE CRYSTAL SET'S EARTH.

K. D. (Gloucester).—"It was either in POPULAR WIRELESS or in one of the B.B.C.'s pamphlets for listeners that I recently saw some advice on how to make sure of a good earth for a crystal set. The article pointed out the methods of connections to various different kinds of pipes, such as lead and iron and gas-pipes.

"I am now going to fix a set for an old couple, and I want to give them the loudest possible result, as they are not so sharp of hearing as we youngsters.

"If you will oblige by sending the article, or details of date, etc., or give some hints on the best earth arrangements for crystal sets it would be much appreciated."

The important points to watch are set out below.

- (1) The earth lead should be short and direct.
- (2) Usually a lead water-pipe is the best earth already available to the listener, but failing this class of connection, he can easily install a buried earth, an especially good type for all-the-year-round results being the percolative or "Flit" type.
- (3) If, however, the water-pipe type is used, care must be taken that the pipe is thoroughly cleaned all round at the point where the wire is fixed to it; a proper earth clip being required to make a good job of this.
- (4) Don't use a gas-pipe, or a hot-water pipe; but failing a lead water-pipe it is often possible to get a satisfactory connection by means of an iron pipe which has a good connection with the lower soil.
- (5) Avoid the use of metal railings and gutter-pipes; these do not generally penetrate sufficiently far into the ground to make a satisfactory connection, and a percolative earth has marked advantages over any such arrangement.
- (6) When a buried metal plate is employed care must be taken that the underground connection is above suspicion.

It is generally better to rivet or bolt this than to solder it. Or alternatively to arrange that a long strip of the metal plate is bent up to reach the surface where a satisfactory joint can be made and maintained.

### CORRECT CONNECTIONS FOR DECOUPLING.

B. S. (Llandudno).—"The set does not seem as stable as before, and I think in rebuilding I may have put back the decoupling incorrectly. I had no sketch for this, but relied on memory, as it was added to the

## 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) About how many volts would be required to "flash over" a spark-gap consisting of sharp points 10 inches apart, in air?
- (2) What are the approximate frequency limits of the male speaking voice?
- (3) What are the characteristic features of a Beverage aerial?

original set, of which I still have the blue print.

"This part of the set is now connected as follows: H.T.+2 to one end of decoupling resistance, and to a number of other points, including one side of the 2-mfd. decoupling condenser.

"Primary terminal (marked H.T.+) of L.F. transformer to the other side of the decoupling resistance.

"Other side of the 2-mfd. decoupling con-

## "P.W." PANELS No. 127. LEIPZIG.

The Leipzig station is one of the most powerful in Europe, being rated at 120 kilowatts. (The new B.B.C. Regional Stations are only 50-kilowatts.)

The Leipzig wavelength is 389.6 metres—between those of Toulouse and Bucharest, immediately below the Midland Regional's wave.

Leipzig is 537 miles from London.

denser to L.T.—, H.T.— lead, filaments, etc.

"Is this correct?"

It is not the usual arrangement. The condenser connections are wrong—or rather, one of them, for it is O.K. for one side of it to go to the common L.T.—/H.T.— lead.

But the other side of the 2-mfd. decoupling condenser should go to that end of the decoupling resistance which is not connected to the H.T.+ battery terminal.

In other words, that side of the condenser is joined between the decoupling resistance and the transformer, not between the resistance and H.T. supply, as you have it at present. (Under certain circumstances these connections may not apply, but they do in all the usual cases).

## REVERSING THE PLUG CONNECTOR OF A D.C. SET.

"LEMON" (Brunswick Square, W.C.1.)—"The set has only been working since May, so I do not know much about it yet, but it is a first-rate instrument which I would not be without for anything.

"Our only trouble was dead silence, which occurred last night, and which made me think it was not switched on, until I examined closely, and then I could see the glow. After failing to get a sound I switched off again, and took out the plug from mains, putting the set on the table in the middle of the room to examine it thoroughly.

"So far as I could see it all appeared to be O.K., so I put it back, and just to make sure switched on again, when to our surprise everything was as right as it could be.

"The only thing I can think of was that we might have got the electric plug round the reverse way. Would this cause a stoppage? And if so, has it hurt the set? (There is no sign of anything at all wrong now.)"

Your explanation is probably the correct one. If the set is run from direct current (D.C.) mains, the reversal of the mains plug would have the effect of robbing the set of all its H.T., so there would be no sound from the loudspeaker.

Such a mistake is not likely to have hurt the set, but of course it is better not to reverse it in this way again, so we advise you to mark the plug and its socket and see that in future it is replaced correctly.

## THE DOUBLE-DIODE TRIODE.

D. R. (St. Helens).—"How far back was the number of 'P.W.' which gave an article on the double-diode triode, with diagram showing the inside arrangements of this?"

The article in question appeared in the June 10th number of POPULAR WIRELESS, No. 575.

(Back numbers which are still in print and cannot be obtained locally can be supplied direct from the publishers. The application should be addressed to The Amalgamated Press, Ltd., Back Number Department, Bear Alley, Farringdon Street, London, E.C.4. The charge is fourpence per copy, post free.)

## RESISTANCES IN PARALLEL.

J. J. S. R. (Newhaven).—"Instead of buying a 1,000-ohms resistance I thought of using my two (new) 2,000's in parallel, if that will be just as good, as I believe this will give the effect of 1,000 ohms.

"Please say if there is any objection."

No objection at all, provided that the current-carrying capacity of either of the two 2,000-ohm resistances is not greatly below that of the correct 1,000-ohms resistance which they will replace.

Each will now carry exactly half the current flowing, so probably you will be able to make certain that they will be capable of doing the current-carrying work required of them.

## ALTERING THE DIRECTION OF ROTATION OF THE REACTION CONTROL KNOB.

C. S. P. (Gloucester).—"Wired up from your sketch, the set went perfectly from the word 'go.' But although the actual results

are all I had hoped for, I find the reaction control a bit of a nuisance because it works the opposite way round from the other sets.

"To get more reaction I now have to 'slack off' by turning to the left. If I turn clockwise, which normally 'increases,' it reduces the reaction effect.

"Is there any way of changing this round without having to buy a new differential?"

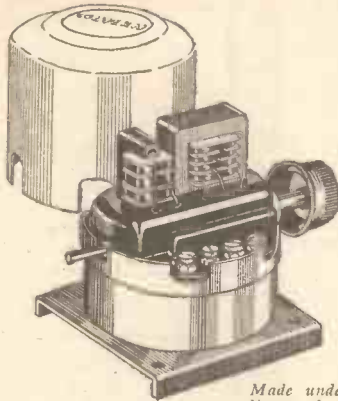
Certainly. There is a very easy way out of your difficulty.

All you have to do is to leave the connection to  
(Continued on page 536.)



# COLVERN FERROCART COILS

COLVERN . . . . .  
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with all that is best  
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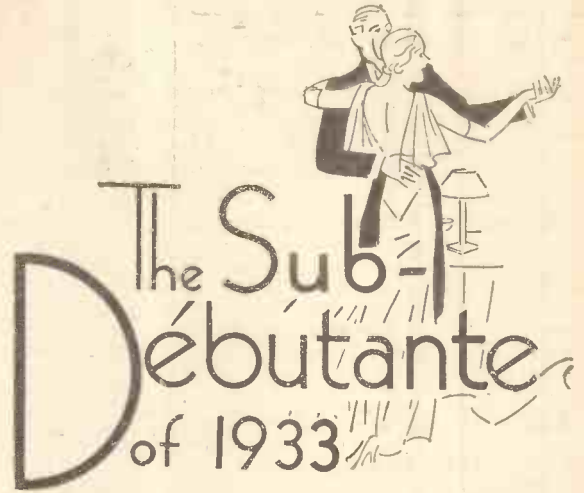
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Vinces Dry Batteries Ltd., Lion Works, Garford St., London, E.14. Phone East 1902



Just seventeen and soon off to that finishing school at Brussels, Miss Sub-Deb. of 1933 must know all that's going on! And where can she get it so crisply as in Daily Sketch? Diana Temple—she worships at her altar of Beauty Secrets. Modestina for the modes—she loves it all! . . . . . And without Mr. Gossip how could she tell whether it was the thing to dance with Peter at the Diplomacy and then on to Cirquaglo's or let Michael flip her down to Datchet for a swim and afterwards dance at the Club with the view . . . "Mr. Gossip never goes wrong on the right places, darling, never lets you make a mistake—socially, I mean." And D'Alroy in Daily Sketch! . . . "She's made finesse a fine art, and suggests all the new impertinences in a paragraph, better than others do in a page. D'Alroy's clever—she's a charm school in herself, my dear!"

AND above all she enjoys those magnificently produced exclusive news-pictures that almost talk as they show her the world at a glance.

DAILY SKETCH

Make it a habit.. order it NOW

The Premier Picture Newspaper

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 534.)

the differential's centre (moving vanes) contact as it stands, but change over the wiring of its other two terminals. This will bring the reaction control to the normal state, i.e. turn clockwise to increase.

(The reason your diagram showed the connections you are using at present is that they are the ones generally required for a differential of the make you name. Evidently yours is an old or unusual model, but there is no reason why it should not give perfect results connected as described above.)

### AN ANODE-BEND DETECTOR ADVANTAGE.

B. W. (Harlesden, N.W.).—"Is it a fact that the anode-bend detector has the advantage over the grid-leak and condenser type because it imposes less damping on the grid circuit connected across it?"

We are not quite sure how you mean us to read your question.

It is true that the anode-bend detector imposes less damping on the grid circuit than a grid-leak

## THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 534  
ARE GIVEN BELOW.

- (1) About 100,000 volts.
- (2) Approximately from 100 to 8,000 cycles per second.
- (3) Its natural wavelength is several times the wavelength to be received, and it is arranged to be suspended only a few feet above the ground.

DID YOU KNOW THEM ALL?

type of detector. And this is an advantage in certain circumstances.

But the other advantages of the grid-leak type of detector render it far more popular than the anode-bend type: so it is hard to pass your phrase "the anode-bend detector has the advantage over the grid-leak and condenser type" without pointing this out.

### THE CAUSE OF A FALL-OFF IN THE STRENGTH.

L. J. H. (Peterborough).—"What is likely to be the cause of my set giving weaker reception now than it did when fitted, back in January?"

You give us so few particulars, L. J. H., that we are compelled to reply in only general terms. For there are dozens of things which might account for "weaker reception," and the only way to trace them is to, know the details—e.g. how much weaker is the present than the past average strength? How did it first show itself? Is it always the same now or does it vary, etc.?

A fall-off in reception may be merely the usual "summer" effect, or be due to one of the following:

### 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.

Loss of Emission of one of the valves. This is liable to occur after the valves have been in use for about a year or more. Or it may occur with new valves if these have been run with insufficient grid bias, or too much H.T. or L.T.

**Incorrect Voltage.** Test your H.T. battery with a good voltmeter (whilst the set is running, if possible), and your L.T. by means of voltmeter or hydrometer, or both.

Run-down batteries are the commonest cause of weakened reception.

**Earth Connection.** A severed or corroded earth wire, possibly underground, is a frequent cause of such trouble. Also dirty connection between the earth wire and a water-pipe, or earth plate.

**Aerial.** Twisted joints which have become corroded, poor connection between the aerial and lead-in tube or between the latter and set, and neglected aerial switches should all be suspected.

These are the likeliest causes, so if they do not apply you probably have something a little out of the ordinary. And the only way to track it is to observe any little peculiarities about the symptoms, and report these fully.

### H.T. FROM THE FILAMENT.

E. C. (Lancaster).—"Not knowing anything about wireless, I only looked the diagram over to oblige him. But I found that the filament winding of the transformer is marked H.T. + (at the centre tap). And the big winding connected to the anodes of the rectifying valve is marked 'H.T. -' at its centre tap.

"Should the + and the - be the opposite way round?"

No. It is quite O.K. as marked, though it does look curious at first.

But the + output terminal of the rectifier valve is always that connected to the filament winding.

### USING TWISTED FLEX FOR FILAMENT WIRING.

G. S. (Bootle).—"As a matter of interest, I should like to know why it is that sometimes the filament leads of a set are given as plain wires, and another set of the same number of valves is given with flex L.T. wiring.

"Is there any sense in this? Or doesn't it make any difference which kind of wire is used?"

Yes, there is a definite reason for using flex in some sets. By its nature twisted flex is specially suitable for carrying alternating currents without allowing undue interference to arise from these, such as might easily occur if the ordinary L.T. leads were used.

So it is always better to follow a set designer's specification in this respect.

## THE LISTENER'S NOTEBOOK

(Continued from page 522.)

I thought the programme on this occasion ran the Contemporary Music Concert of the night before pretty close for noise and, alternately, dreariness.

I am not quite so great a sentimentalist as Mr. Jas. Agate is, judging from the confession he made before his Marie Tempest talk.

"I hate the last of anything," he said. I can understand his feelings of sickness over the completion of his "Stars in Their Courses" talks, for he has obviously enjoyed them all. Future Saturday nights must be flat for him for a time. But he'll get over it.

Frankly, these talks didn't appeal to me at first, but I came to like them. At first I thought them all wrong for a Saturday night. Any other night in the week would have been better. I've changed my mind since, however.

All the same, I think there comes a time when any series of talks—except that wonderful Escape series, perhaps—begins to lose its appeal. For this reason I think the practice of thirteen talks or more to a series is wrong. The course is too long!

I could mention several talks now reaching double figures that have quite lost their initial lustre, and I shall not feel as Mr. Agate does when the last of them is over.

It is like the last of a group of songs sometimes, or the last repetition of a chorus on an accordion from Radio Paris or Radio Toulouse—frequently an occasion for thankfulness.

## MIRROR OF THE B.B.C.

(Continued from page 522.)

happy about the future. The decision to relay ten of the Hallé Society's orchestral concerts from the Free Trade Hall, next season, and the agreement that players in the B.B.C.'s Northern Studio Orchestra, who at one time were leading members of

the Hallé Orchestra, shall be released to take part in these concerts, shows how well the spirit of cooperation has been interpreted.

With the augmentation of the Studio Orchestra by players from the Hallé on no fewer than thirty occasions, one big concert will be given at least every week during the season. The North particularly, and the rest of the country through relays by their own National and Regional transmitters, can look forward to a feast of excellent music.

### Midland News.

Few names are more deservedly popular with listeners than that of Charles Brewer, whose light productions, many of which he writes as well as "puts over," have for some years been among the most appreciated items of the Midland Regional programmes.

Another Midland name which often appears in the broadcast programmes is that of Robert Tredinnick, a young man who was quick to realise that what Christopher Stone had so successfully done in London in the form of gramophone recitals, attractively presented, should also be done in his own part of the country.

Now these two Midland broadcasters have "got together," with the result that on Monday, July 17th, they are to be responsible for a light entertainment, a combination of sketch and gramophone recital, to which they have given the title "Let's Discuss Holidays."

## THE LINK BETWEEN

(Continued from page 532.)

double-diode triodes, but ultimately it will probably be fitted to all Mullard valves in which a top anode terminal is necessary.

## 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.

### New "Class B" Valve.

The latest addition to the famous Mazda range of valves—the Mazda P.D.220—is one that will be of interest to all "Class B" enthusiasts.

It is claimed to give a really good power output, and to be particularly economical in use, and although I have not yet had an opportunity of trying one of these new valves, the name of Mazda is good enough for me!

Adequate stocks of the new P.D.220 are now available, and the price is 14s. Incidentally, full instructions are supplied with every valve.

### Change of Address.

I have been asked to call "P.W." readers' attention to a change in the address of Mr. Eugen Forbat, who is the sole distributor in this country for Ostar Ganz High Voltage Mains Valves and Rectifiers.

Henceforth all communications should be addressed to 28-29, Southampton Street, Strand, London, W.C.2.



# A HIGH-POWER PENTODE

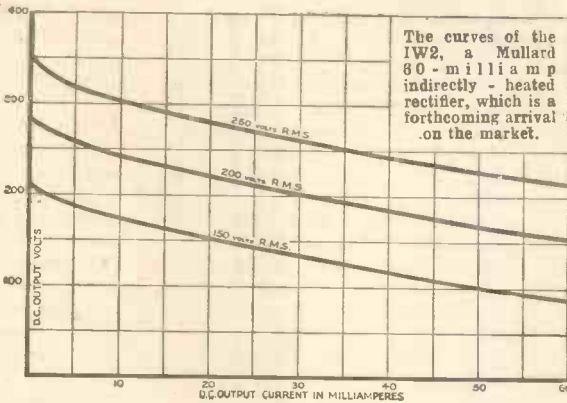
First details of a new indirectly-heated output valve, and of several other noteworthy advances in valve design.

FOR a long time we have become so accustomed to the normal type of indirectly-heated A.C. and D.C. pentodes, giving an output power of some 2,000 to 2,500 milliwatts, that we have unconsciously considered that finality has been reached with that particular type of valve design.

Directly-heated pentodes have been produced with larger outputs, but up to the present nothing has been done to improve on the power-delivering properties of the indirectly-heated kind.

During the last week, however, news has reached us of a valve that has quite upset our foregone conclusions concerning these valves, for Mullard have in production an indirectly-heated pentode for A.C. operation capable of giving the astounding output power of 3,400 milliwatts undistorted A.C.

In addition, the valve, which is to be



The curves of the IW2, a Mullard 80 - milliamper indirectly - heated rectifier, which is a forthcoming arrival on the market.

sensitivity of the Pen. 4VA is some 14 mW/V<sup>2</sup>, while with an input of 12 volts R.M.S. the sensitivity is about 17 mW/V<sup>2</sup>.

But the pentode is not the only new valve that is shortly to make its appearance.

There is the Mullard DO26, which is to supersede the DO25 as an output triode valve in high-power amplifiers. This takes

a filament current of 2 amps. at 4 volts, and has an optimum load of 4,000 ohms. The mutual conductance is 6.3 mA/V, and the anode impedance 600 ohms.

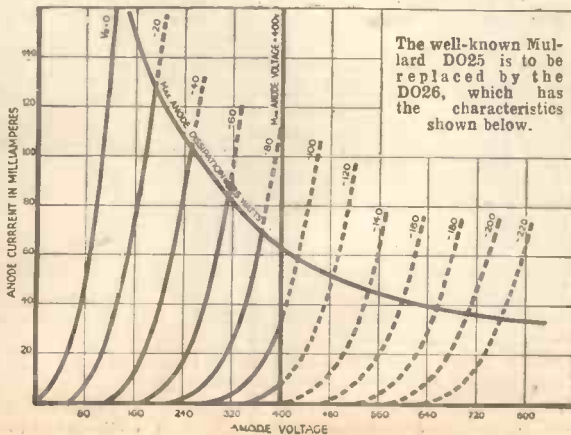
With a maximum input voltage on the grid of 65 volts R.M.S. we get a sensitivity of 1.75 mW per V<sup>2</sup>, and the maximum power output is 7.5 watts. The approximate grid-bias voltage at the maximum anode potential of 400 volts is 92 volts, at which figures an anode current of 62.5 milliamps flows.

Finally, accompanying these valves are two indirectly-heated mains rectifiers, the IW2 and IW3, both from the same stable. The former is to provide a rectified current of 60 milliamps at 250 volts, and the other a current of 120 milliamps at 350 volts. These valves render voltage surges in the set due to H.T. application before its valves warm up, impossible.

known as the Pen. 4VA, will take a greater grid voltage input than its predecessor, the Pen. 4V, so that the danger of grid overloading, so common with the indirectly-heated pentode, as we now know it, is greatly reduced.

Here are the characteristics of the Pen. 4VA, which show at a glance what a particularly useful addition to the ranks of A.C. valves it is. The heater voltage is 4 volts, which is quite normal, while the heater current is 1.5 amp., a slight increase that is not important.

The maximum anode and auxiliary grid voltages are the same, namely 250 volts, while the optimum load is some 6,000 ohms. The mutual conductance is 3.5 milliamps per volt, and the maximum anode current is about 32 milliamps, with a grid-bias voltage of 22 volts. This bias is provided with a cathode resistance of 500 ohms. With an input voltage of 15.5 volts R.M.S. on the grid the



The well-known Mullard DO25 is to be replaced by the DO26, which has the characteristics shown below.



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3,000	29	40,000	6
4,000	24	50,000	5-5
5,000	20-25	60,000	5
10,000	12	80,000	4-24
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### LIT - LOS

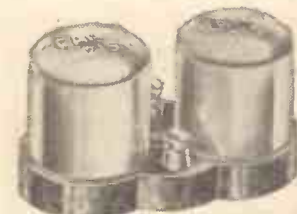
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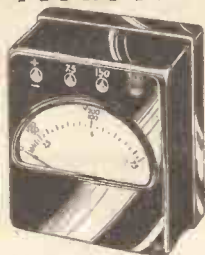
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## P.W.'s TELEVISION VIEWER —WHAT OTHERS SAY

(Continued from page 525.)

busy for several weeks dealing with inquiries and arranging demonstrations. Even the B.B.C. have asked for a “look” at Ponders End, though at the time of writing I believe the demonstration date has not been fixed.

And now for a few words to some of our readers who have written in either expressing appreciation, asking queries or offering useful suggestions. They have been so numerous that I cannot possibly reply fully, if at all, to all of them, and those who have asked definite queries I have had to refer to the Query Department.

To the other communications I will reply if I can, but, in any case, will the writers of my many interesting and sometimes long letters please accept my appreciation and thanks for the views and suggestions contained therein?

### Special Thanks.

Especially, I should like to thank Messrs. G. W. of Eastbourne, F. Dicks of Edmonton, J. Glover of St. Peter's, Broadstairs, J. Smith of Palmers Green, and the many Scottish readers who have given useful information regarding the possibilities of television reception in various parts of the country. I am sorry you are so badly served, Scotland, especially as you are all so keen.

In conclusion, the following letter from a member of the East London College, Department of Electrical Engineering, will be of interest, as it deals with his experiences of A.C.-operated cathode-ray tubes.

“Dear Sir,—I am interested in your articles on Cathode-Ray Television, and I note in the current issue your suggestion that ‘certain sections could be mains-operated, but risk of L.F. interference is rather large.’

### Recent Tube Developments.

“I am using an Ediswan tube, together with one of their mains units, and at first had great difficulty with A.C. ripple, but which I have now completely eliminated. The chief trouble appears to be due to electrostatic charges on the surface of the glass, and I have made tests to show the distribution of these charges on an unshielded tube.

“The practical point which may be of interest to your readers is that the difficulty is very largely overcome by putting a guard-ring, consisting of a band of tinfoil about one inch wide, around the neck of the tube at the point where the tube begins to open out, i.e. just ahead of the foremost pair of deflecting plates. The tinfoil should be connected to the pair of plates that are commoned and earthed.

“I should be glad if you would make use of this note, in the hope that it will help to improve the performance of Messrs. Ediswan's tubes for television purposes, as they have very kindly lent me a tube and mains unit for my experimental work. “Yours faithfully, LEONARD P. CLIFFORD.”

As we go to press I have received news of a further development by Ediswan in connection with the cathode-ray tube—the production of a screen that provides a black and white image. This, of course, is a great advance, and I shall have more to say about it later.

## TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

### Inter-Planetary Transmission.

IT is pretty obvious that any Earth-to-Mars transmitter would have to be very powerful and would need to employ a beam or other highly directive type of radiator. Assuming that Mr. Mars is at least as intelligent as human beings, he probably has all the noise of generating appliances, such as vacuum cleaners, electric signs, traffic signals and so on, that hamper our own reception.

The transmitter must be able to squirt the radio energy, as it were, in a pencil-like beam directed towards Mars, which means some pretty smart astronomical sharp-shooting. It would appear to be quite hopeless to use the ordinary broadcasting type of radiator that scatters energy in all directions.

With the very great increases which are taking place both in the power and efficiency of radio transmitters, it is quite within the bounds of possibility that radio signals may be delivered to Mars at a strength sufficient to operate a receiver similar to a broadcast set, but whether such signals will meet with any response is—and may always remain—a matter for speculation.

### Listening in the Car.

With the summer coming on the idea of portable sets fitted into the car comes to the fore once more. I notice that in America, where radio in cars is much more popular than here, one firm has just brought out a special set with dynamic speaker, all contained in a small metal case so that it can be attached into the car with one bolt. A remote control box can be clamped in any position on the steering column or on the dashboard, within easy reach of the driver.

Ignition interference is always a problem in these cases, but in the above-mentioned receiver this has been got over by double-shielding of the vibrator-power supply, complete shielding of the entire apparatus and the use of tone control which makes it possible to reduce extraneous noises.

### Radio Design Progress.

It is really surprising what a number of people I meet who, having asked my advice as to the best set for this, that or the other purpose, express the opinion at some point in the conversation that radio progresses so rapidly that it is hardly worth while getting a set because, if it is up to date this season it will be out of date next.

It is true, as I have just said, that matters progress pretty quickly in radio—almost more quickly than in anything else one knows—but at the same time, if you are going to adopt that policy you may as well stick to your old “det. and 2 L.F.” which you had years ago, and keep on waiting and waiting for more years to come.

In any case, I think the caution is overdone because, to put it mildly, if you have an up to date set this season it will

(Continued on next page.)



## TECHNICAL NOTES

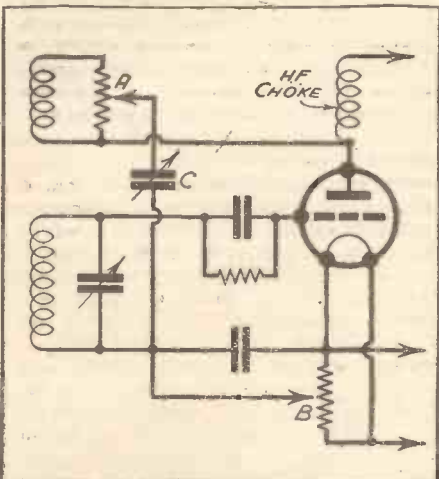
(Continued from previous page.)

certainly last you for two or three seasons and still be an efficient set. Don't forget that improvements in sets each year do not make your set any less efficient. It is just the same as with a car; you may be running a car which is four or five years old and you may envy your friends who have just bought new cars with all sorts of extra gadgets, but that doesn't make your car any less efficient.

### Making Old Batteries Young.

Since I mentioned the "Radiumite" battery electrolyte in these Notes a week or two back, I have had quite a number of letters from readers who say that they have tried this in their batteries and had excellent results. As a typical case, I may mention one letter which states that the writer had an old battery which he had laid aside for months as dead: he had it charged with Radiumite, which restored it, and it now works better than when new. I am very pleased to pass on this information for the benefit of those who may feel disposed to try anything of this kind but, of course, you will understand that I have not tried this myself.

## FOR QUALITY AND SENSITIVITY



The simple modification of the reaction circuit, to which Dr. Roberts refers below.

### Potentiometer Reaction Control.

A reader asks me about the use of a potentiometer control for reaction which I mentioned some time back. There are various forms of reaction control, but a very good one is that indicated in the figure above. The potentiometer shown at A, which may have a value of 10,000 ohms or somewhat less, is connected across the reaction coil and the reaction condenser is connected to the slider of the potentiometer, the reaction condenser being shown at C. Another potentiometer of a much smaller value, say 500-ohms maximum, is connected at B for the purpose of controlling the grid-bias voltage to the detector and so getting the best conditions for rectification. This arrangement of reaction control has the advantage that not only does it preserve the quality of reproduction, but also it increases sensitivity and does away with the need to work on the edge of oscillation when trying to pick up distant or weak transmissions.

### Fitting a Pentode.

I am asked from time to time whether it is a simple matter to use a pentode output stage with an existing circuit, such as detector and one or two L.F. stages.

It is, as a matter of fact, quite a simple matter to fit a pentode stage, although it is better, if you have a two-stage low-frequency amplifier already, to do away with one stage (so as to avoid overloading the pentode with too great an input), using just the detector and the pentode as the low-frequency amplifier and output.

In order to do this—assuming that you have already dispensed with one stage, if this is necessary—you substitute the pentode stage for the existing output stage. This can be done by putting a five-pin pentode valve holder in place of the present four-pin holder and fitting the centre pin with a length of flex and a wander-plug, so that it can be connected to a tapping on the H.T. battery. You will probably find it better to use an H.T. voltage for this pin rather less than the maximum.

### Changing Over Output Stage.

I should, however, mention that the changeover to the pentode is not really quite so simple as this, because you will almost certainly need a tone control—which I have described before in these Notes—owing to the rather high-pitched quality given by the pentode valve and, in addition to this, it is very desirable to use a special output transformer so as to match up the impedance of the pentode with that of the loudspeaker.

The pentode valve substituted for a single low-frequency stage should give you a very noticeable increase in the output, but it will take a distinctly larger amount of H.T. current.

### A Fading Effect.

Readers often wonder why it sometimes happens that distant stations, which can be received fairly well in the evening, but with a lot of fading, can sometimes be received during the daytime—at a less strength it is true—but with fairly consistent volume. This at first sight does seem rather strange, and it gives you the idea that there is less fading during the day than in the evening.

The explanation is a rather complicated one, but broadly the effect seems to be due to the fact that the energy reaching the receiver is carried partly by the ground ray and partly by the indirect ray, as it is called, that is, the ray which travels above ground, sometimes reaching high altitudes.

### The Ground Ray.

It is pretty obvious that this indirect ray is much more subject to the various fading conditions than the ground ray. It therefore resolves itself into a question whether you are getting your reception on the ground ray or the indirect ray. If the distant transmitting station is powerful enough for you to get it on the ground ray then, although you may not get great signal strength, you will at any rate be fairly free from fading.

The result of all this is that in the case of a powerful distant foreigner you may get him on the ground ray during the daytime—rather weak but consistent—whilst at nighttime you get him stronger, on the indirect ray, but very liable to fading.

(Continued on next page.)

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## TECHNICAL NOTES

(Continued from previous page.)

### Improving Selectivity.

Modern sets are generally pretty selective, but sometimes, with a set which is not very recent, you may suffer from lack of selectivity. There are various dodges you can use to improve the selectivity of the set and I have referred to some of these from time to time in Technical Notes.

One very simple dodge you can try is to switch over from leaky-grid detection, if you are using this method, to anode bend. The leaky-grid arrangement is generally considered to be rather more sensitive than the anode bend, but at the same time the latter arrangement can be made to give very good results if care is taken with regard to details, particularly such a detail as the grid-bias voltage.

There has always been a controversy about the relative merits of leaky-grid and anode-bend detection, some people saying that the one system gives better quality, and some favouring the other. As a matter of fact, when properly operated, both of these arrangements for detection will give

the coil should be unearthed and, instead of being connected to earth, should be connected to a tapping on the grid-bias battery. Sometimes it is a good plan to connect this end of the coil also (that is in addition to the grid-bias connection) to earth via a bypass condenser.

### Short-Wave Channels.

If television were assigned to short waves, there is a possibility that a wide band of frequencies could be given to it, and this would make a great difference to the simplification of the problem. You can put it that the transmission of a picture is much easier with a band of frequencies instead of just one or two; or, if you look at it the other way round, a picture of a given size can be correspondingly improved in detail by a greater number of wavelength channels.

### Automatic Volume Control.

I was saying something recently about automatic volume control, and a number of readers have written to me about this. Practically all those who have used it seem to be quite enthusiastic about it, and particularly about the way in which the stations come in with more or less uniform strength.

Of course, whether the automatic volume control makes up for really bad fading and background effects when you are listening for long-distance reception depends upon how powerful the control may be, but even if it is not enough for this it is a great help in keeping the various stations to a reasonable level of loudness.

Instead of switching in one station which sounds as though it were in the next room, and then going over to another that sounds about a million miles away, it is quite a simple matter with automatic volume control to get such stations coming in with an extraordinarily level degree of volume. If you have not yet tried automatic volume control you ought to do so; it seems to have come to stay.

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**NEXT WEEK!**

\* \* \* \* \*

really excellent results, quite up to the limits set by any other part of the circuit and, if it comes to that, any part of the receiver is liable to give distortion and other troubles if it is not operated under proper conditions.

### Anode-Bend Detection.

In case you may think that it means a considerable alteration of the circuit to change over from leaky-grid to anode-bend detection, I should say that the changeover as a matter of fact is quite simple. You will need to disconnect the grid leak and its condenser from the the grid of the valve and connect the grid direct to the end of the coil to which it was previously connected via the grid condenser. The other end of

### Cosmic Rays.

You have heard quite a lot about the cosmic rays which were discovered a few years back and which come from "outer space," and now the discovery has been made of some radio waves, having a wavelength of about 14½ metres, which seem to come from the Milky Way in the heavens. These waves have been discovered by one of the scientists of the Bell Telephone Laboratories in America, and were described in a Paper read recently before the International Scientific Radio Union in Washington, U.S.

### And the New Ones.

The strength of the waves is very low, so that delicate receiving apparatus is necessary to detect them. Unlike most radio waves they apparently are not due to any terrestrial source but seem to come from some point far off in space, possibly beyond our solar system.

If the waves had an earth origin, it is argued that they should have the same intensity the year round, but in point of fact their intensity varies with the time of day and with the seasons, and they get much weaker when the earth interposes itself between the radio receiver and the believed source.



# POPULAR WIRELESS



**THE FIRST AND FOREMOST RADIO WEEKLY.**  
 Scientific Adviser : Chief Radio Consultant :  
**SIR OLIVER LODGE, F.R.S. 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*



**PREPARING FOR OLYMPIA  
 TACKLING INTERFERENCE  
 RUMOURS OF WAR  
 AUTOMOBILE SETS**

## RADIO NOTES & NEWS

**THE NEIGHBOURS' SPEAKERS  
 FOOTBALL BROADCASTS  
 HYMNS AND BEER  
 LATE DANCE MUSIC**

### Olympian Activity.

OUR news hounds report immense activity behind-scenes in preparation for the Great Show at Olympia in August. It would seem that every firm showing is determined to do its utmost to transcend the efforts of all others in staggering the public with novelty and value.

Indeed, I can safely predict that Olympia this year will prove as exciting as a "thriller" when the secrecy seals of all the various bags are broken and our cheery radio showmen tip their contents on to the hundreds of stands for your inspection. I am itching to tell you some of the things I know; but I, too, am bound to secrecy on all sides, and, contrary to the opinion of at least one ill-informed critic, we "P.W."ites never break a confidence entrusted to us.

### Is Europe Decadent ?

IN reference to Jack Payne's return from his Continental tour with his band, the B.B.C. states that whereas there appears to be a wide demand amongst Continental listeners for music of the type of Ravel's *Bolero* and Pierné's *Entrance of the Fauns*, the listeners in some countries favour "hot" music.

In fact, some Dutch and Belgian cities actually harbour "hot jazz" groups, which exist for the purpose of keeping their members *au courant* with the latest works in that medium. I have more admiration for a member of the French "Foreign Legion" than for a member of a "hot jazz" group.

### That Interference Problem.

THE Institution of Electrical Engineers has set up a special committee to investigate "ways and means of eliminating electrical interference with broadcast reception." There are members serving on this committee representing the G.P.O., the B.B.C., the Wireless Industry and many other affected interests.

Our old friend Mr. Joseph is the Radio Industry member, and that is rather appropriate in view of the initials of his great firm, Radio Instruments.

And I am sure he will contribute in no small measure to the labours of this investigatory body, for he is unusually well informed on the subject and is, into the bargain, in no two minds about its vital importance.

### We Stand Uncorrected.

THE "Whitehaven News" gently takes us to task for including "Whitehaven" among the radio stations in our Radiopics Competition. Says their correspondent: "It is news to me that there is a wireless station here."

I'd like to take that gentleman into the

## WORLD WIDE!

With all the nations represented in London at the World Economic Conference, it is particularly opportune to draw our readers' attention to the world-wide aspects of "Popular Wireless."

The most universally employed method of transoceanic home radio reception is by means of apparatus evolved from our original short-wave adaptor, which has been extensively copied

## IN EVERY COUNTRY

Only a few weeks ago "Popular Wireless" instigated 5-metre experiments from the Crystal Palace, London, which gained for Great Britain

## A WORLD RECORD

Following this achievement, we inaugurate this week the **FIRST INTERNATIONAL QUALITY TESTS** for public reception: a continuation of our policy to be not only first with the news of radio progress, but also to join actively in its

## ADVANCEMENT

Golden Lion (one of Whitehaven's excellent hostleries) and, over lunch, explain: (1) There is a quite important Whitehaven in the United States complete with broadcasting station; and (2) we very clearly stated that we drew on the whole world for our station names. After which I think he ought to pay for the lunch!

### Another War in the East ?

IT is reported that Russia intends to build several high-power broadcasting stations on its far-eastern frontiers. Japan apparently considers that the object of this is to disturb the Japanese ether with anti-Japanese propaganda, and, says the same report, is vastly concerned about it all.

Even while I'm thinking what a pity it is that broadcasting should be used for cussing-matches between nations, the thought occurs to mind that cussing is something of a safety valve!

### I Go A-Cruising.

ONCE again I have travelled all the way to Thanet and back. 'Twas the good ship "Royal Eagle" that bore me o'er the vasty deep. I commend the trip to others desirous of an enjoyable experience crowded into one day and costing only a few shillings.

The ship is equipped with a first-class radio outfit, through which music, interspersed by pithy comments on all the interesting scenes passed on the River Thames, is broadcast for the benefit of passengers.

### Radio for Cars.

STIMULATED by the success car radio has achieved in the United States, many British firms are turning their attention to the matter. Undoubtedly there is a good potential market for wireless sets for cars in this country, but, in my opinion, not a big enough market to create boom conditions.

It must be remembered that this is a country of comparatively short journeys, and that, in comparison with the mile-eating Americans, our average motorists are but potterers. And who wants a radio set just to tootle over to Aunt Agatha's and back ?

### A Fine Combination.

VISCOUNT BRIDGEMAN has suggested that the B.B.C. and the Royal Geographical Society should get into close touch and, in co-operation, produce something really peppy in the way of instructional matter for British listeners.

Well, so long as our B.B.C. pundits are determined to pursue an educational policy, the more help they can get in preparing their material the better.

(Continued on next page.)



# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

But although I have nothing but admiration for the work of the benign R.G.S., I cannot help admitting that I, personally, would extend a heartier welcome to a closer contact between the B.B.C. and the entertainment interests!

### Convention by Radlo.

INSTEAD of meeting at some delectable seaside resort and mingling business with pleasure, the R.C.A.-Victor dealers in America just tuned in to a special radio programme, the first item of which was a play about the dramatic moments of radio history. Next, the company's president and sales and production manager held a discussion of trade conditions.



Novel, and excellent as a makeshift or a measure of economy; but nothing can beat the personal touch between head office and the outside men.

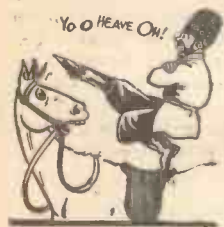
### Hitler On the Air.

I AM unable to understand more than a few words of German, but, no doubt like many others, I haven't found it difficult to follow the purport of many of the talks that are being broadcast from the German stations.

Indeed, the number of times one hears "Hitler! Heil, Hitler!" coming over these days leads one inevitably to the impression that the German broadcasters are determined that someone bearing the name of Hitler should be brought to the notice of their listeners.

### The Choir—and What Was Required.

DON'T you think that this one is pretty good? A booking agent in the States made an engagement for a Russian cathedral choir which had been popular on the ether, and then asked how many of the singers could ride.



On hearing that none could ride he informed the choir's manager that they would do well to learn, and that right quickly, because he

had booked them for a big fair as "The Singing Cossacks" and had contracted for them to enter the fair grounds on horseback singing the "Volga Boat Song." This is a story which grows in beauty the more one considers it. (Acknowledgments to Mr. P. Dixon and his paper.)

### Over the Garden Wall.

A TENANT of a council house was recently evicted because he would persist in running his radio so loudly and for such long periods that his neighbours were driven to distraction.

In this particular case the principal victim was a bedridden ex-soldier suffering still from shell-shock. Well, one's impulse

is to call the culprit all kinds of names. But, charity supervening, one hopes that there was more of thoughtlessness than selfishness or malice behind the action.

### Do Unto Others

I BELIEVE that a great deal of this kind of trouble is due to a widespread acceptance of that fallacy that "An Englishman's home is his castle." This has led too many of us subconsciously, if not consciously, to imagine that once we are enclosed within the walls (and fences) of our houses and gardens we can do what we like, and that there is a sort of impenetrable barrier raised against the outer world.

Unhappily, the sounds we make can only too easily escape from our domain and reach the ears of others. And these others might or might not consider them to be pleasant sounds!

### Naughty Notts.

NOTTS COUNTY wrote to the Football Association and asked them to prohibit the broadcasting of a running commentary on the Cup Final.

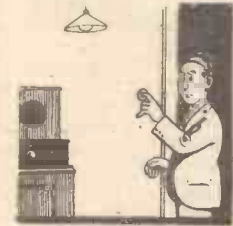
No doubt the jovial footballers of Notts had their own very good reasons for the request, but I am mighty glad that the Association wagged its venerable head in the negative tide.

Goodness gracious, the Cup Final provides us with one of the very few occasions for hearing George Allison at work as a broad-

caster, and he's worth a score of chamber-music concerts, with an odd flute concerto or two thrown in! At least, I consider he is. Now turn and rend me, ye men of bulbous brows.

### Radio Shut Off by Local Arc?

F. J. C. (Rugby), referring to the trouble which I used to have with my radio-gram when the house-lighting switches were operated, tells me that he has been suffering from a different effect, namely, the cessation of his loud-speaker signals when his kitchen light is switched off.



He thinks the explanation is that his aerial tuning-coil has a bad connection which is

actually turned into a "break" when the lighting-switch arcs. I do not altogether favour his theory. I have seen a whole lighting circuit sustained by an arc across a "break," but I do not see how a tiny arc ten feet distant could make a bad connection worse. Any more theories?

### Sermons In Public-houses.

THE "Daily Sketch" reports that many public-houses in the North Country are making a feature of the Sunday evening sermons that are broadcast. Says the "Daily Sketch" (a paper I always read, by the way—I wouldn't miss the daily doings of Jiggs for anything): "Smoke-rooms and bars are filled with men and women who, with glasses of beer in front of them, listen attentively to the sermon and join in the singing of the hymns."

### A Manchester Summer.

THE Manchester Municipal College of Technology has favoured me with a copy of its Summer Evening Classes Prospectus—a document which increases my respect, if that were possible, for the Mancunians.

While lesser breeds experiment idly with the effect of ultra-violet light on the human skin, and gaze into ultra-violet eyes, these terrific Lancashire lads will study, *inter alia*, "The Construction of Main Sewers" and "Cake Decoration."



Radio is represented by "Modern Theory of Radio Wave Propagation and its Effect on Aerial Design." It takes all kinds of people to make a world!

### Alternative Required.

I WISH the B.B.C. would give us an alternative to dance music at the end of the day's programme. I like dance music—at times—but as a daily potion it is apt to get a little boring. And now, having just finished my notes for the week, I switch on my set, and—there's nothing doing except dance music!

ARIEL.

## SHORT WAVES

A man who was recently charged with using a wireless receiving set without a licence pleaded that he was suffering from temporary loss of memory. He is now suffering from a permanent loss of five pounds.

Landlady: "You say you have no children, no motor car, and no dogs?"  
Prospective Tenant: "That's right. But I think I ought to tell you that I build wireless sets."

### A CRUMB OF COMFORT.

The King's English has just been murdered again: "At any rate," he chortled just before he breathed his last, "I have never been tortured quite so much as a French musical title broadcast by an American radio announcer."

A wireless dealer complains that, having invested a good deal of money in a certain type of radio receiver, the demand for these sets has now practically ceased. We can only point out that individuals must suffer for the general weal.

### WANTED—A BRAINWAVE.

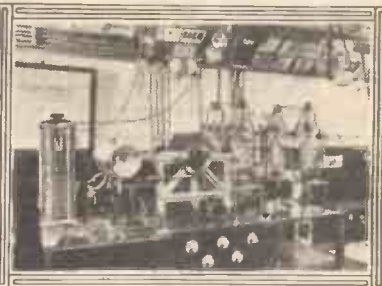
The heads of the Broadcasting Corporation Assembled together in perturbation. For a recent "thriller" had failed to thrill. And they wanted something to fill the bill...

They had strained their clients' mental digestions  
With talks on all manner of curious questions. They had told how the Bolsheviks, keen to a man,  
Were forging ahead with the Five-Year Plan;  
But they doubted if listeners-in would stand a further dose of such propaganda.  
They had broadcast the horn and hounds at a meet  
And the noise of the traffic in Oxford Street;  
And a crowd at one of the summer sales,  
And it wasn't the season for nightingales.



# OUR INTERNATIONAL QUALITY TESTS

LISTEN for LISBON



"P.W." has pleasure in announcing that through the kind co-operation of that very famous short-wave station at Lisbon, CT 1 A A, a series of tests is to take place on the evening of Friday, July 14th, of the utmost interest to every short-wave listener in this country—in fact, to short-wave listeners throughout the world.

There can be little doubt that short waves are destined to play an increasingly important part in the broadcasting affairs of the whole world, for in their development lies the solution to many of our urgent problems. Apart from ether-congestion, with its inevitable impairment of the quality of reproduction, it is only necessary to consider some of the many difficulties associated with television to appreciate that sooner or later the step is inevitable; for as long as we are confined to existing broadcast channels for the transmission of television "lines" the scheme can never be universally successful.

### Serving the Public.

"P.W." has led the way with cathode-ray television, and now we are going one better! We are out to champion the cause of short waves generally, with particular regard to their tremendous possibilities for the successful transmission of television programmes.

It is an ambitious ideal, but it is by no means an impossible one, and by being the first journal ever to institute short-wave frequency tests on an international basis "P.W." is again paving the way to a development, the far-reaching consequences of which may well alter the whole science of broadcast entertainment. That, frankly, is our idea of service!

### Exploding a Popular Fallacy.

No stone has been left unturned in our sincere efforts to make this highly important experiment a success. We have been in constant telephonic and telegraphic communication with Signor Abilio Nunes dos Santos, who has been entirely responsible for the organisation of the work at the Lisbon end; experiments have been made, and now, after weeks of preparation, the

On the evening of Friday, July 14th, commencing at 10.30 p.m., "P.W." will make radio history! Through the kind co-operation of CT 1 A A at Lisbon we have made elaborate arrangements for the broadcasting of a series of international long-distance frequency tests of the utmost importance, and in which every reader of "P.W." is invited to take part. All short-wave enthusiasts will, therefore, benefit from "P.W.'s" policy of inaugurating and actively participating in this new development for the advancement of radio reception.

By G. T. KELSEY.

stage has been reached where we are able with pleasure to invite the co-operation of every one of "P.W.'s" short-wave listeners in a culminating series of tests which are destined to make radio history.

The full significance of these tests will be better appreciated if we here digress in order to tell you something of the reasons which prompted us, in collaboration with CT 1 A A, to organise this international experiment.

If you were to ask the opinions of a group

can be no doubt that passable quality reception of distant short-wavers is now an accomplished fact, or, at least, it can be if you go the right way about it.

### Outcome of Previous "P.W." Developments.

That, as a matter of fact, is a very conservative claim, for in the case of many of the transmissions that are now to be heard on short waves, the quality really does bear comparison with that which we normally associate with our own local stations. It's the logical outcome not only of the famous "A.T.B." scheme for which "P.W.'s" Technical Editor was responsible, but of all the tremendous advances that have recently been made in short-wave technique and in tone-correction schemes generally.

Well, we are out to prove it! And in order to do so we have chosen the most critical test of the lot—a test which one might even hesitate to use in connection with any but the best receivers for ordinary broadcast reception. But at least it will be conclusive!

### Nature of the Tests.

At 11 p.m. on Friday evening the first of the tests will be inaugurated by an introductory discussion which "P.W." has had specially recorded at the H.M.V. studios in London. Immediately following this discussion a series of

constant-frequency notes will be broadcast, ranging from 50 to 6,000 cycles, and including all the usual stepping-stones in the frequency spectrum.

If your set will receive them all at equal strength (and it will if it is properly designed), then television and, in fact, broadcasting generally on short waves is virtually an accomplished fact!

(Continued on next page.)

## CHECKING REPRODUCTION ON THE SHORT WAVES



This is the studio at CT 1 A A, from which the frequency tests will be transmitted. The first of these tests, which will be preceded by a discussion, will take place at 11 p.m. All who can gain access to a short-wave set should make a point of listening to this special broadcast which "P.W." has inaugurated.

of people mildly interested in short-wave reception, nine out of ten of them would tell you that, while distance is no object, short-wave quality, in so far as modern standards are concerned, is to all intents and purposes non-existent.

Such an idea is quite two, if not three, years old! But the tragic part about it is that the general public (with which, incidentally, we do not include "P.W."



## OUR INTERNATIONAL QUALITY TESTS

(Continued from previous page.)

It might perhaps be wondered why we are stopping at 6,000 cycles when 8,000 or 10,000 cycles are usually considered to be the uppermost limit of the frequency spectrum employed in broadcasting. The principal reason is because there are few, if

### MAKING THE SPECIAL "P.W." RECORD



Mr. G. T. Kelsey and a short-wave listener photographed at the H.M.V. studios during the making of the special record which will be heard from Lisbon on Friday.

any, pick-ups that give linear response at frequencies appreciably above this arbitrary limit.

But it is not a matter to which we attach much significance, for if your set gives appreciably the same output at 6,000 cycles as it does at 600 cycles, then there is not much at this stage to worry about, for we have yet to come across a set that has a dead cut-off. For television it might require to go much higher, but for ordinary broadcasting 6,000 cycles is quite a workable limit. It is doubtful in the extreme whether you would notice any audible difference even if it did go higher!

So that for all practical purposes from 50 to 6,000 cycles are quite adequate.

Now we come to the part that we are asking you to play, for the success of this experiment depends very largely upon the co-operation of every "P.W." reader who is interested in short-wave reception.

#### How You Can Help.

For the duration of these tests we ask you to consider yourself as a "P.W." listening-post, and to keep a careful record of the way in which the various frequencies come over. We are particularly anxious to find out what happens to the average set at the lower end of the frequency spectrum—that is, at frequencies of the order of 50 and 100 cycles—and again at the top end, which includes all frequencies beyond about 4,000 cycles.

And if as many as possible of you will co-operate by sending reports on these lines, we hope ultimately to be able to prepare a representative curve as evidence of our contention that passable quality reception on short waves is definitely possible. But more about that when the tests are over.

Meanwhile, just a few more words about the evening of July 14th. The tests themselves are, of course, the tit-bit of the

evening, and are primarily the purpose of the special broadcast. But the whole programme, which will last for rather more than 2½ hours, is one that will be of particular interest to all British listeners.

#### "Please Don't do it."

Those of you who heard the last "P.W." broadcast from Lisbon rather more than twelve months ago will certainly not want to miss this one. The programme this time will be vastly more entertaining, and I am almost tempted to

give details right now, except that I feel you would all prefer the element of surprise to be maintained.

We do ask you to bear in mind that this is a "P.W." programme for "P.W." readers, and for that reason we want you all to make a point of hearing it. But may we make just one appeal?

In the interests of Lisbon, listeners generally, please make a special effort not to oscillate on 31.25 metres during the period of the special broadcast. CT1AA is coming over so remarkably well at the present time that to work on, or even near, the oscillation point should be quite unnecessary. But our appeal carries even greater significance, for the closer you work to reaction the less likely will you be to receive the frequency tests successfully. Need we say more?

#### A Competition for Readers.

By virtue of the fact that this will be the very first occasion on which international long-distance frequency tests have been attempted, this broadcast is destined to make radio history, and for that reason we should like the original record with which the tests are to be inaugurated to pass into the safe custody of one of our readers. But

to determine which of all our many readers is to have the record is quite another problem.

The only fair basis upon which to decide would appear to be a competitive one, and so we have decided to give the original record to the reader who sends in what, in our opinion, is the best and most useful report of the tests. We do not intend to take literary ability into consideration when judging the reports, and the record will not necessarily be awarded to the reader who obtains the most successful results.

Thus everybody will have a fair chance, and the only stipulation we make is that reports should be brief and to the point. Reports will be considered up to the first post on July 21st, after which date the competition shall be deemed to be closed.

For the benefit of those who are not fully acquainted with short-wave reception, may we, by way of conclusion, say a word or two concerning the position of the dial at which CT1AA is likely to be found?

#### Making Reception Certain.

In the absence of a short-wave wave-meter, the only way to set about finding the station is by means of familiar "landmarks." For instance, Rome 2RO and Daventry GSE, on 25.4 metres and 25.28 metres respectively, are both very powerful stations, and both are usually on the air on Friday evenings.

Once you have located these two stations, which should not be a difficult matter, CT1AA, taking the case of the average set, will probably be found from about ten to fifteen degrees higher up the scale.

The transmission at the time of writing is extremely powerful, and in case you should be in any doubt as to whether it is CT1AA, announcements, which will be made in five languages, including English, will be preceded by three "cuckoos."

You will have half an hour of general programme material before the first test takes place, during which time you will have ample opportunities for adjusting your receiver. After that you will probably find, as we have found during our preliminary experiments, that it will not again be necessary to touch the set except to switch off when the special broadcast is over.

### CT1AA CAN BE RECEIVED WITHOUT DIFFICULTY



The wavelength used for the tests will be 31.25 metres, and the programme will last for rather more than 2½ hours. Here we see a portion of CT1AA's transmitting apparatus.





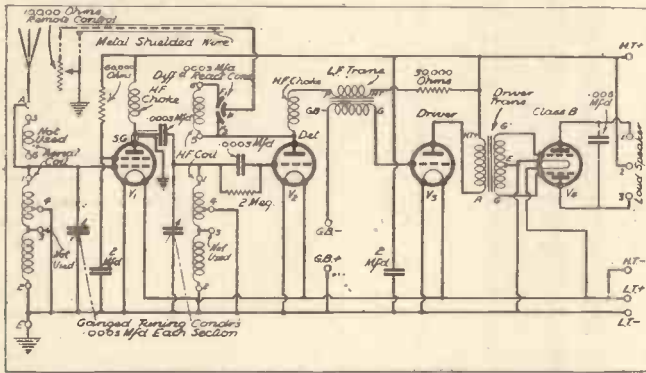
# FOR YOUR CAR: The TRAVELVOX

This ingenious road-radio design is controlled from the dashboard of the car by the driver, full details of the effective method employed and other constructional particulars being given below.

By **BERNARD BARNARD.**

THE unusual and ingenious nature of "The Travelvox," involving as it does a form of remote control, has necessitated the drawing of more diagrams than are usually needed by a compact receiver; so this week we give diagrammatic details of the controls as well as of the wiring, etc.

## A1 RESULTS WITH "CLASS B" STAGE



A screened-grid valve and leaky-grid detector arrangement is transformer-coupled to a driver for "Class B" output. This scheme has marked advantages of sensitivity combined with economy, and allows of quite easy operation from the driver's seat.

The matter of fixing the set in the car needs a certain amount of elucidation; it is not a difficult job, but there are one or two more or less fixed rules that must be observed with regard to the Bowden cable and interference suppression.

Assuming that the receiver has been wired up and tested satisfactorily on the bench,

the next job is to arrange controls for tuning, reaction and low-tension supply; these are, of course, fixed on or near the dashboard.

For the tuning you will require a length of 3 mm. Bowden cable that will reach freely from set to the Ormond-gear drive; the cable must be arranged so that it hangs easily between these two points, and it is most important that there should be no sharp corners or bends to be negotiated.

Unless the receiver is quite close to the dash, it is almost certain that you will have to

drop the cable through the floor boards, allow it to trail underneath the car towards the set, bringing it up to meet the condenser spindle by means of a very gentle upward curve.

If you make these bends in the cable too sharp, the control will be jerky and stiff; before finally deciding on the position for the cable, try pushing the inner wire through the outer casing; it should move very easily and show no tendency to buckle.

The cable must be firmly cleated at both ends close to the termination of the outer flexible cover.

You will see from the illustrations that the drive for the condenser is obtained by

pushing and pulling the Bowden wire through its outer covering, this motion operating a lever attached to the condenser spindle; a similar lever transmits the twist motion of the Ormond drive to the Bowden

## DASHBOARD DETAILS

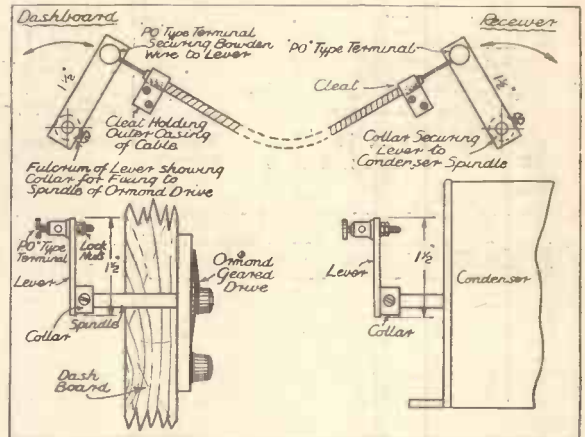


Fig. 1. Particulars of the fixing for the cable and of the method of mounting the slow-motion dial.

wire. It is possible to simplify matters by utilising a direct twisting movement of the cable and so avoid the use of levers, but unless a very short length of cable is used the backlash on the control will be very bad. This arrangement is therefore more or less confined to cars which permit of the set being fixed under the dash and therefore a length of cable that does not exceed two feet.

### Fixing the Remote Control.

With regard to the levers, the details and dimensions of these are shown clearly in Fig. 1; the measurements should be adhered to as closely as possible, although

(Continued on next page.)

## YOUR GUIDE TO THE COMPONENTS FOR THE "TRAVELVOX"

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 Wooden baseboard, 13 in. x 9 in. x 1/2 in.	—	—	1 H.F. choke [former	Bulgin	Telsen
1 Sheet of tin for screening box 1 yd. square	—	—	1 1 : 3 interval L.F. trans-	Igranic	Telsen
1 Twin-gang .0005 variable condenser (less drive)	Polar baby 2-gang	Utility, J.B.	1 "Class B" input trans-	Varley	Benjamin, R.I., Wearite
1 .0003-mfd. differential reaction condenser	Telsen	Polar, Lotus	1 Miniature tumbler switch	Bulgin	—
1 .0003-mfd. fixed condenser	Dubilier	T.C.C., Telsen, Lissen	3 4-pin anti-microphonic valveholders	W.B.	Telsen, Lotus
1 .0003-mfd. fixed condenser	Lissen	T.C.C., Telsen, Dubilier	1 7-pin valveholder	Ferranti	—
1 2-mfd. fixed condenser	Telsen	Dubilier, Lissen, T.C.C.	1 Geared drive	Ormond "Mid-get"	—
1 2-mfd. fixed condenser	Dubilier	Lissen, T.C.C., Telsen	1 10,000-ohm variable resistance	Lewcos	Igranic
1 .006-mfd. fixed condenser	Dubilier	Telsen	1 Terminal strip 9 1/2 in. x 1 1/2 in.	—	—
1 30,000-ohm resistor	Graham Farish	Dubilier	9 Terminals	Belling Lee	—
1 60,000-ohm resistor, with holder	Graham Farish	—	Suitable length Bowden 3mm. cable (see text)	—	—
1 2-megohm resistor	Dubilier	Lissen, Graham Farish	Wire, flex, screws, etc.	—	—
2 Unscreened coils	Lisstype LN5314	Telsen	Loudspeaker	Rola special "Class B"	Celestion, Epoch, R. & A. ("Class B" types)
1 H.F. choke	Wearite	—			

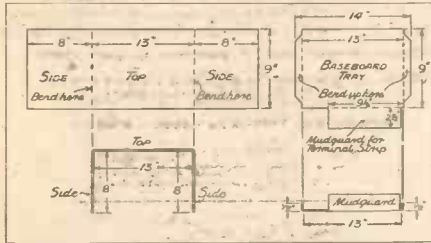
# THE "TRAVELVOX"

(Continued from previous page.)

a certain amount of deviation will be necessary to suit certain conditions.

The construction of these is simple; they are composed of two collars with grub screws, soldered on to flat pieces of brass

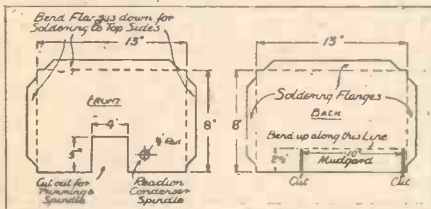
## THE METAL COVERING



These are the dimensions for the cover and the baseboard tray on which it is placed. Note how a "mudguard" for the protection of the terminal strip is bent up, as shown.

of the required size, to the other end of which are fixed two small Post Office type terminals.

## BENDING THE CONTAINER



Further dimensions for the cover, showing the "mudguard" on the back of it (to supplement the one on the tray).

The terminals are locked by means of two nuts in such a manner that they are free to rotate.

An extra spindle is required for coupling the Ormond drive to its lever; the length

of this, of course, depends on the thickness of the dashboard through which it has to pass.

The assembly and arrangements of these parts is clear from the diagrams.

The next point of interest is the reaction control.

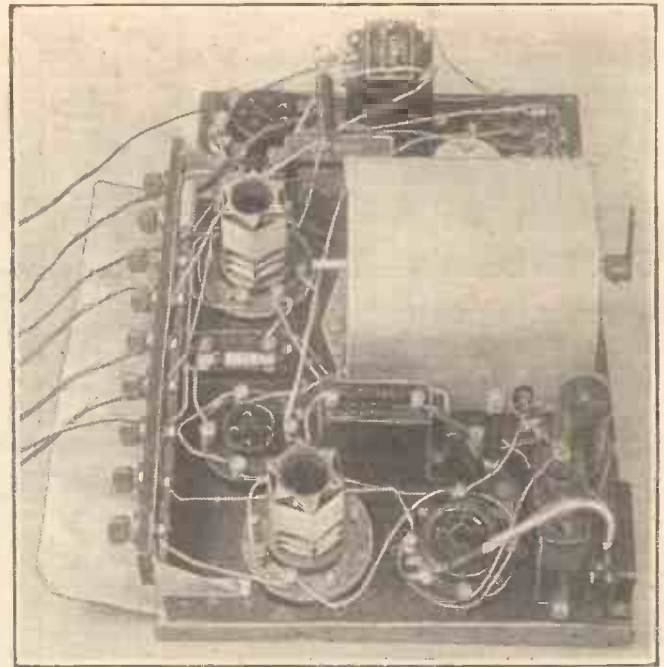
It is a rather unusual arrangement, but one which has proved entirely satisfactory.

An ordinary differential reaction condenser is included in the receiver and wired in the normal way, with the exception that the centre terminal is joined to a wire that runs up to the point of control; here it joins a 10,000-ohm variable resistance, the remote side of which is connected to the car chassis (earth).

The condenser on the control, and is adjusted at the time of installation to a position where the set is just oscillating with the variable resistance about half in circuit. It requires no further adjustment after this.

A Bulgin miniature tumbler switch is mounted with these other controls for the operation of the low-tension current; it is wired in series with the L.T. negative lead.

Having proceeded thus far to a point where these three controls have been wired and completed, we



THE SCREENED-GRID STAGE.

A close-up of the aerial end, showing the S.G.'s anode lead fixed to the .0003-mfd condenser on the right.

may now turn back for a few moments to the Bowden wire mechanism.

## "TRAVELVOX" VALVES

Make	S.G.	Detector	Driver	"Class B" Output
Mullard	P.M.12	P.M.1H.L.	P.M.2A.	P.M.2B.
Cossor	220S.G.	210H.F.	220P.A.	240B.
Mazda	S.G.215	H.L.2	P.220	P.D.220
Mareoni	S.22	H.L.210	L.P.2	—
Osram	S.22	H.L.210	L.P.2	—
Eta	B.Y.6	B.Y.2029	B.W.1304	—
Hivac	S.G.210	H.L.210	—	—
Ferranti	—	—	—	H.P.2

Time spent here will be amply repaid by smooth control and absence from backlash.

### Arranging the Condenser Lever.

I found it a great advantage to so arrange the lever on the condenser spindle that it was being pushed upwards by the Bowden wire when the condenser plates were being closed.

Such an arrangement allows the weight of the rotor vanes to help the wire and so lessen the force required to push the wire through its outer covering.

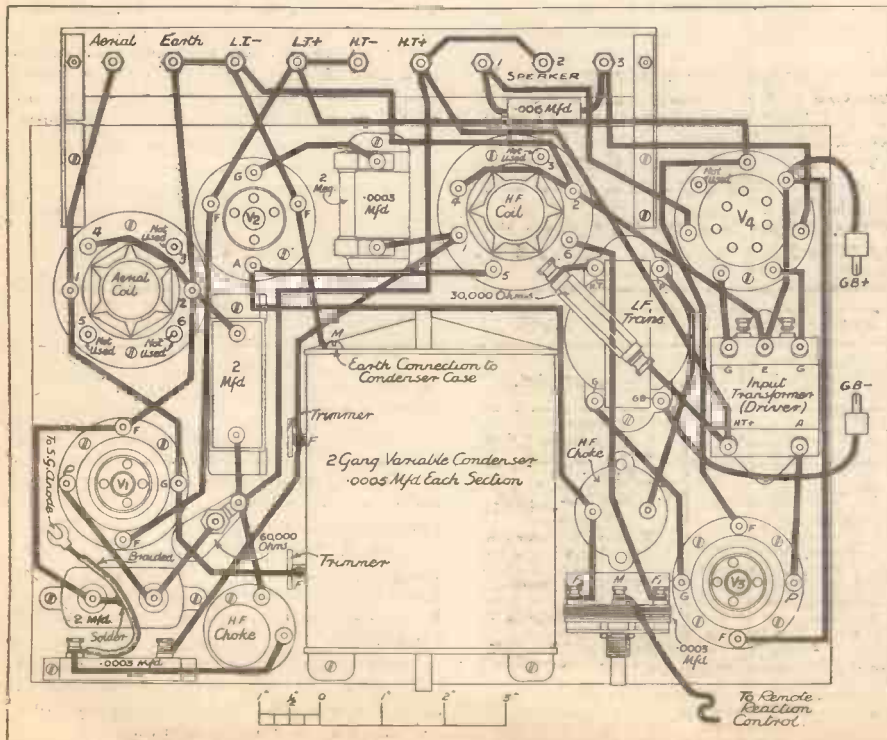
If you follow out these instructions closely and spend a little time and patience on this part of the installation you will find that your remote control is almost as perfect as any ordinary geared drive; there should be not more than two degrees of backlash in either direction, and the movement of the Ormond drive will be found to be quite smooth and easy.

The next matter for attention is the all-important suppression of interference from the car engine.

This, however, needs a fair amount of elucidation, and, although not difficult to overcome, the actual remedy had better wait for a full article next week.

### QUITE EASY TO WIRE.

Despite its novel nature, the set is very easy to construct, and this diagram well illustrates its essential simplicity.





# ECKERSLEY EXPLAINS-



Everyone has to learn, and this week our Radio Consultant-in-Chief takes you back to 1915 and tells how the "basic meaning of the valve" was first explained to him. He goes on to explain just what is the significance of the Miller effect in a valve.

I WAS down at the Brooklands flying show in 1915. I was a young man. My youth was apparently to be dedicated to the business of killing other youth—more indirectly than directly, as it happened.

About that time I came to learn about the thermionic valve—autumn sunshine—the fall of the year—the Battle of Loos—the first Zeppelin—and the enthusiasm about three electrodes in a bottle.

C. E. Prince, one of the few technicians who possess also wide appreciation of the arts, explained to us all the basic meaning of the valve. Very well he did it.

#### "Related to the Valve."

His uniform carried white tabs with, I think, red stripes on them. I, ignorant of the more subtle things of war, thought these tabs were related to the valve—that the red streak, for example, was a symbol of the filament.

One of the things I remember learning, or (not to be unfair to my teachers) one of the things which struck me very forcibly, was that here was a device which was the "perfect" trigger. You could release untold energy and expend *no* energy in doing so—so I thought.

"Swinging the grid" seemed to a young officer to be an effortless occupation. If I had been older I should have remarked that the valve had infinite input impedance. I think many of us thought that the valve had infinite input impedance.

C. E. Prince thought so, because it wasn't until a Mr. Miller explained Miller effect that we began to catch on to one of the duller sides of valve designing.

#### Caused by Capacity.

You see, a valve has a capacity between its electrodes. We are aware that two plates of metal insulated one from the other have capacity between them. And what are the electrodes of the valve other than pieces of metal insulated one from the other?

But, while the root cause of Miller effect is the capacity between the electrodes, this could be effectively dealt with were it not for the fact that the valve magnifies the electrical potentials on certain electrodes. For example, in a triode it isn't so much the fact that the grid has a capacity via the anode to earth (anyhow, this, if the grid circuit is timed, means nothing), but it is that the anode with a largely magnified potential on it induces out-of-phase and unwanted potentials back on to the grid.

The loosely used term "reaction" (which should, I think, be called retro-

action, to give it a more exact technical and less confusing political meaning) describes a process not only to lower the effective resistance of circuits associated with valves, but also to remove the anti-phase "Miller" voltages, which otherwise introduce what may look like dampings on the associated circuits.

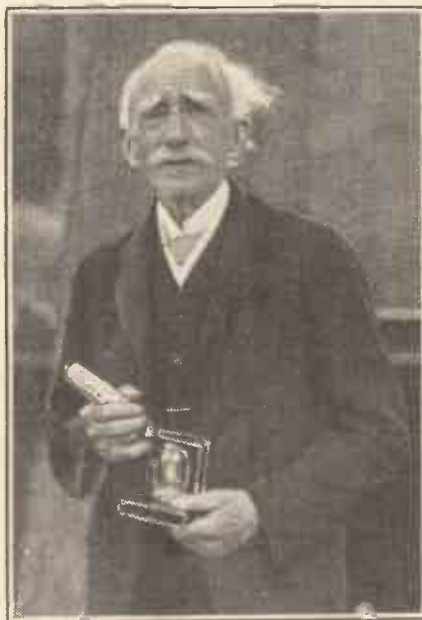
#### Cannot be Neglected.

Do not, then, run away with the idea that a valve has infinite input impedance. With high magnifications, Miller effect may be extremely important. True, any screening electrodes earthed for A.C. currents minimise "Miller," but what you gain on the screening you may lose on the magnification.

If you are dealing with a pentode, for example, and trying to get good quality, you may find that the neglecting of Miller effect means neglecting all that makes for good quality. The distortions inherent in pentode outputs are very probably more due to Miller effect than to pure "non-linearity."

What to do about it? Well, you cannot, in any large measure, use retroaction on

### THE FIRST VALVE USER



Sir Ambrose Fleming, F.R.S., was the first man to apply the emission of a hot filament in a vacuum to radio work. He is here seen with one of his first two-electrode valves, and with one of the most modern of valves, a "Catkin."

low-frequency, because, while you might go and get a nice condition for a narrow band of some frequencies within the gamut 50-8,000 cycles/sec., you would not be likely to be able to remove the distortions all over the range. As a matter of fact, the Miller distortions occur more violently among the upper frequencies than among the lower ones.

No, this explanation is perhaps more discursive than informative towards a solution.

Actually, you will probably have to wait until people become more inclined to study development on the basis of the complete interdependence between valves and circuits around the valves.

#### Fundamental Disadvantage.

To-day the valve manufacturer may know a great deal about valves; unquestionably, too, the more enlightened are studying the circuits which surround the valves, but there must be a fundamental disadvantage when set manufacturer and valve manufacturer are in *any way* set apart by separate organisations and when competition drives organisations to produce new models of valves more for the sake of their newness than their ability to do something useful for the set designer.

I am not criticising any organisation in general or in particular, and, indeed, admire enormously the progressive attitude of valve manufacturers. I am only wondering if progress might not be *more* rapid if the concentration of research and experiment were not more devoted to the solution of problems rather than the inevitable race for sales.

#### Technical Progress.

However, this rough-and-ready system under which we work has produced a lot of technical progress. One of the great problems in wireless to-day is the economic production of good quality. Miller effect—the too-high input impedance and the changing impedance with changing audio frequency—with the modern valve has a deleterious effect upon performance. *Delenda est.*

What a long way from Brooklands and the war and C. E. Prince and the simple theory of the valve to the magnitude and ramifications of modern technique!

Isn't life fun, really?



FROM THE TECHNICAL EDITOR'S NOTE BOOK



TESTED AND FOUND?

WIRELESS ON CARS.

I BELIEVE that car radio is going to grow. In America it has already become very popular and wireless is almost a standard fitting on the better class cars.

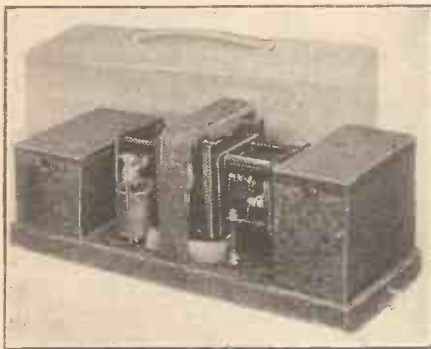
It is said that over half a million car radio outfits were sold in the U.S. during 1932. Over here there are clear indications of a growing demand for it.

Undoubtedly for those who use cars for fairly long journeys it is a most attractive proposition, not only for relieving the monotony of extended runs but also for keeping the driver and passengers in touch with the latest news and weather reports.

Critics of the idea suggest that anything which might tend to distract the driver's attention from his job is dangerous. But as one who has driven tens of thousands of miles with and without a radio accompaniment, I maintain that radio is no more distracting than passing sights and scenes. Less so, in fact, and that the driver who cannot concentrate on his task when there is a background of music is not at all likely to be able to do so when, for example, another car suddenly develops a fit of back-firing.

Anyway, car radio has been in full swing in America for some time now, and nothing has yet been said over there about it being dangerous.

It is not difficult to equip a car with wireless. Both L.T. and H.T. can be derived from the car accumulator. The latter is obtained by means of a converter.



A Rotary Converter for car radio, made by the Electro Dynamic Construction Co.

In this connection it should be noted that The Electro Dynamic Construction Co. are now making one of the rotary type.

Neatly compacted into a conveniently small metal case, this converter takes 6 or 12 volts at the input and delivers 40 milliamperes at 200 volts.

There is an efficient smoothing equipment rendering this output perfectly clean and hum-free. The case into which this anode converter and its smoothing equipment are built is robust and watertight, and can be fixed under the floor-boards.

The apparatus appears to me to be quite snag-free. It runs smoothly and silently and is obviously designed on sound engineering lines.

In conclusion, it is perhaps due to Electro Dynamic that I should mention that the converter of theirs which I reviewed on this page some six months ago is still giving good service and has developed no faults.

There are actually three models of the Electro Dynamic Car Anode Converter, and the one specifically mentioned above lists at 12s. complete.

A NEW BULGIN TRANSCOUPLER.

The Bulgin Transcoupler was, I think, the first, or one of the first, complete parallel-feed units to be made.

And it comprises, as you probably know, all the necessary components for parallel-feed L.F. transformer coupling built into a case no larger than and

somewhat similar in appearance to an ordinary L.F. transformer.

This is a most practical and very convenient method of applying the principle, not only on the scores of circuit simplicity and baseboard space, but also on that of price.



The Bulgin Transcoupler.

It would actually cost more to buy the separate parts in order to achieve a similar degree of efficiency.

With parallel-feeding exceptionally good quality can be obtained and the proverbial "straight-linc" is realisable almost to the point of perfection.

But as compared with the "direct connection" there is a slight loss in amplification. This has now been overcome by Messrs. Bulgin in their Transcoupler by an increase in the transformer ratio which, of course, gives an increased step-up and a higher amplification.

This would not be realised in practice, however, if that increase of ratio were obtained at the expense of primary inductance. But my tests clearly indicate that this has not been done. And the alteration has resulted in clear gain.

IT is good to see that the B.B.C. has more than one way of presenting its light music programmes. An ordinary cabaret show, for instance, can be made a really good thing by allying it to a thrilling story. "Cabaret" is a case in point. The danger of such an alliance, however, is that the story may become the more important part of the whole and the cabaret become just padding.

It is a fact that the chief interest of "Cabaret" lay in the part as designated by its sub-title, "The Mystery of the Blue Dragon." There was something of a thrill in this. So much so that the portion of the cabaret that proceeded while Scotland Yard carried out investigations palled somewhat. I wanted to hear the result of the enquiry. Nor was the result when it came through, disappointing. It was all very clever, I thought.

Yet the cabaret portion wasn't without merit. The cast seemed to be a collection of young folk deserving all the encouragement we can give them. Yvette Darnac is no stranger to listeners now. I always like her perkiness, a rare quality among female artistes, I find. George Sanders, too, pleased, perhaps because of the novelty of his turn.

And we mustn't forget the two "at the pianos," Jean Melville and Ronald Hill, especially the latter, who is obviously making a name for himself at the B.B.C.

Making Comparisons.

Considering the amount that was written in advance in praise of "Gulliver's Travels," I was rather disappointed with it. It had its points, of course, but these were all set at naught by the unintelligible squeaking of the crowd of Lilliputians. This squeaking went on too long—much too long for what was unquestionably an unpleasant noise. It became positively irritating after a time, especially as one had to listen hard to catch what was being said. No! I came to the conclusion that I preferred reading what this concourse of little people had to say to hearing it.

The music by Robert Chigwell was indeed an embellishment and "Gulliver" himself pleasant to listen to. I don't remember the first broadcast of this "drama," so I can't make comparisons.

Billy Cotton, this week, following Jack Payne last

Nevertheless, the price of the modified L.F.10 Transcoupler remains at 11s. 6d. as before. In view of its improved characteristics its usefulness is greater than ever, and it should transcend its previous successes.

"CLASS B" CONVERSION.

The conversion of practically any battery set to "Class B" is rendered an extremely simple matter with the Multitone "Class B" Converter.

This unit embodies no terminals or switches. All that has to be done is to remove the last valve in the set, insert the adapter plug and place the valve in this, and then carry out a similar simple operation with the max. positive and negative H.T. connections with the aid of the two adapter H.T. connectors.

The whole job can be accomplished in a matter of seconds. But the result is a full "Class B" performance, no sacrifices being made for this wonderful simplicity of installation.

The Converter is an exceptionally well-made device, and is striking both for its compactness and neatness of appearance.

And at 37s. 6d. it constitutes an economical method of developing mains power with a battery set.



The Multitone "Class B" Converter.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes, and on microphone personalities of the moment.

he has the wrong sort of instruments. I always feel now, when I listen to his broadcasts, that I ought to be in evening dress, to be holding a programme, to be struggling to keep back a cough, and with a lost-in-wonder look upon my face.

A Break in the Foundations.

Billy Cotton, on the other hand, makes no such demands on one. Everything is free and easy, merry and bright and straightforward. He plays good tunes, and keeps all his boys employed throughout. This, to my mind, is the proper function of a band with saxophones in it.

So there's to be a break in the Foundations of Music Series. What a marvellously long run it has had! I can't help wishing that the break was something more than a short holiday. A year's break, for instance, would give the neglected arts the chance of a look in.

Let me mention one neglected art whose devotees must run into their thousands—the amateur stage. The theatre talks have never catered for this, for these talks have never been from the point of view of the amateur producer.

Help for the Amateurs.

The choice of play is often the bugbear of the amateur dramatic society, and much valuable time is given to reading plays, when it might be given to rehearsals. A weekly talk on suitable plays would be a godsend. I am sure the right man (or woman) could supply a lot of useful information, and the amount of information available could easily provide material for a series of talks.

I needn't mention here the sort of information we want. The right man would be alive to the difficulties that beset a lot of amateur societies. There is a big demand for this sort of talk, and even if it were

(Continued on page 562.)



# ARE CATHODE RAY TUBES DANGEROUS?

BY DR. J. H. T. ROBERTS F. INST. P.

## OUR SCIENTIFIC ADVISER TELLS THE TRUE FACTS

### Television Systems.

**T**HERE are various television systems now being tried out and developed in different parts of the world, and these may be divided broadly into two classes: (a) the mechanical systems, and (b) the electronic (or cathode ray) systems. These are, of course, rather vague distinctions, because no television system is entirely mechanical or entirely electrical, most systems being, in fact, a mixture of the two.

The building up of the picture at the receiving end by means of mechanical scanning apparatus is subject to the limitations imposed by any mechanical arrangement which has to perform a series of functions with extreme rapidity. A rough analogy is provided by the high-frequency alternator for the generation of H.F. radio oscillations superseded by the more modern thermionic valve oscillator.

There is a large body of scientific opinion now inclined to the view that the cathode tube principle constitutes the only hope for any real progress in television reception. On the other hand, there are the protagonists of the mechanical system who still maintain that this latter system is capable of fulfilling all the requirements likely to be made of it and who, moreover, urge certain objections against the cathode ray system.

### The Cathode Tube.

Perhaps I should explain very briefly the particular features of the cathode ray tube which render it especially adapted for television purposes.

The cathode ray tube consists essentially of a vessel, usually of glass, evacuated to a low gas pressure and provided with electrodes by means of which an electrical discharge may be passed through it. At one end of the tube is a fluorescent screen upon which the cathode beam impinges. The spot at which the beam strikes the screen is thereby rendered luminous and, if the point of impact shifts about, the bright spot shifts about correspondingly.

If the screen is made of suitable material, so that the bright effect at any spot disappears almost instantly when the beam shifts away (or, as it is said, if there is a very small "lag" or phosphorescence), then the arrangement is capable of following very rapid movements in the cathode ray beam without blurring or confusion. So far as this part of the device is concerned, it merely involves the use of a suitable material for the fluorescent screen.

### Controlling the Beam.

In addition to this the cathode ray beam itself may be considered to be virtually

without mass. The cathode beam, on its way towards the fluorescent screen, passes between certain sets of electrodes or "deflecting plates," across which an electrical potential difference is established (exactly in the same way that a high-tension voltage is applied between the filament and anode of a wireless valve). If two pairs of deflecting plates are used, and are so placed that the deflecting force exerted on the cathode beam by one pair of plates is at right angles to the deflecting force exerted by the other pair, then clearly by adjusting the voltages across the pairs of plates in the proper way, the spot of impact of the beam on the screen can be shifted about to any desired position.

If the voltages applied to these deflecting plates are rapidly varying, the spot on the screen will shift about correspondingly. You will easily see from this that, by causing the spot to "scan" the screen in a

the negative electrical particles striking the anti-cathode, and in order that any X-rays, properly so-called, shall be produced, it is necessary that the electrons strike the target with a considerable velocity, or—as the phrase "considerable velocity" may be rather vague as applied to electrons—perhaps I should say that the production of X-rays requires a large driving voltage, many thousands of volts. The voltage actually applied to a modern X-ray tube is often in the region of 100,000 to 150,000 volts—that is, the voltage which is driving the electrons towards the target.

### X-Rays Require High Voltages.

It is not easy to define precisely the character or quantity of the X-radiation in relation to the driving voltage, as the whole question is complicated by the composite character of the rays and the presence of secondary radiation and by other factors.

It is, however, definitely known that the strength of the rays increases very rapidly with the driving voltage, or, alternatively, taking actual figures, with a driving voltage of 2,000 volts as compared with a driving voltage of 100,000 volts, the intensity of the rays in the former case would be only a fraction of a thousandth of the intensity in the second case. As a matter of fact, the strength would probably be much less even than this, because at such relatively low voltages as 2,000 volts the rate of variation is probably still more rapid.

In an X-ray tube great pains are taken in the design so as to focus the electron stream as much as possible on to a small spot on the anti-cathode; this is with the object of causing X-rays to issue from a point-source, as far as possible, so as to increase the sharpness of the image obtained by the rays.

### Soft Rays Easily Absorbed.

In a cathode ray tube, however, apart from the question of the sharpness of the focus, the spot of impact is shifting about during the operation of the tube over a considerable area, with the result that, even if any rays were produced, they would in the average proceed from a very extended source and would, therefore, be enormously spread and weakened, as measured at a point away from the tube.

But probably most important of all is the question of the penetrating power or "hardness" of the rays and their absorption. Any rays produced by the impact of the cathode stream upon the screen in a cathode ray tube will be very "soft"

(Continued on page 562.)

Many people regard the Cathode Ray Tube as the "white hope" of Television, but some supporters of the mechanical system have asserted that the Cathode Ray Tube is dangerous to use. Our Scientific Consultant, Dr. J. H. T. Roberts, shows in this article that the possibility of appreciable X-radiation being given out from a cathode tube is remote in the extreme. Dr. Roberts has had great experience with cathode ray and X-ray work generally, and was formerly at the Cavendish Laboratory, Cambridge, with Lord Rutherford and Sir J. J. Thomson.

regular fashion, the character of the cathode beam (which determines the brightness of the spot) being at the same time appropriately varied in accordance with incoming television signals, the television picture will be built up on the fluorescent screen.

The prime advantage of the cathode tube is the fact that it is electrical instead of being mechanical and the beam is virtually weightless, so that it can respond very faithfully to the signal voltages impressed on the tube. There are various other advantages, but this is the principal one.

### Generating Rays.

It has sometimes been urged by those who favour the mechanical system that the cathode ray tube is a source of danger in the hands of those who use it, in that—so it is alleged—it acts as a generator of X-radiation and everyone knows that prolonged exposure to X-rays may be very harmful.

It is, therefore, important to consider whether there is any foundation for such a view. Let us examine the case further.

The production of X-rays is caused by



THE MIRROR OF THE B.B.C.

By O. H. M.

## PEACE WITH SIR HENRY WOOD

The Programme Department—Sir John to Visit America? A Tommy Handley Revue—B.B.C. Organ Recital—King's Prize Relay—The Tidworth Tattoo.

THE relations between Sir Henry Wood and the B.B.C. have followed a tortuous course, and on several occasions recently there has been danger of rupture. Now, however, after months of negotiations, the position has been finally cleared up in a mutually satisfactory way. Sir Henry will take the Proms seasons this year and next, anyway. Also he will do some of the symphony series, it being understood that no other conductor will enjoy an advantage in "first refusals." This happy conclusion will be good news for all listeners, most of whom entertain a special regard and affection for the good genius of the Proms.

### Clearing House for Artistes.

The B.B.C. has been asked to consider coming into a scheme for setting up a clearing house for artistes as between broadcasting, the stage, and the film. This probably is more plausible than practicable or useful. By entering such an arrangement the B.B.C. would be bound to sacrifice some of its present freedom of action, a disadvantage that might not be compensated for by the opening up of any hitherto closed fields for material.

Also the terms of individual contracts, the secrecy of which is jealously guarded in Langham Place, would become known in a wide and not uniformly friendly circle. For these reasons in particular I believe the B.B.C. will reject the proposal.

### New B.B.C. Appointments.

The announcement of the appointment of Colonel Dawnay as a new administrative chief at head office was soon followed by the announcement that Mr. Cleghorn Thomson, who recently resigned, would be succeeded in Scotland by the Rev. M. Dinwiddie, minister for some years at St. Mahar's Cathedral, Aberdeen. Although it would be unfair to judge Mr. Dinwiddie until he has had a chance to show his metal in pro-

gramme building, it is only right to observe that this appointment, like that of Colonel Dawnay, appears to reflect a new attitude on the part of the B.B.C. Board of Governors.

There is a clearly marked tendency to "play safe," to seek the solid, steady, respectable and serious rather than risk the genius or the professional programme builder. Also the B.B.C. gets more and more official both in method and outlook. This is anything but a favourable augury for

### A "POPULAR WIRELESS" DISPLAY



A view of the radio stand at a recent Novelty Exhibition in which the "Popular Wireless" "Catkin 3" receiver was chosen as representative of the latest development in radio. The original "P.W." set can be seen in the centre of the stand.

the outcome of the 1935 Parliamentary enquiry into what to do after the Charter and licence expire at the end of 1936. There is still the chance that the new recruits from the Army and the Church will develop

entertainment flair; but their background is hardly favourable for this.

Sir John Reith and the N.B.C.

Mr. Aylesworth, President of the National Broadcasting Company of America, and a great personal friend of Sir John Reith's, is anxiously awaiting the latter's acceptance of the invitation to be the principal guest of honour at the November opening of Radio City, which will also mark the seventh birthday of the N.B.C. I think it likely Sir John will go.

Studios for Cardiff and Birmingham.

Almost unostentatiously, and certainly with only a fraction of the fuss that was once given to such considerations as relative sizes, acoustic properties and schemes of decoration, the B.B.C. occasionally brings new studios into commission at one or other of its several stations up and down the country.

For instance, a new studio for dramatic productions has just been brought into use at Cardiff to serve the increasing demands of the recently-opened West Regional transmitter, while another large studio at Birmingham is expected to be finished in time for programme use towards the end of July.

The reconstruction work which has been going on at the Midland Regional headquarters has necessitated the inclusion of a large proportion of outside broadcasts during the last few months, but the percentage will soon be rectified to normal standards. On Sunday, July 23rd, the religious service is to come from the studio, with the music given by the Studio Chorus under Edgar Morgan, and an address by the Rev. F. C. Spurr, an ex-President of the National Free Church Council.

Then on the following day Haydn Heard and his band, which have hitherto figured in the programmes as an "O.B." combination, is paying a visit to Broad Street; and the same applies to Ernest Parsons and his orchestra, which is down to perform on the following Friday. Between these programmes the Leicester Imperial Band, one of the oldest bands in the country, is to give a concert on Tuesday, July 25th. Between their items Miss Phyllis Merrett, of Bedworth, near Coventry, will be responsible for some syncopated pianisms, five of which are the compositions of Billy Mayerl.

(Continued on page 561.)



Weekly jottings of interest to buyers.

FOR the benefit of those readers who are without a short-wave receiver, and who would like to take part in "P.W.s." great international frequency test on Friday evening, it might be helpful if I commence my notes this week with a list of firms from whom suitable adaptors may be obtained.

The great advantage of an adaptor, of

course, lies in the fact that you do not have to make any alterations to your existing set. Thus, it is but the work of a few moments to fit one.

If you are interested, I suggest that you get into touch with one of the following firms; Burne-Jones & Co., Ltd., J. J. Eastick & Sons, Igranic Electric Co., Ltd., Peto-Scott Co., Ltd., or Radio Instruments, Ltd. I happen to be able to answer for the efficiency of all these adaptors as I have tested every one.

### Congratulations to Mr. Mould:

Strictly speaking, this is not a personal column, but I simply cannot let the opportunity pass of conveying, on behalf of "P.W." readers, hearty congratulations and best wishes to Mr. J. T. Mould on the occasion of his appointment to the board of the Igranic Electric Co., Ltd.

Mr. Mould has been associated with the industry and with Messrs. Igranic for a very long time, and with his initiative, I am

confident that the new appointment will do much more to enhance the prestige of an already famous company.

### Royal Interest in Radio.

More than one radio firm has already had occasion to be grateful to Prince George for his interest in the industry.

The British General Manufacturing Company recently had the honour of welcoming His Royal Highness to their factory at Brockley. I hear that certain members of the firm, who were in charge of the tour of the works, were astounded at Prince George's wide knowledge of technical matters.

### "Iron-Core" Confusion.

The constructor public generally (not to mention one or two others who ought to know better!) appears to be a little bit vague concerning the difference between the various types of iron-cored coils that have recently been placed on the market.

Just because, for convenience, they are

(Continued on page 560.)



# THE NEW MULLARD *Screened* PENTODE



**I REMEMBER WHAT A PENTODE DID FOR MY SPEAKER STAGE!**

He is the everyday listener. He has learned quite a bit about the inside of his receiver. And he is always anxious to get better results. So he wanted to know all about this new Screened Pentode. Because he remembered when Mullards first introduced the ordinary L.F. Pentode—and the power it brought to his speaker. Imagine his interest when we told him of new Pentode power for his H.F. stage!

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Type S.P.4 for the Detector Stage

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# Mullard

**THE · MASTER · VALVE**

# V.P.4

# S.P.4



# THE "NU-TU"

## A REVOLUTIONARY RADIO DEVELOPMENT.

Some further details about the design and operation of the "Popular Wireless" "Nu-Tu," the first set to use permeability tuning.

"THE first practical expression of the most amazing radio invention of recent times." We quote from an article in last week's "P.W.," in which we introduced readers to the "Nu-Tu," the first published design to employ the new Permeability Tuning that has been creating so much interest of late.

We explained how Permeability Tuning has produced a revolution in circuit theory, and that the "Nu-Tu," which uses a Varley Permeability Tuning Unit, constitutes the foundation of an entirely new era of set design. It is chiefly with the outstanding features of the practical aspect that we wish to deal this week, having dealt with theoretical considerations in our previous article.

### Automatic Wavechange Switching.

Remembering that the circuit is an S.G.-det. and L.F. arrangement, one glance at the photo on this page is sufficient to emphasise the remarkable compactness.

This is entirely due to the new system, for the three-gang tuning unit is no larger than a three-gang variable condenser, and with the lid in place it rather resembles one.

Two of the tuned circuits form a band-pass input circuit, the third serving as a parallel-fed tuning circuit for the grid of the detector valve. The whole of the tuning of the set, including wavechanging, is carried out by the single knob that operates the Varley Permeability Tuning Unit.

Operation, as well as construction, is thus simplified by the remarkable new system. The dial is marked from 0 to 360 degrees, and by turning through one revolution both the medium band from 200 to 550 metres and the long waves between 1,000 to 2,000 are covered.

All switching is carried out automatically at the right points. To ensure that no stations are missed at the positions where switching takes place, small portions of the dial are "blocked" out at these points, consecutive dial readings appearing on either side of the unused portions.

### Eliminating Panel Controls.

Wavechange switches being entirely obviated, we carried the reduction of knobs a step further by combining the volume-control (which varies the bias on the multi-mu S.G. valve) and the L.T. switch. In all there are only three knobs on the panel, the one so far unmentioned providing reaction in a normal manner.

The layout of the components on the baseboard is mainly a grouping of the valve holders and their associated parts, around the tuning unit to which only nine wires have to be attached. As a matter of fact, we found it expedient to wire up all these parts before the tuning unit was put into place, leaving lengths of wire for connecting to the unit when this is dropped into the set.

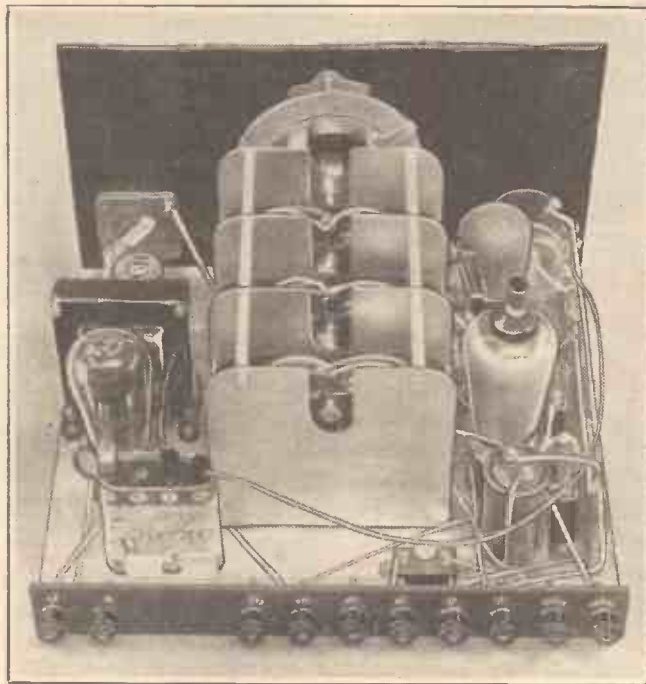
This feature of the construction is one that will permit those who desire to get a set completed, all but the tuning unit, right away. They need then lose no time, when

the units are available, in taking full advantage of this remarkable development in tuning technique.

The tuning unit divides the set into two parts. On the right, looking from behind the panel, is the H.F. and detector portion, while the L.F. part is on the other side.

The lead from the anode of the detector valve connects up the two parts. This lead runs beneath the tuning unit, and shielded covering should be used for it.

## FIRST PERMEABILITY-TUNED RECEIVER



This behind-the-panel view of the "Nu-Tu" clearly demonstrates the remarkable compactness and simplicity of design made possible by Permeability Tuning. The special Varley Tuner is seen in the centre with its cover removed.

This shielding is earthed by two tags screwed to the copper foil that covers the baseboard. A number of points which have to be earthed are taken to this foil, which, in conjunction with the saving of the leads that run between coils and condensers in an ordinary set, make the amount of wiring extremely small for such an efficient and outstanding design.

### Simplicity of Operation.

It is in the operation of the set that one most notices the simplicity born of permeability tuning in the form of a Varley Tuning Unit. As we have already explained, everything connected with tuning is carried out by simply turning the centre knob.

All that remains in the way of operation, apart from the on-off switching, is to turn the left-hand knob when reception is too loud, and the right-hand one when a station is not loud enough, or when long-distance is desired. Actually, this reaction control is not required on quite a number of

stations, and it is by no means critical in adjustment.

As regards the switching of the receiver on and off, this is effected at the fully-anti-clockwise position of the volume-control knob. Actually this is the logical arrangement for the switch.

Volume is reduced by turning the knob anti-clockwise until it reaches a minimum, then a slight further turn operates the switch and reception stops altogether. Similarly, when the knob is turned clockwise, the set is first switched on, and then volume is increased more and more.

### Preventing Battery Wastage.

The switch itself is a three-point one, so that it can disconnect the grid-bias battery connected across the volume-control potentiometer as well as break the filament circuit. If this were not done, there would be a continual drain on this G.B. battery when the set was not in use, and it would not last long.

Before the receiver can be put into operation there is only one preliminary adjustment that requires attention. It concerns the trimming of the three permeability-tuned circuits.

This fine adjustment is achieved by means of tiny variable capacities connected across the iron-cored inductances. They were shown in the circuit diagram given last week.

Access to them is obtained through the holes in the cover of the tuning unit. They are adjusted when listening to a station in the same way as the trimmers on an ordinary gang condenser.

Naturally, their proper settings are found with the cover

of the permeability-tuning unit in place. Although, due to the tuning screen round the coils, this cover is not likely to alter tuning so much as the screen of an ordinary coil, it is bound to have some effect.

### Catalogue of Advantages.

To sum up the chief advantages given by permeability tuning from the practical design point of view, we can enumerate them as follows: A degree of compactness hitherto impossible without complications that made construction difficult, and which is achieved with considerable simplification of layout; fewer connections to put in place, fewer controls to mount on the panel and fewer possibilities of trouble arising from bad wiring. Also simplification of operation.

Truly these are advantages that in themselves would make the "Nu-Tu" an epoch-marking design, even if there were no advantages from efficiency and technical points of view.



# A NEW MAINS UNIT DEVELOPMENT

BY J. ENGLISH



IT has been known for a long time that the neon tube, familiar to all in one form as the electric glow-lamp used for domestic purposes, possesses peculiar characteristics which can be put to advantage for voltage stabilisation. Connected across a high-voltage supply of high internal resistance, such as a mains unit, the neon tube tends to keep the terminal voltage more nearly constant over a wide range of current loads.

Recently a well-known firm of valve manufacturers has introduced an improved type of neon tube which possesses this property of voltage stabilisation to a remarkable degree. Curiously enough it was developed primarily to enable mains users to employ Q.P.P. and "Class B" output stages. As you know, the anode current consumed by the latter fluctuates considerably according to the strength of the received signal.

### Getting the Most From "Class B."

Some surprise may be felt at the idea of using "Class B" valves with mains H.T. feed, seeing that they were developed for battery-set users. But there is more in the idea than is at first apparent.

Battery H.T. supply for "Class B" valves is all right if you can be content with not more than half the valve's maximum output. Going full out, a "Class B" valve takes at times a pretty

from a "Class B" valve with mains H.T. supply considerably more cheaply and easily than from an ordinary mains-operated output stage. It certainly seems to me that for big volume the mains-fed "Class B" stage has a more promising future than the

★ Details of the several advantages of a neon tube specially developed for mains units. Primarily intended for Q.P.P. and "Class B" work, it has proved very beneficial from other points of view as well. ★

battery version, so look out for developments!

Returning to the subject of the neon stabiliser, the theory of its operation is simple enough. Connected across the mains unit output, with a limiting resistor in series, as in Fig. 1, it absorbs any difference between the total anode current and the maximum current supplied by the unit. The load on the latter is therefore constant, so that the output voltage cannot change however much the receiver's H.T. current fluctuates.

In practice the voltage stabilisation effect of this new neon tube, although not perfect, is yet remarkable. The two curves of Fig. 2 show this quite clearly. Without the stabiliser a change of current from 10 m.a. to 50 m.a. causes a drop of 155 volts! With the stabiliser the voltage change is negligible whether you take 5 or 50 m.a., truly an astounding performance for this type of H.T. supply.

Voltage stabilisation is not the only advantage, however, for the neon tube acts as a large-capacity condenser with very beneficial effects on smoothing. So much so that it is more effective than the usual 4-mfd. condenser (after the smoothing choke), which not inexpensive component can now be omitted.

### Dispensing with Decoupling.

Since the neon tube, in stabilising the output voltage of the mains unit, has the same effect as if the internal resistance of the latter had been miraculously reduced, the root cause of "motor-boating" or L.F. instability is largely removed. Consequently, less than the normal amount of L.F. decoupling can often be used, or even dispensed with altogether. This is a valuable feature because the decoupling resistors normally used would drop too many valuable volts.

There is still something else to come out of the hat—free grid bias! How this is arranged will be described further on.

The practical application of the neon stabiliser requires but a few simple connections, as you will see from Fig. 1. The only initial adjustment is the series re-

sistance R, the purpose of which is to limit the potential applied to the tube at full load of some 130 volts. The makers supply curves from which the total resistance of smoothing choke and R can be easily calculated. Alternatively you can use the simple formula:  $R = \frac{E_o - 130}{I} - R_o$ ,

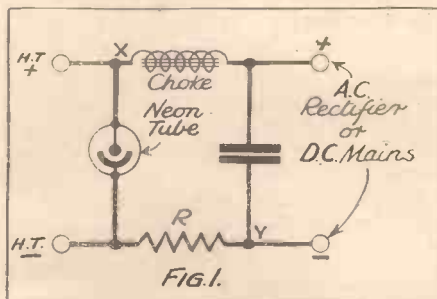
where  $R_o$  = resistance of choke,  $E_o$  = volts at X and Y when unit is supplying full load current I. The resistor R should be a component of sufficient current-carrying capacity, say a 10-watt rating.

When using the neon stabiliser for receivers where the total H.T. current does not change, you can use a variable resistor for R, adjusting until a meter connected at X reads the maximum current required by the receiver plus 5 m.a., or better still, the maximum current the unit will supply at not less than 140-150 volts. The output voltage will then remain almost constant around 130, whether you take 4 or 5 m.a. or up to 50 m.a. of the total current. A margin of some 5 m.a. is necessary to maintain the glow in the neon tube.

### Obtaining Free Grid Bias.

In conclusion there is the matter of free grid bias, which is quite simply obtained

## ACROSS THE OUTPUT

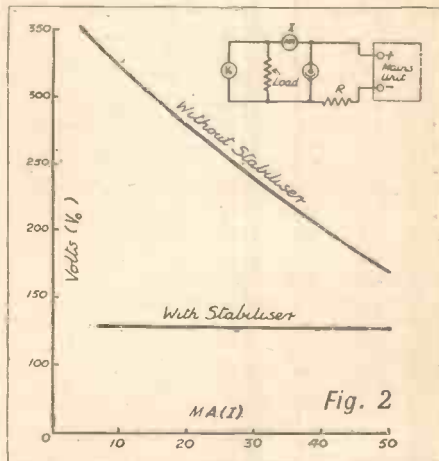


Apart from stabilising the voltage, the neon tube permits grid bias to be drawn from the resistance R.

hefty current out of your dry battery and, in spite of all you have read to the contrary, you cannot hope to get the maximum output for long from a small H.T. battery. Its voltage will quickly drop with increasing internal resistance. Voltage fluctuation and bad distortion is then bound to occur.

This is why mains operation looks so attractive now that we have found a way of stabilising output voltage. A "Class B" valve can then be run full out as long as you like, there being ample current at a steady voltage, plus trouble-free operation. In addition you can get 2 watts output

## A STEADY VOLTAGE



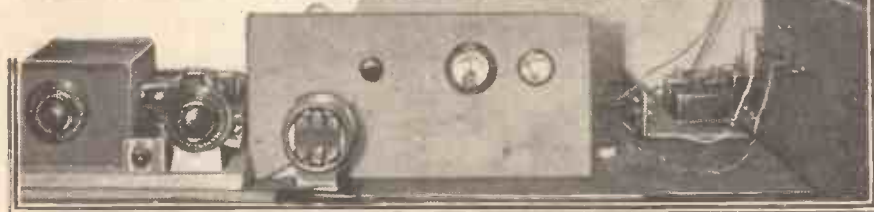
These curves show the remarkable voltage regulation obtained when a neon tube is connected in the mains unit circuit.

from the series resistor R, a tapping on the latter giving a bias voltage up to the maximum volts dropped across this resistance, according to the position of the tap.

A method of getting one variable bias voltage is to connect a high-resistance potentiometer in parallel with R. If the unit delivers 50 m.a. at 200 volts, there will be over 50-volts bias voltage available. Decoupling of the bias feed may be necessary.



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



A weekly chat by our popular expert, dealing with many interesting aspects of current short-wave practice.

I HAVE finished the job of analysing the reports sent in after the "P.W." Receiving Contest during the Whitsun week-end. I did not receive so many reports for this contest as for the similar event last year, chiefly because it only received one brief mention beforehand, but those who *did* enter managed to do very well.

The "amateur" contest, for the logging of amateur stations only, with a view to receiving as many different countries as possible, goes to "V. I. E."—Mr. V. Ingram-Ellesmere, 5, Hereford Road, Wavertree, Liverpool.

Mr. Ingram-Ellesmere received signals from fifty-two different countries during six hours of listening, which, I think you will agree, is pretty good going.

The runner-up is "W. A. L."—Mr. W. A. Laidlaw, West Sleekburn, Choppington, Northumberland, with forty-three countries during twelve hours of listening.

"Highly commended" are "T. C."—Mr. T. Cullingworth, Crofton, Wakefield, and "S. L."—Mr. S. Ledbrooke, 5, Hoopern Terrace, Dawlish, Devon.

## Enthusiasm and Efficiency.

Turning to the Short-Wave Broadcast section of the contest, who do we find on top but our old friend "W. H. R."—Mr. W. H. Rowley, 7, Clarence Place, Stonehouse, Plymouth! "W. H. R." logged twenty stations—not a high total, perhaps, compared with previous competitions, but very good considering the general level of conditions at the time. Reception appeared to be much better on the amateur bands than on the short-wave broadcast bands.

A good second in this half of the contest was "J. E. S."—Mr. J. E. Simmonds, Jenkin's Hill, Bagshot, Surrey, who logged seventeen stations. The winner scored over him by logging Sydney (V K 2 M E) and Bowmanville (V E 9 G W), as well as Y V 1 B C, the famous station at Caracas, Venezuela.

I can't say that there are any "Honourable Mentions" in this section; apart from these two readers no one seems to have had a really good try at it. Lists of six or seven stations don't stand much chance in these days of enthusiasm and efficiency.

## A Super-Log.

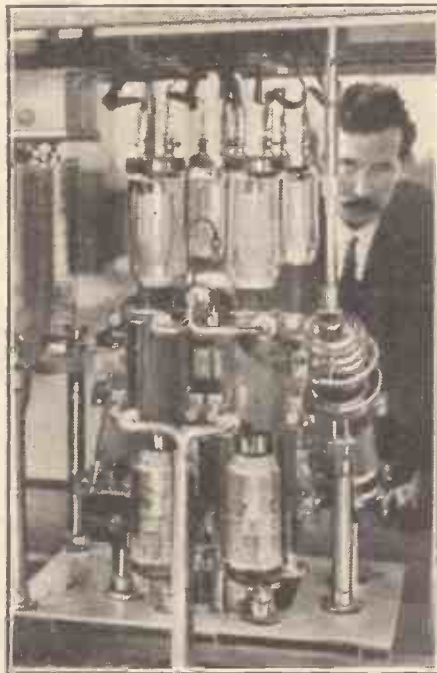
"T. C.," the same reader who was mentioned in connection with the amateur competition, has forwarded to me a copy of a log that he has sent to the International Short-Wave Club. Here is a log that would make some of our readers sit up—four closely-written pages full of stations, together with dates, times, wavelengths, strengths, etc., and identification particulars.

I should like to publish it as it stands, but "P.W." isn't big enough. Incidentally, "T. C.," the station K 5 A A is in the Panama Canal Zone, in case you haven't already found it out.

## Best Listening Times.

A careful analysis of these logs has given me some useful facts about the best times to listen for some of the short-wave broadcasters. They do not seem to vary greatly in different parts of the world. Sydney, for

## SOME ON TELEPHONY, TOO



You do not have to be able to read Morse, although it is a great asset, before you can tune-in to ships. Some of them use telephony on the short waves and work with Rugby, where these 60 kilowatt valves were photographed.

instance, was not logged by anyone except between the hours of 0700 and 0740.

The 49-metre "Yanks" were only heard between 2330 and 0300. South Americans were heard only after midnight, and generally not later than 0100.

So much for the Listening Competition. Another will follow very soon, and will be heralded by a rather more conspicuous announcement than the last batch.

Here is a letter from "W. A. A." (Liverpool), who has been "in the game" since 1919 and is still going strong. He announces his entire agreement with me about the thrills of short waves, but says

that he finds their actual "programme value" much better than most people appear to imagine. He switches on W 2 X A D through his all-A.C. short-wave adaptor and amplifier, goes downstairs to the speaker, and enjoys the whole evening without calling on the B.B.C. at all.

He goes into the rather deep question of the strong harmonics of some of the short-wave broadcast stations, some of which come over at greater strength than the fundamental of the same station. Yes, "W. A. A.," I think it is possible that a station transmitting on a "night" wave, like 50 metres, will be received at greater strength on a 25-metre harmonic during daylight than on a 50-metre wave.

## Interference Phenomenon.

It is only inefficiently-designed stations that put out such strong harmonics as this, but there are plenty of them. Of course, some receivers accentuate this phenomenon, and you can't blame the transmitter for that. A superhet in an unstable state will produce such terrific harmonics that one gains the impression of a marvellous band-full of stations!

Another interesting note from "W. A. A." concerns the ease with which two stations as far apart as 4,000 miles will produce a nasty beat-note if they are too close in frequency. Yes, short waves have added to radio's problems, and interference between two stations separated by half the circumference of the globe is one of them!

## Advertising the Club.

"J. B. M." (Glasgow) reports two new Americans—W E A on about 28 metres and W E F on about 31. W E A was relaying the N.B.C. programme to Rio and Buenos Aires.

"C. T.," of the Coventry Short-Wave Club, opens up a new vista, or whatever it is that one opens up, by describing the "stunt" run by the said club at the Coventry Hospital Carnival. The Short-Wave Club ran a special car with several amateur transmitters on board.

What they did I haven't heard yet. Other local short-wave clubs, please note! Here is an excellent opportunity for making your presence known.

## The Cause of Crackles.

"E. W. A." (Grays) mentions a nice case of mysterious crackles on short waves. They were eventually tracked down to a loosely-fitting iron ring on the metal clothes-line underneath his aerial. Some crackles, I should imagine, "E. W. A.!"

I had to buy non-metallic clothes-lines and instal them, free of charge, many years ago! Now I'm looking for some non-metallic wire netting for the garden, not to mention non-metallic roofs for the garage and coal-shed.

## GET THE BEST

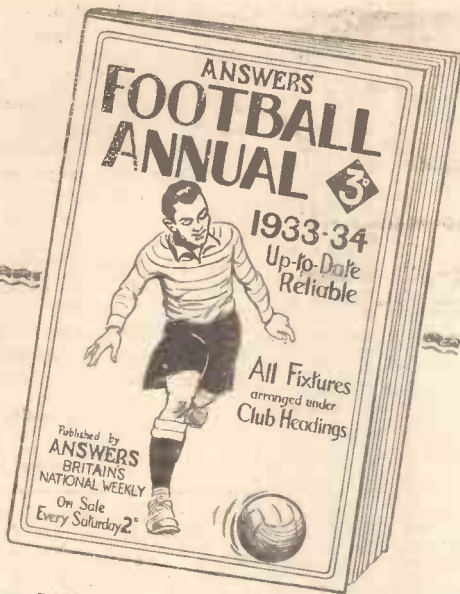
out of short-wave listening by reading

**W. L. S.**

who is an acknowledged expert in this fascinating sphere of amateur wireless activity. His

## SHORT-WAVE NOTES

appear each week in "Popular Wireless," and provide up-to-the-minute information of the latest developments in the field of short waves.



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## A RIGID CHASSIS THAT IS ALL ONE PIECE

Matched to within  $\frac{1}{2}$  of 1 per cent. + half a mm/d.

so strong that there can never be the slightest distortion in use. NUGANG TYPE "A" is similar to the standard Nugang Model but with the addition of a powerful Disc Drive. Easily fitted—only round holes to cut in receiver panel.

Trimmers to each stage operated by external starwheels. Vanes wide spaced and of heavy gauge. Special rotor bearings ensure permanent accuracy and give remarkably free movement. Capacity, .0005 mfd.

NUGANG TYPE "A" (Complete with Disc Drive).

Fully	18/6	2-gang	Semi-screened	16/6
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Other J.B. Gangs include: J.B. "Nugang" (as type A but without disc drive), "Unitune" Gangs and J.B. Superhet Gangs. Write for complete catalogue of

## PRECISION INSTRUMENTS





AN EXCURSION INTO

# THE FIVE-METRE BAND

A highly intriguing account of Ultra-Short Wave experiences.  
By CAPT. ANGUS MacCOLL, A.F.C.

INSPIRED by the news that "P.W." was sponsoring some Five-Metre Tests from the Crystal Palace, I decided to construct a special receiver, and see if I could be successful in picking up the transmissions.

I had, for some time, been considering the adventure of diving into the mysteries of the Ultra-short Waves, but owing to lack of information regarding transmissions had hesitated to take the plunge. Also I had been undecided as to a suitable circuit—being aware of the evasiveness of these "very high frequencies"—but the description of the super-regenerative receivers in "P.W." decided me.

**Constructional Details.**

Perhaps, therefore, a description of my receiver and the results obtained may interest readers who were unable to construct a receiver in time for the tests in question, or, having constructed one, were unsuccessful in picking anything up.

First let me say I can only claim partial success, that is to say, as far as the actual transmissions from the Crystal Palace were concerned, but—and it is a very big "but"—I did, on the Sunday in question, pick up and identify by their call-signs two amateur

**THE GENERAL ARRANGEMENT**

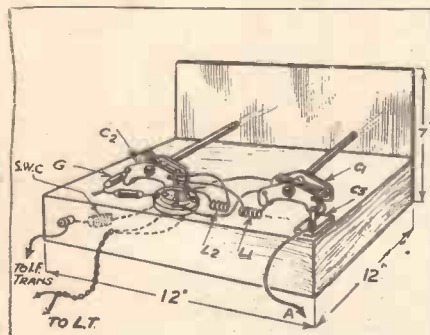


Fig. 1. Indicating the main constructional features.

transmitters on the 5-6-metre band. Confirmation of my reports to them has since been received. Both these stations came in at about R5 on the 'phones, although one was at Croydon and the other at Hammersmith (my receiver being at Notting Hill Gate). One was on modulated C.W. and the other on Telephony. Other faint music and barely audible speech were heard from time to time throughout the day, and I presume these emanated from the Palace, but unfortunately I was unable to catch the call-sign.

But to go back to the beginning. I was unable to start making the receiver until the Saturday, and, partly for economy and also on account of shortage of time, I decided to use what spare parts I had on hand.

Two .00025-mfd. slow-motion condensers were first dismantled and then built up again with about half the plates. The tuning condenser was given four fixed and three moving plates with double spacing. The reaction five fixed and four moving, with ordinary spacing. A valve holder, which was considered fairly low-loss a couple of years ago, was raked up and two 2-megohm resistances, joined in series, made up the grid leak.

The H.F. choke was made from a piece of 1/2-in. ebonite lead-in tube, on which were wound 55 turns of No. 30 S.W.G. enamelled wire, the first ten turns (nearest the anode) being well spaced and the remaining turns touching.

A shallow 5-ply box about a foot square (normally used as a tray for odds and ends) formed, in an inverted position, an excellent "chassis." The condensers were mounted direct to the bottom of this by means of brass clips, thus saving the making of brackets, and positioned about six inches behind an aluminium panel. The problem of extension spindles was solved by cutting two lengths of cane off one of the household feather dusters (fortunately not yet discovered by the domestic staff!).

**Rigid Wiring.**

The positioning of the valve holder and coils was carefully considered first of all, in order to have the wiring as short as possible. The two coils were made from 1/2-in. copper tubing, which was first softened by heating and then coiled round a 1/2-in. former and sprung off. Four and a half turns comprised each coil with the turns spaced about 1/8 in. The coils were mounted direct to the condensers and about 1/4 in. apart, the ends of the windings having been left long enough to facilitate this. The choke was mounted out of the way (against possible induction interference), under the valve holder inside the chassis, and a lead taken from it to a terminal at the back of the of the latter. Filament leads, of flex, were led down through the chassis in a similar manner and then out at the back. (See Fig. 1.)

The rest of the wiring was done with heavy gauge bare copper wire, everything being kept absolutely rigid. A .00005-mfd. trimmer condenser was included in the aerial circuit.

**Smooth Reaction.**

I had originally intended to arrange the quenching, or oscillator valve, on another similar chassis complete with an L.F. stage, but I had left it so late in starting to make the set that I had to abandon the idea for the time being.

Instead, I decided to make use of the I.F. stages of a short-wave superhet. I have in commission, and coupled the set up to this in the manner of an "adaptor." (See Fig. 2.) This short-wave receiver has battery-driven valves, but H.T. is obtained from the mains via the usual smoothing arrangements, the supply being 200-v. D.C.

The five-metre affair now constituted a combined det.-oscillator. An H.L.2 valve of the metallised variety was plugged in, the H.T. adjusted to about 70 volts, and the great adventure started!

Reaction control was perfectly smooth, and no difficulty experienced in keeping the valve working in its most sensitive state.

An ordinary outside broadcast aerial was

**A SIMPLE CIRCUIT**

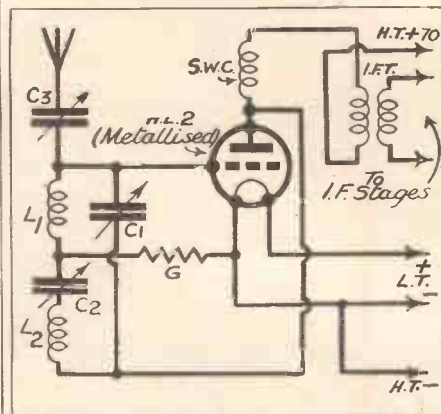


Fig. 2. The actual 5-metre circuit is that of a combined detector oscillator. It was coupled to a short-wave set by the "adaptor" principle—that extremely effective method of short-wave reception which was inaugurated by "Popular Wireless," and which has since enjoyed world-wide popularity.

used, about 40 ft. long, and no earth other than that provided by the mains supply. This aerial, although high up, is badly screened, and this no doubt accounts for the poor results from the Palace. However, the reception of at least two (identified) stations, on really quite simple apparatus, shows what can be done, and no doubt other readers will go ahead and explore this fascinating five-metre band into which "P.W." has initiated us.

**THE PLACING AND SPACING**

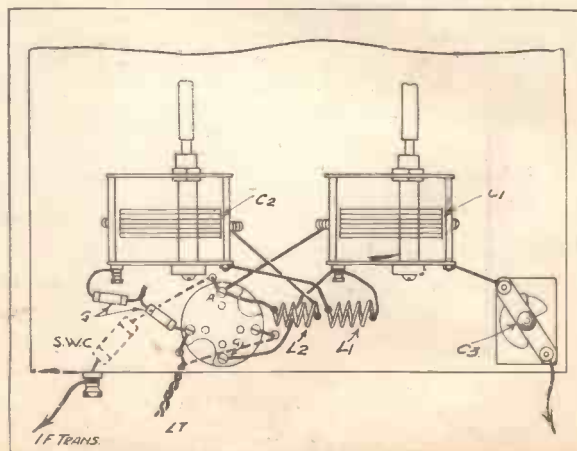


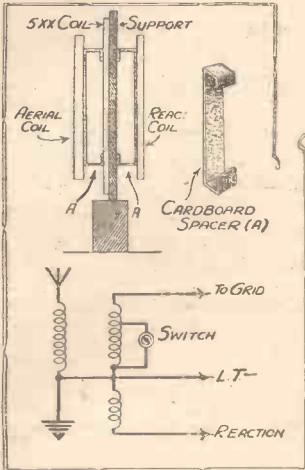
Fig. 3. Using this layout, Capt. MacColl tuned in two 5-metre amateurs at his first attempt.



# RECOMMENDED WRINKLES

## BASKET COILS FOR MODERN SETS.

I HAVE used three basket coils in my set to give long and medium wave stations for several years. There is a large coil for long waves which is tapped at a point found experimentally. From



How the coils are connected.

the tapping a connection goes via a push-pull switch to the L.T. - On operating the switch the greater part of the large coil will be cut out.

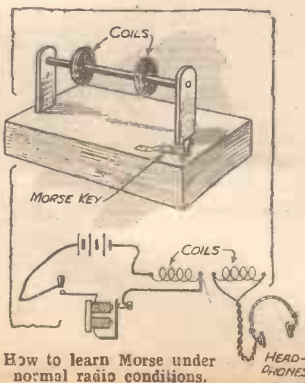
Small home-made basket coils are fixed by means of cardboard spacers and silk ties on each side of the large coil.

The three coils are connected to the required points in the set, as indicated in the circuit sketch.

## LEARN MORSE FOR SHORT WAVES.

A GOOD knowledge of the Morse code is a most valuable asset to all short-wave enthusiasts, and is easily acquired by practising with a simple buzzer set, such as is used by Boy Scouts and Girl Guides. Proficiency in reading Morse with a buzzer does not, however, necessarily imply ability to decipher a weak, perhaps fading message heard in a pair of headphones, as many readers will have discovered for themselves.

A simple practice set, using 'phones, may easily be made from odd materials, as shown in the diagram. And by increasing the distance (and consequently loosening the coupling) between the two coils, the signals heard in the



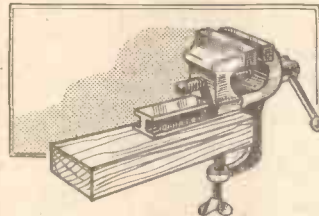
How to learn Morse under normal radio conditions.

'phones may be weakened at will, and the user will learn to read with facility really distant messages.

The coils should each consist of 30 or 40 turns of thin wire (30 or 32 S.W.G.), and be about 2 inches in diameter, wound hank fashion. They should be mounted on a wooden rod about 12 inches long. The buzzer should be mounted in the base, which should be lined with felt so that the buzzer itself will be rendered almost inaudible.

## ONE-ARMED WIRING.

THE idea I am sending to you is one which may be of use to one-armed men, who like myself are interested in constructing wireless sets. I use a small vice (purchased at Woolworth's for 6d.), fastened on to a

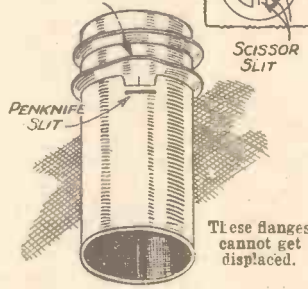


A vice mounted for one-hand wiring.

## FLANGES ON COIL FORMERS.

WHEN making coil formers with thin cardboard flanges to divide the long-wave and reaction windings, difficulty is often experienced

THIS PORTION OF FLANGE BENT BACK



in keeping these flanges upright and in line. A simple method of overcoming this trouble is as follows:

Cut the flanges with internal horns to fit in penknife slits made on opposite sides of the tubing. It will be necessary to bend the flanges as shown to get the

## 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 Stanley A. C. Bunn, Waterloo, Bank Street, Malvern, to whom a guinea is being awarded.

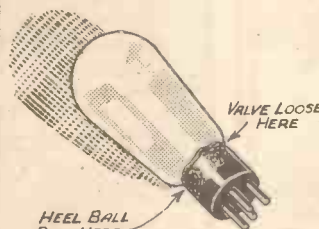
small piece of wood, 6 by 2 in., and held between my crossed legs.

This holds the wire firmly when making loops, stripping off insulation ready for H.T., L.T., and G.B. leads, also wander-plugs when connecting to leads.

I find this a great help, as I have no workshop or bench which I can use.

## REPAIRING SHAKY VALVES.

HERE is an efficient and quick way of repairing a valve which has by constant use become loose where the glass bulb enters, and is held by the chonite bottom. Get a piece of shoemakers' heel-ball, for the cost of 1d., and heat your soldering iron



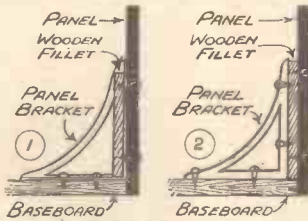
Securing a loose valve-base.

slightly, or the poker would do, and run a collar of the heel-ball or wax round the joint, thus fixing the glass bulb firmly. I repaired a valve like this some months ago and found it a very satisfactory job.

horns in position, after which the halves of each flange are best bent up to the inside of the tube and fixed with "Secotine."

## "FILLETED" PANEL BRACKETS.

OFTEN when screwing the panel on to the brackets the constructor has no small nuts and bolts on hand, and the shops are shut. The following



Fixing panel brackets with wood screws.

dodge will overcome the difficulty and save many hours of waiting.

Cut two strips of 3/8-in. wood (any kind will do), each 1/2-in. wide and the length of the longer arm of the bracket. Now with a few wood screws, fix the panel on to the wood strip with the bracket in between, so to speak. This is shown clearly in Fig. 1.

If the brackets are of another type you can use the method shown in Fig. 2.

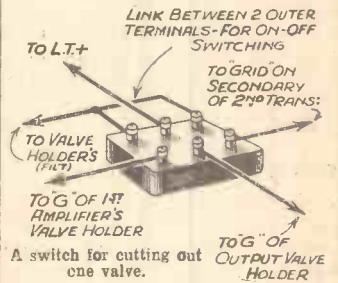
## GRID SWITCHING.

I HEREWITH submit a scheme of switching which I use myself in the "Magic" Three. (Yes! I still

like it better than any other Det. and 2 L.F.) Grid switching, I know, is not generally recommended by those who know; but I have seen it recommended in "P.W.," and it is quite a success in my case. Leads are, of course, short and direct as possible.

The advantage is that a separate control for changing over from 2 valves to 3 valves (and vice versa) is done away with.

When the switch is turned to the



A switch for cutting out one valve.

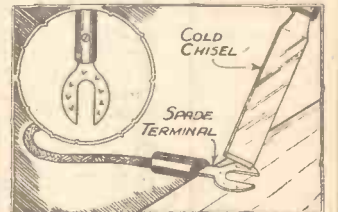
right only the first-stage transformer is being used.

Turning the switch to the left brings in the second transformer again.

The filament switching is, of course, obvious to you.

## CERTAIN CONTACT.

HERE is a tip which is very useful for preventing bad accumulator connection. With the usual spade connector there is nothing on the



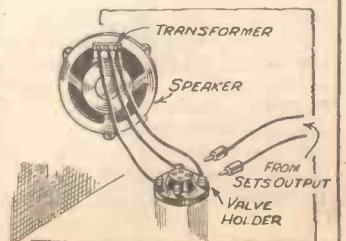
The small bumps ensure good connection.

smooth surface to penetrate the film which develops on the terminals.

However, if the corner of a cold chisel is tapped in a few places on the surface of the spade, it will be found that the rough points always give a good connection.

## QUICK SPEAKER CONNECTIONS.

WIRELESS listeners with moving-coil speakers can quickly find the correct ratio for their particular sets if the transformer connections are connected to a spare valveholder. Two wander-plugs are needed for wires from the output of set, and it is easy to find correct ratio much quicker than changing terminals.



Convenient method of trying different taps.



# 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

### THIS YEAR'S "ECONOMY THREE."

J. F. (Pontypridd, Glam.).—“Congratulations upon the appearance of the new ‘Economy Three.’ It is a wonderful achievement to introduce such a capable set at so low a price.

“If it lives up to the reputation of its forerunners, it will be truly a wonder set. I built both the original model and the modernised version of December, 1932, and the performance in both cases was excellent.

“I note that your latest version includes Lissen dual-range coils. I am sure it would be a boon to many of your readers, myself included, if the Telsen coil of the modernised version could be introduced into the present circuit, and real economy would be realised in the purchase of one additional dual-range coil instead of two.

“I am sure that an early note to this effect would be appreciated in POPULAR WIRELESS, the world's best radio journal.”

It is quite practicable to use the coil named, for the first (serial) unit, instead of the one actually incorporated in the original This Year's “Economy Three.” And constructors who have such a unit, new or left over from the modernised version of the “Economy Three” (Dec. 1932) can incorporate this without difficulty.

It will be necessary, however, to employ a three-point wavechange switch, instead of an ordinary two-point, as there will be one extra wavechange connection to make when the Telsen coil is employed.

Instead of wiring as on page 468 (June 24th issue of “P.W.”), the connections to the switch and new coil unit, etc., should be as follows:

- Coil Unit Terminal 1. Not used.
- “ ” “ 2. To set's aerial terminal.
- “ ” “ 3. Same as before, i.e. to one contact of the (three-point) wavechange switch.
- “ ” “ 4. To a second contact on the three-point wavechange switch.
- “ ” “ 5. Not used.
- “ ” “ 6. To No. 7 terminal, to remaining terminal of three-point wavechange switch, to moving vanes of tuning condenser, and via foil to earth, filaments, etc.
- “ ” “ 7. To 6 (see above).
- “ ” “ 8. To fixed vanes of tuning condenser, and to grid-terminal of S.G. valve-holder.

### EXCESSIVE ANODE CURRENT CONSUMPTION OF POWER VALVE.

T. A. A. (Shenfield).—“As the reproduction did not seem to be half as good as usual, I got a friend who owns a milliammeter to check up the current consumed by the different valves.

“We found that the power valve, which is nearly new, was taking nearly three-quarters as much again as it should! But we cannot see anything wrong with the valve itself or battery, and the latter is surely not able to increase in voltage.

“Should much appreciate suggestion as to what can be causing the trouble, as the set is switched off and will remain so until it is capable again of the good quality reproduction which it gave at first.”

There is but little doubt in our mind as to the cause of the trouble, which we think you will find lies in the failure to apply the correct grid bias.

It may be that the bias battery has run down, though we expect you checked this when considering the possibility of an H.T. failure; but even if the G.B. voltage is proved to be O.K. at the battery, this may not be applied to the valve.

## 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. How many wavelengths are there in the “European system,” regulated by the recently adopted Lucerne Plan?
2. What is to be Europe's most powerful station, under the Lucerne Plan?
3. What does the prefix “micro” denote—e.g. micro-farad, micro-henry, etc.?

So make sure that there is no break or faulty winding in the grid circuit. If this consists of the secondary of an L.F. transformer, see that the external wiring to it is faultless, and check (by clicks) for a broken winding if no external break is disclosed.

If you employ a resistance-capacity coupling connection to the grid of the power-valve holder, check the resistance for a break and the condenser for a leak, either of which would have the effect of “removing” grid bias.

## “P.W.” PANELS. No. 128. LENINGRAD.

Leningrad was for years the bottom-of-the-dial station on long waves (on 1,000 metres), but it is now working on 857 metres, the 1,000-metre wavelength being occupied by Moscow instead.

The power employed is 100 kilowatts. Leningrad's wavelength is likely to be altered shortly, as Russia is overhauling her broadcasting system, and the 857-metre wavelength is held only temporarily by Leningrad.

Usually man announcer. Distance from London, 1,306 miles. Closes down with the words “Spakoiny notchi” (Good-night).

## GETTING VERY EXACT CALIBRATION WITH THE AID OF A MILLIAMMETER.

J. Y. (Aylesbury).—“I am so pleased with the set's distance-getting that I think I am going to break all records with it when the holidays are over and the longer evenings indoors come round. And I have been receiving a tip or two on the subject of very sharp tuning, in connection with a milliammeter.

“As the drawing up of a really big tuning chart is a job I love, I am eager to get my calibration as exact as possible, with all the dial-reading positioned to fractions of a degree. And from what I hear there is nothing to touch a milliammeter indication for that job. I propose to connect it in the plating of the detector, between the H.F. choke and P. terminal of the L.F. transformer.

“There are, however, two points about which I am uncertain, and upon which I should appreciate a word from you, if you think the main idea is O.K.

“(1) Does the milliammeter needle increase or decrease when it indicates that a station has been correctly tuned in?

“(2) Is it desirable to join a .001 mfd. across it when fitting milliammeter to the set?”

We think you will find the scheme a great success, the readings obtained in this way being far more accurate than any you could take by ear. If your detector is of the leaky-grid type, the readings of the milliammeter will decrease. If of the anode bend type, they will increase.

Probably you will not find the .001-mfd. condenser makes any difference, so if you have one we should be inclined to use it; but if not, omit it.

## THE “P.W.” FIVE-METRE TESTS FROM THE CRYSTAL PALACE.

F. D. (Beckenham).—“Although I did not take part in them, and at present have no set capable of going down to five metres. I was very interested in the accounts of the ‘P.W.’ five-metre tests from the Crystal Palace.

“Was the world's record on that occasion set up because of the specially favourable situation of the transmitter, or because of the power used, or what?”

It is not easy to say, but perhaps when the investigations have gone a step further the reason will be clear.

At present we can only refer you to the articles appearing from time to time, which deal with the progress of the tests.

## OUR CATHODE RAY TELEVISION VIEWER.

J. G. (Broadstairs).—“I am a little confused about the H.T. connections of the radio receiver used with your television viewer recently published in ‘P.W.’ How exactly is the H.T. for the set connected in the complete outfit?

“Is it plugged into one of the 200-volt units supplying the diodes? If so, how? (Incidentally, I assume that the ‘H.T.’ on seventh line from bottom of page 454 is a misprint for ‘L.T.’)”

Regarding the H.T. connections of the radio receiver, theoretically the H.T. negative of the set goes into the diode H.T. negative, and the positive of the set is tapped into the diode supply at about 120 volts.

Actually, to allow the H.T. of the set to be switched off automatically with the rest of the set, we take the H.T. negative of the set to the main H.T. switch on the side which goes to 700-volts positive on the supply for the accelerator.

This is electrically connected to the diode negative when the switch is closed. The H.T. positive of the

set is then tapped into the diode battery at 120 volts.

This method of connection allows the H.T. supply of the set to be broken, thus preventing any H.T. drain through the screening-grid potentiometer feed while the set is “off.”

With reference to your final point, yes, L.T. is meant, and the sentence should have read: “The radio viewer can take its L.T. from one of the two cells used for the time-base 4-volt supply, the negative L.T. of the set being common with the negative L.T. of the 4-volt battery.”

(Continued on next page.)



## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

### WHAT CAUSED THE MISLEADING READING?

T. J. J. (Tenby, S. Wales).—"Being a great believer in the use of a milliammeter for testing purposes, I sometimes lend mine out, and was thus let in for a puzzling time the other day. The circumstances seemed to indicate that the valves were at fault, and my first test was to put the milliammeter in the H.T. negative lead and to compare the total current with the valve-makers' specification.

"There did not seem to be anything much wrong with the figures, but I noticed that the reproduction seemed far worse when the milliammeter was in than it was before; and, after trying various other tests, we came to the conclusion that we must repeat the test of checking the total high-tension current passing in the negative H.T. lead.

"Results were the same, and as there was still doubt about them, somebody suggested trying a condenser across the milliammeter whilst the reading was taken.

### 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.

"It certainly made some difference, too. When we put the condenser on (it was a 2 mfd.) the milliammeter ceased to affect the reproduction, and the reading obtained was found to be over a milliamp lower than it should have been, which put us on the track of the fault (dud detector).

"The part that puzzles me is why the condenser across it should make a difference to a milliammeter reading when the condenser itself is an insulator. It certainly did so, and had it not been used we might still have been looking for that fault! Also, why was the quality better when the fixed condenser was joined across the instrument?"

The circumstances seem to point to the set being inherently unstable to begin with, and the addition of the milliammeter in the common H.T. negative lead caused further unwanted coupling, which resulted in self-oscillation of one or more stages.

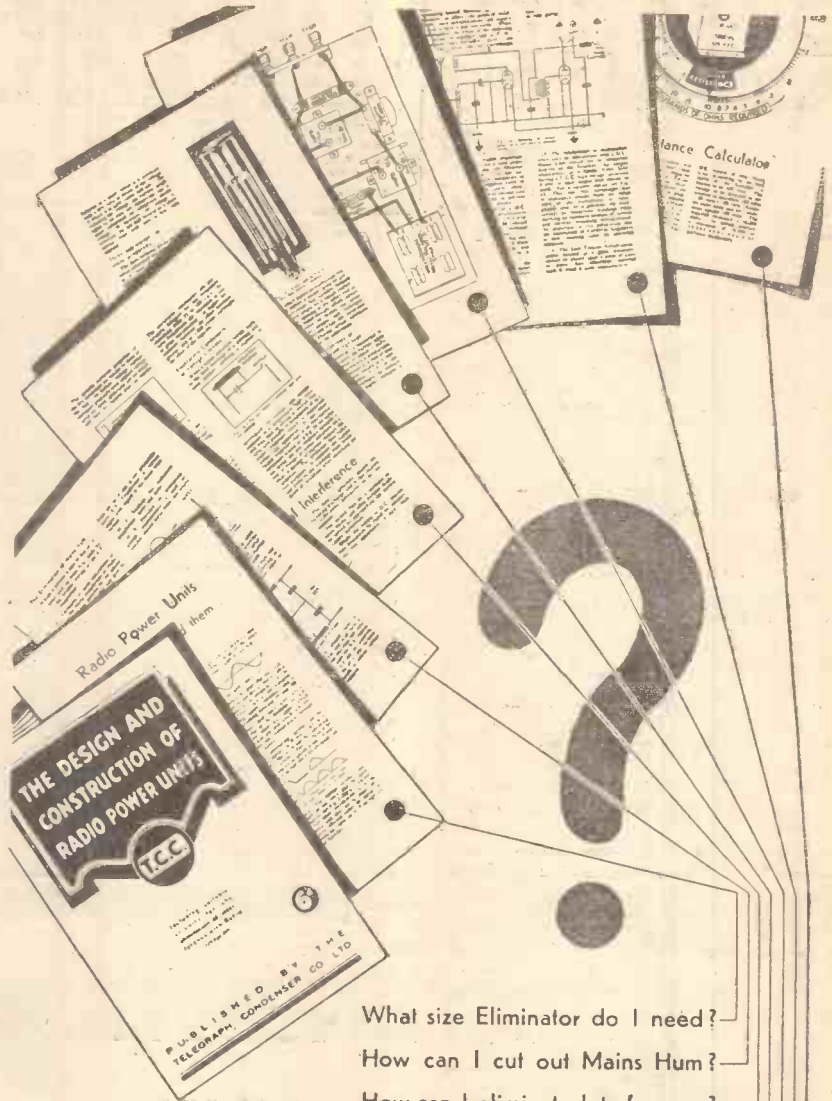
(If the milliammeter has a fairly high resistance, or if the set happened to be very near the instability mark, the extra back-coupling due to the additional resistance in the common H.T. lead might easily have proved to be the last straw.)

In such a case the coupling effect would be removed by the provision of a large condenser across the milliammeter terminals, and so the spurious oscillation would disappear.

Such an oscillating condition might well cause the altered current reading, and, of course, it would account for a deterioration of quality such as you noticed.

Your experience emphasises the advisability of using a condenser shunt across the milliammeter when taking test readings.

(Continued on next page.)



What size Eliminator do I need?

How can I cut out Mains Hum?

How can I eliminate Interference?

When should I use an Electrolytic?

How do I build an A.C. Power Pack?

What special precautions for D.C.?

What resistance do I need?

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Please write in block letters

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ALL-BRITISH  
CONDENSERS



## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

### RESISTANCES OF TRANSFORMER'S PRIMARY AND SECONDARY.

L. T. P. (Gravesend).—"When checking up for a broken winding, I accidentally discovered that the resistance of the secondary of my transformer is almost exactly ten times as big as that of the primary, although the ratio is only 3:1. How is that?"

If you have been assuming that the resistances must vary proportionally with the ratio, you have been wrong.

There is no reason why the two windings should be made of the same wire, and, unless this condition were fulfilled, it would obviously be most improbable that the respective resistances would vary more or less proportionally to the ratio. As a matter of fact, a secondary of ten times the resistance of the primary is not out of the ordinary.

## THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 558  
ARE GIVEN BELOW.

1. 130 wavelengths.
2. Moscow, which is to be allowed to use a power of 500 kilowatts.
3. Micro means  $\frac{1}{1,000,000}$ ; and therefore  
1 mfd. =  $\frac{1}{1,000,000}$  farad; 1 micro-henry  
=  $\frac{1}{1,000,000}$  henry, etc.

DID YOU KNOW THEM ALL?

### L.F. TRANSFORMER BETWEEN PICK-UP TERMINALS AND GRAMOPHONE.

R. T. (Henley-on-Thames).—"To get rid of a squeal when the pick-up is touched, I am advised to try a transformer connected between the pick-up terminals of set and the leads from these which go to the pick-up. "What ratio transformer is needed?"

We doubt if any transformer will be found to give improved results. We think a better plan would be to earth the frame of the pick-up, and to use metal encased pick-up leads. The metal casing should also be connected to earth.

## THE LINK BETWEEN

(Continued from page 550.)

all popularly referred to as "iron-cored coils," there is a tendency to assume that they are all the same, irrespective of make.

While it is true that fundamentally the principle, in each case, is the same, the methods of approach and the manufacturing processes involved are entirely different.

For instance, in the case of the new Varley Nicore coils, the core consists of an entirely new and patented alloy dust. It is the outcome of extensive research work over a considerable period, a fact that must be obvious from the remarkably efficient way in which the coils perform.

Moral: If iron-cored coils are specified, do not assume that any one will do. Either follow the designer, or else judge the various coils on their merits.

### Suppressors for Car Sets.

Apropos my recent "moan" about the absence of suitable suppressors for motor-car and motor-boat radio installations, I appear quite unconsciously to have stirred up a hornet's nest!

From the numerous letters and telephone calls that I have received, I gather that such things are made, and have, in fact, been available for some little while.

But I'm afraid I am a hard nut to crack. If I did not know about them, how can my readers be expected to know? And might I innocently inquire for what purpose advertising columns are intended? Ah well, I must have my little jest, but at least I hope that I have succeeded in planting the necessary seed for the future.

Meanwhile, in case any of my readers are waiting to install a mobile outfit, it is worth passing on that suitable suppressors can be obtained from Dubilier or Graham Farish. Alternatively, special plugs into which the necessary resistances are built can be obtained from the Champion Sparking Plug Co.

### Exide Service Convention.

Representatives from all parts of the world were present at the Thirteenth Annual Exide Service Convention which was held recently at Torquay. Just imagine, thirteen years of it, and still current (Sorry, but it must be the effect of the sun.)

Several of the 600 delegates arrived at Torquay by air, where they were met by the Mayor, Councillor W. Denis Thomas, J.P. The method of transport of the others is not clear from the report that has been forwarded to me, but I have a strong suspicion that electro-motive force played an important part!

Anyway, it is a comforting thought for battery users to know that Exide's are going from strength to strength, and we wish them the best of luck.

### Attractive Hire-Purchase Scheme.

The Marconiphone Company has just hit upon a hire-purchase scheme which is full of attractive possibilities.

It isn't everybody that can afford to pay spot cash for a commercial receiver, and the extended payment idea—which I regard as a quite sound one—enables sales to be effected which might not otherwise be possible.

But the average Englishman is nothing if not proud. And the idea of having to go and pay a weekly instalment is definitely one of the disadvantages of the scheme.

Under the new Marconiphone scheme, hire-purchase customers can be supplied with a home safe into which they can place their weekly instalments. An authorised collector then calls once every month, and that is all there is to it.

Personally, I think it is an excellent innovation: just one of many bright thoughts for which Marconiphone has been responsible.

### Magnavox Change.

As from the first of this month, the marketing and sales of the famous Magnavox range of moving-coil speakers has been transferred to the Benjamin Electric, Ltd.

I understand that no changes have been made in the Magnavox sales personnel, but all communications relative to Magnavox speakers must in future be addressed to the Sales Manager, The Benjamin Electric, Ltd., Tarriff Road, Tottenham, London, N.17.

# FROM THE EXTENSIVE

# POLAR! RANGE!



### POLAR "No. 2"

A condenser with fast and slow ball-bearing action. Rigid construction and bonded rotor vanes ensure long service, with permanent accuracy. **6/6**  
·0005, ·0003 - - -

The Polar range of condensers covers every possible need—and more. Every individual condenser is a precision-made instrument—one in which set designer, manufacturer and amateur alike, place implicit trust. Be guided and use "POLAR."

Send for descriptive Leaflet



### POLAR "COMPAX"

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·0003, ·00015, ·0001, **2/6**  
·00005 - - -



### POLAR "DIFFERENTIAL"

Constructed of highest quality materials throughout. Insulated spindle. Smooth action. Very accurate control. **3/6**  
·0001, ·00015, ·0003 e/s

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POLAR WORKS: OLD SWAN, LIVERPOOL



# MIRROR OF THE B.B.C.

(Continued from page 550.)

## Tommy Handley Solus Again.

Tommy Handley as a single turn in vaudeville programmes or as the leading light in his own productions is always welcomed by his scores of thousands of wireless enthusiasts. and how well he can concoct a delightful show is recalled by such titles, as "Handley's Manœuvres," "Rin-Gin-Gin," and "The Disorderly Room." On Monday and Tuesday, July 17th and 18th, he is contributing a new revue for National and Regional listeners respectively, to which he has given the intriguing title of "Morning, Noon and Night." The cast will include Jean Allistone, Wynne Ajello, John Armstrong and John Rorke.

## More Gramophone Music.

Had the B.B.C. some months ago announced the intention of increasing the proportion of gramophone music to what listeners are getting to-day, it is very doubtful whether that always-disgruntled section of the public would have accepted the idea without the usual clamour for wholesale dismissal at Broadcasting House.

But by saying nothing and putting on skilfully-compiled recitals, and always retaining the freshness of Christopher Stone as the keynote of all gramophone broadcasting, the Corporation has got away with it, as they say, so that this form of wireless entertainment is as much appreciated as any other, and perhaps a little more than some.

Even more variety will be introduced into the recital for National listeners on Saturday, July 15th, when, under the title of "Voices of the British Stage," records made by such famous stars as Sir Herbert Beerbohm Tree, Lewis Waller, Sir Frank Benson, Arthur Bouchier, Matheson Lang, and Sir John Martin Harvey will be heard. The records consist of selections from plays in which they have appeared on the British stage. On the following Monday evening a recital of Mexican records, not usually obtainable in this country, will be broadcast.

## A Kipling Feature.

Songs from the "Just-So Stories" of Kipling, the music of which is by Sir Edward German, will be a feature of the London Regional programme on Wednesday, July 19th. They will be sung by Dale Smith, and, as was the case when they were given a first performance in April, the singer will be accompanied by Victor Hely-Hutchinson and Berkeley Mason on two pianofortes.

The titles of the songs are: When the Cabin Portholes; The Camel's Hump; The Uninhabited Island; I Keep Six Honest Serving-men; I am the Most Wise Bavarian; Kangaroo and Dingo; Merrow Down; Of All the Tribe of Tegumai; The Riddle; The First Friend; There Never Was a Queen Like Balkis; and Rolling Down to Rio.

## New Organ in Action.

Every Friday, at noon during August, the recently opened organ in the Concert Studio at Broadcasting House will be heard by listeners, when Mr. C. H. Trevor gives a recital. Another date which lovers of high-class organ music will pencil in their diaries is Monday, July 31st, when the Regional programmes will contain a recital,

also from Broadcasting House, by Sir W. G. Alcock. This programme will consist of Overture in D minor (Handel-Ellingford), Larghetto in F sharp minor (Bach), Caprice (Guilmant), and Postlude in C (Alcock).

## King's Prize Relay.

The final stage of the competition for the King's Prize at Bisley will be described for National listeners on Saturday, July 22nd, in the form of a running commentary by Captain B. H. Robinson.

## The Tidworth Tattoo.

More or less the same plan that was adopted in this year's broadcast of the Aldershot Tattoo of linking up the actual relays with suitable broadcasts from the studio will be followed on Saturday, August 5th, in the broadcast of the Tidworth Tattoo. The relay starts at 9.25 p.m., and goes on until midnight, with intervals of community singing from the studio led by Joseph Lewis, with Ernest Butcher as the soloist.

## A NEW Q.P.P. VALVE

THE struggle between pentode Q.P.P. and "Class B" amplification goes on apace, in spite of the apparent triumph over the former by the latter mode of valve coupling: for we hear on good authority that one of the very well-known valve manufacturers has for some time been hard at work designing a special double Q.P.P. pentode output valve that will revolutionise quiescent push-push circuits.

The old trouble of using two pentodes and matching them in a push-pull (or push-push, as you like) circuit will be obviated, for the two valves are to be enclosed in one envelope, and will be completely matched by the makers. The result will be that they can be plugged in a Q.P.P. circuit without any of the qualms that have assailed users of that type of amplifier in the past.

No grid-bias balancing will be required, a fixed bias, common to both sections of the valve, will be possible, and the valve will plug into the standard "Class B" type of valve holder. The new valve will be of the two-volt type, operable from H.T. batteries of 120 to 150 volts, and with a quite normal grid bias of a few volts.

The output wattage is not yet definitely fixed, but we understand it will be of the order of two thousand milliwatts, while the quiescent current will be some two milliamps or so.

## HONOUR FOR SIR AMBROSE FLEMING

THE Institute of Radio Engineers of New York, U.S.A., meeting in their Annual Convention at Chicago on June 26th, have awarded their Gold Medal of Honour this year to Sir Ambrose Fleming, F.R.S., for the conspicuous part he has played in introducing physical and engineering principles into the science of radio. Sir Ambrose was the inventor of the first form of thermionic valve, which is now the master weapon of wireless telegraphy and telephony, and without which there would have been no broadcasting as it exists to-day.



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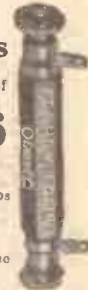
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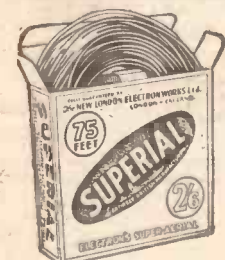
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## ARE CATHODE RAY TUBES DANGEROUS?

(Continued from page 549.)

(owing to the extremely low driving voltage), and it is a characteristic of "soft" rays that they are rapidly absorbed by matter. It is, therefore, very doubtful whether any appreciable percentage of such rays would even get through the screen itself, let alone the glass wall of the cathode ray tube. In fact, very soft X-rays are absorbed by a few centimetres or even a few millimetres of air.

Summing the whole thing up, it seems to me that whatever may be said for or against the cathode ray tube for commercial purposes, including its application to television, there is not the slightest ground for alleging that it can be a source of danger owing to any harmful radiation proceeding from it.

Learning from Experience.

When I was working at the Cavendish Laboratory at Cambridge I once got a bad attack of X-ray burn on the face, which was very irritating and painful for a few days—for all the world like extreme sunburn—but the tube I was using was not a cathode ray tube, it was very much "harder" and enormously more powerful. After that, you may be sure that I took extra special care to avoid any possibility of a recurrence of the same experience, and, although I have worked with all kinds of cathode ray tubes, I have never found it necessary to take the slightest precautions against soft X-rays and I have never experienced the slightest harm.

In any case, it is a perfectly simple matter to view the cathode ray screen through a small sheet of lead glass. Since lead glass can stop the penetrating radiation from a powerful X-ray tube the use of such a simple precaution should clear away any possibility of danger from soft easily-absorbed rays from the cathode tube—even assuming that such rays existed.

## THE LISTENER'S NOTEBOOK

(Continued from page 548.)

supplied at the expense of a little music, the music-lover wouldn't have cause to grumble. Now, what about it, B.B.C.?

With Wimbledon on the cover of the "Radio Times," we might have expected a lot of Wimbledon this week. We certainly got a lot, and lawn-tennis enthusiasts must have been flattered by the B.B.C.'s consideration for them. If only I could believe that these enthusiasts were numerically so large as to justify this consideration, I would accept these "broadcasts throughout the week" with greater resignation. But as I can't, I don't.

Ready for a Change.

Apart from these broadcasts, the week was remarkable for the winding-up of the first half of the Summer Talks. Well, there may be some regrets on this score, but don't let us forget those people who are always ready for a change. Personally, I don't regret the completion of those series I haven't attempted to listen to. But I am sorry that Mr. J. B. Priestley has finished. When he began his series I ventured to suggest in these notes that we should have to revise our order of microphone personalities by the time he had told us everything. Was I right? I will answer my own question in the words of that all-too-rare broadcaster, the Vicar of Mirth: "M'yes; I think so!"

## TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Television.

TELEVISION has quite a few "puzzlers" still to be solved. Some of these relate to what you may call purely technical problems, and others to matters concerned with the production of the show which is being put over.

As regards the technical side of television, it is often said that a great deal more can be done on short waves than on medium waves, not particularly because of any inherent advantage in the short waves themselves, but because of the availability of a greater number of channels.

It is obvious that there is already quite sufficient congestion of the medium channels with ordinary broadcasting; in fact, the problem in that direction is already acute, so that it would seem to be quite out of the

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question to bring in a whole lot of television channels into an already overcrowded region, at any rate during broadcasting hours.

Dual-Range Frame.

A reader wants to know whether he will gain any advantage by winding a frame aerial for dual wavelengths in two parts at right angles to one another, so as to avoid interference. The idea, of course, is to apply the same principle to the frame aerial that we are always told to apply to components in the set which are not to interfere with one another, that is, the principle of arranging them at right angles to one another. The same principle is used in the old variometer, but there the coupling was obtained by actually varying the angle between the axes of the two coils.

Dead Ends.

As a matter of fact frame aeriels are often made in just this way, with the long-wave winding in one direction and the medium-wave winding in a direction at right angles to it. More generally a frame aerial is wound all in the one plane, the whole winding being suitable for the long waves and being tapped, so that a portion of it can be short-circuited, leaving the remainder suitable for medium-wave reception.

This, however, has the well-known "dead end" effect, the short-circuited portion acting partly as a shield and partly

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## TECHNICAL NOTES

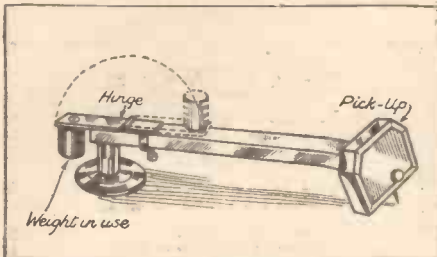
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as an absorber, and thereby interfering with the efficiency of the active part of the coil. This shielding and absorption effect is almost entirely eliminated if the two sections of the winding are wound in planes at right angles to one another, so that for a dual-wave frame aerial this is the best way to arrange it.

### Spare the Record.

Here is a simple dodge for counterbalancing the weight of the pick-up and preventing it pressing too heavily on the record. Take an ordinary hinge and saw off one of the arms to a shorter length, as shown. Solder this to a clip of a size to fit round the pick-up arm and with a brass lug soldered at the lower part and drilled and tapped for a small thumbscrew. The clip should not be a complete circle, otherwise it will not go on the pick-up arm. A suitable weight—this depends on the weight of the pick-up and how much of this you wish to counterpoise—may be secured by a screw to the other arm of the hinge.

### FOR PICK-UP USERS



This simple dodge counterbalances the weight of the pick-up and prevents it from pressing too heavily on the record.

If a slot is provided in this arm the weight can be shifted about and so the counterpoise effect can be adjusted.

An advantage of this arrangement is that when the pick-up is not in use the hinge can be turned over, as shown by the dotted lines, out of position. Some degree of adjustment can be obtained also by shifting the clip along to different positions on the pick-up arm.

### New Valves.

I have said something in these Notes once or twice lately about automatic volume control by means of the multi-mu valve and control valve and how this enables the signal strength to be kept at a constant level automatically. Experiments have, of course, been going on for some time past with a view to improving the special valves used for automatic volume control and the latest valve for this purpose is the Cossor double-diode multi-mu pentode, which is given the short title of D.D.Pen.

### Automatic Regulation.

This valve has an extraordinary capacity for regulating the volume output, since it can control between 1 volt and one-thousandth of a volt in the way of input without appreciable variation in the output. If you think what this means in relation to actual broadcast reception you will see what a remarkable advance in automatic control is achieved by the introduction of

this valve. It means, for instance, that with proper adjustments of the receiver a distant station, perhaps hundreds of miles away, can be made to regulate itself automatically to give the same output as a local station only half a dozen miles away. This is without having recourse to any conventional volume control with which the set may be fitted.

### Background.

The valve has the further advantage that the background noise may be reduced, which is also a very great benefit where automatic volume control is used. As those of you who have used A.V. control know, the keeping of the signal energy constant has the curious effect of making the background apparently rise and fall in volume, this, however, is only a comparative effect and is brought into prominence in this curious way by the fact of making the signal energy, as it were, "stationary."

The D.D.Pen. valve has special applications to circuits where the input into the detector is large; this means a considerable sphere of usefulness in superheterodyne receivers, especially powerful ones where the second detector comes in for a large input. We should hear a lot more of this valve in the future.

### Screen Voltage.

Talking about volume, but in a different connection, many set owners do not realise that the volume is affected by the voltage applied to the screening grid of the S.G. valve. In some types of set this voltage also influences the stability of the set and the smoothness of the reaction.

This screen-grid voltage, in fact, is really quite critical, so that it should always be adjusted by means of a variable tapping on the H.T. battery or unit in order to enable you to get the best position. You know, of course, that the detector voltage is often quite tricky, and in some sets—for instance, in many of the older sets not using screen-grid H.F. amplification—the detector voltage had to be adjusted very accurately, otherwise the set would become so lively as to be unmanageable.

### Critical Values.

With a screen-grid set, however, the voltage on the screening grid is usually more critical than that on the detector. It is, indeed, desirable to apply both of these voltages by means of variable tappings, but if by chance it is only possible to use one variable tapping for the purpose it is better to allot this to the voltage of the screening grid, and to use a fixed connection for the detector.

### H.F. Interference.

If you are troubled with high-pitched squealing and howling in a set this is sometimes due to H.F. current getting into the power-valve circuit. If you put a condenser in the circuit between the anode of this valve and earth you will soon see whether this is the cause of the trouble, because, if so, the condenser will bring about some sort of improvement—in some cases more than others.

But this is not really the best way to deal with the trouble, because it does not keep the H.F. currents out of the valve, and it is better to arrange a filter at an earlier part of the circuit. If such a filter is introduced

(Continued on next page.)



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## TECHNICAL NOTES

(Continued from previous page.)

in the anode circuit of the detector it will probably keep out the H.F. currents from getting along to the power valve, but here, again, there is sometimes a snag, because you may find that if large enough to act properly as a filter, the condenser capacity interferes with the proper action of the detector and upsets the quality of reproduction. This condenser, by the way, may be connected between the detector anode and earth.

### Use a Filter.

If you find that by this simple dodge you get over the howling and so on but are in trouble with bad quality, it is best to go in for a filter of a more efficient type, using an H.F. choke with two condensers in series across it, connecting their centre point to earth.

Alternatively, you may find it better to connect this centre point of the condensers direct to the negative filament terminal instead of to earth.

Another dodge which is sometimes useful is to use an H.F. stopper in the grid circuit of the power valve which, of course, keeps down the high-frequency currents.

### A Radiogram Trouble.

I had an experience a few days ago with a radiogram which struck me as being rather peculiar, and I am going to mention it in order to see whether any of you have had a similar experience.

This particular radiogram (which, by the way, is of a very good make) had been used, on and off, for short periods for many months but latterly it had been used rather longer each time. For some months it was only used for perhaps a quarter of an hour at a time, but lately it has been used for half-an-hour and an hour.

I noticed that the fuses tended to burn out rather unnecessarily, and once I thought I detected a "hot" smell. However, eventually when the fuses "went" for about the fourth time in a month, the set was examined and I found that the high-tension rectifier was so hot that it was almost impossible to touch it. At first I thought that this particular component must be ruined but, to my surprise, when the fuses were replaced and the set switched on again a few hours later, it functioned merrily as before, so that apparently the H.T. rectifier was little the worse for the cooking.

### Have You Noticed This?

I now noticed that the main input to the radiogram, where you adjust for different mains voltages, was tapped in the wrong place; it was, as you have already guessed, tapped into a voltage distinctly lower than that which was actually being used. The plug was put into the right position and since then the set has been used for long periods without any further trouble.

Of course, we know that the main input voltage adjuster should be set to approximately the right value, but it will probably come as a surprise to many of you to know what damage you can do by departing at all seriously from the proper tapping. Personally, I must confess I would not have thought that it would have made all that difference.

### Crackles.

A lot of people suffer from crackles in their sets due to faulty condensers and faulty rheostats, not forgetting also faulty switches. I think there is nothing more irritating than a set which gives forth loud crackles when you touch the controls or, in fact, when you touch anything, and this is made all the more aggravating by the fact that you never seem to be quite sure what it is that you do touch when you cause the trouble; the only remedy is to carry out a thorough examination of the set, testing out every component likely to give this trouble.

We have all met the sort of man who connects aerial and earth leads to the aerial and earth sockets by means of bared flex held in precariously with broken-match stalks: this is a very prolific source of crackles, but here the listener has nobody to blame but himself.

### Moving-Coil Excitation.

I came across somebody the other day using a moving-coil loudspeaker of the type which requires 6 volts for energising the pot, and he was complaining that this monopolised one perfectly useful 6-volt accumulator which was continually requiring recharging. He said that he had had this moving-coil speaker for some years, and wished that he had got one of the 200-250-volt type in the first instance, which he could have used direct on his D.C. mains.

### On D.C. Mains.

I pointed out to him, and I should like to do the same to any of my readers who happen to have a similar low-voltage moving-coil speaker, that the difficulty can be got over by using a series resistance if the mains are D.C., or a small step-down transformer and rectifier if the mains are A.C. As a rule, the current consumed by the pot of a speaker of this type is in the region of 5 ampere. Since it takes this current at 6 volts, the resistance is evidently somewhere about 12 ohms.

A current of  $\frac{1}{2}$  ampere from 200-volt D.C. mains will be drawn by a 100-watt lamp, so that this forms a convenient series resistance. The resistance of 12 ohms in the speaker pot is so small in comparison with the resistance in the lamp that it can be ignored.

This is perhaps rather a wasteful way of working your loudspeaker magnet, but it has the advantage that it requires no attention, and remains steady the whole time. Any minute ripple on the D.C. mains supply, by the way, will be smoothed out by the high inductance of the magnet windings.

### A Simple Change-Over Arrangement.

If your supply is A.C. you can use, as I say, a step-down transformer and any-type of rectifier, or more conveniently these two components made up into the form of a trickle-charger. Most trickle-chargers, as a matter of fact, are designed to give a current of just about  $\frac{1}{2}$  ampere, so that they are excellent for this purpose.

You can either use the 6-volt accumulator and keep it always up to normal by means of a trickle-charger, or you can use the trickle-charger direct on the magnet windings.

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### Fit Locking Nuts.

If you have done any set building, or, for the matter of that, any other electrical work, you must have noticed how aggravating it is when a screw terminal is not securely fixed in its base, but turns round when you want to secure a wire under the head. It is all the more irritating since it is not always easy to correct the trouble for yourself once it arises.

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 Chief of Research Department: **K. D. ROGERS.**

*The Paper that Made Wireless Popular*



**RADIO OLYMPIA  
 BETTER U.S.A. RECEPTION  
 OUR 5-METRE RECORD  
 "P.W." GETS THE NEWS  
 THE BENEVOLENT FARMER**

## RADIO NOTES & NEWS

**ELIMINATING  
 INTERFERENCE  
 B.B.C. AGRICULTURAL  
 TALKS**

**JIMMY WILDE'S VENTURE**

### Vienna's New Station.

**L**ISTENERS who have picked up a programme from the new Vienna station, now working nightly on 517 metres, will be interested to be reminded that this station apparently has no aerial!

Instead of the usual arrangement of wires supported by masts, Vienna uses a huge metal mast which is insulated and connected to the transmitter, the mast itself being the "aerial."

American listeners who have tried it swear by this kind of arrangement, and it will be interesting to see if it proves equally successful in Europe.

### The Radio Exhibition.

**A**UGUST 15th is rapidly approaching—the date when the National Radio Exhibition at Olympia opens its doors. There has been the usual crop of advance rumours, mostly unreliable, but this year there has also been a conviction that the manufacturers have an unusually inviting chance to show us something superlative. There is a quiet confidence about the result of their labours which suggests that the listener is going to be offered something far better than ever before.

It is going to be an uncommonly good show. Don't forget the date—August 15th to 24th.

### On the Pirates' Trail.

**H**AVE you noticed how cleverly the Post Office people are following up the trail of suspected radio "pirates" these days?

In one recent case a man before the court said he had only used the set a few times; but the Post Office representative wanted to know why he had been getting his accumulator charged regularly, and awkward questions like that!

Apparently the postal authorities had gone to no end of trouble to prove that he had been listening without a licence. And the magistrate, without any trouble at all, inflicted the fine.

### U.S.A. Programmes—Then and Now.

**T**HE recent statement about an increase in the number of British programmes coming from America lent a special interest to that Fourth of July talk which the B.B.C. relayed from the U.S.A. recently. Every word clear, no troublesome

fading, no atmospherics, and no mistiming made the talk a triumph of transatlantic reception.

Somebody deserves a full-size pat on the back for this. It seems only a year or so ago since we heard America, if at all, through a nightmare of electric Niagaras,

### THE MEN

With Sir Oliver Lodge, P. P. Eckersley, and Dr. J. H. T. Roberts heading its consultative staff, "Popular Wireless" possesses a unique and absolutely unrivalled editorial and research organisation.

### THE MATERIAL

"Popular Wireless" is equipped with an efficient laboratory and all the necessary resources for active and fruitful radio investigation and development.

### THE METHOD

Not content with the first publication of all the radio news of vital importance, "Popular Wireless" is itself in the forefront of radio progress and advancement. For example—

"POPULAR WIRELESS" produced the only set ever to be commended by the whole of the British Radio Industry.

"POPULAR WIRELESS" produced the world's first short-wave adaptor.

"POPULAR WIRELESS" instigated the first cathode-ray television for home constructors.

"POPULAR WIRELESS" initiated the first National 5-metre tests and the first International Quality tests.

### "POPULAR WIRELESS" IS PRE-EMINENT

all-sparking, all-fizzing! Then we never got a whole sentence. Now we need not miss a word!

### On Five Metres.

**A**CCORDING to reports from Canada, the U.S.A., Japan, and various European countries, interest in 5-metre broadcasting is everywhere growing

apace. At the time of writing no other country appears to have succeeded in beating the British 5-metre reception record, set up during the "P.W." Crystal Palace tests; but it is unlikely that this will remain a record for all time when the whole world is trying to exceed the 200-miles mark.

One very interesting possibility is that, as the number of experimenters increases, totally unexpected reception may result in regions where at present there are no sets adjusted to 5 metres.

### The Final Question.

"I DON'T get much time to write," begins P. L., of Sunderland. And he straightaway proves it by filling nine sheets of foolscap, on both sides, full of common-sense, wisecracks, and radio experiences.

He wants more of those articles on television, he says, though, incidentally, some of his difficulties on the subject had already been dealt with in "P.W.'s" back pages. And then he spoils the climax of a splendid letter by raising once again that old foolishness about "Is A. J. Alan really Sir John Reith?"

The answer is "No."

### No Foreigners Available.

**T**HE learned judge at Bow County Court is evidently one who moves with the times.

In trying a wireless hire-purchase case which came before him recently, he said: "If a three-valve radio set will not get more than the London Regional and National stations, it was not worth £35 when it was bought, or now."

The "owner" of the set explained that on Sundays he wanted a change from church music, but foreign stations completely eluded him. When he had said "Regional" and "National" he had said all.

And the judge ruled that he could send the set back to the firm which supplied it.

### You Watch Us.

"POPULAR WIRELESS" has been extraordinarily interesting these last few months," said a prominent manufacturer to me the other day. "You seem to be able to corner all the news. But I don't suppose you can keep it up indefinitely. It must be a terrific strain."

*(Continued on next page.)*



# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

I assured him that we'd got broad shoulders and that there was no prospect of any remission for our rivals. I say "we," but I'm in the way of being a privileged observer, and so I, too, can pay my humble tribute to those who bear the "P.W." banner so nobly.

## Brookes the Benevolent.

MR. GEORGE BROOKES, of Cwybr Fawr and Cwybr Ucha Farms, at Rhuddlan, Vale of Clwyd—you gather dimly that these farms are in Wales because of the spate of w's—must be the reincarnation of St. Francis of Assisi. He is so kind to the beasties.

His pigs trot on rubber paving—to spare their poor pawes—and his cows are delivered of their milk to the accompaniment of radio-borne music. Might I suggest that his hens be allowed to lay their eggs under the influence of chloroform?



## The Painful Truth.

IT seems that a riverside boat proprietor has been complaining that the B.B.C.'s broadcasts of imminent rain leads to the cancellation of week-end orders for his craft. Well, isn't that why the weather forecasts are published—for the guidance of the public?

What would our jolly waterman desire the B.B.C. to do? Lie to the public and say that it ain't gonna rain no mo'?

Or announce the weather only when it is expected to be good? Let us not attempt to corrupt the integrity of the righteous, my brother!

## News from Japan.

HAPPY Japan! The wireless licence fee has been reduced by twenty-five per cent. As one result the number of licensed listeners became 1,384,969 at the end of February, an increase of 327,147 for the twelve preceding months.

A new station is projected for Kurume. It is to be of 100 kw. power, and is to cost £100,000.

Why Japs want to listen to radio when they have cherry orchards, geishas, dwarfed trees, paper houses and Fujiyama passes my understanding.



## Tram and Trolley-Bus Interference.

WHEN questioned in the House of Commons recently about the plight of listeners whose reception of broadcasting was spoilt by electrical interference, the Postmaster-General made a very important announcement.

He said that in general the P.O. found the owners of the electric traction services were willing to modify their plant to prevent such interference taking place; but he went on to say that although he had no statutory powers of insisting on such remedies, the P.O. might find it necessary to seek such powers.

There is a welcome hint here of iron under the glove, and it looks as though we shall get rid of those crackles some day, after all.

## Atlantic-phone Eavesdropping.

POST-OFFICE experts paid a visit to the home of the Midland radio amateur who claimed he was able to listen to the transatlantic radiophone conversations despite the "scrambling" secrecy methods adopted. But they didn't hear much. A

## A Rap for the B.B.C.

AT a York conference of rural listeners, convened by the B.B.C.'s Central Council of the Adult Education Section, a Beverley gentleman, with that charming bluntness which is characteristic of Yorkshiremen, complained that rural listeners could not understand the experts when they spoke on agricultural economics. He wanted a practical farmer, not an "expert."



This bit of criticism strikes deeper even than its begetter intended, for the B.B.C. is professor-ridden, and in many instances the talks are "over the heads" of the public. I have heard practical workmen teach a lot to men with degrees and theories and whatnot.

## Breakfast-Time Programmes.

IF you have never tried breakfast-time listening you may now find it worth while to give the dials a twirl occasionally before beginning the day's work.

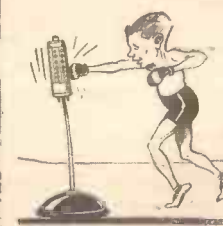
Several of the Continental stations are being well received, and some of my correspondents are eager that I should pass the news on. My own bag included Langenberg, Hilversum and Poste Parisien at the first attempt—all round about eight o'clock.

There are plenty of others, but I liked Hilversum best because he started with

a realistic cock-crow—very appropriate, as I happened to be bringing the back of the spoon down on the top of the breakfast egg with a crack at the very moment.

## From Ring to Counter.

AFTER battling his way through the jaws and noses of the lightweight pugilistic world, Jimmy Wilde has subsided into a Cardiff radio business. Good luck to the little man!



He will find just as hard a fight in trade as ever he fought amidst the wild halloos of boxing fans. I believe that he must have been attracted to this new career by the boastfulness of the "Catkin," and that he is saving up for that ironclad article a punch that will make the advertisement writers think hard.

ARIEL.

## SHORT WAVES.

American scientists claim to have found that milk can be sterilised by means of the sound-waves produced by a high-pitched musical note; but it is not stated whether their discovery is the result of experiments with the yodel.—"Punch."

## A SCHOOLBOY HOWLER.

A running commentary is a very swift animal with two humps found in Egypt.—"Sunday Mercury."

According to a Harley Street specialist, few people appreciate the importance of the ears. Except when they have to listen to that continuous loudspeaker next door.

## THIS WEEK'S BROADCASTING QUERY.

Is listening lessening?

A correspondent in a daily paper states that wireless and music are two tastes which do not always go together. That's just as well!

Holiday-maker (in tin-roofed bungalow): "Good Heavens, isn't this rain awful? I simply can't hear the radio at all."  
Second ditto: "Neither can I. Ain't Nature grand?"

## RADIO REGAINED.

Gaily  
The hosts of jazz, with drum and ukelele,  
Shall spill their floods of syncopated splurge;  
And when I've had enough,  
A delicate string quintet will next emerge  
To do its stuff,

Lofting the soul to planes of rarer joy.  
Shrill operatic screeches  
And after-dinner speeches  
Shall titillate my tympanum.  
Oh, boy!

bit when the conversations were on long waves and practically nothing on the short waves.

I almost hesitate to suggest it, but I have the feeling that the Post Office may have "hotted up" their apparatus after the outcry that anyone with quite simple apparatus could overhear everything said!

## Crystal Clear.

DO you know anyone who still uses a crystal set? I know of no less than three families who tiddle the humble catwhisker for their broadcasting. They seem to be quite satisfied, too, and one of these crystal users declares he has actually voluntarily changed over from a four-valve loudspeaker outfit. Says he can now hear the programmes much better and with less interference from non-listening household activities.

I wonder if there is a listener who has used nothing but a crystal set since broadcasting began? If there is, I'd like to hear from him. He'd deserve a paragraph in my notes all to himself.



# THE FIRST INTERNATIONAL QUALITY TESTS

An Interesting Report on the Lisbon Record-making Tests.



"P.W.'s" world broadcast from Lisbon! The interest it has caused! It will be many days before we shall have succeeded in getting to the bottom of the huge pile of correspondence that has been received as a result of that world-wide interest.

Letters have poured in from all quarters, and they are still coming in at the rate of several hundred a day. We like them; the more the merrier; and we should like to take this early opportunity of thanking everybody who has taken the trouble to write in.

Meanwhile, the inevitable "marking time" period affords an excellent opportunity for us to take you behind the scenes at the H.M.V. studios during the making of the record which was the *pièce de résistance* of our world broadcast:

the record, incidentally, which is to be passed over to the safe custody of the reader sending in the best report of the broadcast. However, more about that in our next issue.

For the moment, let us go back to the early part of this month.

Normally speaking, there is nothing new to "P.W." in record-making. It's the sort of thing that happens frequently as the logical outcome of our policy to provide an unrivalled service for our readers, and it no doubt accounted for the fact that none of us showed particular surprise when the Editor announced one morning that we were going to make another record. Actually, surprised countenances might have been much more in evidence had he told us that we were *not* going to make a record!

### Overcoming Difficulties.

But this was to be a record of a rather different nature: a record, in fact, with which to make a record, which all sounds very complicated, but which is really very simple.

"P.W." was to be the first journal to inaugurate international long-distance frequency tests. The special broadcast during the course of which these important tests would be made was to take place from Lisbon on the evening of July 14th, which meant that the full details could be revealed to "P.W." readers—and their co-operation invited—in the issue on sale on July 12th. An almost perfect schedule; two days of

preparation, and then the great tests themselves.

The first and only obstacle presented itself when we realised that not even aeroplanes could carry the appropriate copies of "P.W." to the remote parts of the world in time for our special broadcast.

To have released the details in "P.W." at an earlier date would have been undesirable from many points of view, and in any

weeks before it was due to take place. No, we would stick to our original arrangements, but in order that listeners in all parts of the world might have an opportunity of participating, we would explain the purpose of the tests by means of a special record.

But we could not countenance the idea of a straightforward talk! Definitely not; for this was to be an intimate affair between "P.W." and its readers, and the prospects of a "talk" half-way through the programme might rob us of all our good intentions.

### A Better Idea.

A much better idea; we would arrange for Mr. Kelsey, the well-known short-wave expert, to go down to the H.M.V. studios in company with an ordinary short-wave listener, and we would leave them both to the tender mercy of a recording microphone.

Questions could be asked, answers could be given; the whole thing would be natural as well as being informative. *Comme il faut!*

The idea was no sooner thought of than acted upon; in fact, the afternoon of the very next day—a hot, oppressive sort of day—found the two gentlemen in question, with Mr. Campbell—who was to say a few words of introduction—and one or two other members of the "P.W." staff in one of the smaller studios of H.M.V.'s famous "home of impressions" at St. John's Wood.

### The Unknown Artiste.

The studio which was to be used for the recording of "P.W.'s" record was one which is used almost exclusively for talks. Acoustically, it is perfect for the recording of the human voice, but, like most other studios which are padded for the complete exclusion of all forms of extraneous noises, one would hardly call it an ideal place in which to spend a hot, sultry afternoon. That fact alone nearly resulted in the introduction of a fourth (an unknown) artiste who was busy at the time on the other side of the road. But that follows later in the story!

In recording, it will be appreciated that one of the main factors is time. Whatever is going on to the disc must first be accurately timed, for if it runs as much as five or ten seconds over, the whole record will be marred.

In the case of the "P.W." record, which was to be a twelve-incher, the absolute  
(Continued on next page.)

In arranging for an International Quality Test from the Lisbon station, CT1A A, on Friday, July 14th, "Popular Wireless" made a unique contribution to the question of good-quality broadcasting on short wavelengths. Even if you did not hear the special broadcast, on 31.25 metres from Lisbon, you will enjoy this article describing the pioneer work at the studios of The Gramophone Company during the making of "the record that created a record."

case for them to have been of use to readers in, for instance, Australia, we should have had to announce the broadcast five or six

### HOW RECORDS ARE MADE



The finished H.M.V. record being removed from its press, ready for the final trimming, polishing and examination.



## OUR INTERNATIONAL QUALITY TESTS

(Continued from previous page.)

time-limit was four and a half minutes. That meant that a certain amount of rehearsing, during which notes were taken, had to be done before the actual recording could begin.

But that was only one of the little preliminaries, for when working up to the high standard for which H.M.V. is renowned, the job of the recording engineer, or, for that matter, that of the artistes, is not exactly a sinecure. Everything has to be just right.

### A Matter of Distance.

Voice tests have to be conducted in order to determine that the speakers are just the right distance from the microphone: a matter requiring particular attention when, as in our case, two people are involved at once. One of their voices may be stronger than the other, in which case the owner of the stronger voice has to be a little further away from the microphone in order to obtain even modulation on the record.

These and other technical matters have all to be attended to before the sapphire cutter can begin its work.

Then the fun really begins!

A buzzer signal from the recording engineers in the adjoining room announces that the great moment has arrived, and in a silence that can be felt the speakers await the signal to commence recording. Suddenly it comes; a red light flashes, and after what has seemed an age, but what, in reality, was little more than half a minute, the tense silence is broken by the voice of Mr. Campbell.

### The "P.W." Record.

"Good evening, everybody!"

"Through the kind co-operation of our old friend C.T.I.A., POPULAR WIRELESS again has pleasure in calling to you from Lisbon on a wavelength of 31.25 metres; this time for the purpose of inaugurating a test in which every short-wave listener is invited to take part, and which is destined to make radio history.

"So that you may know something of the tremendous significance of these tests, we are going to let you hear, by means of a special His Master's Voice record, a short discussion between Mr. Kelsey, of the technical staff of POPULAR WIRELESS, and an ordinary short-wave listener.

"Just before this discussion starts, POPULAR WIRELESS would like to take the opportunity of sending hearty greetings not only to its hundreds of thousands of readers in Great Britain, but also to short-wave listeners throughout the world.

"And now here is Mr. Kelsey . . .  
"If it were possible for me to say 'Good evening' in person to every one of you to-night, I wonder how many listeners would be able to recognise me from the voice that you are hearing at this very moment?"

"It is an interesting thought, isn't it? And yet, in a few words, it sums up the whole purpose of these important POPULAR WIRELESS frequency tests."

"Just one minute, Mr. Kelsey. What exactly has your 'good evening' got to do with frequency tests?"

### Purpose of the Tests.

"Well, first and foremost the whole purpose of these tests is to prove that high-quality reception is at last possible from distant short-wave stations; and surely to be able to recognise a voice is one of the fundamental tests of a good receiver. You see, hitherto it has been generally thought that quality reception on short waves is not possible, and POPULAR WIRELESS, by being the very first journal to institute international, long-distance frequency tests, is out to smash this defeatist attitude."

"Yes, I quite see all that. But does it follow that because I am able to recognise your voice, my set is perfect? Because if it does, then I can't quite see the value of these frequency tests."

"Unfortunately it doesn't follow at all. Supposing we consider the matter from another point of view entirely.

"It is, perhaps, rather an absurd thought, but suppose you went to a cinema and you saw a full-size picture projected on to a screen only half the normal depth. It isn't difficult to imagine what would happen, is it?"

"Well, I should imagine that that part of the picture which was projected on to the screen proper would be clear and in focus. It would, in fact, be exactly as it was intended to be—a readily identifiable replica of the original scene."

"Very ingenious! But you don't go far enough. What of that part of the picture which overlapped the curtains and drapings at the top and bottom? Surely, in the light sense, it would be distorted."

"Of course it would. But how is this 'half-projection'—business connected with my radio receiver?"

"As a matter of fact, the link is rather closer than may at first be apparent. Just consider your set for a moment as a sort of sound screen on to which the broadcast station projects its realistic picture."

"Now this picture ranges from the lower to the upper limits of the frequency range used in broadcasting. Right down at the bottom of the frequency scale there are the lowest notes of the horn, the cello and the piano; while at the uppermost end come the high notes of the violin, the clarinet and again the piano—all of which might require to be played in a single musical composition."

"From this it should be clear that the extent of the frequency projection—I use the word 'projection,' of course, for the purpose of the simile—

## LIKE A PLASTIC BISCUIT!



Another view taken in the H.M.V. factory. It shows the plastic "biscuit" stage prior to the stamping process. Innumerable copies of a record can be made in this way.

must be sufficiently wide to take in the notes of these instruments at the opposite ends of the musical scale."

"I see. But how does all this affect my receiver?"

"Well, if we consider your receiver as the screen, in the radio sense, on to which this perfectly projected sound picture is focused, then it is clear that the beauty and realism of the transmission will be marred unless it is sufficiently wide to take the full extent of the frequency projection without, so to speak, any overlap."

"If you are unable to hear or distinguish the really low notes, or if the high ones are so weak as to be almost inaudible, then your receiver is comparable to the screen only half the normal depth."

"I see. So these POPULAR WIRELESS frequency tests show me whether my 'receiving screen,' as you call it, is adequate or not?"

"Yes, that's the idea. You see, these frequency tests will enable listeners to determine exactly where their receivers fall short of perfection—that is, if they do fall short of perfection."

"In any case, they should dispel the idea that quality reception on short waves is impossible."

"Once having determined the failings, to remedy them in the light of a modern scientific progress is a comparatively easy matter. As a matter of fact, it's a subject that we deal with almost every week in POPULAR WIRELESS."

"Well, without further ado, let us pass on to the frequency tests themselves. . .

The 4½ minutes are up; the red light goes out and the first wax impression is completed. But this is only a trial record!

So that there shall be absolutely no flaw on the finished record, this first wax impression is played back through an H.M.V. radiogram almost as soon as it is completed, and the "playing back" process renders it unsuitable for further use.

To those of us who were privileged to be spectators, the "play back" was most impressive. It seemed almost uncanny to be listening via a loudspeaker to the voices—very definitely the same voices—that a few moments before had been speaking into the microphone. Such is the excellence of H.M.V. recording methods.

It was during the taking of the next impression, which was to have been the record proper, that the fourth (and still unknown!) "artiste" made his appearance. His turn consisted of rhythmic hammer taps which floated in through a window. This, inadvertently, had been left open after the "breather" between the taking of the first and the second recordings. Certainly an original combination, but hardly suitable for our purpose!

### All Risk Eliminated.

It was from one of two further attempts that the final record was made. Although impression number three was a perfect recording, a fourth was taken to eliminate every possible risk of accident.

Thus, due to the thoroughness of the H.M.V. recording engineers, the voices that were to modulate the Lisbon transmitter were the self-same voices that addressed themselves to you in the H.M.V. studios in London. And if the reader to whom the record is finally entrusted would care to call in at Tallis House, he is at liberty to prove it for himself!

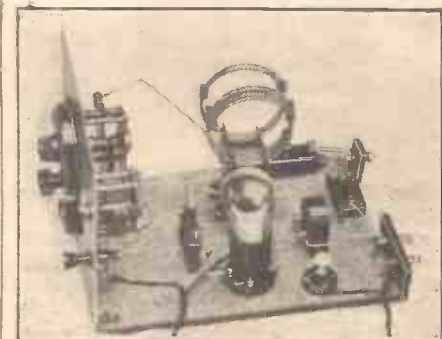
## ONLY AUSTRALIA MISSING!

Fifteen-Year-Old's Success with "W.L.S." One.

The Editor, POPULAR WIRELESS.

Dear Sir,—I recently constructed the "W.L.S." One, from which I have had very successful results. Besides hearing dozens of amateurs on the 40-metre band and most of the broadcasting stations, I have heard S U 1 E C, S U 6 H L, O H 5 N G and W 9 B H T, as well as others whose call-sign was lost, due to fading.

## A WELL-BUILT SET



An example of neat and efficient construction by a 15-year old reader which many, an old hand would like to emulate.

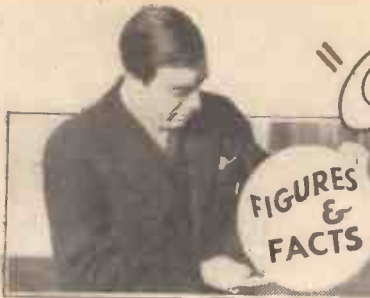
And I beg to say that I am not yet fifteen, but have heard all Continents with the exception of Australasia.

Hoping you will accept the photograph enclosed.

Yours sincerely,  
V. RUSSELL.

S. Farnborough, Hants.





# "BELIEVE IT OR NOT"

By P.P. ECKERSLEY M.I.E.E.

I AM always interested in the efforts of the "believe-it-or-not" people.

I wonder if we could start a broadcasting "believe-it-or-not" series? All suggestions thankfully received (and probably not published!). I abuse my position by using all the good ones first.

So! "Believe it or not" —

The B.B.C. have stated publicly that they think they exist to entertain the public. But that's by the way.

With one hundred stations and one hundred wavelengths available, there are about a million million million more possible plans of wavelength allocations than there are electrons in the universe.

Lead in liquid helium has zero resistance, and if you flip a magnet near it the magnetic field set up by the current in the lead persists as long as the lead is as cold as liquid helium—"Perpetual motion?"

Professors are sometimes wrong.

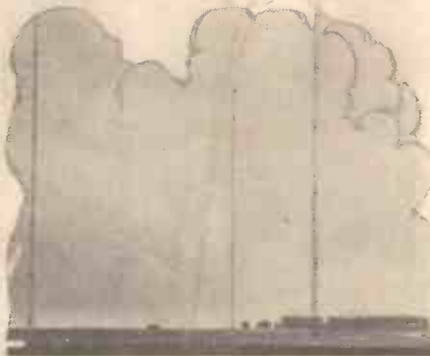
You can recognise faces by television, but those recognised are not always pleased.

The Trade is selling some sets.

The theoretical magnification of a high-frequency valve is never the same as its actual magnification. H.F. valves are stated to have voltage magnifications of over 1,000, but it is doubtful if in a practical case they have magnifications exceeding 50.

If wireless were entertaining enough to make people go to bed an hour later than was their normal pre-broadcasting era habit, the domestic

An entertaining contribution by our Radio Consultant-in-Chief, which at the same time contains interesting and helpful information. It is written in his usual vivacious and striking manner.



"No discoveries or inventions of any major value have been made in broadcast transmission technique since 1928."

which will get foreign stations easily, has been produced which is smaller than the Eckersley tuner.

The number of clear broadcasting channels in Europe exceeds the number of those cleared in the United States of America by a substantial margin.

A long-wave high-power station gives a bigger true-service range than a smaller medium-wave station; but a lot of the small and/or sparsely populated countries have long waves, viz. Holland, Denmark, Sweden and Luxembourg. France has two long-wave stations.

The frequency of oscillation of a valve-operated tuning fork, kept as far as possible at a constant temperature, does not vary more than one-thousandth of one per cent. under practical (not laboratory) conditions of working.

All questions, articles and statements made in POPULAR WIRELESS under my name have been written by me.

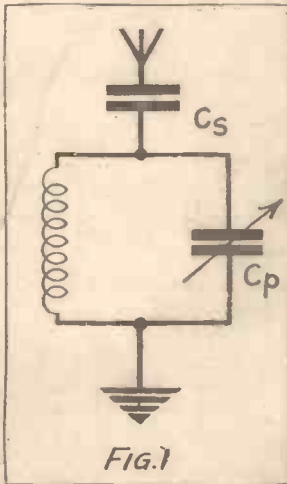


FIG. 1

## DO YOU KNOW WHY?

In both diagrams the circuits tuned by  $C_p$  are exactly the same and are fed through similar series condensers  $C_s$ . Yet varying  $C_s$  in Fig. 1 will affect the voltage across  $C_p$ , but not so in Fig. 2. The only difference is the energy supply.

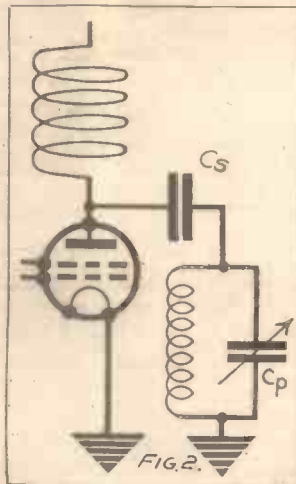


FIG. 2

Now I understand that in the best "believe-it-or-not" series one sets a puzzle and gives the answer next week. Here is a puzzle, but the solution is written, by me, in one of the query corners of last year. I am risking you searching the back numbers—anyway, no prizes will be given!

Now in Fig. 1 I have drawn a familiar circuit. Altering  $C_s$  will profoundly affect the voltage appearing across  $C_p$ . Everyone knows that. As  $C_s$  is altered,  $C_p$  must be

(Continued on page 585.)

## THAT LAST HOUR



If radio made people stay up one hour later than in pre-broadcasting days, the electricity consumed would increase by about 30 per cent.

consumption of electricity would increase by from 25 per cent. to 30 per cent.

If wireless relay subscribers were to continue to increase at the present rate it would take a thousand years before all the houses in the country were "wired."

No discoveries or inventions of any major value have been made in broadcast transmission technique since 1928.

The cost of a valve bought retail is greater than the manufacturing cost. This is not true of some wireless sets.

A five-valve set, adaptable to A.C. or D.C. mains, complete with loudspeaker

## FOR BETTER SERVICE



Long-wave stations such as Huizen, shown above, have better service areas than those on medium-waves.



## THE MIRROR OF THE B.B.C.

By O. H. M.

## THOSE EMPIRE PROGRAMMES

The Dance Band Situation—B.B.C. Re-organisation—Broadcasting and Downing Street—Revue From Olympia—The West National—Opening The New Dock.

THERE is renewed agitation about the quality of the programmes the B.B.C. is providing for the Empire through its short-wave service.

Some time ago complaints on this subject were met by the B.B.C. with the argument that, after all, they had to do all the paying, and therefore overseas listeners had no right to criticise. To this retort people overseas have replied that the B.B.C., after waiting in vain for two years for co-operative financing, suddenly reversed their policy and made a great show of their ability to provide a service which would be so acceptable to the Dominions and Colonies that there would be no question of co-operation in finance.

Now listeners overseas are suggesting that the B.B.C. cannot have it both ways. If the policy is to provide a service so attractive as to enlist support, then by all means try it out; but it is a corollary to this policy that the B.B.C. pay special attention to the criticisms and suggestions of its overseas listeners.

It seems to me that there is considerable danger of a mess-up. On the one hand, the B.B.C. is naturally anxious to economise; on the other hand, it meets competition abroad, which is quite different from the competition to its home service.

The whole problem needs solution, and is a matter quite important enough to engage the attention of Mr. Ramsay MacDonald.

## That Second Dance Band.

Whether or not the approach of the "silly season" may be held accountable, it is true that the Radio Dance Band situation is the cause of a kind of fever of sensational rumours. There is, of course, a great

industry in the control of broadcast dance music taken from outside the studios. It is to be hoped that the latest outbreak of feud between rival song-pluggers will convince the B.B.C. of the necessity of establishing a second central dance orchestra on a full-time basis.

## B.B.C. PERSONALITIES AT LEEDS



At the recent inaugural luncheon of the new Leeds Broadcasting House. From left to right are Messrs. Noel Ashbridge, Chief Engineer of the B.B.C., G. P. Fox, and E. G. D. Liveing, North Regional Director.

It is high time that the B.B.C. took steps, and effective ones, to free itself from the present situation:

## Zero Hour, October 1st.

I do not know whether the battalions of the new organisation of the B.B.C. will go over the top at sunrise on October 1st; but I

do know that that is the day of the great change which is expected to immortalise the B.B.C. It is another matter, and of course of less importance, whether programmes for listeners will be more acceptable!

Anyway, it is interesting to know that October 1st is the first day of "input and output."

## Downing Street Interest.

It is understood that No. 10, Downing Street has become intensely interested in the affairs at Broadcasting House. An impelling motive may be the tradition of No. 11, Downing Street when Lady Snowden was hostess there.

Anyway, the fact remains that broadcasting is more directly under the notice of the Prime Minister than at any time since the General Strike.

## American "All-Star" Programmes.

Programmes, sponsored by advertisers, are as integral a part of American broadcasting as the diametrically opposite are to what the B.B.C. is likely to put on for many years to come, but that does not mean that either country is wrong.

An occasional American programme is quite enjoyable, by way of a change, to British listeners, while if it serves, at the

same time, to reaffirm our opinion of the superiority of our own broadcasting service, so much the better. It may, perhaps, be the real reason why we are to hear what an all-star American programme sounds like on Monday and Tuesday, July 24th and 25th respectively.

(Continued on page 585.)

THESE are the days of leisurely listening. With a number of talks out-right out of the programmes, one feels able to take the rest more in the holiday spirit.

Whereas listeners were wont to settle down for an hour or so of an evening, they may now switch on for an odd minute or two: to hear a song, a variety turn, a gramophone record or a movement from a Sonata.

A talk has to be listened to through-out. It is not an item for the casual or odd-minute listener. It demands concentration, and it demands time. Now it is on holiday we are spared our concentration, we are allowed our time.

This is a change, and changes are good for all men. Light music for light evenings sounds a reasonable proposition. In practice it has proved so.

With more opportunities I have listened to much music at odd intervals this week, and I have enjoyed it all. The fact is I have a preference for talks; to me they are always the bigger attraction. Consequently I am inclined to neglect music. But this neglect of music hasn't made me lose my powers of musical appreciation.

It would seem from my experience this week that it has strengthened them, for I have succeeded in working up a mild enthusiasm for music. For instance, Section C of the B.B.C. orchestra in that recent programme beginning with the Overture, "The

## THE LISTENER'S NOTEBOOK

Frank comments on recent programmes, and on microphone personalities of the moment.

"Cricket on the Hearth," pleased me immensely.

"Please Ring," the same evening, was not as advertised, an entertainment of Jingles and Jangles. It was the usual combination of song, sketch and story, with an occasional tinkle. In spite of this, however, I thought the show was 100 per cent entertainment. Every item was worth listening to, and the whole cast—the male members particularly—was brilliant. Apart from Harry Hensley and Bobbie Conner—there's never any mistaking him—I couldn't tell who was who. The official programme isn't much of a guide sometimes in this sort of show. Personally, I would rather see a more detailed programme than the picturesque sort of thing we get as a rule.

Despite my remarks last week about "Wimbledon," I listened to Capt. Wakelam. But it was only accidental. I switched on, hoping to hear a particular orchestra, but instead I found a gramophone in action.

The record finished, we are told to

wait a few moments for Capt. Wakelam. I wait the few moments. The announcer then fears we shall have to have another record, as Capt. Wakelam, or Wimbledon, isn't ready. A new record is put on, and another, but this survives only a few rounds. It is faded out, and Capt. Wakelam begins.

I've said before how fond I am of running commentaries, provided they dry up some time. Somehow Wimbledon can't do this: it will overflow into other people's territory.

But that's by the way, as I really wanted to give Capt. Wakelam a big pat on the back. His commentating is superb! He never gets flustered; he never hums and haws; his flow of comments is perfect. Very wisely he doesn't attempt to report on every shot, yet he succeeds in giving a comprehensive picture of every game. He is easy listening—a stylist to the finger-tips.

A variety hour given by entirely new blood compels attention. Hence the hour I gave to Fritz and Behnitz, John Oliver, etc., etc. I thought Fritz and

Schnitz (alias Dutch and Double-Dutch) would make Alexander and Mosee look to their laurels if their dialogue were more humorous. They have the right manner, but their subject-matter is very thin in places.

John Oliver, a Scottish bass, sang "Father O'Flynn" and "King Charles"—hardly new acts, but pleasant ones.

Naima Wivstrand rather petered out, I thought. She began her turn with every promise of creating a furious audience, things fell a bit flat.

Naima Wivstrand has an excellent voice, but it is difficult to hold listeners with songs they can't understand. This must be a difficulty peculiar to "all distinguished" visitors from abroad, and a specialty of British artists, too, incidentally.

Billy Campbell and Billy Noble singing songs of their own composition did their best, I'm sure, but dear me! Were we expected to laugh?

Madge Stephens and Peggy Rhodes, a couple of "chars," indulged in a bout of unelavating backslat, after which they became serious, and one of them sang "Sally." The other then butted in with a Clara Butt number. This was variety with a vengeance.

Max Hoffmann, making his first attack on the microphone, also made the programme. He almost made one believe in studio audiences after all.

(Continued on page 586.)





# SUPPRESSING IGNITION INTERFERENCE WITH The TRAVELVOX

USUALLY when a receiver is first fitted to a car it is found that reception is impossible, owing to a crescendo of cracklings and pops that are heard from the loudspeaker.

This interference has two distinct sources. The first, and by a long way the worst, is the ignition system.

To avoid going into unnecessary detail, we may consider the sparking plugs as ordinary spark transmitters which have for their "aerials" the short lengths of cable that run from them to the distributor.

Considering the high voltage that is used to create the ignition spark and the necessary proximity of the "Travelvox" aerial to the spark plug leads, it is not surprising that severe interference is picked up if special means are not employed to prevent the "transmitters" from radiating.

The other source of trouble is the car dynamo; this has ordinary rubbing brushes and consequently creates a certain amount of spark which, in its turn, causes interference.

In regard to the ignition system, it is necessary to devise some means of preventing radiation without affecting the spark itself, which is, of course, essential to the proper running of the engine.

### Efficient, Simple and Cheap.

After a great deal of careful experiment, I adopted a method which combines the desired freedom from radiation with the other desirable factors of simplicity and cheapness.

The method is to fit a 20,000-ohms fixed resistance in series with each sparking plug lead, as close to each plug terminal as possible.

It was necessary to find a type of resistance that was capable of withstanding a considerable temperature without being electrically or mechanically affected.

I found that the Dubilier type with the wire connecting leads could be satisfactorily employed; some precautions are necessary, however, to secure trouble-free running over a long period.

The resistances should be attached to the

.....  
 In our last two numbers we have given particulars and diagrams for building the "Travelvox," a compact receiver for fitting to a motor-car. This week final details are given of the set in use and of methods to prevent interference from the ignition.  
 By BERNARD BARNARD.  
 .....

plug terminals by means of their wire ends.

The other wire end of the resistance must be joined to the ignition cable either by soldering or by use of a suitable nut and bolt.

Arrange each resistance so that it cannot touch against the cylinder block and cover it and its connections with a short length of rubber tubing or similar insulating material.

This method of tackling the interference problem entirely removes any noises in the set due to the ignition spark; it functions equally well with either magneto or coil systems, although, in the latter case, it may be necessary to fit an extra 20,000-

ohms resistance in series with the feed lead to the distributor.

The lead is usually the centre one of the bunch that enters the distributor cover, and its remote end is connected to the middle terminal of the ignition coil.

This resistance should be connected as close to the distributor cover as possible.

As soon as you have fitted these resistances, you can start up the engine and switch on the set; the great majority of the interference will have disappeared.

### Dealing with the Dynamo.

In all probability, however, there will still be a faint intermittent crackling when the ignition switch is in the "Charge" position. This is interference from the dynamo.

The first point to examine is the dynamo itself; remove the brush cover and ascertain if there is any undue sparking due to worn brushes or dirty commutator.

If such trouble exists, the remedy is obvious, and should be applied before investigating any further.

Attention should next be directed to the brush gear cover itself; this should be making good connection to the dynamo proper.

Many covers have a lining of insulating material which prevents such connection being made.

### The Last Trace.

In this case, you should cut a portion of this lining away and clean up the metal surfaces so that good electrical contact is made.

This will, in almost every case, remove the last traces of interference.

If your dynamo is in a very bad condition, it may be necessary to fit a 2-mfd. condenser across the positive brush to earth, but such treatment is exceptional.

### FITTING THE SCREEN IN PLACE



To protect the terminals and the terminal strip, flaps or "mudguards" are arranged on the set's metal cover.

The ordinary type of grid-leak detector receiver takes slightly less current when the programme is coming through than when it is switched on with no broadcasting being received.

\* \* \*

Loudspeakers which have an adjusting screw are rather liable to have this moved from the maximum sensitivity position by accident, so it is a good plan to check up the adjustment at intervals.

\* \* \*

Moscow is to have thirty-six studios in its projected Palace of Radio, in the Miusskya Place.

### RADIO TIT-BITS

Three notes on a zylphone is the unusual interval signal adopted by the Hartford, Conn. broadcasting station.

\* \* \*

The words "Glem ikke at soette antennen" which are sometimes heard from Copenhagen and Kalundborg when they close down contain the good advice to listeners to "Remember to earth your aerials."

If lead extension bars are used on the terminals of an accumulator, to obviate the necessity of having flex close to the cells, remember not to let such bars swing across from one terminal to touch another, as such an accident will seriously damage the accumulator.

\* \* \*

Kalundborg and Copenhagen, the Danish stations, always open with one stroke of a gong and close down with three strokes.

\* \* \*

The two masts of the Scottish Regional station at Westerglen, near Falkirk, are each 500 ft high.



I HAVE had the rather unique experience this week of listening on eight different short-wave receivers during two evenings. Several friends of mine collaborated, and we held a kind of conversazione (bring your own batteries!).

Three of them were single-valvers, and the party of owners unanimously agreed, after some discussion, that they were the nicest sets to operate, on account of the quiet background and general headphone comfort. Next to the singles came a resistance-coupled detector and note-mag. set which you will very shortly see in "P.W."

#### Straightforward Circuits.

I have been pulled to pieces by one or two readers for my policy of sticking to straight circuits and not building short-wavers incorporating double-diode pentodes, "Class B" amplifiers, and all the other modern developments. Although I am not conservative in most things, I must admit that I *am* when it comes to short-wave receiver design.

You see, the whole problem of designing an efficient short-wave receiver is so completely different from anything that we have to tackle on the broadcast wavelengths. We don't want noise; we don't even want sensitivity beyond a certain point; but we *must* have quiet background, stability and general ease of operation.



All the interesting news and views of current short-wave practice.

This problem is complicated still more by the fact that no two short-wave listeners want exactly the same thing. One man says: "Never mind all those little squeaks—give me half a dozen American stations on the 'speaker and I'm happy." He wants a superhet. or an S.G. Four. Another says: "Never mind quality or loudspeaker work—I want to spend hours picking out the little signals that no one else has ever heard." He generally wants a one- or two-valver.

An overseas listener, to quote a specific example from a letter, says: "What is wanted is a screened-grid four-valve set, two-pin plug-in coils, which alone will give the degree of adjustment wanted under conditions abroad, and two transformer L.F. stages. I wrote to you on this point before and showed my letter to other S.W. enthusiasts locally, who were unanimous in agreeing that this was the general requirement for tropical reception."

You have here an example of a man who

(but less spectacular) damage being done to a receiver by the accumulation of static charges on the aerial. Here again there is little to worry about, since complete protection against this risk is afforded by fitting a lightning arrester such as, for instance, the Graham Farish "Gard." Such a device is easily fitted, and it certainly does do away with this element of risk.

By the way, my reference to Graham Farish prompts me to wind up with a personal footnote.

At the time of writing, Mr. Graham Farish—who is the enterprising chief of the Bromley organisation—is in hospital recovering from the effects of an operation.

Happily, he is making excellent progress, and I am confident that "P.W.'s" great army of home-constructors will want to join with me in wishing him a speedy recovery.

#### For Short-Wave Enthusiasts.

Considerable interest in short-wave reception generally is being aroused by "P.W.'s" Lisbon broadcast.

Reports are expected from all quarters, and there is evidence that a great number of people are making our test a jumping-off point for their entry into the short-wave field: people who have hitherto confined their activities to the ordinary broadcast bands.

To these and others a booklet which has just come to hand from Messrs. J. J. Eastick will be of particular interest. It gives full details of the Ealex range of short-wave

very definitely knows what he wants and refuses to be put off with anything else. (Incidentally, he refers to our "little local sets," by which I expect he means the poor old single-valver.)

A short-wave "super-set," using all the more modern components just for the sake of exploiting them, would be of singularly little use to anyone at all. "Class B" amplification can certainly be used on short waves, but it isn't my job to design note-mags. Anyone keen on "Class B" can make his own amplifier and my single-valver, and run the two together. I know someone who has done this and is very pleased with the results.

#### Using Existing Parts.

As I have said before, though, the short-wave fan is a type of man who delights in using up all the "old junk" about the place and making it do useful work. Rather than make a "Class B" amplifier he would probably spend the money on a new set of short-wave coils and condensers, or something more exclusively "short-wave" in its appeal. That is why I am keeping off it all at the present.

(But that doesn't imply that I am not busily experimenting on my own! I wish I could describe some of the weird contraptions that start at one end of my bench on a Monday morning and depart from the other end on the following Friday. "Pre-release" views, however, are not allowed.)

converters, and in addition it contains a lot of really useful information concerning short-wave reception generally.

Readers desirous of obtaining a copy of this new Ealex booklet can do so through the medium of "P.W.'s" postcard literature service. Just send the usual postcard to Tallis House, and don't forget to provide us with your name and full address! (No. 42.)

#### Colvern and "Ferrocart."

From correspondence that I am receiving it is obvious that confusion still exists concerning the iron-core coil position. For

#### EXIDE CONVENTION AT TORQUAY



A group of delegates and others at the 13th Exide Convention. Included in the picture are the Mayor of Torquay and Councillor Harold Elston, ex-Mayor of Brecon, who arrived by the G.W.R. Air Service.

some reason or other the name "Ferrocart" is assumed to mean any type (or make) of coil in which dust iron is used for the core.

May I, therefore, call attention once again to the fact that Ferrocart coils are the exclusive product of Messrs. Colvern. They were the first iron-cored coils to be produced in this country, and the name by which they are known is a registered trade mark of Colvern.



Weekly jottings of interest to buyers.

GLANCING through an evening paper a short while before I sat down to write these notes, I happened to catch sight of a paragraph in the stop-press column in unusually heavy black type. On reading through it I was more than a little surprised to find that the Press had in this case been stopped for the express purpose of including the news that a Mr. So-and-so's wireless set had been struck by lightning.

I have no doubt that to many people that paragraph would have conveyed a note of warning, but upon me, alas! it had quite the reverse effect. The mere fact that the occurrence had been considered of sufficient importance for inclusion in the stop-press column was, in my opinion, evidence of the extreme rarity of the happening.

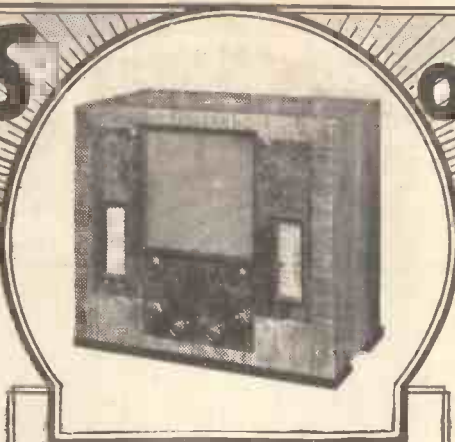
While the chances of any individual aerial receiving a "direct hit" by lightning are admittedly so very remote, there is, though, a more common risk of expensive

#### 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.



# RECEIVERS of RENOWN



**THE H.M.V. "SUPERHET SELECTIVE" FIVE.**

**T**HE superhet has come to stay. It has been a subject of perpetual controversy almost from the earliest days of commercial radio enterprise in this country. For years it was dropped almost entirely; then an attempt was made to revive it. People said that it would never come to anything, but they were wrong.

The modern superhet, holding up as a criterion the one that we have just had the privilege of testing, is a magnificent instrument. Robbed of all its frills and drawbacks, it has at last emerged as an instrument—one of the few instruments—that can really be said to fulfil modern requirements.

### Results of Research.

But it must not necessarily be assumed that that is typical of all modern superhets, for although, generally speaking, the standard is very high, the few remaining difficulties have not, in every case, been overcome. But that is beside the point.

At the moment, we are concerned only with the new H.M.V. "Superhet Selective" Five, the culmination of fifteen months of intensive research work in the "His Master's Voice" Laboratories, and an instrument that confounds the critics no matter from what angle it is considered. Veritably, it's a triumph of modern radio engineering and design technique. It possesses all the manifold advantages of a superhet arrangement, with not a single disadvantage; not even the second channel or "image" interference difficulty which is rarely absent from a design of this description.

It is styled the "Superhet Selective" Five; a designation which, to do it full justice, is not strictly accurate, since only four of the valves are directly concerned in the receiving chain. The fifth is the rectifier.

### New Cabinet Design.

The chassis is built into a cabinet of the table type. In general design, it is rather away from H.M.V. instruments with which we are already acquainted, but it is none the less pleasing. The use of light walnut and the

portates an energised field moving-coil speaker of improved design, and the inclusion of a mains aerial device provides for complete transportability.

### Ease of Operation.

One of the inherent advantages of a well-designed superhet is the ease with which it can be operated, and this was never more true than of the new H.M.V. instrument.

The controls are four in number, and they consist of a switch, a tuning control, a tone-variation device, and a volume regulator; a combination which can truthfully be said to be the minimum possible for the attainment of completely satisfactory results.

Separate wavelength scales, which are mounted vertically on either side of the loudspeaker fret, are inscribed not only with wavelength settings but with the names of the principal European stations, and the rotation of the control switch to which we have already referred automatically illuminates the appropriate scale. This main switch has, in addition, positions for "gramophone" and "off."

So much for the design itself; and now for a word or two concerning our own particular tests.

### No Tuning "Images."

It was with more than usual interest that we approached our tests of the "Superhet Selective" Five, for here at last was a set that was claimed to be free from "image" effects.

Despite the fact that there was a station at almost every degree of the medium-wave dial, we were unable to trace so much as one single tuning "image." Each and every one was a genuine transmission, and the general sensitivity of the instrument was literally amazing.

From the point of view of quality of reproduction the "Superhet Selective" Five is definitely up to the standard upon which H.M.V. has justly earned its reputation.

At the astonishingly low price of 15 guineas, there is little doubt that the new H.M.V. "Superhet Selective" Five is a winner.

choice of suitable veneers give it a definite air of distinction, slightly modern, perhaps, but certainly artistic.

The circuit, which is the subject of several new patents, is based upon the arrangement of screened-grid combined first detector and oscillator, multi- $\mu$  intermediate-frequency amplifier, power grid second detector, and power pentode output. Due to an ingenious method of cathode coupling, the tuned aerial circuit is completely isolated from all oscillations, and the arrangement is therefore definitely non-radiating. The "Superhet Selective" Five incor-

## COMPACT AND HIGHLY EFFICIENT



Compact design is one of the features of this highly efficient superheterodyne, which is equipped with a special device for eliminating second channel interference.

## TECHNICAL SPECIFICATION

**GENERAL DESCRIPTION.**—A self-contained table model superheterodyne for A.C. mains operation. Five valves are incorporated, one of which is the rectifier.

**CIRCUIT DETAILS.**—The four valves in the receiving chain are arranged in the following circuit sequence. Screened-grid combined oscillator and first detector; multi- $\mu$  intermediate-frequency amplifier; power grid second detector and power pentode output. By the use of an entirely new method of cathode coupling, the aerial circuit is isolated from all oscillations and the arrangement is therefore

non-radiating. The use of a "double action image suppressor"—a new H.M.V. patent—completely eliminates second channel interference troubles.

**CONTROL ARRANGEMENTS.**—Four controls, with separate wavelength scales for medium and long waves, are on the face of the cabinet. The controls consist of a main switch giving "medium waves," "long waves," "gramophone" and "off"; a tuning control; a tone-variation device and a volume regulator. The rotation of the main switch to "medium waves" or "long waves" automatically il-

luminates the appropriate scale.

**SPECIAL FEATURES.**—(1) High selectivity and remarkable sensitivity; (2) freedom from second channel interference trouble; (3) inclusion of tone-control device and provision for use of mains aerial; (4) tuning scales that are calibrated in both wavelength and station names; (5) provision for permanent connection of pick-up; and (6) undistorted output of 2 watts.

**PRICE.**—15 guineas.  
**MAKERS.**—The Gramophone Company Limited, 98-108, Clerkenwell Road, London, E.C.1.





**A "CLASS B" SPEAKER**

QUITE a lot is said about "Class B" being rather expensive to instal, although practically all are agreed upon it being a worth-while proposition.

But is it expensive? Of course, if it is being added to an existing set it necessitates an additional complete stage of moderately costly parts.

When a new outfit is being built, however, the system compares favourably in cost with "Class A" amplification, particularly when the outlay includes a new loudspeaker, because "Class B" loudspeakers can now be purchased at similar prices to ordinary ones.

For example, the Baker's "Selhurst" Permag Permanent Magnet Moving-coil Speaker Chassis sells at 4/- with either a 3-ratio transformer for normal power and pentode working, or with a Q.P.P. or "Class B" transformer as desired.



The "Permag" "Class B" Speaker.

The Baker's "Selhurst" Permag is a first-class instrument, as well it might be, for behind it lies eight years of specialisation in moving-coil speakers.

The whole article bears the stamp of expert design and craftsmanship. The 8½-in. cone has a free movement and imposes the smallest possible restriction on the coil.

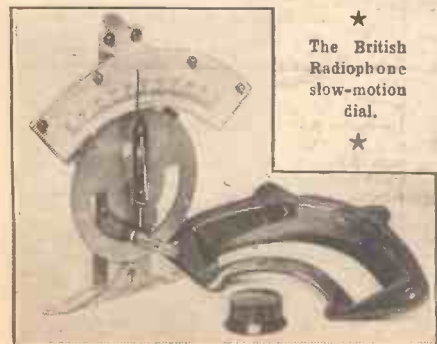
The result is a good bass response as well as a clean, peak-free treble reproduction.

Precision workmanship and accurate assembly have resulted in fine clearances and a sensitivity above the average, while the speaker is able to handle up to five or six watts.

**BRITISH RADIOPHONE DIAL**

There is really only one thing of vital importance to be found in a wireless set that is purely mechanical, and that is the slow-motion dial.

Its sole purpose is to provide reduction gearing for the variable condenser. But this is a very important duty, and its manner of application can considerably



The British Radiophone slow-motion dial.

affect the performance of a set in the hands of an average listener.

One of the most frequently encountered faults to be found in a slow-motion dial is slip, and it may be wondered by some why it is that a quite positive drive, such as through cog-wheels, is not adopted.

Well, this has been tried, but, as far as my experience goes, only at the expense of smoothness and freedom from back-lash.

But although the alternative, friction drive, is less likely to fall through these faults, it can, as will be appreciated, easily slip if special precautions are not taken. Particularly does this seem to be the case when the friction surfaces are of hard metal such as steel.

In the new British Radiophone Dial, however, I notice that the driving members are stoutly constructed of aluminium, with a strong bearing spring.

The result is a positive, slip-free drive in which whatever slight wear might occur would at once be taken up and the freedom from slip maintained despite even rough handling.

This British Radiophone Dial is equipped with a sharply engraved translucent scale, behind which there are two lights for clear and complete illumination.

The pointer crosses right over the eacutcheon aperture, and thus enables quick readings to be taken.

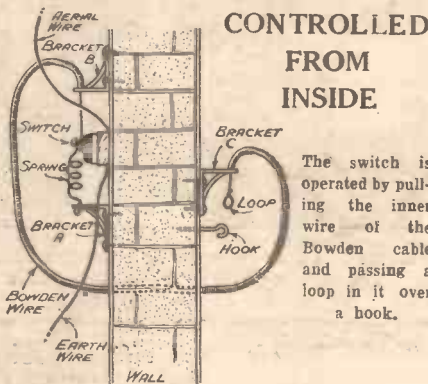
An unusual feature of the dial is that the total travel of the pointer is not a complete semi-circle as is almost invariably the case when the scale moves. Actually the whole of the scale is always in view through the panel aperture.

From all this it must be quite obvious that the dial is a sound and workmanlike production, and one that will give a maximum of service and no trouble.

**AN AUTOMATIC EARTHING SWITCH**

A mechanical means of operating an external aerial switch from the inside of the house, using easily-obtained material.

THE safety switch for earthing the aerial should always be placed outside the house, and this has a drawback of necessitating one's going out into



**CONTROLLED FROM INSIDE**

The switch is operated by pulling the inner wire of the Bowden cable and passing a loop in it over a hook.

the back garden to operate it—a very unpleasant necessity on wet nights.

However, I never feel quite satisfied myself, unless the aerial is earthed at night after the programme is finished, and I have managed to fix up a form of remote control by which the switch can be operated inside the house.

Being a motor-cycle enthusiast, I found

**NEW T.C.C. CONDENSER**

WHEN electrolytic condensers were first introduced, some three or four years ago (or, maybe, it was five or six!), it was freely suggested that they could not last long.

Even those who were most eulogistic about their general qualities hesitated to be dogmatic on that point.

But experience has shown that they do not wear out like batteries or even any more readily than paper condensers.

We were the first to use electrolytic condensers (yes, we generally are first!), and it will no doubt be of interest if I relate the adventures of those early specimens.

They were two T.C.C.'s, and after they had appeared in a "publication" design they were delegated to duty in a special D.C. amplifier in the Research Dept.

For three or four hours every day of every week since then they have each applied their 2,000-mfd. to important work without the slightest suggestion of failure or even tiredness. They are every bit as good as when T.C.C. first sent them to us.

That, I think, is proof enough of the lasting qualities of electrolytic condensers in general and those made by T.C.C. in particular.

I have recently received a quite new T.C.C. Electrolytic Condenser. This is of the dry type, and though made up in the now-familiar tubular form for chassis mounting, it can be mounted in any position.

It is, of course, a perfectly satisfactory component in every way.



A T.C.C. Electrolytic Condenser of the dry type.

in my junk-box the necessary materials for the purpose, and I have no doubt that others will have similar oddments on hand. In any case, the few parts needed can be purchased very cheaply.

The switch is of the type similar to a house light switch. The spring and Bowden cable were originally used for operating a front wheel brake of a motor-cycle.

Three small brackets are required in addition, and a hole must be drilled in one of the extremities of each. In the case of B and C the hole must be just large enough to permit the wire to run through but small enough to prevent the outer sheath doing so.

A loop is made at the indoor end of the cable with a hook to hold the wire in position once it is pulled and the switch closed.

Of course, when the wire loop is released the spring pulls the switch knob down and earths the aerial. A hole is drilled through it as in the illustration. H. C.

**"A.T.B." ADAPTATION OF THE "ECKERSLEY THREE"**

Dear Sir,—Many thanks and appreciation for instructions given re above in "P.W." Radiatorial. These instructions have been put into effect with very good results, and I am very pleased with my old pal. Please extend my warm appreciation to Mr. Eckersley for introduction.

I must say your service to home constructors is without parallel, and the bulk of my successes I attribute to knowledge obtained from your most popular weekly journal.

Believe me, Sir,  
Yours faithfully,

W. R. CHADMAN,  
K.C.C. House,  
Throwley, Faversham, Kent.



# What's this chap's circuit?

—whatever it is, the new Screened Pentode was designed for it.

He may have the oldest type of circuit. He may have the latest. He may have designed his own circuit, or it may be the outcome of the scientific researches of a vast radio organisation. It may be a three-valve, four-valve, five-valve A.C. set—but whatever it is, if it now employs one or more screened grid valves this new Mullard Screened Pentode will plug into it.

That is one of its great advantages. Not only does all the Power of the Pentode design of valve come into the first stages of the set, but all those old doubts which have always arisen when contemplating new valves—all those old "special circuit" pitfalls, are overcome. Ask your dealer about it. You remember the difference it made to your speaker stage when Mullards first originated the Pentode—so now plug in a Screened Pentode and bring Pentode Power into the early stages—bring your old receiver up to date.

TYPE V.P.4 Price 17/6

TYPE S.P.4 Price 17/6

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., Rel. C.-W.M.



## V.P.4

## S.P.4

# Mullard

**THE · MASTER · VALVE**

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



# ECONOMICAL MAINS OPERATION

Details of the new low-filament-consumption Mullard mains valves. These valves are for use on D.C. mains and are intended for connection in series, thus providing a considerable saving in the wattage needed to run the receiver.

**T**HOUGH much of the attention of the radio world has recently been focused on the various developments in battery valves, the mains-set user has by no means been forgotten by the valve manufacturer.

We have seen a great deal of development in A.C. valves, H.F. pentodes, double-diode triodes and so forth, and now a complete range of low-consumption D.C. valves has made its appearance and will be on the market in the near future.

### Alternating or Direct Supplies.

This range should have a marked effect on the design of mains sets, for though the valves are specifically for operation on the D.C. supply, they can be used with equal success on A.C., with the addition in the set of merely a mains rectifier, and perhaps one or two smaller components.

Where the normal everyday A.C. valve has hitherto scored over the D.C. variety is in the matter of the wattage consumed by the heater. The A.C. valve takes in this way but a matter of 4 watts, so that a three-valve set will need only 12 watts of heater energy.

The D.C. valve set varies in its heater current requirements according to the make and type of valve, and the voltage of the mains. This latter is due to the fact that the valve heaters are run in series with the mains, the voltage being broken down by a series resistor, a necessary but wasteful system.

### Making D.C. Sets Economical.

Thus, although three valves will not consume any more current from the mains than one valve, the wattage is nevertheless very much higher than in the case with A.C. types. For instance, the 1/2-amp. types

of D.C. valve need half an amp. for their heaters, and if this is taken from 200-volt mains there is a dissipation of 100 watts right away, this increasing to 120 for 240-volt supplies.

The 25-amp. valves take half these amounts, but even so the consumption is unpleasantly high. This greediness is being reduced by the valve manufacturers, and we are promised very shortly a complete range of 1/8-amp. valves from the Mullard factory.

These will allow D.C. operation to be carried out with a much lower wattage consumption, the figure being 36 watts for the 200-volt supply, a consumption that compares well with that of the normal electric light bulb.

Moreover, as there is no rectification to be carried out for D.C., this figure compares well with the total consumption of an average 3-valve of the A.C. type, with its rectifier and transformer losses. Thus at last the D.C. owner is offered a proposition that will enable him to operate on the same

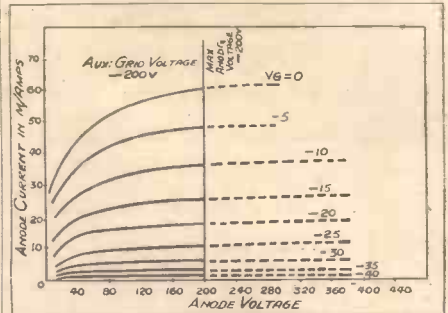
grid detection" the anode resistance recommended for use with this valve for R.C. or shunt-feed transformer coupling is about 25,000 ohms, when the anode current is 3.5 milliamps and the anode potential is about 120 volts.

As an L.F. amplifier the anode current is round about 3.5 with 200 volts on the anode and a bias of 3.5 volts, while 2.5 milliamps pass at 150 volts with a bias of 2.5 volts. The valve is, therefore, what we often term a "square" valve, taking the same figure of anode current as grid-bias voltage. The cathode biasing resistance is obviously 1,000 ohms.

### For the Output Stage.

The last of the series is the pentode, Pen. 20. This again is designed for 200-volt

## 1.5 WATTS OUTPUT



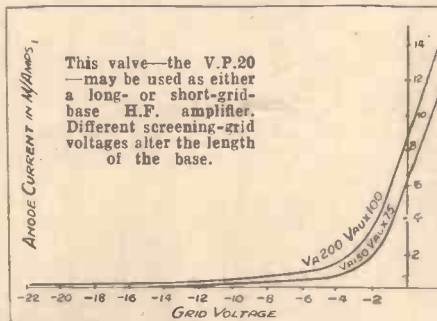
The Pen. 20 is obtainable with either the ordinary 5-pin base and side terminal, or with the new 7-pin base.

working, both anode and auxiliary grid taking this voltage.

The approximate auxiliary grid current is 9 milliamps, while the anode passes round about 25 milliamps. At this figure, 200 volts being applied, the grid bias should be 15 volts, obtained by a cathode resistance of 450 ohms. The valve has a mutual conductance of 2.5 m.a/v.

(Continued on page 586.)

## MULTI-MU PENTODE



This valve—the V.P.20—may be used as either a long- or short-grid-base H.F. amplifier. Different screening-grid voltages alter the length of the base.

level as the A.C. user, especially as the valves included in the new range cover all the normal requirements of H.F. and L.F. types.

There are two high-frequency pentodes in the new Mullard range, the V.P.20 and the S.P.20. The former is of the multi-mu variety, and the latter a "straight" type. The V.P.20 operates on a voltage of 200 for anode and screen, and can be operated as either a long- or short-base valve.

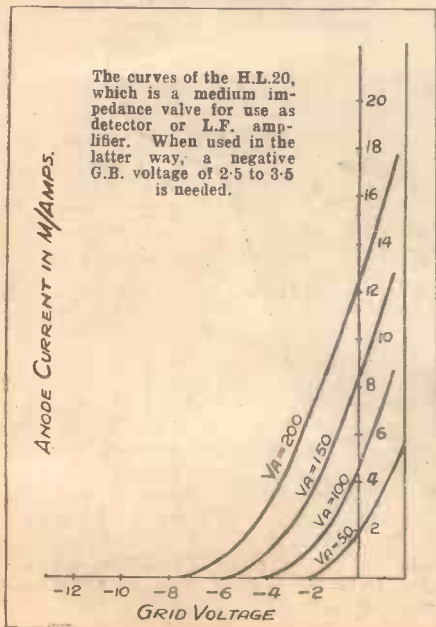
### H.F. or L.F. Amplification.

In the former case the auxiliary grid voltage should be 100 volts, and the grid base becomes 32 volts, while for short-base working the auxiliary voltage is 65 when the grid base becomes only 16 volts. In either event the anode potential is 200.

The S.P.20 is designed for ordinary non-controlled H.F. amplification, or as a detector. It takes 200 on the anode and 100 volts on the auxiliary grid, and at zero bias has a mutual conductance of 3.5 m.a/volt.

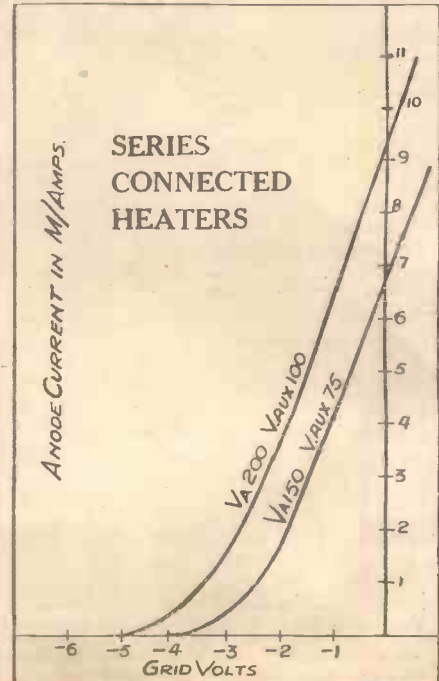
Next we have the H.L.20, which is a fairly steep slope rectifier or first L.F. valve with an impedance or 14,000-ohms and a mutual conductance of 2.5 m.a/v. This means it has an amplification factor of 35. With 200-volt H.T. supply and used for "power-

## EFFICIENT DETECTOR



The curves of the H.L.20, which is a medium impedance valve for use as detector or L.F. amplifier. When used in the latter way, a negative G.B. voltage of 2.5 to 3.5 is needed.

## SERIES CONNECTED HEATERS



Like the other valves whose curves are shown on this page, the heater current of the S.P.20 is 18 amp., and is intended for connecting in series with the other valves in the set.





# HOW TO MAKE A SHORT-WAVE TWO

By W.L.S.

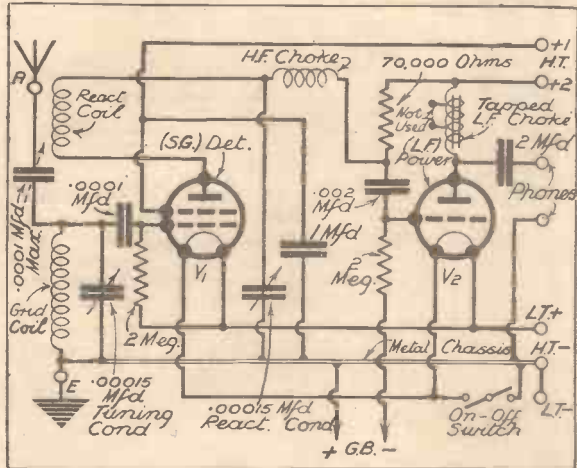
This straightforward, trouble-free receiver is capable of bringing in short-wave stations from every part of the world. The use of a screened-grid detector provides a high degree of amplification with a particularly smooth control of reaction. Suitable for either headphones or loudspeaker listening, it is a set that can be relied upon to give first-class results over the whole of the short-wave band.

**T**his Short-Wave Two, like all short-wave sets, is a bit of a thriller. None of us can tune in the four corners of the world, even in these enlightened days, without a mild sensation of thrill. The set was chiefly created for the purpose of making a really fool-proof short-waver available to those who have not yet tasted the pleasures of short-wave listening,

Africa seems, at its most favourable time of day, to produce a real rattle in the headphones; and when a pentode is used the Short-Wave Two becomes a real loud-speaker set. So much for the preliminary announcements. We may now analyse the circuit and the practical details of the constructional side of the set.

A general-purpose set like this it is less trouble than most, and gives adequate signal-strength and selectivity. The grid circuit of the detector consists of a plug-in short-wave coil of 2, 4, 6 or 9 turns tuned by a .00015 variable condenser, equipped with a slow-motion dial with a vernier adjustment.

## S.G. DETECTION AND R.C. COUPLING.



From the theoretical diagram it will be seen that the set is "straight"; but then who ever expected anything but a straight set from W. L. S.? One or two misguided people have told me that I keep to straight sets because I'm not capable of producing anything more ambitious! My reply to them is that most people have more use for results than ambition.

### Tuning In Americans.

Bearing in mind that many who make this set will be attacking their very first short-waver, I have been more careful about what to leave out than what to put in, and the result certainly justifies that policy. It may interest such readers to know that this set went perfectly "from the word Go" with no adjustments or "fiddling" whatever.

### Perfectly Straightforward.

The S.G. detector is used in the conventional circuit in which one would normally use a triode. Reaction is used in the anode circuit, the screen merely being supplied with a potential of 25 volts or so from a separate H.T. tapping, and being by-passed to earth by a non-inductive condenser of 1 mfd.

The L.F. stage, to which the detector is resistance-coupled, is again perfectly straightforward. A tapped choke is used for the output, so that the substitution of a pentode for a triode presents no difficulties.

### Live Parts of the Set.

In my own opinion, the chief charm of this particular set is the "handle-ability," which I am sure is due largely to chassis construction. With a small chassis set, the proportion of "live" parts to "dead" ones is very low indeed, and this gives various troubles that can upset the performance of a short-wave receiver.

The two "live" portions of the wiring (speaking in terms of H.F.) are the grid and

(Continued on next page.)

but it turned out to be such a useful receiver that I am using it for every purpose that such a set can be used for, and a few more besides!

The circuit I have used is one that I mentioned casually some months ago as being quite good. That mere mention induced several of the keener readers of "P.W." and "M.W." to try it out for themselves, and ever since then I have been receiving letters asking me to publish complete constructional details of a set embodying it. Here is the result.

### Analysing the Circuit.

The circuit I refer to uses a screened-grid detector, resistance-coupled to an L.F. amplifier, which may be a pentode or triode according to taste. For headphone work, I definitely do not recommend the pentode, since an ordinary power valve gives all the volume needed to identify the weakest of signals and stations, and rather more than is comfortable on the "locals."

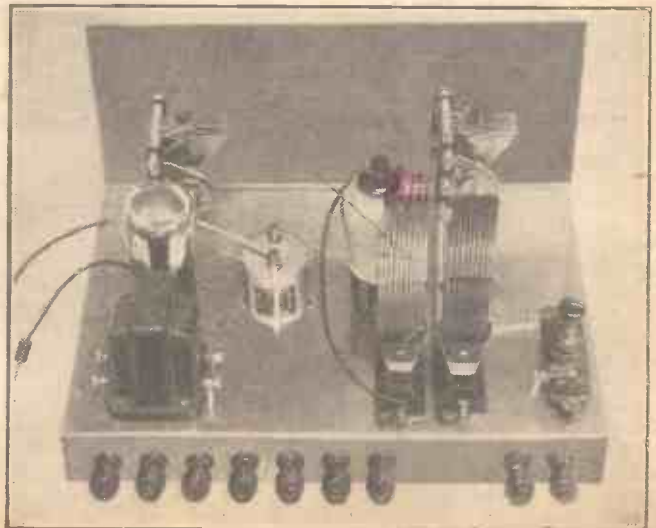
When we short-wave fans talk of "locals" we mean anything within a thousand miles or so. Any station in Europe or North

Had I made the set up from a diagram and known nothing whatever about radio, I am sure I should have been tuning in the Americans just the same.

Starting with the aerial terminal, it will be seen that the aerial is coupled to the grid coil through a small "pre-set" condenser. This may not be the best form of coupling, but for

.....  
One of the special features of the design is its remarkably clean layout. Practically the whole of the wiring is carried out on the underside of the chassis, thus giving a true "factory-finish" to the completed set.

## SIMPLICITY THE KEYNOTE





# HOW TO MAKE A SHORT-WAVE TWO

(Continued from previous page.)

anode circuits of the detector, and all the wiring connected with these is extremely short.

As a matter of fact, I have come to the conclusion that this business of the proportion of "live" to "dead" wiring in a set is a more important matter than most of us imagine. The conditions are bound to be more favourable in the case of a chassis set than in that of a panel-and-baseboard rig, because the metal of the chassis itself must be regarded as "dead" wiring throughout.

### Construction is Easy.

It stands to reason that a number of short "live" wires cannot cause much harm when there is a much greater expanse of earthed metal all about them, and this is doubtless one of the reasons for the great success of the chassis set in the hands of the more or less unskilled constructor, who is

the wiring is cut down by quite an appreciable amount.

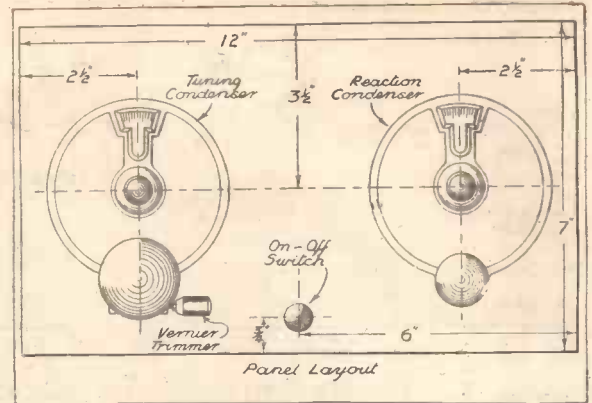
Note the wiring of the grid circuit of the detector. One side of the coil goes straight to earth, by means of a piece of wire not more than a quarter of an inch in length! The "live" side is then taken directly to the fixed plates of the tuning condenser, the moving plates of which are wired across to the third terminal, "frame," which is, of course, earthed by virtue of the fact that the condenser is directly mounted on the metal panel.

The "live" side of the coil is also connected to one side of the aerial-series condenser, and to one side of the grid condenser. The latter component, although mounted underneath the chassis, is in the direct path of a line from the "live" side of the grid coil to the grid itself, and the total length of grid wiring is thus extremely small.

One side of the reaction coil goes directly to the plate of the S.G. detector through a short length of flex, while the other side is taken to the H.F. choke, and, in turn, to fixed plates of the reaction condenser, which has the same "earth return" scheme as the tuning condenser.

Those three short paragraphs have exhausted the "live" H.F. wiring of the set, and the rest is relatively unimportant. Care has been taken, nevertheless, to make all the other wires as short and direct as possible.

The L.T. switch is mounted low down on the panel, so that it emerges on the underside of the



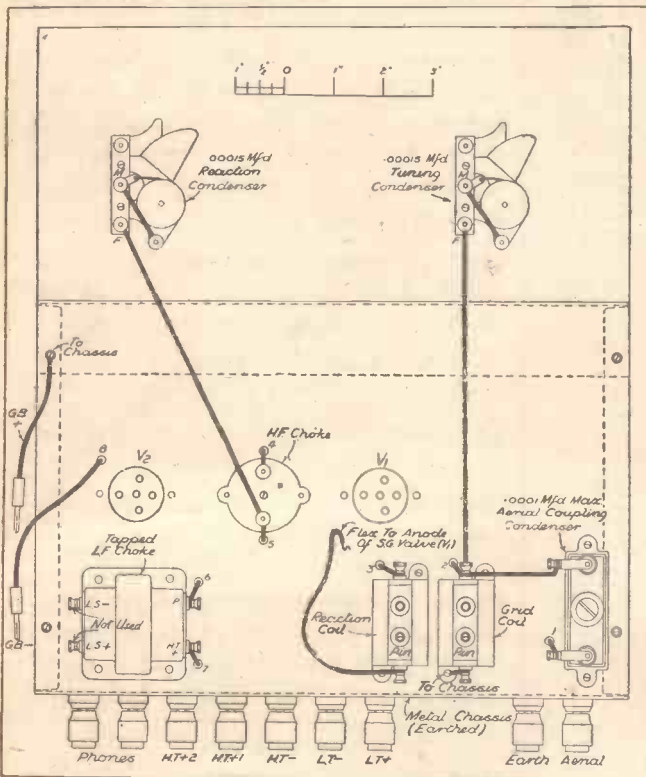
Slow-motion controls are employed for the tuning and reaction condensers—a very necessary refinement in a short-wave receiver, and one which greatly simplifies the handling of the set.

chassis. This saves the drilling of holes and effects yet another economy in wiring.

Only one side of this switch has to be used, since it is not bushed and the moving contact is therefore earthed. The switch terminal that is insulated from the frame is used, and taken to the L.T. — terminals of the valve holders.

These and other points should all be

## REMARKABLY CLEAN LAYOUT



forced to make a blind copy of a given layout.

The construction of this receiver is an easy matter. The chassis is received with the valveholders fitted and the holes ready drilled for the terminals at the back. The rest of the drilling takes no longer than the usual business of affixing the panel to the baseboard in the case of an ordinary set.

Wherever there is a wire that has to return to earth, a convenient spot is found within an inch or so, and the total length of

These two diagrams show the above- and below-chassis construction and wiring. The various leads can be easily traced out with the aid of the numbers by the side of the holes through which the wires are taken. Certain terminals are insulated from the chassis. These are as follows: Aerial, L.T. +, H.T. +1, H.T. +2, and the phone terminal nearer the end of the chassis.

## USE THESE VALVES

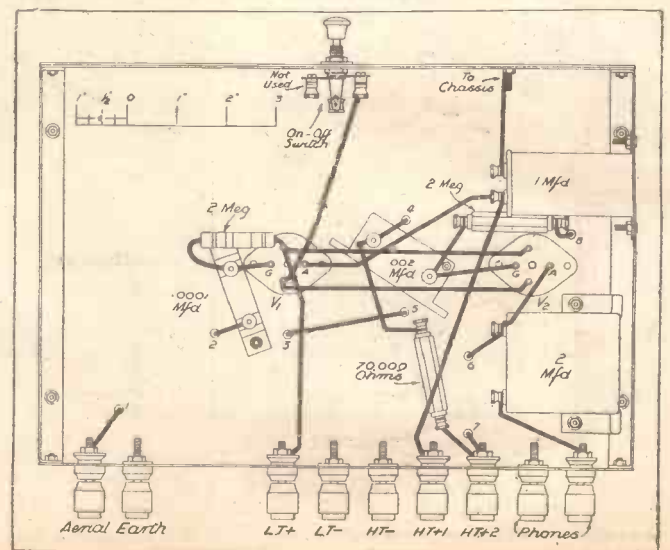
Make	S.G. Detector	Power Output
Mullard	P.M. 12A	P.M. 2A.
Cossor	220S.G.	220P.A.
Mazda	S.G. 215	P. 220
Marconi	S. 22	I.P. 2
Osram	S. 22	L.P. 2
Eta	B.Y. 6	B.X. 604
Hivac	S.G. 210	P. 220

clear from the wiring diagram, but a few "special mentions" of this kind generally clear up possible queries in a more satisfactory way.

No decoupling has been provided for the detector, as it was found to be unnecessary with this receiver. A 70,000-ohm anode resistance is employed, the "dead" end of this goes directly to the

(Continued on page 580.)

## THE WIRING UNDERNEATH THE CHASSIS







CLOSING DATE OF THE

**LION**

H.T. Battery Slogan Competition  
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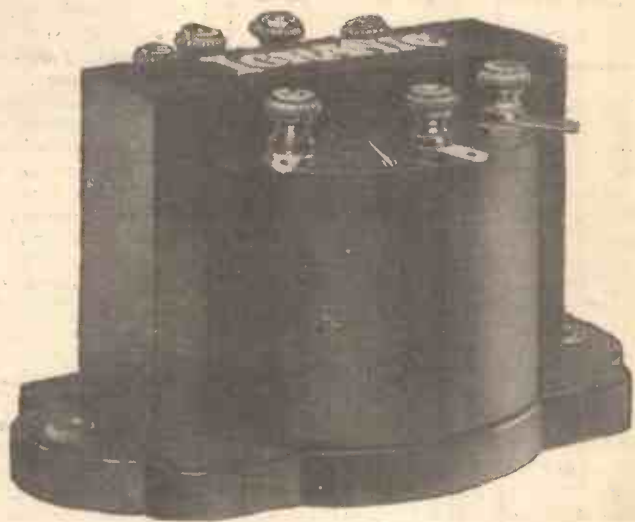
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Designed and produced after intensive technical research—so vital yet so frequently neglected—this new Igranitic class-B Driver Transformer is a masterpiece of scientific precision. Here are a few of its most notable advantages:

- High primary inductance, due to the use of a generous core, constructed on the well-known patented bi-metal principle.
- Low resistance windings prevent distortion of heavy peak currents.
- Fidelity of response obtained by accurate matching of windings.
- Maintenance of inductance on peak currents, ensuring accurate matching with the preceding valve.
- Two tapings are provided, giving two ratios (1 : 1 and 1.5 : 1), which permit many combinations of valves to be used. Price **11/6**

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149, Queen Victoria Street, E.C.4





## HOW TO MAKE A SHORT-WAVE TWO

(Continued from page 578.)

full H.T. positive, which should be between 100 and 120 volts.

The best screen voltage for detection, tried out with four or five different types of valve, appears to be between 22½ and 30 volts. If one goes much above 30, it is difficult to obtain really perfect reaction control.

At the same time, it should be understood that even with a fairly high voltage on the screen, the reaction control is far more smooth than the usual control obtained with a triode detector. With the correct setting of 25 volts or thereabouts, it has to be tried to be believed.

And now, while dealing with the reaction control, we are coming to one of the most pleasing features of the set.

### Ideal Reaction.

The ordinary reaction control can be unsatisfactory in two entirely different ways. It may be affected by some instability in the detector circuit, which will probably lead either to "ploppy" control or to threshold howl; and it may be perfectly smooth, yet have a marked influence on the tuning.

This latter condition is most annoying, especially if there are any "flat spots" in the tuning range. Every reader of this article knows what a flat spot is, and how one has to increase the degree of reaction considerably to make the set oscillate continuously over the range. A good set shouldn't have flat spots, admittedly, but many of them do.

The point I am coming to is that if one has to increase the reaction by a large amount to navigate one of these flat spots, and if the reaction affects the tuning, we

may easily have a narrow band which cannot be covered on that set.

Just visualise this imaginary state of affairs for a moment. You are tuning downwards in wavelength, and come to a flat spot. To keep the set oscillating, you have to increase reaction quite a lot.

Reaction control being bad, this means that increasing the setting of the reaction condenser puts the wavelength up again. What happens is simply that the flat spot is condensed into a space of perhaps half a degree, but that one "jumps" the wavelength concerned, all the same.

To my mind, the biggest advantage of

## RECOMMENDED ACCESSORIES

**BATTERIES.**—H.T. 120 volts. Ever Ready, Lissen, Marconiphone, Siemens, Pertrix, Ediswan, Drydex, etc. L.T. 2 volts. Exide, Oldham, Ever Ready, Ediswan, Lissen, Block, etc. Grid Bias, 6 volts. Drydex; Siemens, Ever Ready, Ediswan, etc.  
**AERIAL AND EARTH EQUIPMENT.**—Goltone "Akrite," Electron "Superial," Radiophone "Receptru" down lead, Graham Farish "Fit" earthing device, Bulgin lightning switch.  
**PHONES.**—E.T.-H., Ericson.

30-metre band. But when the set just began to "peter out" on the edge of a carrier-wave, one had only to increase the reaction condenser setting a little to bring it back to a state of oscillation, and the beat-note with that carrier-wave did not vary by more than 20 or 30 cycles.

One can tune in a C.W. signal and increase the reaction setting from the very edge of oscillation right up to the point at which the set is just going to "super" or produce an audible squeal, without even changing the beat-note on that signal.

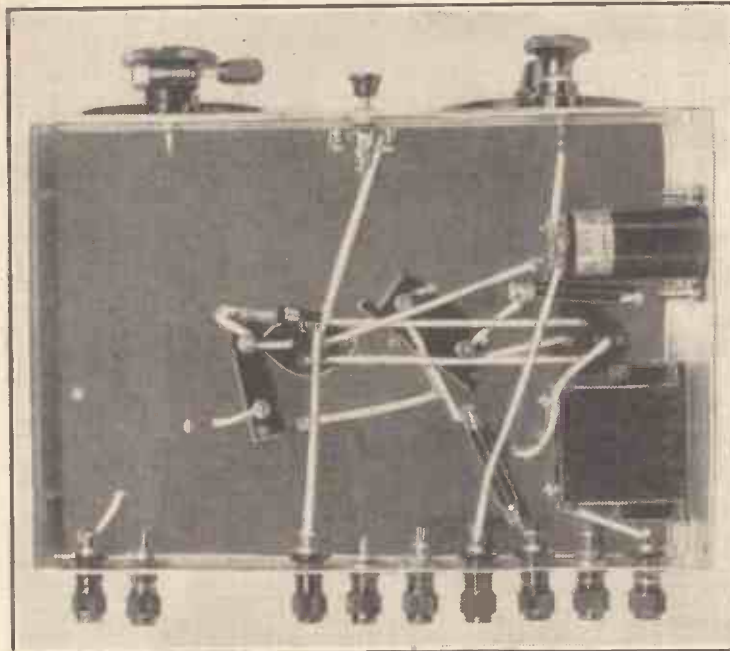
### Wide Range.

Naturally, one doesn't want to do this, but I quote it as an illustration of how much simpler the matter of tuning has become. The two controls don't "interlock" at all. If you tune in a telephony station with the set oscillating, you simply have to reduce reaction until the oscillation stops, and there is your station, still perfectly in tune.

I do not propose to waste space too much by talking about the results obtained. I can only say that during a week's test of the set I heard everything that one could reasonably expect to hear on short waves with two valves, bearing in mind the conditions prevailing at the time.

The wavelength range covered, with a complete set of short-wave coils, is of the order of 11-70 metres. It is an advantage  
 (Continued on page 585.)

## PRESENTS NO CONSTRUCTIONAL DIFFICULTIES



This view of the underside of the original set should be examined in conjunction with the diagram on another page. One terminal of the "on-off" switch is not used, since the required connection is obtained via the metal panel and chassis.

screened-grid detection with resistance coupling is that, when the detector circuit is properly planned, reaction has no effect whatever upon tuning.

### Tuning Unaffected.

Just for a test I used this set with an absurdly large condenser for aerial coupling. As I had expected, it produced a tremendous flat spot in the middle of the

## THE PARTS YOU WILL NEED TO BUILD THE 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 chassis, 12 in. x 7 in. x 8 in., fitted with two valveholders	Magnum	Peto-Scott	1 .0001-mfd. fixed condenser	Dubilier type 620	Telsen, T.C.C., Lissen
2 .00015 mfd. short-wave condensers	J. B.	Polar, Utility	1 .002-mfd. fixed condenser	Lissen	T.C.C., Dubilier, Telsen
2 slow motion dials (one with micrometer adjustment)	Igranic	Code words VINIL and VINAD	1 2-megohm grid leak, with wire ends	Goltone	Lissen, Dubilier, Igranic
2 Single coil holders	Igranic	Magnum	1 70,000-ohm resistance	Graham Farish	—
1 Set short-wave coils	Igranic	Clarke's "Atlas"	1 2-megohm resistance	"Ohmite"	—
1 Standard H.F. choke	Bulgin (screened)	R.I. Quadastatic, Wearite, Graham Farish	1 Push-pull on-off switch	Graham Farish	—
1 Pre-set condenser, .0001 mfd. maximum	Sovereign	R.I. Quadastatic, Wearite, Graham Farish	1 Wander fuse	"Ohmite"	—
1 Output choke	Lissen tapped choke	Goltone, Telsen	4 Wander plugs	Ready Radio	Telsen, Lissen, W.B.
1 2-mfd. fixed condenser	T.C.C.	R.I., Ferranti	2 Accumulator spades	Belling & Lee	Belling & Lee, Bulgin
1 1-mfd. fixed condenser, non-inductive	Dubilier 9200	Dubilier Ferranti, Telsen	9 Terminals	Clix	Bulgin, Clix
		Telsen, T.C.C.	3 yards tinned copper wire	Belling & Lee	—
			2½ yards insulated sleeving	Belling & Lee type "B"	—
			Flex, screws, etc.	Goltone	Wearite
				Goltone	Lewcos, Wearite



# ECKERSLEY EXPLAINS-



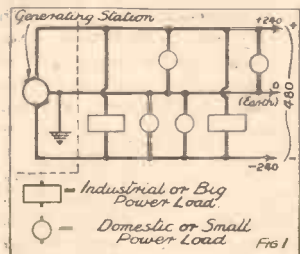
In spite of the increasing distribution of A.C. current in the country, our Radio Consultant-in-Chief considers D.C. will play an important part in electricity supply for a long time to come. So he explains how metal panels and other earthed parts on D.C.-operated sets may be prevented from becoming live and liable to give shocks.

I SAW, sweeping gracefully over the Welsh mountains, a long line of pylons, perfectly aligned, each lovely catenary relieving the monotony of the dour mountain-side.

That great network of wires called the "grid," besides beautifying the often too dull countryside, should mean a lot in the lives of wireless experimenters. It means mains power and doing away with batteries; it means mains units and great puzzles for Eekersley to explain.

I find more people asking questions about mains units than almost anything else. I explained the A.C. mains unit some while ago, and, I hope, showed a puzzled person why he could not draw more milliamps and yet maintain the applied pressure at its

## THE THREE-WIRE SYSTEM



This diagram is for the purpose of explaining the system of electricity distribution usually adopted for D.C. mains working.

"open-circuit" value as can be done, within limits, with a battery.

I showed that the A.C. mains unit had greater internal impedance than a battery internal resistance, if you like, and that, as more milliamps flowed from it, more volts were dropped, or lost, in its "innards."

But with a D.C. mains unit the same does not apply. The mains have relatively no internal impedance.

Mark you, D.C. mains are being superseded, A.C. holds the future, but, in my estimation, it will be a long time before A.C. gets everywhere where D.C. is to-day. So D.C. mains units will continue to have an importance.

### D.C. Mains Unit.

I proposed to devote some care in trying to explain the D.C. mains unit because, unless it is understood, people may get themselves shocks, both electrical and mental, the first from the mains themselves, the second from the companies supplying power via such mains!

A. J., at Ilford, has got to the former stage, and, having changed from H.T. batteries to a D.C. mains unit, "was sur-

prised to find that my first attempt to operate the set with mains H.T. resulted in my getting a shock." (This occurred when A. J.'s hands got on to the grub screws on the condenser dials.)

The usual D.C. mains system is 3 wire (see Figure 1).

Thus you will see that a householder may be across +240 volts (this figure is typical, not necessarily always the same) and neutral (or earth), or -240 and neutral (or earth). By connecting about the same number of houses across either, the load is balanced.

### Quite Straightforward.

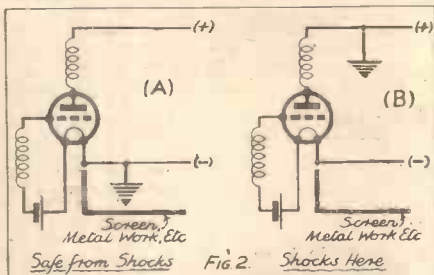
But when big machines or any apparatus taking a lot of power are used the earthed neutral is jumped, and since power is amps.  $\times$  volts, twice the power can be given for the same current, and so less drop of volts occurs in the conductors than if big power were taken across an outer and neutral.

A current will flow equally well from below earth potential (negative) to earth as from above earth potential (positive) to earth. This obvious remark is included because most people who do wireless think of the negative as always earthed. (So it is in good practice, but it need not be.)

So that a valve, joined as in Figure 2, would function equally well with an earthed positive as with an earthed negative; all we have to be sure of is that both positive and negative are not simultaneously earthed!

In both Figure 2A and Figure 2B

## EARTHING OF D.C. MAINS



When the negative main is earthed, as on the left, there is no risk of shocks such as may occur when the positive is earthed (right).

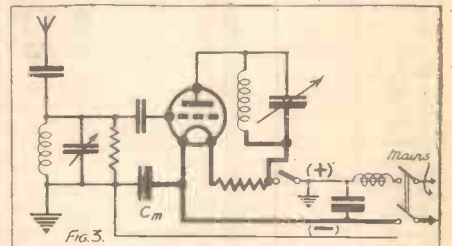
there is a difference of voltage across the valve, and that is all it wants, essentially, to make it work. But usually all the metal parts of a wireless set are connected to H.T.—

When this is earthed all is well; one cannot get a shock. But when we cannot earth the metal for fear of shorting the high tension (Fig. 2B), and we touch it, it may be 240 volts below earth potential, and in consequence currents flow through the toucher to earth. And the toucher gets a shock.

Now in Fig. 1 we see that many houses will have a floating negative, or what comes to the same thing—an earthed positive (the neutral). A. J. was one of these.

But it is possible to avoid a large part of the difficulty and design a practically

## HOW TO AVOID SHOCKS



Conventionalised diagram showing how the main metal parts, tuning condensers, etc., of a D.C.-operated set may be made safe to touch in spite of a "floating" negative.

conventional set, provided you do not earth filament directly to the case, and provided, in fact, you follow out the ideology of the diagram of Fig. 3.

The whole point lies in having a good condenser,  $C_m$ , which isolates everything except the filaments. But do take care and see that you understand what you are doing when fitting a D.C. mains unit. If you have indirectly-heated valves, ask the valve makers what to do.

### Connecting the Cathode.

If, as you will see, you have one side of the cathode full (240 volts) negative, and you directly earth the cathode itself, you establish 240 volts between heater and cathode, and I should think risk a breakdown. However, I believe valves are being made for this work which do not break down.

In any case, the cathode can always go to the live side of  $C_m$ , because, of course,

(Continued on page 586.)



# 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. Life, 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

### WHICH IS SAFER—A.C. OR D.C. ?

W. W. (Leicester).—"I was very surprised to be told that A.C. mains receivers are supposed to be less dangerous than D.C. Is that a fact, and if so, why, since A.C. voltages can be so much higher than the supply?"

The term "less dangerous" needs to be elaborated before we can give a full answer to your question, because, if properly installed, there is no danger in either the A.C. or D.C. types of receivers.

Each system has certain advantages, and also certain disadvantages, and both systems can be rendered perfectly safe.

In the case of D.C., it is sometimes an advantage that the voltage can never rise above that of the mains, as you infer. But a bigger advantage of A.C. is that the use of a transformer at the input allows the mains to be completely isolated (except inductively) from the receiver, and therefore they are less liable to deliver a serious shock or damage in the event of something going wrong with the insulation of the set.

But, as stated above, there is no danger of anything of the sort going wrong with either type of receiver, provided it is reasonably well designed, constructed and maintained.

### HUM ON A D.C. MAINS SET.

J. E. (Liverpool).—"The joining of a lamp in series between each main in turn and earth showed that the positive main was earthed. But in trying to get rid of the last trace of hum, I discovered a curious fact about this main.

"Although, as stated, it did not light the bulb up when tested, as the negative main did, it is not at earth potential as it is supposed to be: for the voltmeter shows there is a difference of just over a couple of volts between the two.

"I have been tempted to earth it, in the hope that the hum problem would thereby be solved, but am afraid of blowing something up.

"Would it be likely to make any difference to hum?"

It might, and you can easily try it without the slightest risk of "blowing something up" if you have a large fixed condenser available.

The impedance of this would be very low indeed, so that it would act as a "hum" short when connected between the two points in question, especially if it is really big—say, 4 mfd. or so.

But, being an insulator, it could not have any harmful shorting effect so far as direct current was concerned. It is well worth trying, in the circumstances.

### FINDING INDUCTANCE OF COIL.

F. J. WALKER (Devonport).—"Your 'Radiotorial' page must be a fine help to radio fans who subscribe to your paper. Until now I have not had much opportunity to study the theoretical side of wireless, being content with the information given in the various designs so ably set forth by you and your staff, not forgetting the 'Titan,' 'Magic,'

and, further back still, the 'Hartleys' and 'Trinadynes,' which put the 'It' into home-constructed sets of those days.

"But now I am in dry dock—for the past few years I have been more or less of a bed-lie—the study of the theoretical side of radio helps to pass the hours, and helps one to forget the cussedness of life.

"Here is a little problem that, no doubt, is child's play to you experts; but, unfortunately, I am no Einstein, and before I fill a few more waste-paper baskets, will you put me wise to the meaning of the following, to me queer-looking conglomeration of symbols, which give me a headache every time I give them a 'look-see.'

"From a text-book I have gleaned the following:—

Formula for Finding the Inductance of a Coil which has no Metallic Core.

$$\text{Inductance} = \frac{4\pi A N^2}{l} \times 10^9 \text{ henries.}$$

Where A = Sectional area of coil (sq. cms.)  
N = Number of turns.  
l = Length of coil in cms.

"Will you please reply in your 'Radiotorial' column, setting out the method of working?"

"On looking back through some back numbers of 'P.W.' I have noticed you have cleared up a few 'mysteries' concerning condensers in series and parallel, also using resistances to drop the volts on an accumulator of larger rating than the valve in use, showing the reader how to work out the answer for himself.

"Will you adopt the same method in your answer?"

"One or two articles on questions like the above would be appreciated by a lot of your readers; but 'P.W.' is usually so full of good things, I suppose space does not permit."

The usual formula for finding the inductance (L) of a coil (solenoid) which has no metallic core is not the formula you quote.

Perhaps you copied it wrongly? Or perhaps the text-book is wrong. It is surprising how many text-

## 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. Is it an advantage to keep a buried earth-plate watered in the summer?
2. Are the ultra-short wavelengths—5 metres or so—good for long-distance results?
3. What will be the wavelength of the high-power Luxembourg station, under the Lucerne Plan, which comes into force in 1934?

books contain serious errors in the statement of fundamental formulae!

We think that the particular equation you refer to is the following:

$$L = 4\pi N^2 A l \times 10^{-9},$$

where  $\pi = 3.14$

N = Number of turns per centimetre

A = Area of each turn

l = Length of the solenoid (in cms.)

Note particularly the last term is  $10^{-9}$ , and not  $10^9$ , which makes all the difference between

Working this out for a practical case, as desired, let us suppose we have a 48-turn winding on a 6-cm.

## 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.

(about 2½ in.) former and that the length of this winding is 6 cm.

We desire to learn the inductance (L) in henries from the formula

$$L = 4\pi N^2 A l \times 10^{-9}.$$

Simplifying this, we get

$$L = 4 \times 3.14 \times 64 \times A l \times 10^{-9}.$$

A, the area, is equal to  $\pi r^2$ , where r is the radius of the coil, so  $A = 3.14 \times 9 = 28.26$ .

And, simplifying the multiplications a step further, the formula becomes

$$L = 4 \times 3.14 \times 64 \times 28.26 \times 6 \times 10^{-9}.$$

$$L = 12.56 \times 1808.64 \times 6 \times 10^{-9}.$$

$$L = 75.36 \times 1808.64 \times 10^{-9}.$$

$$L = 136299 \times 10^{-9}.$$

$$L = 0.00136299 \text{ hy.}$$

This is approximately 136 microhenries ("micro" being a millionth), and this is a lower value than is likely to be met with. The usual medium-wave broadcast coil has an inductance of the order of 200 or 300 microhenries, but, for simplicity's sake, we supposed only 48 turns (8 per centimetre) on the 6-centimetre-long coil; in practice there would be more turns.

## DOES THE MULTI-MU VALVE DISTORT ?

H. S. C. (Tamworth).—"If the multi-mu S.G. has such marked advantages as a method of distortionless volume control, can you explain why it causes noticeable distortion upon my set in the following circumstances?"

"After a lot of trouble I am satisfied that the L.F. and output are well-nigh perfect (yes, I mean it!), and, as you can imagine, good quality reproduction has become an obsession with me. And I notice the effect of the multi-mu valve on its low-bias side is not so good as when highly biased to receive the Midland Regional.

"If, for example, I get big volume by keeping the multi-mu rather insensitive, compensating for this by opening the low-frequency volume control all out (maximum amplification), there is no distortion.

"But when I get the same volume from the same station by reducing the low-frequency volume control, compensating by making the multi-mu S.G. more sensitive (i.e. less S.G. bias), there is quite noticeable distortion.

"This vanishes when I reduce volume a bit further on the S.G., so it seems clear that the distortion arises in the multi-mu, although, as I said, the 'advantage' of this valve is

(Continued on page 584.)



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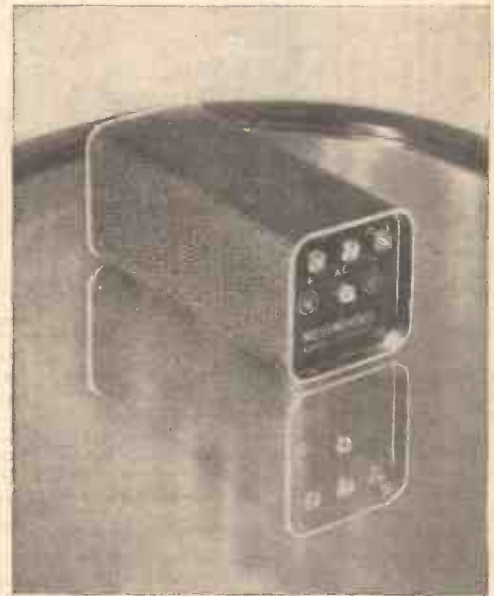
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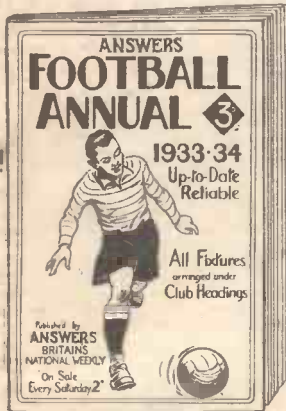
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**RADIOTORIAL  
QUESTIONS AND ANSWERS**

(Continued from page 582.)

supposed to be that it obviates the old distortions inevitable before its introduction.

"I have tried two different valves of the same characteristics, and it happens with both. Why?"

You have overlooked the likeliest cause of the trouble. What about the overloading of the detector? By adjusting the S.G. stage to give big amplification on a comparatively near station you run the direct risk of detector overload, and no reduction of the L.F. volume control to attain only the same volume as before will eliminate that distortion.

We think that this is why your H.F. stage volume control is falling under suspicion. But you should really absolve it from all blame in the matter, as the fault is really in the conditions under which you are operating the detector stage.

**CHANGING OVER TO A.C. VALVES.**

R. O. (Chadwell Heath, Essex).—"For financial reasons the good old S.G., Detector and L.F., is going to do duty again for another twelve months or so, but I am contemplating changing over to A.C. valves and mains unit H.T.

"It has been suggested to me that as I shall have more voltage available than before, and as the set will probably be more frisky with

**THE ANSWERS**

TO THE QUESTIONS ON PAGE 582 ARE GIVEN BELOW.

1. Yes, the soil should be kept moist around the earth-plate.
2. No. The service area of a 5-metre station is strictly limited, and the longest recorded range for such a station was that obtained recently during the "P.W." Crystal Palace 5-metre tests, when reception was achieved in Yorkshire—about 200 miles from the transmitting station.
3. Luxembourg has been allotted the 240.2-metre wave.

**DID YOU KNOW THEM ALL?**

the new valves, it would be a good plan to increase the value of the decoupling resistances when making the change-over.

"Would this be a good move?"

Yes. We favour the increase in these circumstances.

**HOWLING CAUSED BY THE USE OF H.T. UNIT.**

G. S. S. (Newcastle-on-Tyne).—"I am having a bit of trouble with an H.T. eliminator, which seems to be playing up in a curious manner.

"When I first made the change from the battery I was delighted, as the power on the eliminator was much greater and the quality was, if anything, better than before. This was when I had the set and eliminator hooked up temporarily for the try-out.

"Since I put it inside the cabinet things have not been so good. In fact, it always seemed a bit inclined to hum and burble. But the old H.T. battery gives no trouble at all when inside the cabinet.

"What would cause the unit to hum inside the cabinet when it does not do so outside, and there is no hum with a battery inside?"

The probability is that you are placing the H.T. unit too close to the set, or to the set's wiring when it is inside the cabinet.

There should be adequate separation between the two, as in this respect the unit is different from a battery and so might not work satisfactorily when placed on a battery shelf, though it would be quite O.K. if placed a little farther away, where its magnetic field did not interfere with the set or set wiring.

Bear this in mind, and watch that there are no straggling leads from the set, aerial, etc., running close to the unit, and we think you will find that the trouble will disappear.

**£25 AND 50 OTHER PRIZES WON!**

**Our "RADIO-PICS" COMPETITION FULL RESULTS**

In this recent competition, no reader submitted a correct solution to the six sets of puzzle-pictures. THE FIRST PRIZE OF £25 has therefore been divided between the following three competitors, whose efforts contained one error:—

Mr. W. NASH, Junr., Acton Trussell, Stafford.

A. RIDOUT, "Mayfield," Bray Road, Maidenhead, Berks.

K. M. WARNE, Station House, Wolviston, Stockton-on-Tees.

THE FIFTY CONSOLATION PRIZES—Valuable Wireless Components—have been awarded to the following competitors, whose solutions each contained two errors:—

- Mrs. P. ALDERTON, Dereham, Norfolk.
- H. ANDERSON, Glasgow, C.5.
- H. ASCROFT, Longshaw, nr. Wigan.
- Mr. F. BALL, Darby Street, Derby.
- Mr. W. BOWES, Heavely, Stockport.
- Mrs. A. BRADLEY, Drighlington, nr. Bradford.
- Mr. E. BRASHAW, Sheffield.
- Mr. H. BURTON, Leytonstone, London, E.11.
- W. D. CADDY, St. Thomas, Swansea.
- J. CASEY, Walsall, Staffs.
- C. W. CHILTON, Bacup, Lancs.
- J. C. B. CLARK, Morningside Park, Edinburgh.
- Mr. P. B. CREGGAN, Town Hill, Swansea.
- Mr. C. N. DENT, Hull Road, York.
- E. DOBSON, Llanfach, Abercarn.
- Mr. A. C. DRAPER, Acton, W.3.
- R. F. FIELD, Harborne, Birmingham.
- Mr. A. D. GAUTREY, Arbury Road, Cambridge.
- J. GREGSON, Moston, Manchester.
- Mr. J. GRIFFITHS, Earby, via Colne, Lancs.
- T. L. GUTTERIDGE, Peakirk, nr. Peterborough.
- E. HEWETT, Marlborough, Wilts.
- Mr. W. C. HOCKINGS, Newbury, Berks.
- Mr. E. E. HOLDER, Highdown Road, Hove.
- C. W. JEFFORD, E.R.S., R.A.F., Henlow Camp.
- Mr. G. LOVEGROVE, Wandsworth, S.W.18.
- G. M. MARLOW, Bushey, Herts.
- A. MASSEY, Old Trafford, Manchester.
- H. W. MAW, Gainsboro', Lincs.
- Mr. H. J. MERRICK, Northampton.
- W. NORTHOVER, Parkstone, Dorset.
- Mr. J. ONIONS, Hollinwood, Oldham.
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- Mr. T. C. SMITH, Lytham, Lancs.
- Mr. A. SMITHIES, Billington, nr. Blackburn.
- Mr. H. SWANNACK, Sellers Street, Sheffield.
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- Miss C. P. TAYLOR, Kilconquhar, Fife.
- J. A. TIDSWELL, Leicester.
- W. TOWNROW, Hillsbro', Sheffield.
- Mr. A. WAGSTAFF, Sutton-in-Craven.
- M. WILKENS, Enfield, Middx.
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| 6. PITTSBURGH      | 24. KIEL       |
| 7. COLOGNE         | 25. PLYMOUTH   |
| 8. MOSCOW          | 26. MADRID     |
| 9. BELFAST         | 27. TOULOUSE   |
| 10. LYONS          | 28. BRANDON    |
| 11. WEYMOUTH       | 29. WHITEHAVEN |
| 12. HAMBURG        | 30. HOLLYWOOD  |
| 13. NEWCASTL E     | 31. CHELMSFORD |
| 14. BRUSSELS       | 32. BARCELONA  |
| 15. BEACON         | 33. STOCKHOLM  |
| 16. MILAN          | 34. VIENNA     |
| 17. WATERTOWN      | 35. NORMANDIE  |
| 18. DUBLIN         | 36. COLONIAL   |



## HOW TO MAKE A SHORT-WAVE TWO

(Continued from page 580.)

to have two 4-turn coils, since the "4" works better with another "4" as reaction than it does with a "6," which is on the large side. If you find that the set will oscillate with a "4" as grid coil and the "2" as reaction—which is not impossible, although somewhat unlikely—there is no need to use two "4's."

Both the "2" and the "4," when used as grid coils, require a "4" for reaction, as does the "6." When the "9" is used as grid coil, the "6" is just right for reaction purposes.

Under these conditions the wavelength ranges covered are roughly as follows: "2"—11 to 19 metres; "4"—18 to 30 metres; "6"—25 to 42 metres; "9"—35 to 70 metres.

Short-wave broadcast stations are grouped in "bands" in the regions of 14, 16, 19, 25, 31 and 49 metres; and of these only the last four are important. Thus the 19 and 25-metre bands are covered with a 4-turn coil; the 25 and 31-metre bands with a 6-turn coil; and the 49-metre band with the 9-turn coil.

### NEXT WEEK

### How-To-Make

Instructions for a

### HIGH-POWER LOW-COST FOUR-VALVER

Wednesday. - "P.W." - Usual Price 3d.

In addition, many interesting things are to be heard on the amateur bands in the regions of 21 and 42 metres, found on the 4-turn and 9-turn coils respectively.

My regular "Short-Wave Notes" cover the ground of "stations to listen for" at the various seasons of the year, so that there is no point in giving long lists here. Suffice it to say that during the summer and autumn there is plenty of activity below 30 metres, both from the U.S.A. and from the Antipodes.

Sydney, the recognised Australian station for short-wavers, works just above 31 metres, but anyone wanting to hear Australia and New Zealand is fairly sure to find an amateur from those parts in the 21-metre band.

### Tune the Set Carefully.

Please don't forget that the quality of Patience is badly needed for short-wave work. I have provided good slow-motion dials on this set, and the detector tuning dial is equipped with a further vernier. Don't spin the knob and go hurtling over thousands of kilocycles at a time! Search round slowly and you won't miss much.

Keep the set just on the point of oscillation, so that you can hear the faint "breathing," usually referred to as "mush." If this is distinctly audible all the time, it follows that any signals strong enough to come through it will also be heard.

A bad set can do wonders in the hands of a good operator; but the very best set is of little use in the hands of a bad one. Ponder over this, and reflect what a good set can do when properly handled.

## MIRROR OF THE B.B.C.

(Continued from page 570.)

### The B.B.C. at Olympia.

The secret of the form of B.B.C. co-operation with the National Radio Exhibition has been well kept. The Radio Manufacturers' Association is to be congratulated on its bold policy to build a real theatre, capable of holding 1,500 people, where artistes and genuine broadcasts can be witnessed, as well as heard.

The theatre will be opened on Tuesday, August 15th, with a star radio revue called "Good Listening," for which two of the B.B.C. producers will be responsible. The revue will be broadcast on the opening night, and again during the following week, and there will also be a number of variety performances, four of which are likewise to be included in the broadcast programmes.

Perhaps one of the greatest attractions of these variety shows will be the first public appearances of the B.B.C. Dance Orchestra directed by Henry Hall.

### The West National.

It is hoped to complete the public reception tests of the new West National transmitter by the middle of August, so that the full alternative service for the West Region can be introduced before the commencement of the Promenade Concert season.

### Getting the Goods.

There seems to be no limit to which the outside broadcast department of the B.B.C. is prepared to go to "get the goods," judging by what will happen when the King opens the new graving dock at Southampton on Wednesday, July 26th.

His Majesty's speech is to be broadcast, as well as the service that accompanies the opening, when he steps ashore after the royal yacht has broken the tape at the entrance to the dock, and Mr. Howard Marshall is to describe the scene in the form of a running commentary.

Mr. Marshall will speak from the roof of the outside broadcast van; and in order that he may get an uninterrupted view of the proceedings the van is to be slung out by a giant crane to a privileged position on the wall of the dock, to where it will be carried first on a railway truck, because there is no road along which it can travel.

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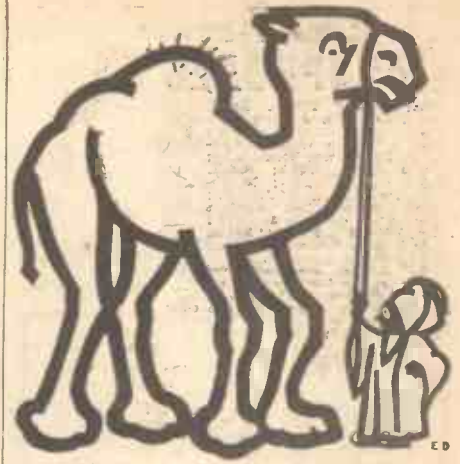
(Continued from page 569.)

altered too. In Fig. 1 the source of energy is an aerial.

In Fig. 2 I have drawn exactly the same circuit, except that the source of energy is a valve. Altering  $C_3$ , within wide limits, will make no difference to the voltage across  $C_p$ .

Why, if the reactances of Fig. 2 are connected together exactly as they are in Fig. 1, is this so?

Answer, maybe, next week—or maybe never; but the answer, "believe it or not," will be the right answer!



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100° F. Temperature rise.

Ohms	Milliamps	Ohms	Milliamps
1,000	40	20,000	8
2,000	35	30,000	6-75
3,000	29	40,000	6
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## ECKERSLEY EXPLAINS

(Continued from page 581.)

this is not earthed; but then don't go and connect cathode to the metal screening case.

A few other precautions before I cease: at (a) use a small fuse in series with the set, do not rely only upon the house fuse; (b) the smoothing condenser should be connected as shown, not on the other side of the chokes. No condenser is required to go slap across the mains, because the mains themselves have high capacity.

Lastly, if you want to find whether your negative or positive is earthed, your best plan is to talk to the electricity people. If you won't, then get a polarised voltmeter (240 volts D.C. sort of thing), connect its negative terminal to earth and the other to the mains.

### A Voltmeter Test.

If the voltmeter reads full volts over the scale when the positive terminal of the voltmeter is connected to one side of the mains and practically nothing when connected to the other, then your negative is effectively earthed. No complications.

If this does not happen, connect the (+) terminal of your voltmeter to earth, when the voltmeter should read full volts over the scale when the (-) terminal is connected to one side of the mains. This means that your negative is live and your positive is earthed.

I had a house like that once, and persuaded the electricity people—well, perhaps that story's better left untold!

## THE LISTENER'S NOTEBOOK

(Continued from page 570.)

Anyhow, he brought the real music-hall atmosphere with him, and I should say gave Broadcast Variety a new lease of life.

The secret of his success was, I thought, his ability to use his audience. Radio-comedians can't do this as a rule. Or, at any rate, they don't.

He might have been broadcasting from the Shakespeare Theatre, Liverpool. The relay from this theatre convinced me more and more that all broadcast variety should take the form of these relays. It's all a question of atmosphere, and the studio hasn't the right sort. Everybody is too well behaved there. I know cat-calls and whistling wouldn't be tolerated at Broadcasting House, but at the Shakespeare Theatre this never got out of hand. In fact, it was all jolly good fun.

## ECONOMICAL MAINS OPERATION

(Continued from page 576.)

An interesting innovation concerning this valve is that it can be obtained either with a normal 5-pin base, and an auxiliary side terminal, or with a 7-pin base to fit the new valve-holders. The optimum load of the valve is 8,000 ohms, and the undistorted output wattage about 1,500 milliwatts.

Finally, though it does not come into the same range, we must mention a new indirectly-heated A.C. full-wave rectifying valve, the Mullard I.W.2A. This has similar characteristics as regards maximum voltage and current to the I.W.2, being rated to give a current output of 60 milliamps with a voltage of 250 R.M.S. applied to each anode, but with better regulation.

It has a heater current of 2.4 amp. at 4 volts, and at full load will give a higher D.C. voltage output than the I.W.2, which takes but half the heater current.

## TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

### Switching.

**BAD** switches seem to be extraordinarily common, so much so that it is quite a treat to get hold of a set in which the switches all really work, and silently. The change-over switch from gramo to radio in a radiogram set is a frequent offender and when it comes to wave-change switches, these are a most fertile source of trouble. I never can quite understand why switches should give so much trouble because, after all, it is just as easy to make a switch that gives you proper contact as to make one that gives a kind of feathery "touch."

### Potentiometers.

Rheostats and potentiometers also leave a lot to be desired. I was using a radiogram the other day with a potentiometer volume control—extremely harsh and grating—and at one spot, a short way from minimum volume, reproduction suddenly stopped, coming on again at a reasonable strength as you moved on. As the same thing always happened at the same spot, I could only assume that the slider left contact altogether with the resistance element at that point. It seemed very ridiculous, but there it was.

These things are so annoying, on the one hand, and are so easily put right, on the other hand, that it is really worth while to get your coat off to the job and make a clean-up of all these bad and doubtful contacts in every part of the set. I hasten to add that the above-mentioned radiogram did *not* belong to me, otherwise it would have been put right in less time than it takes to tell.

### Simplified Tuning.

There are many listeners who live near to a Regional station and only want to get the dual programmes. In such a case it is a very simple matter to arrange for the set to have two definite tuning positions, one for each of the two stations, without having to tune on the dial every time. All you have to do is to tune for the shorter wave station by means of a variable or semi-variable condenser across the tuning coil—a pre-set condenser is suitable for the purpose, as a rule—and then to arrange a second condenser in parallel with the first but capable of being switched in and-out of circuit; when this second condenser is in circuit it must be tuned (not touching the first condenser) until the longer wavelength is tuned in. To switch over from one station to another, therefore, you simply switch in or out this second condenser.

### Single and Double Coils.

All this applies in the case where there is a single tuning coil, but if two tuning coils are used, it is necessary to use four condensers on this arrangement, each pair

(Continued on next page.)



## TECHNICAL NOTES

(Continued from previous page.)

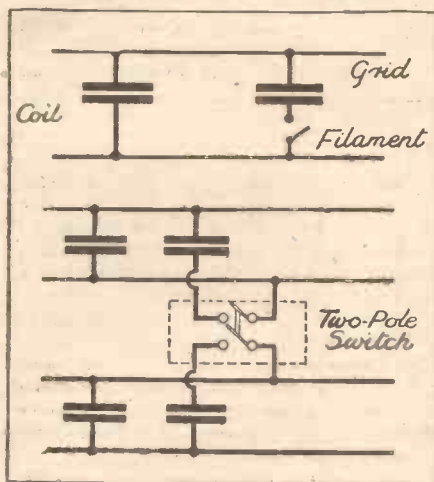
being arranged with its coil as already described. The switching in and out of the alternative condenser, as we may call it, can be provided for by means of any suitable type of switch such as a small push-pull.

### The Connections.

The circuit arrangement, which is quite simple, is shown in the accompanying figure. This is, of course, merely diagrammatic, and shows both the single coil and double coil methods.

With a single coil one condenser is permanently in circuit, whilst the second condenser can be switched into circuit in parallel with the first when required for the

### FOR PRE-SET TUNING



The condensers are arranged and adjusted as explained in the text.

second station. With two coils there are two condensers permanently in circuit and two extra condensers are switched in simultaneously by means of a two-pole switch. In circuits where one side of both circuits are common, an ordinary 3 point on-off switch could be used.

### Suppressing Noise.

Static and noises of various kinds have always been more or less a bugbear to radio listeners, and the more sensitive your receiver, and the more you go in for long-distance reception, the more trouble you get into. Everyone knows how "delightful" it is, when you switch on an expensive and sensitive set, to get a chorus of crackles, growls, whistles and various other noises, recording the movements of the lift, the activities of the local neon sign and goodness knows what besides.

### In a Mains Set.

There are, of course, different types of such interference, and some noises are more difficult to deal with than others.

The interference due to switching on and off electric lights on the same circuit (in the case of a mains receiver), and the noises due to flashing signs, electric motors and so on, are difficult to cut out. But the general background of static, which you get on long-distance reception, can now be largely got over by the use of various types of noise suppressor.

### Dodging the Bumps.

The action of these dodges is rather like that of the driver of a car who drives in such a way as to avoid as far as possible bumps and bad places in the road. The manufacturer of the car does as much as he can in the way of design, springs, and so on to smooth out the bumps of the road, but even when he has done his best a certain amount still remains with the driver of the car; two different drivers will get quite different performances out of the same car.

By means of the suppressor you can adjust until the background noise becomes practically inaudible, the adjustment being made whilst the receiver is detuned and set to maximum volume. Having made this adjustment you can then tune the set to different points on the dial or adjust the volume to any desired level within limits without being seriously bothered with the noise.

Only signals which have a sufficient intensity to stand out from the background noise will get through to any appreciable extent.

### Distant Reception.

The set manufacturer makes the set as sensitive as possible so as to give it good all-round characteristics and distance-getting qualities. This high sensitivity, however, by the same token, makes the set sensitive to noise disturbances, and you can only expect good reception when there is a pronounced difference between the loudness of the desired signal and the loudness of the background noise.

The suppression control adjusts the sensitivity of the receiver so that it cannot appreciably respond to the prevailing noise, but hears signals which rise prominently above the background. The noise level will vary for different places and from time to time, so that the maker of the set has to leave the suppression control adjustable in order to allow the user to adapt it to varying conditions.

### Inductor Speakers.

I am often asked whether a speaker of the inductor type is not likely to be just as good as a moving-coil. There seem to be quite a lot of people who swear by the inductor speaker and, in fact, I have many times had letters from readers asserting that they "had yet to hear" any moving-coil speakers which would compare with their inductor-type instrument.

### Moving-Coil Results.

It is always a difficult matter to express an opinion about loudspeakers, because their performance depends on so many conditions, and also people's tastes vary so much. It is generally considered that the moving-coil type of speaker holds the field over all other kinds from the point of view of all-round reproduction, but at the same time to drive a moving-coil speaker properly it requires a set of reasonably powerful output, and if you have only a small set with power valves taking, say, 5 milliamps at 120 volts, you may find it better to use an inductor speaker.

Inductor speakers are now made which will give a very good bass response as well as a proper reproduction in the upper register, owing to the moving-iron element

(Continued on next page.)

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## TECHNICAL NOTES

(Continued from previous page.)

being adapted for vibration through a much greater amplitude than formerly. It goes without saying that a good inductor speaker is preferable to a bad moving-coil speaker.

The mere fact that the speaker is of the moving-coil type does not necessarily mean that it will give you what you understand by "moving-coil results." I have many times seen moving-coil speakers which, from their construction, were entitled to be so-called, but which, in point of fact, were not as good as an old-fashioned iron-diaphragm speaker.

### Cone Vibrations.

The total magnetic flux in a moving-coil speaker has a great effect on the sensitivity, and another important point which affects the sensitivity is the actual vibrations which are set up in the cone diaphragm itself. Many people do not realise that the cone does not move as a rigid whole but must necessarily vibrate in parts, as it were.

This vibration is greater in some types of cone than in others, but it must always be present, as the cone and associated parts can never be absolutely rigid.

Now some manufacturers actually make use of the resonances of the vibrating system (which includes the cone), so that it will bring out particular parts of the register. Provided this is scientifically done and that individual tones are not picked out (which is very liable to happen) there is no reason why the resonance of the system should not be made use of.

On the other hand, there are cases where it is desirable to avoid as far as possible emphasis of any particular frequency or frequencies.

### Speaker "Tone."

It has been said that a perfect speaker should have no "tone" of its own, that is, that it should simply reproduce the original sound without impressing upon it any special quality or characteristic, which it may do by adding something to the quality of the original sound or by absorbing and therefore subtracting something from it.

The cone diaphragm is liable to be set into vibration in second and third harmonics, and although harmonics may sometimes add to the desirable quality of the sound, generally speaking they are to be avoided as they are liable to produce complications and interfere with the quality.

Talking about inductor speakers, I have been making some tests lately with a Ferranti 1933 Inductor, and have been very impressed with the performance of this speaker. This particular model, by the way, has a coil impedance of about 5,000 ohms and a maximum A.C. input of 2½ watts.

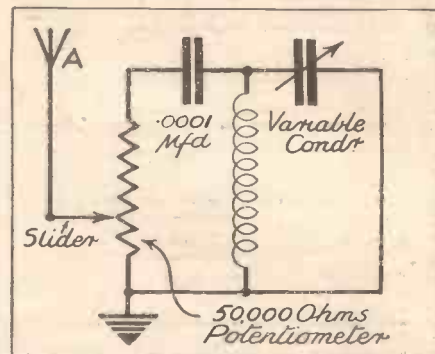
### H.F. Control.

I spoke in these Notes the other week about volume control at the high-frequency end of the circuit, and in the accompanying diagram you will see a simple means by which this is carried out. The arrangement shown in the diagram has the advantage that it does not upset the tuning.

A potentiometer is used in the aerial circuit and a coupling condenser. The value of the coupling condenser may be .0001 microfarad, although this value is subject to considerable variation and you really ought to try different values until you get the best result.

As regards the potentiometer, if you have one of a maximum value of 100,000 ohms this can be used but 50,000 ohms is probably

## DOES NOT UPSET TUNING



This is the simple scheme of connections referred to by Dr. Roberts.

preferable. You will notice that the slider of the potentiometer is connected direct to the aerial.

### Output Filter Values.

A reader tells me that he is fixing up an output filter circuit for his receiver, and wants to know what value of choke and condenser should be used.

This is a question I have had several times before, so I thought it might be worth dealing with in these Notes for the benefit of others who may be fixing up an output circuit.

My correspondent does not give me any information about the type of speaker which he is going to use, nor does he say anything about the power valve, so it is not easy to give exact values for the choke and condenser. As a general guide, however, I may mention that a choke of 20 to 30 henries should usually be suitable, whilst for the condenser at least 2 microfarads should be used.

Of course, if you have a larger condenser of 4 microfarads you may try this, whilst in some cases a choke of a lower inductance than the one mentioned above will serve the purpose. As a matter of fact, there is really nothing very exact about these values, and if you happen to have some spare components on hand, there is no reason why you should not try them.

The above will give you a general idea of the values which are found suitable in what I may call the average case.

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# POPULAR WIRELESS

*The Paper that Made Wireless Popular*

**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.**



**EXHIBITION FEATURES**  
**B.B.C. TIME SIGNAL**  
**"SUMMER SUNDAYS"**  
**U.S.A. ORGAN RECITALS**

## RADIO NOTES & NEWS

**FUTURE OF MICRO-WAVES**  
**BALLOON EXPERIMENTS**  
**VIEWING HIS CONSTITUENCY!**  
**THAMES POLICE RADIO**

### New Scottish Regional Director.

FOR a Corporation which yearns to speak peace to the nations the B.B.C. seems to bank heavily on distinguished men of war. We have had Colonel Dawnay, Admiral Carpendale, and others, and now the new Scottish Regional Director is Melville Dinwiddie, D.S.O., M.C., who began his military career as a bombing officer.

Strict regard for truth bids me add that since the war Mr. Dinwiddie has become minister at that fine St. Machar's Cathedral at Aberdeen. I was told in Scotland that there is considerable criticism of this appointment there. I wonder—do soldiering and preaching comprise the qualifications required for it?

### Greatest Show on Earth.

I UNDERSTAND that those who are organising the Radio Exhibition at Olympia do not intend to be caught napping by any vagaries or poor jokes of our British weather.

If in August, as so often happens, the weather is dull and chilly, great ultra-violet-ray lamps will be brought into action; and if there should be a heat-wave, iced air will be used to keep matters to about 65 degrees of comfort. The whole building will be supplied with ozone, and the air throughout will be changed every four hours.

Mr. Alex. Moody, the organiser, deserves congratulations and our best wishes that the various seaside resorts will not ask him to correct their climatic troubles.

### More About the "Show of Shows."

A GREAT theatre, with seating for nearly 2,000 people, is to be built at Olympia, and will be controlled by the R.M.A. and the B.B.C. Our old friends, John Watt and Harry S. Pepper, will produce a special revue, and, as stated, there will be variety shows as well.

The shows will be "twice nightly," and will be broadcast. The afternoons will be devoted to light orchestral concerts at an entrance fee of, probably, sixpence.

I understand that the stage will be about as large as the average size of London theatre stages, and that a new form of colour lighting will be used.

### At Last! At Last!

IF I were an orthodox "radio critic" I should probably say: "As a result of my insistent demands the B.B.C. has agreed to suppress any time signal which would have an inartistic effect."

I prefer to report simply that from August such suppressions will be made, except those at 10.30 a.m. and 6 p.m., and that even the regular time signals may be suppressed in exceptional circumstances. Readers will bear witness that I have continually cried aloud for some sense of artistic propriety in these time signals,

parrot, macaw, hornbill and toucan. If you are a televisionary I wouldn't invite too many friends to see this show, for animals, etc.—like human babies—often refuse to do their tricks when admiring onlookers are around.

### Sunday Alternative Programmes.

PROPOS my paragraph "Summer Sundays" (July 8th issue), an impulsive but doubtless well-meaning reader, who quite unnecessarily writes in block capitals and forgets to give his name and address, sends me a postcard in which he upbraids me for my selfishness and narrow-mindedness in wishing to deprive old folk and invalids of the broadcast Sunday services.

I invite my anonymous critic to read the paragraph again and to point out wherein I expressed such a naughty-desire. Surely, surely, I bewailed only the possibility of losing alternative programmes!

Though I never listen to the services, I would vote for their retention—and I will accept my unknown reader's apology.

### Erin's Radio Finance.

THE Irish Free State's Minister for Posts and Telegraphs states that the 1932 revenue from broadcasting licences was £17,296, to which may be added Customs duties on apparatus, £64,682, and miscellaneous receipts, £220—a total of £82,198.

The expenditure on broadcasting services was £87,945 (including £46,000 for the Athlone station), resulting in a loss of £5,747. During 1932 there were 33,083 licences issued, an increase of 4,438.

### A Treat for Organ Lovers.

WITH the object of demonstrating the beauty of good organ music and of educating the public to appreciate it, the American Guild of Organists is to sponsor a series of organ recitals in the coming autumn.

A New York broadcasting station has offered to broadcast the recitals over a coast-to-coast chain, and four universities which have fine organs will assist by giving  
*(Continued on next page.)*

### HONOUR FOR SIR JOHN REITH



The Director-General of the B.B.C. (back row, left) with other graduates and the Principal of Aberdeen University. Sir John received the honorary degree of LL.D.

so that we might no longer hear, for example "Pale hands I loved, beside the pip, pip, pip," etc.

### Televising the Zoo.

ON July 26th certain animals, birds and reptiles are to be seen and heard in a television programme at 11 p.m.—certain animals, birds and reptiles being willing. The exhibits may include an alligator, a monkey, a boa constrictor and some birds such as the mynah, cockatoo,

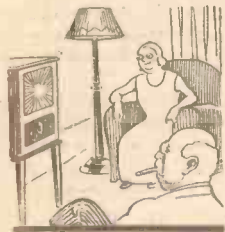


# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

weekly recitals. This scheme should provide a searching test for loudspeakers, and some repercussion of it may be felt by the American radio "trade."

## Now Then, Kiddies!

I EXTEND my thanks to the B.B.C. for repeating one of those excellent little children's hour plays late at night so that us elderly kiddies could hear it.



I hope they will do that again.

Incidentally, has it ever occurred to you that the B.B.C. suffers from a great disadvantage in its Children's Corner activities as compared with the traditional news-

paper? I say "traditional" because I happen to know that the Aunties of Fleet Street do not really drink beer and smoke pipes! 'Tis a fable, my dears.

## Micro-Wave Possibilities.

TALK about the surprising results obtainable from 5-metre transmissions reminds me that wavelengths much shorter than this may be springing a big surprise on us at any moment.

Back in May of this year Marconi confessed that these micro-waves were then engaging most of his attention, and had more than justified the time spent on them. In fact, he guardedly admitted that "they appear to be of unexpected importance."

## The Lesson of the Beam.

IT will be remembered that only as far back as 1924 Marconi proposed the commercial use of short waves, resulting in England being first off the mark with beam stations and reliable Empire radio communications.

Those pre-beam hints were no plainer than this latest tip about the micro-waves, so it looks as though the investigations may come to a head at any moment.

Will it be broadcasting that is most affected? Or ship's radio? Or trans-ocean transmissions? We shall probably know soon!

## Here's a Tip.

IN a Sunday newspaper there was an article about aeriels. The writer said that he remembers experimenting some years ago with toy balloons filled with hydrogen. He continues: "The balloon experiment is well worth trying if you are having a day in the country. Fill them with hydrogen from a cylinder, throw them in the car, and they will



gather along the roof and stay there."

I presume that if grandpa, sitting in the back, gets careless with his cheroot, this aerial experiment achieves an enormous success. Goes with a bang, as the saying is!

## Defence of the B.B.C.

THE "Catholic Herald" suggests that the B.B.C. is "mean and partisan" and bigoted because, in announcing that a woman, for the first time, won the Chancellor's English Essay Prize at Oxford University, they omitted to state that the lady is a Catholic nun.

Really, one must defend the B.B.C. from this sort of criticism. What has the lady's religious belief to do with the matter? Is the B.B.C. to inform us that Mr. X, who won the Nobel Peace Prize, is an agnostic, or that Miss Y, who won the Women's Singles at Wimbledon, is a Baptist? Bless me! If this is to be the line of attack, then we may expect to be told that Mr. Z, who won a Senior Wranglership, is a Moslem, loves Swinburne's poems and takes two lumps in his tea!

## SHORT WAVES

A man found guilty of burglary said he was a saxophone player on the wireless.

The judge, however, was merciful enough not to take this into consideration when passing sentence.

"Progress! You talk about bein' able to telephone to America as progress! Well, I can 'oller so loud you can 'ear me a mile away, but I can't pay my income-tax. Is that progress?" "Punch."

## OUR NURSERY RHYME.

One little nigger boy,  
"Spirituals"—of course!  
Nine more joined him,  
And then it was worse.

Ten little nigger boys,  
"Atta-boy"—of course!  
Tune in another wave,  
We'd sooner hear Morse.

## AN APOLOGY WHICH IMPENDS CLAMOROUSLY.

"7.30. 'Diseases of Organised Society.' Mrs. Sidney Webb."—Wireless Paper.

"Punch."

## MORE SCHOOLBOY HOWLERS.

Resistance is three kinds—passive, negative and leased. Leased resistance is a line leading to a thing the easiest weigh.

Oscillation is something going to and throw. If it goes too fast it whistles and thus jabs the B.B.C.

Atoms are what Sir Lodge talks about on crystal set, and are smaller than molly-coddles. Induction is what they do to curates.

## Odds and Ends.

Belgrade has a new station, now working on 430.4 metres.

The Moroccan short-waver CN 8 MC now transmits on 48 metres on Mondays and Tuesdays.

On August 3rd, 4th, and 5th the American Radio Relay League will hold its annual convention at the World's Fair in Chicago. (This is the biggest body of radio amateurs in the world, so there will be much excitement on the amateur wavelengths on the above dates.)

Lisbon is to open a new 20-kilowatt broadcasting station on October 25th. Wavelength about 290 metres.

The only country in Europe into which it is impossible to take or send a wireless

set is Rumania. No matter what excuse you put forward, the answer is always the same—just a plain unvarnished "No"!

## Wireless for Water-Bobbies.

SO they are experimenting with wireless on the motor-boats of the Thames Police Patrol! What strikes you as funny about that? For my part, I find it strange that they should have gone to the length of fitting radio sets in the helmets of foot police before tackling the easier and, surely, equally important task of bringing police boats into line with B.B.C. barges.



However, I may be wrong; perhaps radio won't be vitally useful to the Thames Police. But in that case, why—oh, heck, let's change the subject!

## The Mug-Catchers.

RADIO broadcasting in America has given rise to a new and questionable industry. It seems that certain get-rich-quick gentry advertise for talented artistes, and then persuade them to pay for "polishing-up" courses, promising them employment in broadcasting.

A similar method of plundering was employed in the early cinematograph days. It is pleasing to learn, however, that this unethical business is being combated by a bureau which is trying to induce the newspapers not to accept the advertisements.

## Radio in the Highlands.

DURING my two weeks in the Western Highlands I heard not a note of music, radio or other, though kilted pipers made noises like pigs' death-cries and the landlady's sister played Scottish airs on a piano. It was good to see an occasional aerial on some crofter's cot incredibly remote from the world.

What a veritable godsend must radio be to such out-dwellers! In one village I saw a power line whose poles—and therefore whose current—ran right along the fronts of a row of cottages, the poles being actually planted in the front gardens. Poor souls!

## Up the Pole.

I SUPPOSE you all read about that intrepid member of Parliament who climbed to the top of one of the masts at the North Regional Station in order to obtain a bird's-eye view of his constituency?

He was watched by a steeplejack who played the trombone on the top of a Barnsley mill chimney when the news of the relief of Lady-smith was received. Which incidentally makes me wonder what would have to happen to make Sir Walford Davis play a Jews' harp on the summit of Mount Everest. ARIEL.





# THE VISCOUNTESS SNOWDEN J.P. ON—

## CHANGES AT THE B.B.C.



**A**N unknown person in my hearing spoke of the B.B.C. Headquarters as Heartbreak House. I should have liked to challenge him on the point, but the room was crowded, and I am not good at accosting a stranger, even when we are fellow-guests.

I cannot believe that this is a true description. It was certainly not true twelve months ago. Whilst it would be unfair to suggest that there was no discontent amongst the officials in my time, the staff of the B.B.C. was, on the whole, the happiest body of men and women it was my privilege to know. They were proud of their connection with the Corporation, and they maintained a most excellent esprit de corps.

### The New Appointments.

If it be true that the present discontent at Broadcasting House warrants anything like the description I have quoted, can it be by any chance connected with recent changes in administration?

Listeners learnt from their newspapers a few weeks ago that a new post had been created to which a distinguished soldier had been appointed. The new official is to have control of "output" and be second in rank only to Sir John Reith.

A clergyman has been appointed in place of the late Mr. Stobart. I cannot imagine that this can have caused acute distress, surprising though it is, unless it has meant the mutilation of some other official's work.

But the other appointment may have caused some heartburnings. Only exceptional knowledge and ability can justify the elevation of an outsider over the heads of those who have given long and faithful service. Such an appointment should be so obviously and outstandingly superior that the old employees should themselves feel that objection to it would be ridiculous.

### Promotion Step by Step.

In all normal conditions of public service the various ranks should feel that good work and length of service should assure them a passage, step by step, to the head of their particular department, and that even the headship of the whole vast concern should not be beyond their grasp for any other than natural reasons.

Advancement by rotation joined to merit, cannot be as the laws of the Medes and Persians. Supreme gifts for a task have sometimes to be sought outside;

The recent appointment of a B.B.C. Controller of Output, who is to have the last word on all programme matters, is a step of vital interest to every listener. Our distinguished contributor, who was, until recently, a Governor of the B.B.C., speaks with unusual authority about the possibilities—pleasant and otherwise—of such an appointment, from the listener's point of view.

but I very much doubt if this appointment necessitated such action.

Colonel Dawnay may be the one man in the world for the new job, and I wish him well in it, even whilst I admire his courage in being willing to be the victim of such invidious policy. We shall see.

I understand that more than one person was approached before Colonel Dawnay, and was either unable to accept or unwilling to be responsible for the unrest which would be almost inevitable in such circumstances.

I have not myself heard one word of

His finger was continuously on the pulse of the machine. He carried his responsibilities with him wherever he went. He had to be forced to take holidays.

Gradually he was brought to see that the growth of the organisation necessitated a delegation of responsibility; but he never completely lost

his personal touch upon the work of every department.

I am not at all sure that he will be happy in the new scheme. His is the nature which takes or gives all or nothing. By nature and temperament he is not the sort of person who could enjoy sitting aloft and receiving reports without participating in the work.

### Control of Policy.

I doubt if any man who likes building up from the ground and hacking his way through problems which are delightful in proportion to their difficulty could long be content with the middle-aged occupation of watching the thing that he has created work!

Of course, there will be policies to shape and maintain, but I had always thought this was the business of the Board. If policy is now to be the sole business of Sir John Reith, I can see no reason why he should not occupy a seat on the Board, and perhaps become its Chairman when the next change is made.

### Bewildered Public.

Meanwhile, the general public will be inclined to think that a post has been created for a person, and that there is one too many on the salary list.

There is no member of the Board who has any great knowledge of the business of popular entertainment, nor was there

such an individual on the last Board. I have never thought this absolutely essential so long as there are expert Advisory Committees and skilled professionals to advise the Board.

But this being so, and assuming that the advancement of a trained official was not possible, and that a new man was necessary for the new job, his knowledge and experience might have been more obviously related to his new post than a military career seems to be.

Mr. Charles Cochran may not be absolutely essential to the good working of the Board, but his presence there would be a relief to the bewildered public, who see

(Continued on page 609.)

## ENTERTAINERS ENTERTAINED



Not long ago, when Mr. Val Gielgud retired from the post of Director of Light Entertainment, and Mr. Eric Maschwitz took it over, B.B.C. stars gathered en masse in honour of the occasion. Above, from left to right, we have Norman Long, Miss Herzy-Tae Gingold, Leonard Henry and Yvette Darnac.

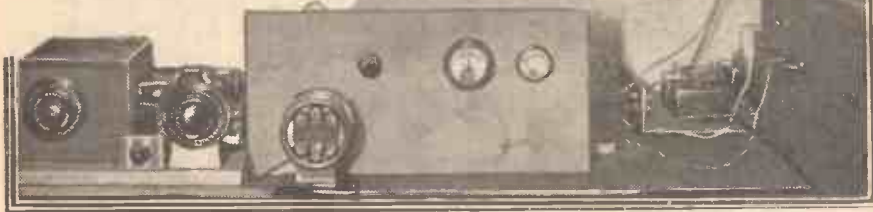
complaint about the appointment from any official. Modesty and the fear of being thought over-ambitious might very well prevent that.

But I have heard indirectly that there is some soreness over the rearrangement of departmental work; and undoubtedly there is real regret that the heads of departments must now report to the new man, thus severing the intimate association with Sir John Reith which the years had created and which the Board of Control had so greatly appreciated.

It had become obvious to the members of the last Board, long before action was taken, that Sir John Reith was working too hard. That was always Sir John's way.



# 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 I shall be thinking of that painful business—the return to work after a fortnight's holiday. Even if it has only been a busman's holiday, one gets into such a state of lazy bliss that the thoughts of London, offices, telephones and the Underground seem decidedly revolting.

Yorkshire is the scene of activities this year, together with a large amount of 5-metre gear, both transmitting and receiving. Stirred to sudden activity a few days ago by the sight of a remarkably nice 5-metre portable transmitter, I interviewed the junk-box. The result (almost immediate) was a second 5-metre portable transmitter on a baseboard, four inches by three, complete with two four-foot lengths of stout wire as an aerial.

## Special Appeal of Short Waves.

This, installed in that (sometimes) trusty vehicle known as "Bonzo," is to be tested out under various conditions in the wilds of Yorkshire. More of that later.

I had a long talk with a well-known personality in the radio trade the other day on the subject of short waves. He wondered whether I could enlighten him on two points.

First, why is the ratio of home-constructed short-wave sets to commercially-built short-wave sets so much higher than the corresponding figure for broadcast receivers? And, secondly, why doesn't some enterprising person in the trade do something about it?

The answer to the first question, I think, is this. The short waves have a special appeal to what we may call the younger generation of radio enthusiasts. Young fellows who have just left school, and who have quite a fair knowledge of electrical and radio matters (on the theoretical side, at any rate), are not particularly attracted by the idea of buying a commercial set and just listening. As an entertainment it may be all right, but they don't want an entertainment—they want a hobby.

## Popularity of Home-built Sets.

And a young fellow's idea of a hobby, nine times out of ten, is closely bound up with "putting together" and "pulling to pieces." The more affluent members of the listening public, who create a beautiful market for the maker of expensive, high-quality broadcast receivers, are simply not interested in the tuning-in of faint squeaks from fabulous distances.

If someone would market a short-wave set that would really pull in the Americans as easily and as clearly as the average superhet pulls in Radio-Paris, they would sit up and take notice. Till then, however, there

will not be much doing with *that* class of listener.

The result is that the market in this country for ready-made short-wave receivers is nothing to become excited about. Most of the rabid short-wave fans would sooner make their own set out of the contents of their junk-box than they would accept, free, gratis and for nothing, a very nice commercially-built set.

## Satisfaction of Creating.

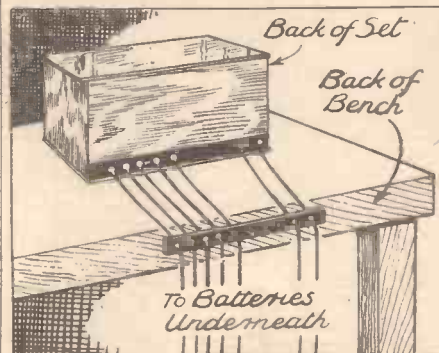
After all, if you treat radio as a hobby, and not as a mere fireside amusement, the greatest charm lies in the creative aspect of it. If I were to make a present of one of my own sets to each of six readers (steady on, though: I said "IF"!), I guarantee

## TIDY BATTERY LEADS

**B**UNDLES of loose battery leads do not improve the performance of a short-wave set. Anything loose and movable is to be avoided, and it is well worth while, even in the case of battery leads, to separate them out and keep them as tight and as direct as possible.

Where the set is mounted on an old

## CLAMPED TO THE BENCH



The leads pass through holes in a piece of wood or ebonite clamped to the bench.

bench, a good plan is to drill holes through the bench at positions corresponding to the various battery terminals, taking each lead straight through to the floor or the shelf on which the batteries are housed.

If this is not practicable, an ebonite or wooden "spacer," as shown in the diagram, is a useful acquisition.

that at least three of them would immediately try to build up their own version of the same set rather than sit in their chairs and twiddle the knobs of the free gift night after night.

(Whether my set would eventually be returned to me I don't pretend to know, but I have a shrewd idea of my own on that subject.)

Moreover, I'm not too certain that the recipients of my supposed gifts would be content merely to make copies of my pet designs. It is more than likely that the sight of a W.L.S. "effort" would inspire them to go one better, which might (or might not) place some of my gear in jeopardy.

## New Programme-Providers.

What do you think of the crop of new stations on the air? Quite a number of Americans that are new to me, at any rate, have been coming over during the past fortnight. Just below 50 metres there is W 2 X A L, Coytesville, N.J., relaying the W R N Y programme. Not far below him there is W 2 X C X, Kearny, N.J., who relays W O R.

In the 49-metre band there are now ten Americans and four Canadians in regular operation! I find W 8 X K, W 3 X A L and W 3 X L the best "Yanks," and V E 9 G W (Bowmanville) the best Canadian.

When the conditions are also good for South America this little group is swelled by the addition of Quito (H C I D R), Barranquilla (H K D), and Bogota (H K C).

This is not the best time of the year for the 49-metre band, but the autumn and winter should be productive of some marvellous results, especially as another patch of good conditions is due then.

"J. B. M." (Glasgow) has kindly forwarded me a letter from the owners of the Belgian station that so many readers have reported on 29.04 metres. The station is at Ruyselede (Belgium), and works with the call-sign O R K. It is at present carrying out tests with the Belgian Congo. Input is 9 kw., and the usual time of transmission is 8 p.m.

As an echo of the Crystal Palace tests, Mr. R. H. Kidd (G 2 G G), of Newbury, writes to inform us that he did not hear G 6 Q B from Newbury, but from a 400-foot hill about eight miles south-east of that location.

"F. A. B." (Ridgewell, Essex) wants us to provide a certificate for the H.A.C. Club and to insist on verifications in every case.

## Reader's Remarkable Reception.

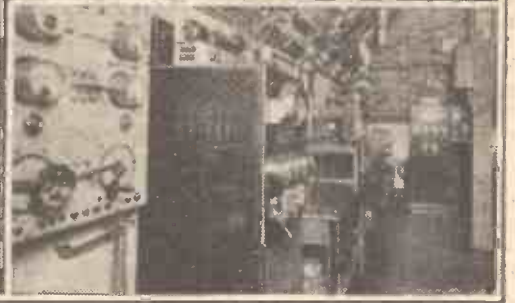
As a matter of fact, "F. A. B.," the International Short-Wave Club follow that procedure already. I started my informal H.A.C. Club in the columns of "P.W." in 1928, but the I.S.W.C. started a duplicate affair a few years ago and are now issuing certificates. Who knows the sincerest form of flattery?

"A. A. H." (Seven Kings) remarks upon the reception of an unknown Italian station, well below 10 metres, on the day of the Crystal Palace tests. "Ariel," he says, dismissed it as "harmonics," but he rightly thinks that it would still be rather remarkable for a harmonic to be received on such a wavelength and from such a distance. The R.S.G.B.'s group of 10-metre experimenters usually think harmonics from distant stations worthy of comment.



# THE FIRST INTERNATIONAL QUALITY TESTS

All about the historic "P.W." short-wave broadcast from CT1AA, the Lisbon station, on 31.25 metres.



"HELLO, Everybody; hello listeners in Great Britain and in the British Empire, this is CT1AA, Lisbon, Portugal, on a wavelength of 31.25 metres. To-night we shall have the pleasure to broadcast a programme that has been specially arranged in collaboration with POPULAR WIRELESS, the well-known British wireless journal. . . . For the first time, a special transmission of frequencies will be made from a station broadcasting on the short wavelengths, and we hope that all our friends in the British Empire will be able to collect sufficient data to prove that quality reception on short waves is at last possible. . . ."

The announcement was the last of five in which the whole world, through the languages of Portugal, France, Germany, Spain, and finally our own mother tongue, had been acquainted with the details of our great broadcast from the capital of our oldest ally.

As far back as 1386 a treaty of alliance was drawn up between Great Britain and Portugal, and here we were, rather more than 500 years later, about to listen to a broadcast that was to weld still another chain in the historical associations of the two countries.

But let us go back to the evening of July 14th, and to the scene that was enacted in the main "P.W." receiving station, for this was no ordinary evening in the eventful lives of "P.W.'s" technical staff, and the atmosphere of tense excitement within those four walls would have put the crowd at a prize-fight in the shadows. And no small wonder!

### Complete In Every Detail.

Picture a band of enthusiasts, headed by "P.W.'s" Technical Editor, around a collection of apparatus which was to receive, to measure, and to record the events exactly as they happened at Lisbon. Everything in duplicate and complete right down to the last detail. Complete even to the extent of having wired-up and ready the most simple short-wave outfit imaginable, just to convince ourselves that what we were about to do could be done by every one of our readers!

On one table was a five-valve superhet with its speaker facing a microphone which, in turn, was connected to an amplifier and to the recording apparatus; on another was

a stand-by three-valver, while on a third were the measuring instruments and the simple short-waver.

At five-and-twenty past ten, the short-wave super was switched on and what, a few moments previously, had sounded rather like a bun fight (yes, we are very human!) gave place to a silence that could be felt. The great moment had arrived.

We make no apologies for the fact that

showed a slight tendency to fade, it was possible for the shorthand writers who were present to get down all the relevant details.

Almost from the commencement, and at intervals throughout the broadcast, we experienced slight heterodyne interference from a station that we have reason to believe was British, but the trouble was not serious, by virtue of the fact that CT1AA was easily the more powerful of the two transmissions.

In his opening announcement, CT1AA referred briefly to the previous occasions on which Great Britain and Portugal had been linked by means of special "P.W." transmissions. He talked of Nairobi and of our famous "Cosmic" broadcast last year, when the voice of Captain

Eckersley was heard over the air after an interval of many years.

The talk was appropriately concluded by an outline of the aims and objects of the present tests and by an expression of gratitude for, as he put it, "the splendid co-operation which existed between British listeners and CT1AA."

At nine minutes to eleven the musical programme commenced with the overture from "Oberon" by Weber, followed by Dvorak's Slavonic Dance in D Minor. The quality and volume during the rendering of both of these pieces were excellent; hardly any interference, and very little fading.

### Results on Two Valves.

As a matter of passing interest it was at this part of the programme that we made the first change-over to the simple short-waver and we were pleasantly surprised to find that when using only two valves it was still possible to obtain loudspeaker results. The volume was not great, but the reproduction was a hundred per cent intelligible.

The speech of Sir Ronald Garland Jayne, the President of the English Chamber of Commerce in Portugal, which commenced at one minute past eleven, proved to be most interesting.

"As an Englishman who has enjoyed the hospitality of Portugal for many years," said Sir Ronald, "I welcome this opportunity to broadcast a few words to my fellow-countrymen."

And those "few words," which were  
(Continued on next page.)

Readers who heard the recent broadcast quality tests from Portugal will be specially interested in this account. To those who were unable to listen it will convey an excellent idea of the proceedings, and of the enthusiasm which marked "P.W.'s" latest pioneering work—the inaugurating of the first International Quality Tests, on short waves.

CT1AA was a little more than five minutes late with his opening announcement, a part of which we have already quoted. Those five minutes were valuable ones, inasmuch as his carrier-wave was on all the time, and the slight delay in making the first announcement afforded an excellent opportunity for adjustments to be made without fear of losing part of the transmission.

### THE POWER SUPPLY AT CT1AA



Quite a considerable space is occupied by the power plant at the Lisbon CT1AA station, the large accumulators near the middle of the picture being the 18-volt L.T. supply. The charging-board for this is in the foreground, and in the background can be seen part of the 5000-volt High-Tension equipment.

When, eventually, his opening announcement was made, in so far as our results were concerned, it might for all the world have been from one of our own local stations. Every word was clear and distinct, and although the transmission



## FIRST INTERNATIONAL QUALITY TESTS

(Continued from previous page.)

both intimate and interesting, could not have been chosen better.

Sir Ronald reviewed the progress that has been made in Portugal during the last few years, and it was gratifying to learn than an increasing number of commercial and industrial contracts are being placed with British firms.

At the conclusion of Sir Ronald's address, at eight minutes past eleven to be precise, the tit-bit of the evening was heralded by the not-too-realistic notes of C T I A A's synthetic cuckoo.

## THE LATEST PIANO MODIFICATION



The piano, with its wide band of frequencies, has always been a test of good quality reception. This is the Neo-Bechstein, in which the string vibrations are picked-up by microphones, amplified, and reproduced by a loudspeaker.

"And now, ladies and gentlemen, we have pleasure in welcoming to our studio Mr. Kelsey, of POPULAR WIRELESS, who, in the course of a short discussion, will tell you something of the purpose of the frequency tests that are to follow."

It isn't surprising that we should have been more than a little amused at the way in which that announcement had been made, for the gentleman who was at that moment being welcomed to the studio in Lisbon was, strangely enough, rather more than a thousand miles from it. He was, in fact, enjoying the joke with the rest of us in the main "P.W." receiving-station! But the gesture was indeed a friendly one, and the *faux pas* was really quite excusable when one remembers that English is not the language that is normally spoken by the Portuguese. As a matter of fact, apart from that little gem of unconscious humour, the announcer's command of the English language was commendably good.

### The Special "P.W." Record.

From the moment when Mr. Campbell (also of the "P.W." staff) commenced his introduction, to the time when Mr. Kelsey had concluded the discussion, the "P.W." record came over so excellently that there is hardly any need to repeat the subject matter here. We are quite confident that you will all have heard every word of

it, likewise the frequency notes which followed.

The frequencies selected for our test were 33, 61, 104, 205, 2592 and 5905 cycles, and our results and measurements in this connection will form the subject of a separate article which will be published as soon as we have time to go carefully through the reports from our other receiving stations.

### That Intimate Touch.

Meanwhile, the comments of the announcer during the broadcasting of our special frequency signals are worthy of a paragraph all to themselves. His reference to 205 cycles as being "a rather beautiful one," and again to 2592 cycles as being "quite a jolly one," provided a welcome diversion from the more serious side of the tests. His comments conveyed just that intimate touch with which we have always endeavoured to characterise our programmes from Lisbon. Nothing red-tape about us!

At twenty-one minutes past eleven the frequency tests were over. Rather less than a quarter of an hour, and yet in those precious minutes an experiment of world-wide importance had been made; an experiment, moreover, that may well lead to the development and utilisation of short waves for ordinary broadcasting. "P.W." has sown the seed, and remembering that "mighty oaks from tiny acorns grow," we look to the future

with more than usual interest. What will it bring?

The serious business over, the programme continued with pianoforte solos played by Professor Campos Coelho. The three pieces that he played were all received at good strength, and were marred only by a slight technical hitch lasting for about three seconds.

### Good Reproduction.

As a matter of interest, the quality of reproduction of this part of the broadcast was good, but fading was definitely more pronounced than during the early part of the programme. The interfering station, too, was rather more in evidence, although even now it was not sufficiently bad completely to spoil the programme.

A large part of the talk by Doctor Penha Garcia which followed at 11.31 was up to such a high standard that

we were able with some measure of success to record it. For some inexplicable reason the transmission suddenly became far less prone to fading and interference!

But do not let us create the wrong impression. We have referred to the programme as being good, and indeed it was.

While, to an extent, there was definite programme value in several of the items transmitted, the primary purpose of the tests was not to explore the possibilities of international entertainment so much as to explode the fallacy that *quality* reception on short waves is not possible. With that in mind, there can be no doubt from our own measurements and from readers' reports already to hand that the tests were entirely successful.

It was a happy but tired gathering that heard the broadcast brought to a close by a few well-chosen words from Signor Abilio Nunes Dos Santos Junior, the enthusiastic and enterprising owner of C T I A A. His co-operation was invaluable, and the work that he put in both before and during our historic broadcast commands our sincere admiration and grateful thanks.

### A Great Success.

Our own National Anthem, followed by that of Portugal, came over at 12.15 B.S.T., but at 12.15 G.M.T. we were still discussing the interesting outcomes of the transmission! Nor did that finish the matter. For, keen to know what had happened at our other listening-posts, telephone calls were instituted so that we might discuss the matter there and then!

As a matter of passing interest, at two out of three of the outposts to which we spoke the results were almost identical with our own. In our case the test was made on a Trix "Explora" superhet short-waver with extremely satisfactory results; and at another listening-post excellent speaker results were obtained from a Peto-Scott "Discoverer" S.G. Three.

That was sufficient to convince us that the experiment had been a great success, and so, by way of concluding what had been a most interesting and enjoyable evening, a congratulatory message was cabled to C T I A A on behalf of "P.W." and all its readers who listened to the broadcast.

## FAMOUS BRITISH AMATEUR STATION



This is the equipment at G 6 Q B, operated by Mr. L. H. Thomas of Thornton Heath, who is well known as an unusually successful experimenter on short waves. Not long ago Mr. Thomas "walked away" with the first prize for the amateur making the largest number of contacts with other amateur stations of all countries.



# ECKERSLEY EXPLAINS-



"Why the word 'band-pass'?" As our Radio Consultant-in-Chief says, this is a "thinking question," and it is one that opens up an interesting subject with which he deals in a simple but really informative manner.

I SUPPOSE "words" are terribly important in mesmerising people. "Band-pass" and "superheterodyne" are lovely words. But here's a thinking question asking "Why the word 'band-pass'?" —presumes it means a circuit to pass "bands" of frequencies and by inference won't pass others, therefore a selective device. But doesn't every circuit pass bands of frequencies and wouldn't it be a poor show if it didn't?

But, of course! As I once said: "How many bands will a band-pass pass if a band-pass could pass bands?" More than a tuned circuit without band-pass surely; but then there are little tricks to get over the difficulty of the peak-tuned circuit which does not pass so many of the upper frequency sidebands.

### Uniform Response.

Let us begin and explain things concisely. A selective set is one which makes audible only the station it is desired to hear, even though that station may be weak. In general terms it has a "tuned circuit," i.e. a circuit which only responds appreciably to a certain band of frequencies which contain the carrier-wave and the modulations of the carrier-wave it is desired shall be picked up.

as the 50, 30 or 10-cycle modulations, will be equally dealt with, whereas anything outside this band will not be heard at all.

### Loss of "Top."

In practice, however, we cannot do this. The sergeant-major type of shoulders get rounded off in practice, and, if we don't use band-pass we get, for selective response, a response curve something like that of Fig. 2. This curve won't give the same intensity to 10,000 cycles/sec. as to 5,000 cycles/sec., and the 5,000 response is less than the 2,000, the 50 theoretically smaller than 30, than 10, and so on.

So the ordinary peak-tuned circuit cuts down the upper frequencies of modulation relative to the lower, while the band-pass circuit gives an equal or-nearly equal response over the range, and is therefore considered by its protagonists to be a better circuit.

But you have heard the word demodulation. You know that if you have a straight-line detector, and, provided the strength of the carrier of the wanted station is much greater than the unwanted, you get an apparently enormously enhanced selectivity. What really happens is, provided always the wanted carrier is much stronger than the unwanted,

from the wanted carrier and little from the unwanted. Of course, the ideal curve of Fig. 1 gives this. The band-pass gives it to some extent, but not so efficiently as the peak-tuned circuit of Fig. 2. The band-pass (Fig. 3) not only has a trough in the very place where it ought to augment the strength of the wanted station carrier, but also is inclined to have flat skirts which pick up the unwanted carrier and so acts against the beneficial effects of demodulation.

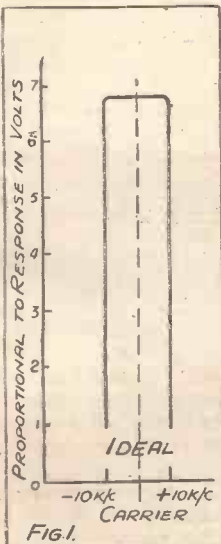
### Overcoming the Difficulty.

So we arrive, now, at this band-pass circuit very good for reproduction but bad for demodulation and vice versa, peak tuning bad for production of upper frequencies but good for demodulation. If, therefore, peak tuning can be adapted for upper frequency reproduction it will be all in all better than band-pass.

Now, in effect, the peak tuning gives a relatively small reproduction of upper frequencies. If, then, the low-frequency stages can counteract these effects (giving smaller bass and greater treble reproduction), the peak tuning will give good selectivity and yet—thanks to the adaptation of the low-frequency circuits—good reproduction.

### Basic Design.

Now, a pentode with an ordinary iron-core transformer or choke in its anode circuit gives a greater reproduction of top than bass. So I suggest that a very good basic design for a wireless set contains a peak-tuned circuit and a pentode output of same kind. I also suggest that band-pass has unselective properties and that a peak-tuned circuit, compensated for, has better selective properties, thanks to demodulation, that its lack of top can be easily compensated for, and that it does pass bands.



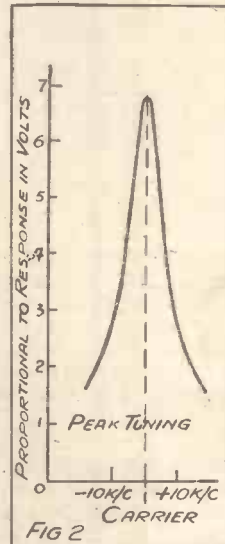
### THE PERFECT CURVE

The resonance curve on the left, with its "sergeant-major type" shoulders, is a true conception of ideal tuning.

Many people state that the ideal tuned circuit would respond equally plus and minus, say, 10 kcs. on

either side of the "wanted" station, and would not respond at all to frequencies outside this "band" of frequencies. In other words, people say that Fig. 1 shows the "ideal" response curve.

This curve shows, with its square-shouldered shape, that the 10,000, as well as the 5,000, as well as the 2,000, as well

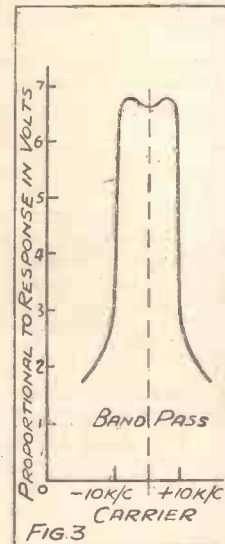


### TUNING IN PRACTICE

The curves to the left and right are what we get in practice, Fig. 2 from an ordinary peak-tuned circuit and Fig. 3 from a band-pass arrangement.

that the side-bands of the unwanted station "beat" with the wanted carrier. Thus, with a 20-kc. separation of carrier-waves a 2,000-cycle modulation of the unwanted station becomes an 18-kc. beat with the wanted and is obviously, therefore, inaudible. This is the extra selectivity you get by demodulation.

This is all to do with detector theory. Never mind about it now; just remember the detector has got to have lots of strength





THE MIRROR OF THE B.B.C.

By O. H. M.

## BROADCASTING HOUSE NOT BIG ENOUGH!

Television—The Dance Bands—Continuous Broadcasting on Sundays.

THE announcement that the B.B.C. has acquired No. 16, Portland Place on lease has surprised many people who had heard of negotiations in connection with Nos. 12 and 14, Portland Place. The inside story is this.

The B.B.C. had taken all possible steps to secure the latter houses before the move from Savoy Hill was completed. But there were certain tenancy clauses which had to be complied with before occupation. And it has turned out that these conditions are still unfulfilled.

Meanwhile, congestion in the new building has gone from bad to worse, and it has become absolutely necessary to secure an immediate outlet. Hence the acquisition on a temporary basis of No. 16.

Of course, new studios will not be erected there. The purpose is to use the building for overflow of offices and office staff. But even with these additional facilities the main problem is still acute.

The fact is that Broadcasting House, however excellent technically and artistically, is just about two-thirds of the size it should be. Even with the addition of Nos. 12, 14 and 16, Portland Place, it will not be long before the B.B.C. will have to acquire further properties.

### The Television Situation.

The appointment of Captain West to the Board of the Baird Company promises some interesting technical results. Captain West was for some years principal research engineer at the B.B.C. Then Captain West went to talking pictures. Now he is devoting all his time to television, and I hear that he still shares some of the doubts of his former chief, P. P. Eckersley, about the folly of thirty-line television, which the Baird Company has been providing for the B.B.C.

The future of television in this country

is even more obscure than it was. I wonder if the new methods of cathode-ray transmission, particularly popular in America, will be accepted by the B.B.C. with Captain West's agreement?

### Broadcast Dance Bands.

It is understood that the B.B.C. is budgeting to spend about £15,000 a year to subsidise dance bands providing programmes of dance music from restaurants and hotels and night clubs. The idea is to secure control

## DUKE ELLINGTON



Part of the famous Duke Ellington dance band which broadcast recently during a tour in this country. "The Duke," as he is called in America, is at the piano.

of the selections chosen in order to put an end to the evil of "song plugging."

I hope this succeeds, but I have my doubts, and for this reason: how in the world can the B.B.C. exercise effective control over bands outside its real authority, especially with restive hotel and restaurant managements?

Surely the B.B.C. will be forced ultimately not to discontinue restaurant music, but to replace most of it with a second staff dance band.

### B.B.C. Sunday Policy.

It amuses me to observe how B.B.C. Sunday policy, so jealously guarded for the past ten years, is being "sapped" by public insistence. It was only a few months ago that popular music was provided at lunch time on Sunday. Care was taken to emphasise that this meant no change in policy.

Now there is uninterrupted broadcasting from 12.30 p.m. to 10.30 p.m. The effect of this is to fill the silent gap between six and eight, hitherto regarded as sacred to churchgoers and to wireless amateurs anxious to test their apparatus.

The real reason, of course, is an attempt to make it more difficult for the sponsored programmes from the Continent to get a good listening audience in England. A better reason would have been to attempt to provide the continuous service to which the British listener is entitled. Fortunately, the result is the same.

The next step forward will be to give real alternative programmes on Sunday, including appropriate music as alternative to religious broadcasts; moreover, and *verb. sap.*, it is a pity the B.B.C. is putting itself into the position of making it possible to say that it alone can determine what the British listener receives.

I wonder sometimes if the B.B.C. realises that the 10s. licence fee is paid for a receiving station and not for B.B.C. programmes only.

### Cowes Week.

We cannot all enjoy the delights and extravagances of a visit to the Isle of Wight during Cowes Week, but it is one of the most beautiful sights to be wished for.

A talk about Cowes Week will be given in the programmes on Saturday, August 5th.



Weekly jottings of interest to buyers.

ACCORDING to one of the design engineers of the Gramophone Company, there are something like 2,300 soldered connections linking together the 600 parts of an average commercial receiver. That means to say that, however thoroughly a set may be tested prior to despatch from the works, there are still 2,300 ways in which it might possibly go

wrong if it were subjected to rough treatment in transit.

With a view to overcoming the possibility of damage in transit, H.M.V. has been investigating the matter for some little while, and their research department has now emerged with an artificial "train," on which a set can be sent on an equivalent journey from London to Glasgow in 26 minutes.

### The Train Test.

The H.M.V. "train" comprises a movable platform that is rocked up and down through eccentric cams operated from a powerful electric motor. The set to be tested is strapped on to the platform, the motor is started, and it then receives 1,500 vibrations a minute.

I think it is an excellent idea, in fact, just what one would expect of the Gramophone Company. My only hope is that they will now continue their investigations with a view to producing a robot porter, for I am very much afraid that it isn't always

the actual journey that is to blame in the event of trouble!

However, the artificial train will no doubt go a long way towards solving the transport problem, and I am full of praise for the scheme.

### A Useful List.

The appropriate H.T. batteries to use for well over 100 battery-operated commercial receivers are given in a useful leaflet that has just been published by Britannia Batteries, Limited.

But that is not the only reason why I feel constrained to include the leaflet in the literature available under "P.W.'s" postcard literature scheme.

Most battery users are, as a rule, a little bit in the dark as to which is the most economical type of battery to use for a particular set, and apparently aware of this difficulty, the Pertrix people have graded the batteries included in this latest list into "number-of-valves" order.

(Continued on page 310.)





**TAPPING-DRILL GAUGE**

THE correct size of drill to make a hole suitable for being tapped to fit a certain screw can be determined by trying the drill through a nut that fits the screw. One should be chosen that fits inside the nut without any

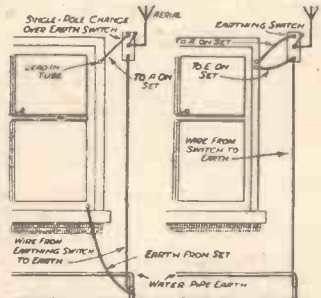


The drill should be a close fit for the nut.

play, otherwise the hole produced will be too small, which, when being tapped, will cause undue strain upon the tap and perhaps break it.

**AN EARTHING TIP.**

IN the majority of aerial-earth switching arrangements, the aerial lead-in from the switch to the aerial terminal on the set, and the earth lead also from switch to set, are running parallel,

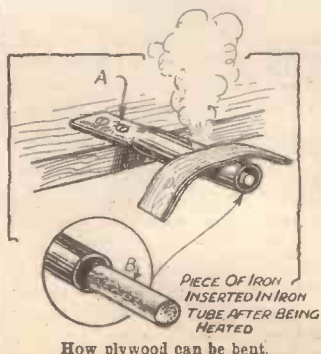


Keep aerial and earth leads separate.

as shown in the sketch on the right, and are likely to introduce H.F. losses. If the switch is wired as shown in the left-hand sketch, these losses are done away with and the earth wire is shortened as always recommended.

**BENDING PLYWOOD**

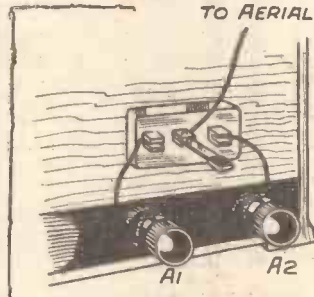
TO the radio man who builds his own cabinets this hint on bending plywood may prove useful.



A piece of iron tube (A) is flattened at one end, and fixed to the bench. A piece of iron (B) is heated and inserted in the tube. Wet plywood can now be steamed to the desired shape by pressing it over the hot tube.

**SWITCHING AERIAL INPUT.**

AN arrangement I find to be much more useful on a set with two aerial terminals is, instead of changing the wire each time from aerial one to aerial two, to fix a single-throw switch at the back of set, as shown below.



Quick change over for aerial.

amount of tension can be applied to spring washer by adjusting the two nuts, in order to pull the arm below brake stop when switching on.

The spindle, being a 2 B.A. brass rod, passes through an adaptor fixed to small board. The arm spring is taken from an old brake and the rubber buffer is from an accumulator. The brake arm is approximately 3 in. in length.

The whole thing, of course, can be made quite a nice job by anyone with a little ingenuity.

**MANSBRIDGE CONDENSERS.**

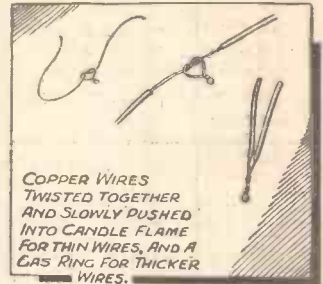
LARGE condensers don't very often give out, but a short while ago I pulled to pieces a dud 2-mfd. to look inside, and found that it had been constructed in two parts, 1 mfd. each.

On testing them I found that only one was dud, so I thought I might fit the other part up again and use it. Consequently it was replaced in its bakelite case, packed tight with waxed paper, and once more sealed up with sealing compound taken from an old H.T. battery.

I find that quite a few manufacturers construct their Mansbridges like this, probably to assist mass production, so several economic readers may be able to convert old 2-mfd. condensers which they thought were gone for good.

**JOINING THIN WIRES.**

I HAVE often found this method of joining thin copper wires of chokes, coils, etc., much easier and quicker than soldering. It also has the advantage of being done without the use of the soldering-iron and flux.

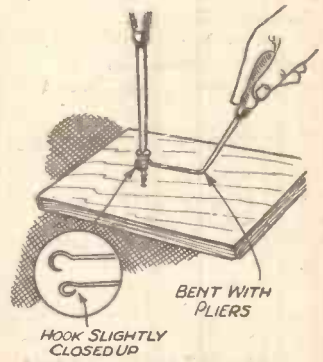


The two ends to be joined are lightly twisted together and slowly pushed into a candle flame; or a gas-ring for thicker wires.

When very thin wires are to be joined it is best to make a knot before twisting. This relieves the joined ends from strain.

**AN EASY START.**

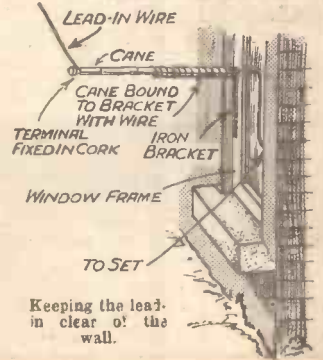
THE problem of keeping a screw steady when driving it into the baseboard can be overcome quite easily by making this simple tool.



Hold screws upright for starting

A button-hook is taken first of all and bent a little way from the hook. The hook is slightly closed up so that the screw will fit snugly in it, leaving sufficient space for its removal when the screw is fixed.

(Continued on next page.)



Keeping the lead-in clear of the wall.

**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.

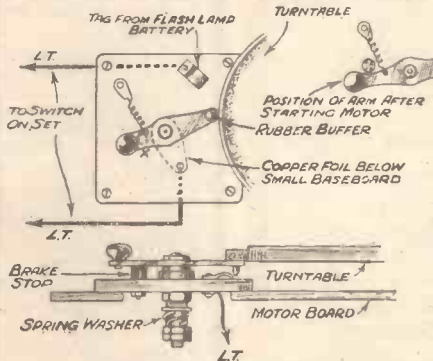
Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

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 in the July 15th issue was sent by E. Thompson, 24, Hill Street, Seaham Harbour, to whom a guinea is being awarded.

**AUTOMATIC L.T. SWITCH.**

IT is nearly always the case with a radiogram that after playing a record and, of course, stopping the motor that one forgets to switch off the set, due to the fact that the speaker is dead silent on the pick-up. In mains sets this does not obtain, as one can hear the hum, which serves as a warning. Mine being a battery set, I have overcome this inconvenience by means



An automatic switch for a battery radiogram

of a motor brake which switches off the set when stopping the motor, and it works out quite well. The brake arm, which is made from brass or copper, rides on brake stop (marked X) when turntable is stationary, and the right

**SAFE SCREENING.**

IT is a good idea for those new to radio, with its abundance of screens, cans, and other metal parts which offer such splendid opportunities for short circuits, to insure themselves by purchasing a threepenny tin of quick-drying stove enamel and painting over these potential danger sources.

A coat of enamel doesn't impair the screening power of a screen in any way.

**A CLEAR LEAD-IN.**

HERE is an idea for holding the lead-in wire away from walls and guttering, etc.

Obtain a piece of cane about 1 yd. long and make a hole through the centre with a stiff piece of wire. Next bend a piece of iron to form a right angle, and drill two or three holes in one side. These are for screws (perhaps one could find an iron shelf bracket suitable). Bind cane on to this iron and screw to window frame over the hole where the aerial wire goes through. The lead-in wire, if covered, could run straight through the cane

into the house without being cut, binding the end of cane with insulating tape, or a terminal could be fixed in the end through a cork and a separate wire run into the house. This forms an efficient extended lead-in tube. The whole could be stayed with wire if thought necessary and painted the same colour as the other woodwork.



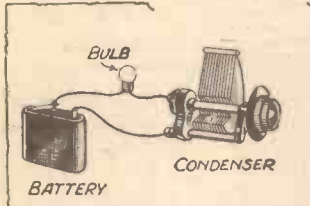
## RECOMMENDED WRINKLES

(Continued from previous page.)

### TRACING CONDENSER SHORTS.

SOMETIMES it is necessary to trace a short between the vanes of a condenser and I have found the following very useful.

Connect one end of a torch battery to terminal on condenser, the other terminal to a suitable bulb, and the other end of battery to the remaining connection on bulb.



Visual indication of "shorts" is provided in this manner.

If the vanes on the condenser are rotated the bulb will light when the vanes touch, then the vanes can be adjusted by a slight pressure of a screwdriver.

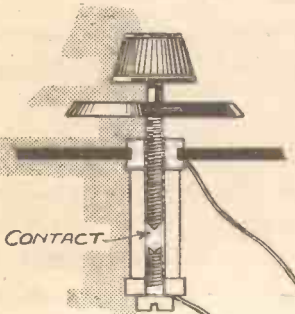
When the vanes are set correctly the light will go out.

### A SCREW-DOWN SWITCH.

IF you have never used a screw-down switch, try it. It is much more reliable than a push-pull switch.

I have used one made up from an old variable grid leak (one-hole fixing type).

There is very little to do. The ebonite body is shortened, and all the parts cleaned up. The grid leak is adapted so that the screw-down knob



A screw-down switch always makes positive contact.

spindle touches the metal bush at the end when screwed down. Two or three turns releases it, and the point of contact is kept bright.

This type of switch never gives trouble. I have used one for years.

### MEASURING RESISTANCES

A MILLIAMMETER can be used to measure resistances fairly accurately and quickly by connecting a resistance permanently in series with it.

Its value should be such as will allow a full scale deflection when a 2-volt accumulator (reading exactly 2 volts) is connected to its other end and the other terminal of the meter. For a 0-5 m/a., 400 ohms (less the resistance of the meter) will be required.

To obtain this, connect up a length of wire of approximately 400 ohms, and reduce it until the meter reads exactly 5 m/a.s. with a 2-volt accumulator reading exactly 2 volts. This resistance is necessary to prevent the meter being accidentally burnt out.

A Table is now prepared for as many readings as desired, e.g.:

Reading.	Total Resistance.	Resistance under test.
1	20,000 ohms	19,600 ohms.
5	4,000 "	3,600 "
1-0	2,000 "	1,600 "
3-0	666 "	266 "

These are worked out from ohms law, viz.:

2-v. will pass 1m/a through	2,000 ohms
" "	4,000 "
" "	666 "

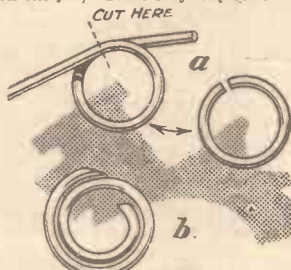
If this resistance is now connected up in some permanent form, it is only necessary to put a 2-volt accumulator, the meter complete with resistance, and the resistance under test all in series and take the value from the reading obtained from the table.

### WASHERS WHILE YOU WAIT.

IT is a wearisome business making a washer, even if you have the material and tools; and the need for one usually crops up unexpectedly. Yet nine times out of ten you can meet the emergency with a piece of wire.

Choose a suitably thick gauge, bend it into a suitably-sized ring, and there you have in a jiffy a washer robust enough for the spindle of a cycle wheel, or one delicate enough for a watch! There is no need to file the sides of a thick ring flat.

Round-nosed pliers are a great help on the job, but an easy way is to bend



Useful washers may be made from suitably sized wire.

the wire round a rod of fitting size, allowing a liberal lap for cutting off, as in a of the sketch.

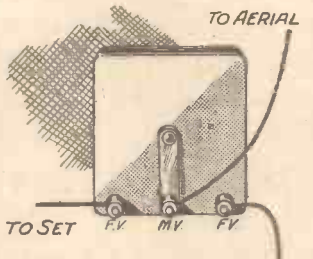
In special cases an expanded surface may be obtained by a spiral form, as in b.

### DIFFERENTIAL VOLUME CONTROL.

AN ordinary differential condenser is used, it being placed in the aerial lead.

Break the aerial lead to the set, and connect the wire from the lead-in to the moving vanes.

Connect the wire from the set to one set of fixed vanes; the remaining set of fixed vanes are connected to earth.



Condenser control of volume is smooth and progressive.

Maximum volume to nearly dead silence will be obtained by rotating the knob of the condenser, and the device in no way interferes with the normal operation of the set.

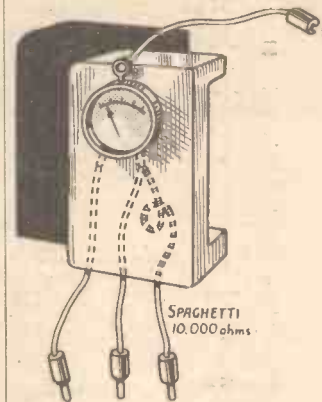
### AN A.C. VOLTMETER FOR 5s. 6d.

IN making up, or tracing faults in an A.C. receiver it is useful to be able to check roughly the voltages of the secondaries of mains transformers.

An A.C. voltmeter can be readily

made from a cheap non-polarised pocket voltmeter.

They usually have scales 0-6 v. and 0-120 v. The 0-6 v. will check the heater windings, and the 0-120 v. is useful for some transformers for metal rectifiers, but an extra scale can be readily arranged by adding a spaghetti



resistance equal to twice that of the voltmeter resistance—that of the 0-120 v. scale, of course—and then multiplying the reading by 3.

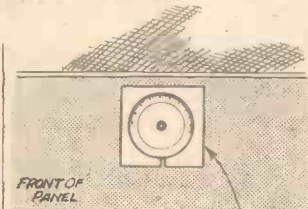
My voltmeter, costing 3s., has a resistance of 5,000 I added a 10,000 spaghetti, which gives a maximum reading of 360 volts.

I made it up on a 2-way switch block as sketch.

The leads should be tipped with plugs with insulating sleeves.

### DIAL SPACING.

THE sketch shows how to obtain even spacing of slow-motion condenser dials from the panel, which I found very useful as my dials kept binding on the panel.

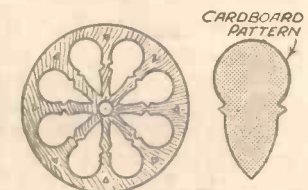


The dial will turn freely if fixed in this manner.

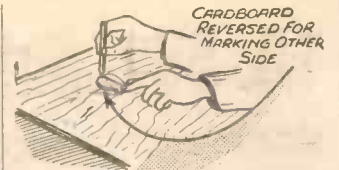
When the lower half of the dial has been fixed the card can be withdrawn and placed on top of it before fixing the smaller dial.

### DESIGNING FRETS.

LOUDSPEAKER constructors who design and cut their own frets and cabinet vignettes, but who have difficulty in balancing their designs



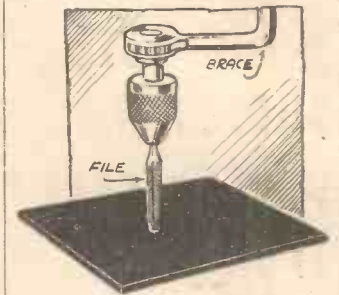
when they are repetitions of one portion will find that if this one portion is cut out first in cardboard and then used as a pattern, a perfectly balanced design will result.



Turn the pattern over for a reversed "match."

Where the opposite sides of a design or vignette are the reverse to each other, it is only necessary to turn over the cardboard before the pencil marks are made.

### REAMERING PANEL HOLES.



IN the absence of a reamer, insert a triangular file into a brace and reamer the hole as shown, first from one side of the panel and then the other.

### DRILLING PLATE GLASS.

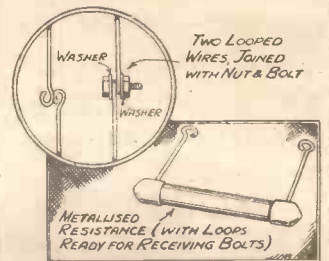
NO doubt some of your readers would like to know how to drill plate glass for panels.

Obtain an old worn-out three-cornered file, grind it to a sharp point on a wet grindstone, and fit in a carpenter's brace.

Drill halfway through, and turn glass over to finish. Use American turps to drill.

### CLAMPING JOINTS.

IF two pieces of wire have to be joined together, twisting them round one another is never very satisfactory. It is much better to use a nut and bolt with washers: 4B.A.'s or 6B.A.'s, such as can be obtained from any good wireless dealer prove very satisfactory for this purpose.



Wires are joined more securely by nuts and bolts than by merely twisting them together.

A loop should be made at the end of each piece of wire, and then the bolt screwed through the loops, with a washer under the head, and a washer under the nut.

Resistances having a piece of wire at each end can be connected in this way.

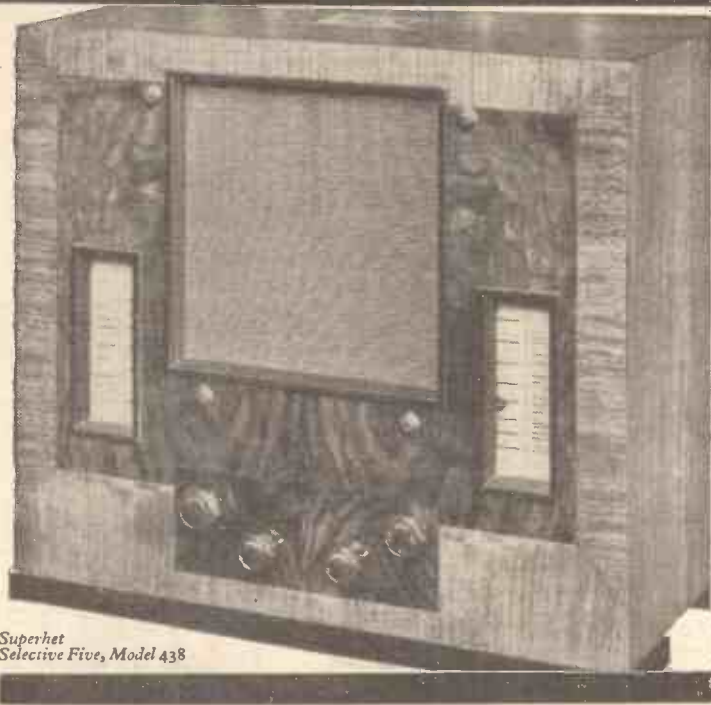
### RE-USING BASEBOARDS.

MANY constructors who use the same baseboard more than once find it gets full of holes and unsightly. Those who do not want to go to the expense and trouble of a new one should lay a sheet of fairly stout brown paper on the baseboard, folding it underneath and fastening it with drawing pins. It then looks neat and tidy, and can be changed every time a new set is made.



# WHERE IS ITS EQUAL?

● FOR FULL  
SUPERHET  
PERFORMANCE,  
TESTED  
SELECTIVITY  
AND FINE  
APPEARANCE



Superhet  
Selective Five, Model 438

**SUPERHET  
SELECTIVE FIVE  
MODEL 438**

**SPECIFICATION**

*Electrically operated. Five Marconi valves (inc. rectifier). Variable mu I.F. amplifier. New type energised moving coil speaker. Super-heterodyne circuit with band-pass tuning. Station names on illuminated wave-length scales. Mains aerial. Provision for gramophone pick-up and high or low resistance extra speakers. 200-250 volts, 50-100 cycles (models for other voltages to order). Acoustically designed cabinet of finely figured walnut on ebonised base.*

## 15 GNS. ONLY!

This five-valve superhet set, with nothing skimped, and bearing the world's most famous trade-mark (itself a guarantee of high quality throughout) costs you no more than fifteen guineas! At this price, unrivalled value for wireless that offers such performance.

The model is the latest and finest radio product of the famous Hayes factories. Before being catalogued for sale, it was taken to Prague, centre of the most congested ether in Europe, and to within sight of Brookman's Park, notorious for "second channel" interference, and subjected in both places to the most severe practical tests. No set of its type has ever before offered so wide a range of stations. "His Masters' Voice" invite its comparison with any other similar receiver on the score of giving you each station absolutely cut off from immediate wave-length neighbours; of giving you that most important quality from the set you have to live with—"true-to-life" tone; and of allowing you all the volume you will ever need, entirely free from distortion.

Go to any "His Master's Voice" dealer and ask to hear it. You will recognise it instantly by its distinctive cabinet of finely figured walnut, carried out in that restrained "straight line" style which is the best of modern design.



## "HIS MASTER'S VOICE"

**'TRUE TO LIFE' RADIO AND RADIO-GRAMOPHONES**

The Gramophone Co., Ltd., 98-108 Clerkenwell Road, London, E.C. 1

(Price does not apply in I.F.S.)



## STATIONS WORTH HEARING

A review of recent conditions on the "broadcast" bands, including details of stations that are coming in well, and other information that will enable you to get the best results when searching for foreigners.

By R. W. HALLOWS, M.A.

JUNE was an extraordinary month, for, though comparatively little rain fell in most parts of the country, thunder was hanging about for the whole of its last fourteen days. July's coming was heralded by a change for the better in weather conditions and a blessed relief from atmospheric interference.

I wonder if any readers have noticed a peculiarity about reception in thundery weather of which a good many instances have been entered in my log during the last few years. It is an accepted fact that most, if not all, atmospheric effects are due to electrical discharges in the air or between clouds, and that most of them come to us from storm-centres.

### Two Remarkable Cases.

Investigations made not long ago by the Radio Research Board showed that many of the atmospheric effects heard in this country come either from mid-Atlantic or from Northern Africa. It was proved, too, that a lightning flash might give rise to a crackle at a range of hundreds of miles. From my own observations it appears that by no means every flash of lightning does cause atmospheric effects, or perhaps I should say that it may fail to give rise to them even at short range. Here are two rather queer examples, both of which occurred within the last few weeks.

In the first case vivid lightning flashes could be seen to the north of my locality, and I learned on the following day that there had been a big storm over a town less than ten miles away as the crow flies. My most sensitive receiving set was in action whilst the storm was going on, and there was hardly a sign of an atmospheric effect.

The second case is, if anything, more remarkable. A sharp but very local thunderstorm occurred over a place six miles to the south-west. Again there was almost no atmospheric interference, though lightning flashes were nearly continuous. Is it possible that atmospheric effects, like short-wave wireless transmissions, have a skip area? In other words, is there a region some miles from the centre of a thunderstorm in which they are not heard?

### The Lucerne Plan.

By this time readers will have had an opportunity of digesting the Lucerne Wavelength Plan, which is full of interesting points. Have you observed, to begin with, how very small are the frequency separations on the long-wave band? The widest are only 9 kilocycles, and there are very few of these. The great majority of long-wave stations will be separated from their neighbours by only 7 or 8 kilocycles. One of the most difficult stations to receive will probably be Radio-Paris, which will have a Roumanian station 7 kilocycles away on the one side and the giant 500-kilowatt Moscow 8 kilocycles on the other.

A good many old friends will probably become difficult, if not impossible, to tune

in without interference when the Plan comes into operation on January 15th next. On the other hand, there are more than fifty stations with exclusive wavelengths, and these should provide very ample scope for the long-distance man.

### Good Long-Distance Reception.

The summer of 1933 will certainly go down to wireless history as marking the beginning of a new era in the reception of distant broadcasting stations. Old ideas proverbially die hard, but there is now no reason whatever why wireless should be regarded as mainly a winter pastime. At the time of writing lighting-up time is not until after ten o'clock, and it is not really dark before most of us go to bed. Yet the choice of foreign stations remains a wide one. Looking at the pages of my log for May, June

and 15 kilowatts for some little time. If you have not logged this station you should certainly take the first opportunity of doing so. The settings are immediately below those required for Langenberg, and you will have no difficulty in finding it. The new Vienna station has still not managed to settle down quite happily. It is received on one or two nights in most weeks at very great strength, but on others it is usually rather poor.

### How They Come In.

These variations may, of course, be due to the seasonal falling off which has affected stations at the top of the medium wave-band more than any others, but I believe that they are caused largely by actual increases and decreases in the power output from night to night. Other stations whose performances suggest that experiments are being made with their transmitters are Belgrade and Brno. Belgrade's best performances do not always coincide with evenings when the all-round strength of stations is at its greatest, but seem to occur at intervals of a few days. The difference between the volume obtainable from Belgrade on some nights and its normal level is so remarkable that changes in natural conditions do not supply a satisfactory explanation.

## IN THE STUDIO AT COPENHAGEN



Although you would probably be lucky to receive a low-powered station such as Copenhagen (which works on 75 kw.) during the summer evenings, there are many other stations that will come in well, for the winter months by no means have a monopoly for long-distance listening.

and the early days of July, I see that the worst (!) bag of stations recorded at good loudspeaker strength is twenty-six, the best thirty-nine, and that the average is rather over thirty. This is not counting home stations or Athlone, though these would add a further nine or ten to the total of any evening.

With such an array of genuine alternative programmes at the height of summer, no one can say that wireless is not nowadays a real all-the-year-round hobby.

### Well Worth Logging.

In my last notes I said that Lyons Doua must certainly be using at least ten times the power of 1.5 kilowatts shown against its name in the official lists. This turns out to have been a remarkably good guess, for I learn now that Lyons Doua has been using

Brno's record is an extraordinary one: either you hear this station at full loudspeaker strength or you don't hear it at all.

On the long-wave stations Huizen, Radio-Paris, Zeesen, the Eiffel Tower, Warsaw and Luxembourg can be well received at any time when they are working. Motala is not so consistent, though generally good.

On the medium band Budapest is generally faint and Munich is not too good.

Paris Ecole Supérieure is now free from heterodyne troubles. This station is well worth the attention of those who have not previously logged it. Rome is first rate, though Stockholm is less reliable than it was last month. Madrid Union Radio and Berlin Witzleben are both to be heard occasionally. Katowice continues to be a good station, but Söttens is apt to be a little over-powered by the Midland Regional.







## THIS YEAR'S "ECONOMY" FOUR

(Continued from previous page.)

This term is really a relic of the days when various reflex and specialised experimental arrangements were in vogue, and was used mainly to describe the conventional straightforward circuit as opposed to the more experimental and less reliable type.

to "deliver the goods," month in and month out with an unflinching consistency. The basis of this reliability is accounted for partly by the solid simplicity of the design and partly by the careful decoupling and by-passing throughout in order to ensure stability under all conditions.

### THE CORRECT VALVES TO USE

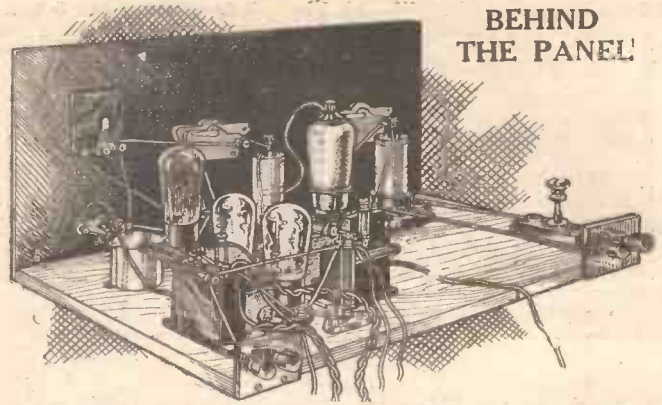
Make	S.G.	Detector	L.F.	Power
Mullard	P.M.12A	P.M.1.H.L.	P.M.2D.X.	P.M.202
Cossor	220S.G.	210H.F.	210L.F.	220P.
Mazda	S.G.215	H.L.2	L.2	P.220A.
Marconi	S.22	H.L.2	L.210	P.2
Osram	S.22	H.L.2	L.210	P.2
Eta	B.Y.6	B.Y.2020	B.Y.1210	B.X.604
Hivac	S.210	H.210	L.210	P.P.220

These days the word "straight" is universally applied to those circuits which follow accepted and well-tried principles, and which can therefore be built with the certainty of eminently satisfactory results.

Using, as it does, a time-tested circuit, the "Economy" Four can be relied upon

are the detector and first L.F. stages.

By adopting this procedure any fear of "motor-boating" or instability due to back-coupling in the anode circuits is eliminated, and the receiver is therefore suitable for use with either H.T. batteries or mains units.



BEHIND THE PANEL!

This sketch shows the completed receiver with the valves in position. The flexible lead going to the anode of the S.G. valve is joined to terminal No. 4 on the tuned-anode coil.

For example, the screening grid and anode of the S.G. valve are each provided with a decoupling resistance and capacity. So also

Both the aerial and H.F. tuned circuits are of the wavechange type, having separately controlled wavechange switches and tuning condensers.

#### Faultless Reproduction.

A .0003-mfd. pre-set condenser is joined in series with the aerial so as to give the necessary selectivity adjustments to suit different localities, and the reaction control incorporates the well-known differential principle, one of the advantages of which is the negligible effect of reaction variations upon the tuning control settings.

One of the outstanding features of the "Economy" Four is its exceptionally fine reproduction. The total amplification on the low-frequency side is not quite so high as it would be if a transformer occupied the position of, say, the second resistance-coupled stage; but from the quality standpoint the receiver is right in the top flight.

With two stages of resistance-capacity coupling the low, treble and high notes are all faithfully reproduced with a clarity that has to be experienced to be fully appreciated. The frequency response extends down to fifty cycles, and there are no peaks or resonances anywhere along the musical scale.

Those who prefer the additional magnification given by a transformer can substitute one for the second L.F. stage without difficulty, but in the vast majority of cases the overall amplification given by the four valves will be amply sufficient for all ordinary purposes.

#### Economical Low-Frequency Stages.

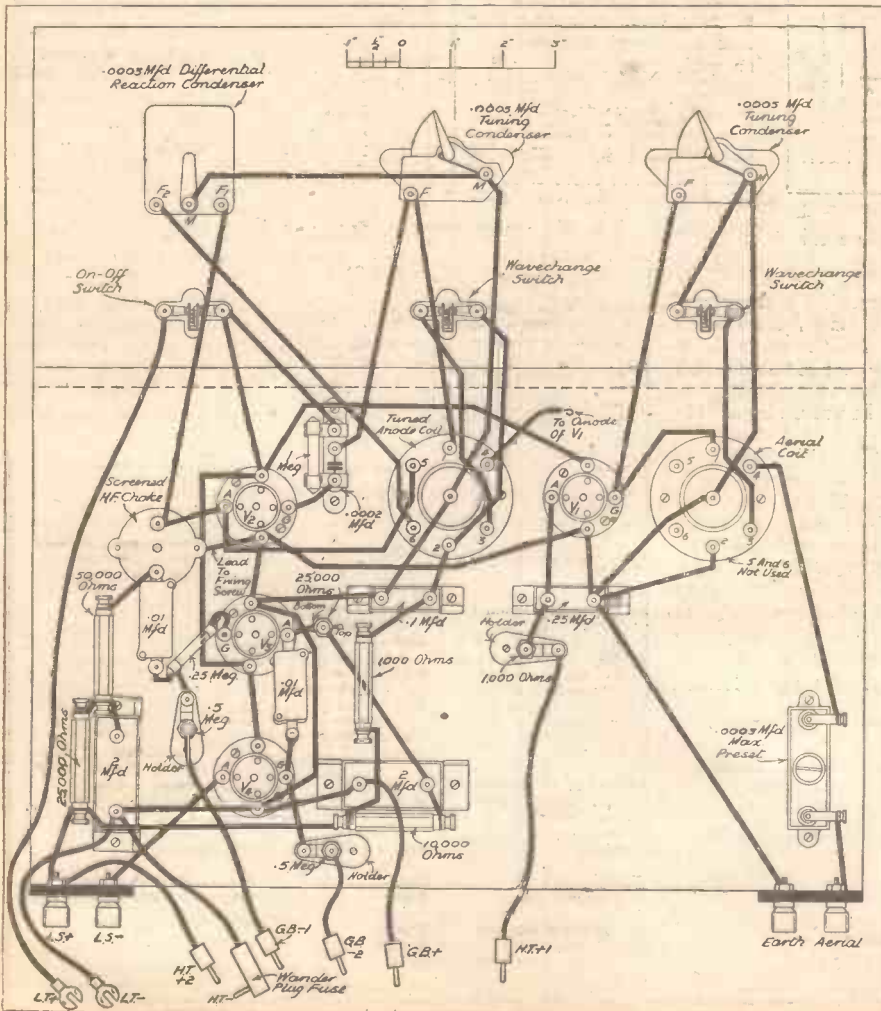
It is possible also slightly to increase the magnification by using anode resistances of higher value. For example, the 50,000-ohm resistance could be replaced by one having a value of 100,000 ohms; but there is the risk of upsetting the reaction control, particularly when the H.T. voltage is less than 120.

Certainly nothing greater than 100,000 ohms should be tried, and we only mention this point for the benefit of those who may have resistances of various values on hand.

Resistance-capacity low-frequency stages are economical in so far as their anode current consumption is concerned. The

(Continued on next page.)

### STRAIGHTFORWARD LAYOUT—EASY TO WIRE



The "Economy" Four is a particularly easy set to build and will offer no difficulty in construction if the wiring diagram is carefully followed. The valves are inserted in the following order: V<sub>1</sub> the S.G., V<sub>2</sub> Detector, V<sub>3</sub> first L.F., V<sub>4</sub> output.



## THIS YEAR'S "ECONOMY" FOUR

(Continued from previous page.)

detector and first L.F. valves of the "Economy" Four will consume only about 3 milliamps at the outside, a point worth considering with H.T. dry batteries.

An average figure for the S.G. valve is approximately 3 milliamps, whilst the consumption of the output stage will naturally depend upon the type of power valve chosen.

### Keeping H.F. in its Place.

Using a small power valve in the output stage, there is no reason why the H.T. consumption should not be kept down to within 10 milliamps for the whole set.

It will be noticed that a .25-megohm resistance is connected in series between the .01-mfd. coupling condenser and grid of the first L.F. valve. The reason for this is that, in spite of the H.F. choke in the anode circuit of the detector, there is always the possibility of a certain amount of H.F. leakage through into the L.F. stages.

If no means of stopping this was provided, the effect of any stray H.F. energy would be to cause distortion; but by inserting a resistance of the value specified this possibility is eliminated.

Turning now to the constructional side, there is nothing here that is likely to cause any anxiety in the mind of the most inexperienced constructor. The layout is particularly well spaced—a point that facilitates ease of construction—and the wiring perfectly straightforward.

Having drilled the panel and screwed this firmly to the baseboard, the various components are then mounted into position in accordance with the wiring diagram.

For wiring up, one of the proprietary connecting wires or tinned copper wire and systoflex covering should be used, and it will be observed that no soldering is needed.

### Fuse Protection Against Shorts.

Every component specified is provided with terminal to which direct connection is made simply by looping the end of the wire round the shank and tightening up.

In some instances certain of the smaller components are suspended in mid-air above the baseboard, being held by the wire connections to the terminals at the two ends.

Examples of these are the 25,000-, 50,000-, 1,000- and 10,000-ohm resistances, also the .01-mfd. condensers and .25-meg. resistance.

A very practical refinement is the use of a wander-plug fuse for the H.T.—flexible lead, and the advisability of adhering to this component cannot be too strongly stressed.

The fuse will "break" the H.T. battery circuit in the event of excessive rise in cur-

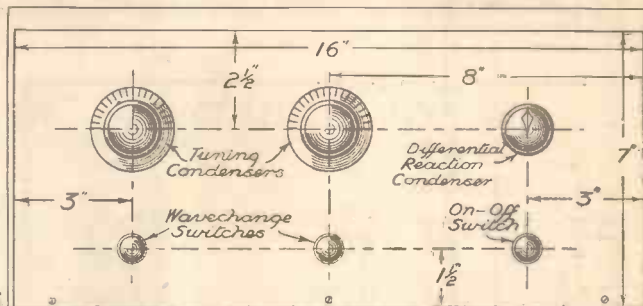
rent, and forms a valuable safeguard against damage through accidental "shorts."

The set is by no means critical as regards its voltages. Obviously the valves will be of the usual 2-volt variety, and will therefore require a 2-volt accumulator which is joined to the L.T. + and L.T. - spades on the L.T. flexible leads.

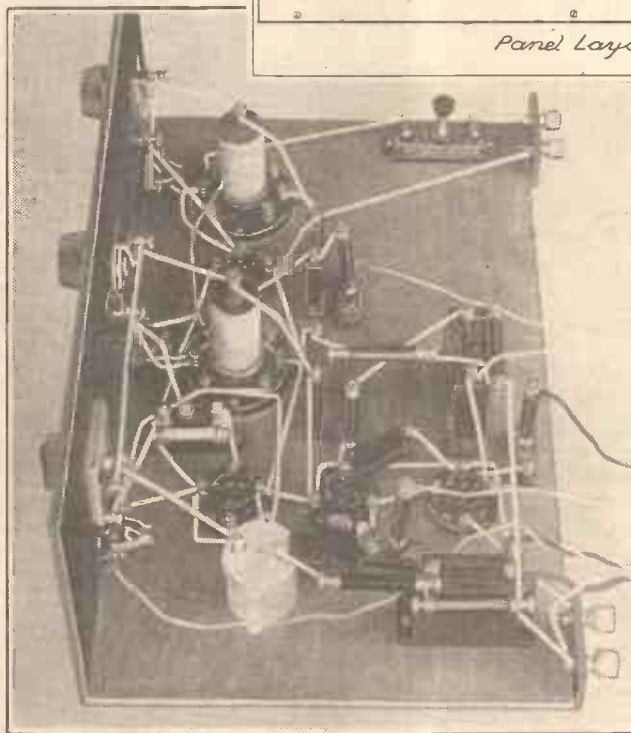
H.T. + 2 supplies the anodes of all the valves, and is plugged into the maximum voltage tapping on the H.T. battery or

### PRESENTS NO DIFFICULTIES

The panel layout is perfectly symmetrical and there are no awkward dimensions to contend with. It will be noticed in the view below that certain of the components are suspended by their wiring, a point which still further adds to the constructional simplicity.



Panel Layout



mains unit. In the case of a battery this will usually be 120 volts, and if the supply is derived from a mains unit the 120-150-volt socket is the correct one.

H.T. + 1 goes to the screening grid of the S.G. valve, and a certain amount of experimental adjustment is desirable here. Normally, about 72 volts is a satisfactory working value, but the constructor can try small variations on either side of this figure, ranging from, say, 60-80 volts or so until he finds the most suitable value.

With mains units the S.G. tapping is sometimes fixed and sometimes variable, and it therefore depends upon

(Continued on page 610.)

## THE PARTS REQUIRED TO BUILD THE "ECONOMY" FOUR

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, Becol	1 50,000-ohm resistance with terminals	Graham Farish "Ohmite"	—
1 Baseboard, 16 in. x 10 in.	—	—	2 25,000-ohm resistances with terminals	Graham Farish "Ohmite"	—
1 Cabinet to fit above	—	—	1 10,000-ohm resistance with terminals	Graham Farish "Ohmite"	—
2 .0005-mfd. solid dielectric tuning condensers	Lissen L.N.283	Telsen, Polar	1 1,000-ohm resistance with terminals	Graham Farish "Ohmite"	—
1 .0003-mfd. differential reaction condenser	Telsen W.185	Ready Radio, J.B.	2 Screened coils	Lissen L.N.5101	R.I. "Quadastatic," Wearite, Graham Farish, Varley
2 2-mfd. fixed condensers	Telsen W.226	Dubilier, T.C.C., Igranic	1 H.F. choke	Bulgin H.F.9	Lissen, Ready Radio
1 .25 mfd. fixed condenser	Telsen small type	—	3 three-point on-off switches	Bulgin S.13	Lissen, Benjamin, Telsen
1 .1-mfd. fixed condenser	Telsen small type	—	4 four-pin valve holders	W.B.	—
2 .01-mfd. fixed condensers	Dubilier 670	Telsen, T.C.C., Lissen	2 terminal strips, 2 in. x 1 1/2 in.	—	—
1 .0002-mfd. fixed condenser	T.C.C. type S.P.	—	4 terminals	Belling & Lee type "R"	Clix, Igranic
1 .0003-mfd. max. pre-set condenser	Goltone	Telsen, Eovereign	5 Wander plugs	Clix	Bulgin, Belling & Lee
2 .5-megohm resistances with vertical holders	Graham Farish "Ohmite"	—	2 Accumulator tags	Ecelex	Belling & Lee, Bulgin Clix
1 1,000-ohm resistance with vertical holder	Graham Farish "Ohmite"	—	4 yds. insulated sleeving	Goltone	—
1 1-megohm grid leak	Dubilier	Telsen, Lissen	6 yds. 18-gauge wire	Goltone	—
1 .25-megohm grid leak with wire ends	Dubilier 1 watt	Igranic, Goltone	1 Wander fuse, flex, screws, &c.	Belling & Lee	—



FROM THE TECHNICAL EDITOR'S NOTE BOOK

# TESTED AND FOUND?

## FERROCART COILS

LOOKING back over a year of intense activity in the radio world, one or two things stand out head and shoulders above all others as bright high-lights.

For instance, the introduction by Colvern in this country of Ferrocart coils. These were the precursors of an "iron age" in tuning coils.

And I fancy we have yet to see the full effect of the event. At the moment we are too close to it in time completely to appraise its historical significance. But although the lot of the pioneer is seldom a happy one, in this particular case it is certain that Colvern have enjoyed a large measure of the success they deserve.

Colvern Ferrocart coils have probably been used in greater numbers by the vast home-constructing public than any other single component during the past few months.

In this, constructors have exhibited good judgment, for these new coils are exceptionally efficient.

That they are extremely small as compared with ordinary air-cored coils is only an incidental advantage. That is, speaking in terms of smallness for the mere sake of smallness.

Technically, however, their dimensions are of vital importance, for they enable effective screening to be applied with unusually low screening losses. This advantageous effect is amplified by virtue of the negligibility of the stray field that surrounds the coil.



A Colvern Ferrocart Ganged Unit.

The iron-core of a Ferrocart coil is of a most ingenious construction, and combines the merits of lamination and pulverisation.

It is entirely protected from any variations due to mechanical injury, etc., by a cleverly-shaped casing which encloses the whole coil.

Colvern Ferrocart coils definitely are superior in performance to air-cored coils, even those of efficient construction. I say that deliberately after having tested many sets incorporating them.

They have set us a new standard in performance, and are not mere novelties, as will be obvious from the fact that we have included them in some of our most important sets.

## VARLEY "CLASS B" COMPONENTS

Varley are, of course, well in the public eye just now as sponsors of that revolutionary new permeability tuning scheme which was recently given its "send off" in POPULAR WIRELESS.

It is not surprising that it should have been that noted firm that led the way with the new method, for permeability tuning is a logical development of the important work Varley have been undertaking with special iron cores during the past five or six years.

This incidentally is reflected in a major degree in the L.F. transformers and chokes made by this firm, while in regard to the equally important subject of winding, Varley build on a similar basis of specialised experience.

A compacted practical expression of all this is to be found in the Varley "Class B" components, which are, as would be expected, very good indeed.

As I have frequently stated, the requirements of "Class B" are specific and strict, and are not observed by all the components made for it.

I do not want to make any invidious comparisons, and Varley would not thank me if I did, so suffice it

to say that this particular new development, "Class B," found many surprisingly wanting.

Therefore, it behoves the constructor to choose his parts for it with care, and to confine his choice to

those makes for which good words can be said by people in a position to apply thorough tests.



The Varley D.P.41 "Class B" Driver Transformer.

Driver transformer, which has been especially designed for use with the Mazda "Class B" valve.

We have tested it under these conditions and find it perfectly satisfactory. It is a soundly designed and well-made component.

## A BLUESPOT SPEAKER

I do not think anyone will quarrel with me when I say that it was largely Bluespot who initiated the high-class, popular-price loudspeaker movement.

The loudspeaker situation was not a particularly happy one when Bluespot made their debut. And I still remember with pleasure the new standards of performance and price which were set by their first electro-magnetic models.

But it is even more pleasing to note that this firm fully maintaining its pre-eminent position in face of the very keen competition of modern times.

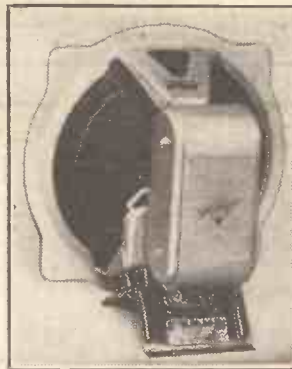
Their new 45 P.M. Permanent Magnet Moving Coil Chassis is Bluespot at their best, and that is saying a great deal.

Although the price of this is only 45/-, it is a speaker that can challenge comparison with any instrument. Its sensitivity is above the average, so that it can be used with as great a comparative effectiveness with a small set as it can with one capable of delivering a substantial output.

And the now traditional Bluespot brightness of response is maintained to the full, plus the ability to reproduce clean bass.

I was considerably impressed by the results it gave on test, for on a frequency glide from 50 to 6,000 cycles there was a most commendable evenness of response and a freedom from those peaks so often experienced.

It is a speaker which I can wholeheartedly recommend to the attention of all who desire good reproduction at a moderate cost.



This is the Bluespot 45 P.M.

## AMPLION H.F. CHOKE

The name "Amplion" has hitherto been associated mainly with high-class loudspeakers, but now it would appear that Messrs. Amplion (1932) Ltd., are to give it a wider significance, for they are entering the component market.

They have recently produced a High Frequency Choke, a sample of which they send me for testing purposes.

It is of binocular construction and is built into an excellent bakelite moulding.



The Amplion H.F. Choke.

Good features in the design are that the terminal screws are slotted so that they can be tightened with a screw-driver as well as with pliers, and the body of each terminal is solidly buried in the component's base so that looseness and turning cannot develop.

The choke adequately covers both medium and long waves, and is fully effective from below 200 metres to over 2,000 metres.

The retail price is 4/6, which seems to me to be very reasonable.

## THE LISTENER'S NOTEBOOK

Frank comments on recent programmes, and on microphone personalities of the moment.

THERE has been a disappointment of late about the programmes that I can only liken to that I feel when, settling down to a good book I discover I have already read it. The disappointment in the latter case can, of course, be lessened by getting another book. A little inconvenient, perhaps, but still, it can be done.

In the case of broadcasting, however, with its inevitable you-can-have-it-or-leave-it attitude, it is different.

Recently, for instance, it was "R.U.R.," broadcast for the third time. Before that it was "Flags on the Matterhorn." Both good plays, "R.U.R." exceptionally so.

The last-named play also had the advantage of a particularly brilliant cast, all of whom seemed to the microphone born. Gabriel Toyne wasn't too steady, however, being too inclined to fall over himself in his endeavour to speed things up. "No Teleglams"! "Glorius"! Was the sort of thing he did. But he can be excused this in view of his otherwise perfect rendering of his part.

The chief attraction of "R.U.R." is the story itself. I remember how this gripped me in the earlier broadcast. But the recent broadcast hadn't this valuable feature, for a story once told must henceforth lose some of its appeal.

Radio drama, with its inevitable limitations, can't afford any such handicap. It is true that three years have elapsed since the last production. But a striking play like this isn't easily forgotten, and three years isn't a long enough interval.

I thought there was no justification whatever for broadcasting "Flags on the Matterhorn" again, after only a year's interval. The story must still be fresh in everyone's mind. The practice during these interim weeks of reviving plays may be misinterpreted as indifference on the B.B.C.'s part.

True, there aren't nearly as many listeners tuning-in on an evening, at present, but this is no reason for lowering the standard or reducing the variety of the weekly fare!

I usually judge a week's programmes by the number of extraordinary items included. The bulk of all transmissions must necessarily be the same each week, for the simple reason that light music is always light music, just as cinema organs and brass bands are always cinema organs and brass bands.

Whereas these cannot make a week, a good play, or a unique talk, a running commentary even, can

(Continued on page 610.)





The well-known Director of the B.B.C. Dance Orchestra suggests that music must be regarded as one of the blessings of life.

EVERY day scores of large packets addressed to me are delivered at Broadcasting House. They are songs written by Britain's "hopefuls."

Not one of the people who send along their musical compositions think but that one day he or she will be famous. With almost all the scrolls are letters.

Some of them tell a long and involved life story; others are brief and to the point. One I had given to me the other day ran, "If you like it, play it."

It is not a pleasant job, this sifting of material. Frankly, much of it may be vulgarly termed "tripe," but who knows that there is not the hit of the season somewhere in that forbidding-looking pile. And so I look at them all.

**Illustrating the Power of Music.**

All of them, whether futile or otherwise, have been laboriously composed. What a world of hopes and ambitions can you put into a single line of music! It would be nothing less than a crime to condemn to the wastepaper basket something which its creator had hoped would win him fame.

I have told you of my postbag to show you something of the power of music. In a world which is believed to be supremely practical and material this, I think, is all for the best.

Whether it be the power of dance or classical music or whether it be some military air or patriotic song is beside the point. Sufficient that it wields great influence in our lives.

I believe that it is not so much the art of the composer or musician which touches us so deeply but the association of certain tunes.

**Reviving Memories.**

It may be a humorous or even a tragic association. For instance, I remember when I was a youth of eighteen seeing a show in which W. H. Berry sang "I want to Go to Bye-Byes; Will Someone Put Me to Bed?"

After the show I had a really splendid "beano"—the first one I had ever had. I ate and drank just what I liked. I lived for the hour. And throughout that glorious night one tune raced through and through my brain—that titillating ditty of Berry's, "I Want To Go to Bye-Byes."

The other day I heard it played on a wheezing organ. At once a flood of old memories engulfed me. I was back in that hectic fling of youth. I relived the scene through the amazing elixir of that tune.

When it was over the past vanished and I was thinking in terms of "Round the Marble Arch" and "The Sun Has Got Its Hat On"; but that old song will always

be dear to me. Its association is unforgettable.

On another occasion, again when I was very young—lest you think of me as grey-bearded veteran, I am thirty-two now—I took my first girl out. Again a tune stuck in my memory. Whenever it is played today the old scene is re-enacted.

Yet I could not even tell you the girl's name. Such is the power of music!

I do not think it is because I am particularly susceptible to it, either. I know men and women who could not tell a sharp from a flat who at the first bar of certain tunes have leaned back with ecstasy in their eyes and said, "I remember one June night—"

**MUSIC AND SONG**



Henry Hall in conversation with Irving Berlin during a visit by the famous American composer of syncopated songs to Broadcasting House.

After all, when you hear the famous "Wedding Marches" you think of your own marriage, or if you are single, then your memory is filled with some colourful picture of a friend's wedding. That is the secret of music's potency.

It creates vivid pictures in the mind. It draws on the rich storehouse of the past and brings old incidents forth fresh and fragrant.

Whenever a band strikes up the rousing songs, "It's a Long Way to Tipperary" and "Pack Up Your Troubles," one's mind is carried back to the war years. Through thousands of listening minds march khaki-clad hosts.

There is a tangled picture of feverish Paris, war-scarred Belgium, and then,

perhaps, some tragic incident in the trenches. For the association of music is not always happy. The "hottest" jazz number of some three years ago may arouse particularly unpleasant memories in certain minds. It depends purely on the environment in which one hears the songs.

The part music plays in our lives is greater than we realise. We may be under its spell without being aware of it superficially. We may have been driven into a bad temper by it, too. For music can work both ways. My first few months in front of the microphone have taught me that.

**Disparity of Public Taste.**

The hundreds of letters which are sent to me each week show the influence of music. Ten people write, "I had to switch off last night. Your new number spoiled my supper and ruined my night's sleep. Scrap it."

Perhaps with the same post come a hundred letters, saying, "this time, Mr. Hall, you have certainly made a real hit. What an amazing number! So sweet, so irresistible, so—"

Of course, the disparity of public taste does not confine itself to wireless programmes. I have been to the theatre and thought a certain well-known comedian absolutely superb, yet in the foyer on my way out I have heard people whispering to each other, "Poor fellow! He's completely played out. I am so sorry."

The scope of wireless, however, is so vast that naturally the criticism—and the praise—is much greater. In ten days a tune can be sent to every corner of the globe. People can be humming it thousands of miles away.

**A Letter from Alaska.**

Explorers bound to the Poles whistle it; hunters in darkest Africa sing it. The miracle of radio has made the world small. Indeed I would not be surprised if a letter arrived from an Alaskan trapper telling me that a certain song I had played had put him off his catch!

There is scarcely a person in the world whose heart strings are not touched by music. We may have our own particular likes and dislikes, but as a whole we regard music as one of the blessings in life.

**RADIO ITEMS FROM ABROAD**

**NAZARETH.**—Amongst the possible sites for relay stations to augment the projected Palestine service from Jerusalem is the birth-place of Christ.

**SLOVAKIA.**—This is the name for the new Czechoslovakian station which is to have a daylight power of 30 kws. The power will be reduced to 15 kws. after dark.

**CAIRO.**—Twenty kws. is the power allotted to the projected broadcasting station at Cairo.

**MEXICO CITY.**—Almost coincident with the Lucerne Conference on wavelengths, the North American Radio Conference was held in Mexico City during July.

It was attended by Canada, U.S.A., Mexico and Cuba.

**OSLO.**—Norway has promised to do all that is possible to reduce the field-strength from Oslo in a south-easterly direction.



# MAINS UNIT DISTORTION



**C**AN a mains unit cause distortion? A strange question, perhaps, to those who have never actually encountered the phenomenon, but a perfectly reasonable one, all the same.

Suppose that the set and unit are not sufficiently "decoupled" and there is therefore a strong tendency to "motor-boating." There is a point just short of actual howling or popping at which quite severe distortion will occur, often in the form of a sort of intermittent fluttering on loud passages which sounds as though it might easily develop into a definite "motor-boat."

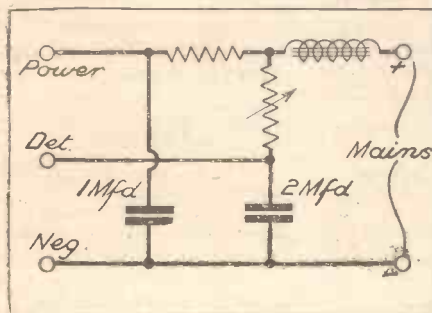
## An Obscure Case.

That is a pretty obscure case, but there is another of a far more obscure kind which I want to tell you about in this article. It seems to occur not infrequently with some of the cheaper mains H.T. units, so perhaps an explanation of its nature and some practical hints on its cure may be of interest.

An example will probably be the easiest way of showing you the kind of trouble I have in mind. This is how it sometimes arises: you have a set which is working well on H.T. batteries, but you decide that you would like to run it from the mains so as to get more volts on your power valve and thereby enable it to give a bigger output without overloading.

You buy a mains unit and at first all seems well. The set works excellently,

## A SIMPLE ARRANGEMENT



The unit employing this circuit was greatly improved by a 4-mfd. condenser across H.T.— and H.T.+ Power.

there is very little hum, no sign of "motor-boating," and of course you are getting the undeniable benefit of constant, unvarying results

After a while, however, you begin to realize that in spite of the higher voltage your power valve seems to overload just as easily as ever. In bad cases you may even find that it overloads more easily than it did on batteries, and you are worse off than before.

This may be pretty puzzling the first time you encounter it, but there is a perfectly simple explanation. In a nutshell, it is just that the maker of the mains

spurts required by these positive alternations cannot do this, and must be supplied from the charge stored up in the reservoir condenser.

The volume of this charge depends upon the voltage across the condenser and upon the capacity, and if it is not large enough to supply the needful spurts without a serious momentary drop of voltage, distortion must occur. Hence, you see, if overloading seems to set in too early it may well be due simply to the fact that the power tapping reservoir condenser is of too small a capacity.

## Practical Example.

As an example, look at the diagram reproduced on this page. It is the circuit which I actually traced out when investigating the "inwards" of a small D.C. mains unit which produced just the symptoms I have described. On moderate signals it gave quite normal results, but as soon as one turned up the wick a bit distortion was severe and volume was poor. It really seemed almost as though some choking effect were taking place.

The cure was simple: a spare 4-mfd. condenser was connected between H.T. negative and the "power" tapping (outside the unit, for lack of room inside), so as to provide an adequate stored charge for working the output valve, and all was well.

The moral is obvious. If you have an unsuitable type of mains H.T. unit and you feel that your output valve is not entirely happy, just try the effect of a few additional microfarads connected between its feed point on the unit (or set) and H.T. negative. In many cases this will provide a definite improvement.

It is possible for a change from battery to mains unit H.T. to produce distortion. Why this is, and how it may be avoided are explained  
By GEOFFREY ELTRINGHAM.

unit has been too stingy with the microfarads.

He has provided just the bare minimum needed to get hum down to the desired level, but not enough to act as a reservoir to supply the large pulses of current drawn by the power valve when dealing with very strong signals.

You see, the condenser across the "power" tapping on a mains unit has a

## TYPICAL OF AMERICAN LAYOUT



There is generally something about the appearance of American broadcast transmitters which gives away their nationality. This is well exemplified by our photograph of the 50 kilowatt transmitter of WCAU, Newton Square, Pa.

double duty to perform. In the first place it plays a part in smoothing the output of the unit, but it must also supply the pulses or jets of current required by the valve when it is reproducing the positive alternations of the signals.

The steady anode current of the valve can make its way through the chokes and resistances in the unit, but the intermittent

You will note, by the way, that I am stressing the fact that I am referring here to *commercial* types of units. You need have no fear of these troubles with a unit made to a "P.W." design, because your designers seem to understand the matter too well to adopt the "penny-wise pound foolish" policy of so many of the commercial people.



# The B.B.C.'s Short-Waver



ONE big occasion when the B.B.C. can't wire up its Outside Broadcast microphones with the Station Control Room is, of course, the Boat Race. There are other events, too, when it is not easy to get

wavelength (determined by the master oscillator) and the other tunes the aerial circuit.

### How Interference is Avoided.

"If while the radio-link is being used, we get reports of serious interference," explained the official, "it is a quick matter to change the wavelength. But we have never had to do it yet, thanks to the sensible attitude adopted by amateurs who might otherwise screech round with oscillating sets, till they picked up our short wavelength."

He then showed me the dual condenser microphones, packed in wool in a shielding case. Only one microphone is used at a time, the other being kept as a spare. The microphone box is connected up by a shielded cable with the L.F. amplifier in the aluminium case of the transformer.

I asked about the battery supply and was told that 12-volt car batteries drive the 100-volt generators, which give the H.T. for the transmitting valves, and similar batteries supply the 6-volt 5-

is carried, and can be rigged up in any convenient place. A spike from a direct earth is also carried, and a water earth is made when the radio-link gear is carried on a boat. The metal rudder of the launch "Magician" is used.

### Four-Valve Receivers.

I remembered that the last short-wave receiver I had seen at the B.B.C. Research Section was a single-valve Reinartz job, coupled up to a standard type of R.C. amplifier.

"We have scrapped those old receivers," said the official, "and our new short-wavers are four-valvers, with a screen-grid stage, leaky-grid detector, and L.F. and power stages. This is wired up to an ordinary land-

line amplifier connected to the Post Office telephone lines. A condenser and line transformer arrangement is put between the amplifier and the lines."

### Keeping Volume Constant.

For the benefit of short-wave enthusiasts, I asked for some technical details of the new receivers, and was told that a variable- $\mu$  valve is in the S.G. stage, so that they can control the volume easily, and that it is choke coupled to the detector. This leaky-grid detector, in a Reinartz circuit, is R.C. coupled to the first L.F. valve, which is in turn transformer-coupled to the power valve. The distance between the transmitter and the receiver of the radio link is usually not more than a mile or so, and the problem, if the distance varies, is to keep the volume constant.

Nothing is altered at the microphone end, but at the receiver the control engineer, listening on 'phones, adjusts the volume.

I asked how the commentators could know whether or not their broadcast was going over well, and I was shown a little "side-tone" set which, standing at the side of the case of the transmitter, picks up the field strength and gives reception on 'phones, so that the engineers or commentators can hear what is going over.

You may have wondered how some of the O.B.s are linked with the Control Room when telephone lines are not available. On this page you will find described the short-wave transmitter used by the B.B.C. engineers for this purpose.

By A. ASHTON STEWART.

suitable telephone wires between the control point and the places where they want to have "mikes."

B.B.C. experts, heartened by the fact that the N.B.C. of America has built suit-case transmitters for their O.B. commentators, decided to scrap the old-fashioned radio-link gear and to build a new short-wave outfit of their own which would connect up the microphones almost anywhere with a convenient Post Office "pothead" (telephone-line junction, underground) and thence to the control room.

An official showed me the new radio-link gear, and I feel sure that a description of it will interest you, as it is so typical of the best amateur short-wave practice. It has been built and designed by the Research Department of the B.B.C.

Here are some surprising facts about it. Condenser "mikes" are used, in spite of the rumour that only Reisz microphones are suitable for outdoor work. The new gear takes up a sixth of the space of the old outfit. It works entirely from batteries. The whole transmitter weighs only just over one hundredweight.

### Few Control Knobs.

The official introduced me to a copper and aluminium case bristling with meters, but with only two or three control knobs on the front.

"That's our new short-wave radio-link," said the official. "We can take it anywhere and work it on a small 10-feet high aerial. The car type batteries driving rotary generators for its 'juice' can be carried with it. It is a Daventry 5 X X in miniature. Look!"

He opened the case and showed me on the right the master oscillator and H.F. amplifier, and on the left the resistance-coupled L.F. amplifiers and the final modulator valve. He explained that it is called a 5 X X in miniature because the system of modulation is the same as that of Daventry.

"It looks simple," I commented, noting that there were only two knobs as main controls.

He explained that one knob controls the

## A MINIATURE BROADCASTER



The whole transmitter weighs only a little over a hundredweight, so it can be taken practically anywhere. Above it is shown in use on the "Magician," from which the running commentaries of the Boat Race and similar events are transmitted.

amperes for the filaments of these valves. All the L.F. and microphone amplifier valves take their current from these batteries, too.

A short-wave aerial about 40 feet long



# 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

### TWO TUNING POINTS NOTICED ON A BAND-PASS SET.

G. M. (Banbury, Oxon).—"Take back all I ever said against band-passing. It's the goods."

"I am charmed with the sweetness and easiness of the tuning, but there is one thing I have noticed which I think could be improved upon."

"It is this. When I tune in very carefully I find that the maximum value is obtained from a station in two slightly different tuning positions."

"These two points are very close to one another, so there is no real drawback in them, except that it does not seem to be quite as it should to have two dial readings for the one station."

"If there is an easy way of improving this I should like to try it; but I do not want to go to any extensive alterations, because really I am too satisfied with the results I am now getting."

"As I write, Brussels No. 1 station is coming in at tremendous power. Better than I ever heard it before. But a close investigation shows that this result is obtained either a fraction below the 91 degree mark or else at a fraction above it. On the dead 91 position the station is there, but not so powerful."

What you describe is known as "double-hump" tuning and occurs at the top of the dial sometimes, and at other times at the lower dial readings. It is due to the fact that the coupling between the two circuits of a band-pass tuner is not constant over the whole of the wave-range which the tuner covers. When the coupling is too "tight" you get two-position tuning. Careful trimming often assists matters, but in your case we think that the trouble is too slight to call for re-trimming.

### FITTING A LOUDSPEAKER FILTER CIRCUIT TO THE "AIRSPRITE."

L. W. B. (Whitley Bay, Northumberland).—"As I want to run a loudspeaker point in the bedroom, as well as one in the front of the house, I am going to use an 'output filter' circuit, which I am given to understand is the recognised best way when more than one loudspeaker is to be worked."

"In the 'Airsprite' blue print the anode of V3 valve holder is connected to L.S.—, and the L.S. + goes to the H.T. + terminal. Please say how these leads should be altered for the filter."

"Also, do I leave the No. 17 lead in place (from H.T. + 3 to H.F. choke)? And where should the filter components stand, there being apparently no room to spare on the baseboard?"

"The output choke I have is marked 20 H. Is that O.K.?"

Yes, the 20-henry choke is quite suitable, and in addition you will need an ordinary 2-mfd. fixed condenser.

Mount these two close to the set's L.S. terminals, the most convenient spot generally being on the inside of the cabinet. (If flex wires are used for the connections to them it is a very easy matter to undo these connections when it is required to remove the set from its cabinet for overhaul or other reason.)

If the receiver has been completed exactly as per the blue print, it is a very easy matter to alter it, the amendments being as described below:

The lead from the plate terminal of the V3 valve holder should be removed.

Also that from the H.T. + 3 terminal to the L.S. + terminal. Then connect one terminal of the output choke and one terminal of the 2-mfd. fixed condenser together, and to the plate terminal of the V3 valve holder.

Connect the remaining terminal of the output choke to the H.T. + 3 terminal.

The remaining terminal of the 2-mfd. fixed condenser is connected to the set's L.S. — terminal.

## 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 station is now experimentally sharing the London National wavelength, 261.6 metres?
- (2) What will be Athlone's new wavelength under the Lucerne Plan?
- (3) When will the Lucerne Plan wavelengths come into operation?
- (4) What is the best way of making sure that a set is not taking H.T. current owing to a broken-down condenser, or similar leak?

Finally, the set's L.S. + terminal is joined to the negative filament terminal of the V3 valve holder (the one to which the G.B. + lead is already connected), and this completes the alterations.

The long leads to the various speakers can now be connected to the set's L.S. terminals, the + and — markings on which will now have no significance, as all the direct current from H.T. battery to the power valve will be diverted from the loudspeakers and will flow through the new choke instead.

You will note from the above that the No. 17 lead is left alone.

### HOW TO WIRE A UNIT FOR H.T. FROM THE MAINS.

R. A. S. (Birmingham).—"I have been asked to look over a D.C. mains unit of the type with one variable and one fixed H.T. voltage, the former being a slider on a 20,000-ohm potential divider."

"The unit was made up from a 'P.W.' circuit, and in addition to the H.T. — terminal there is a 2-mfd. condenser (beside it). There is another 2-mfd. condenser and a 4-mfd. condenser, and also a smoothing choke and 10,000-ohm resistance variable."

"Could you tell me how these are connected together, and to the plug for the mains?"

The usual connections for a simple unit of this type are as follows: Earth terminal to one side of the 2-mfd. condenser. The remaining side of this condenser goes to H.T. —, to one end of the potential divider, to the 4-mfd. condenser, to the other 2-mfd. condenser, and to the negative lead of the plug for mains. The positive lead of the mains plug goes to one side of the variable resistance, the other side of which goes to the 2-mfd. condenser which is not connected to the earth terminal and to a smoothing choke.

The other side of the smoothing choke goes to the remaining terminal on the 4-mfd. condenser, to the end of the potential divider and to the maximum H.T. terminal (H.T.+2). Finally, the slider on the potential divider is taken to the H.T.+1 terminal and this completes the connections.

### CHARGING L.T. AT HOME.

R. S. A. (West Wickham, Kent).—"The liquid in my accumulator is about a quarter of an inch below the line marked on the case. I always charge at home, and the accumulator is never moved, and could not have been spilled, so it must be evaporation. Is it doing any harm?"

Yes. Partly because of the warm weather, and possibly partly due to gassing on charging, etc., some of the liquid is bound to get lost. It should be replenished before the level falls below the tops of the plates.

In other words, the plates must always be completely covered with liquid. When a listener does his own charging, it is always advisable to use a hydrometer. Had you been doing this you would have appreciated the fact that the cells needed refilling because it would have been difficult to draw off the acid when the level fell.

Unless the gassing has been excessive, probably you only need to replace the loss of liquid by distilled water. You can get this at any chemist's for a few pence, and the level of each cell can be brought up to the indicating mark with the distilled water if voltage appears to be O.K. After "topping up" with the distilled water give the cell a good long charge.

Keep constant watch with voltmeter and hydrometer if you want to get good service. Observe the maker's instructions carefully, avoid high temperatures, see that the plugs and connectors are tight and that the vent holes are open.

If either voltage, or specific gravity as indicated by the hydrometer, is low, and is not restored by a rather longer-than-usual charge, it is worth getting an expert at a service station to look at your accumulator for you.

### COUPLING RESISTANCES IN PARALLEL.

D. E. S. (Wolverhampton).—"My set is a three-valve—Detector, resistance coupled to 1st L.F., which is transformer coupled (3 to 1) to power valve. Results quite satisfactory, though my friends who run three-valvers near me said it was not as loud as it ought to be."

"It is a bit of an 'old-timer,' having been built in 1928, and the anode resistance (mounted in a strong clip, as there were no such things as spaghetti's then) was marked 150,000 ohms. I also had a second of these same wire-wound resistances marked 150,000, left over from a prehistoric set."

"And I changed over the spare with the other anode resistance to see if it would make any difference."

(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.)

"There was none to speak of, but when putting it back to try once again, I held one resistance with its metal ends touching the metal on the other one—quite by accident. But up came the volume.

"It was decidedly better that way, so, as I could not see any harm in it, I tied the two firmly together (string!), and then poked one into place in the holder with the other making firm contact at both ends. Results were good.

"What I do not understand is why two resistances should give better results than one in the anode circuit? And have I made the coupling to the next valve stronger by passing more current than before?

"Or what?"

The effect of connecting one resistance "across" or in parallel with another resistance of equal value, is to reduce the total effective resistance by one-half.

Thus you now have, in effect, a 75,000-ohm anode resistance, instead of 150,000 ohms.

Normally, this reduction of the value of the coupling resistance of an R.C. stage would tend to reduce the coupling by an appreciable amount. But your results are stronger, so evidently there is another factor at work.

In all probability there is something unusual about your detector valve stage, as it appears to be unusually critical of the amount of H.T. applied to the detector. You were probably "starving" the plate of current by the use of a 150,000-ohm resistance, and this was causing the valve to work at low efficiency, even with a high-value coupling resistance.

When the lower anode resistance permitted more H.T. to reach the plate of the detector, the overall results (despite the lower value of coupling resistance) were noticeably improved.

It may easily happen with a valve that is rather critical of its H.T. voltage.

### "P.W." PANELS No. 129. LILLE, FRANCE.

"Ici Radio P.T.T. Lille" is the usual announcement from this station, which is situated about 150 miles from London.

The power rating is only 1.3 kilowatts; but Lille can frequently be heard clearly in daylight, in this country, on sets employing H.F. stages.

Lille's wavelength is 265.4 metres, which brings it about two degrees above the London National dial reading.

### TO STOP "MOTOR-BOATING."

A. J. L. (Redhill, Surrey).—"When moving to a new house here, I parted with most of my old 'P.W.s' and now I want some information which you gave back in the spring, and which proved very successful with a friend's set.

"It was to cure motor-boating, and you gave the details for fitting a resistance and a large condenser. But I can't remember which valve's circuit was concerned or how the wiring was altered.

"Please repeat the details, and also the

## THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 603 ARE GIVEN BELOW.

- (1) The new West National, which is situated at Washford Cross, Somerset, and will soon be working a full and regular programme.
- (2) Athlone has been allotted the 531-metre wavelength, which it will share with Palermo, and possibly other Italian stations as well.
- (3) January 15th, 1934, is the date when the Lucerne Plan will become operative.
- (4) Insert a sensitive milliammeter in the H.T. negative lead, and make sure that its reading drops to zero when the L.T. switch is "off."

DID YOU KNOW THEM ALL?

necessary number of ohms and mfd. for the condenser."

The "anti-motor-boating" device is usually best inserted in series in the H.T. lead of the detector valve. The procedure is as follows:

The lead which goes from the detector valve H.T.+ terminal on the set to the primary of the L.F. transformer should be broken.

A resistance of 20,000 to 40,000 ohms is now inserted between this H.T.+ terminal and the L.F. transformer primary terminal.

A lead is taken from the side of the resistance which is joined to the primary terminal to a 4-mfd. condenser. The other side of the condenser is connected to H.T.—.

This scheme can be employed externally to the set by those who do not wish to interfere with the wiring of the receiver.

In this case, the resistance would be inserted between the H.T.+ lead from the H.T. supply, and the detector's H.T.+ terminal on the baseboard terminal strip. The condenser would then be connected to the H.T.+ terminal on the strip and the H.T.—.

In the case of receivers incorporating two L.F. stages, the inclusion of another resistance and condenser connected in the H.T. feed to the first L.F. valve in the same manner as described for the detector is often beneficial. In this case, the resistance should be 10,000 to 20,000 ohms, and the condenser 2 mfd.

### BRESLAU'S CLOSING TUNES.

T. L. (Kessingland, Suffolk).—"The Breslau station, on 325 metres (just below the Poste Parisien wavelength), is very clear and good here, so I often get him on as an alternative, the high power permitting daylight as well as after-dark reception.

"I have become interested in his signing-off tunes, one of which is a hymn-tune which I am told is the German national anthem. Is that so?"

Yes. The tune in question is a hymn-tune, called "Austria" in this country. But it is the National Anthem (the famous "Deutschland Uber Alles") in Germany.

Breslau also sometimes closes with other martial-sounding airs, such as the Nazi hymn.

## CHANGES AT THE B.B.C.

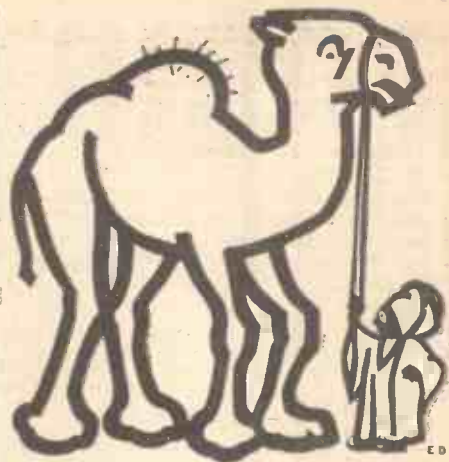
(Continued from page 591.)

clergymen, soldiers and sailors appointed one after the other to direct their entertainment!

There is more than enough of the disciplinary element in the Corporation. With a soldier in the second and a sailor in the third rank it only remains for the B.B.C. to discover a good air officer and create a job for him to give complete assurance to listeners that the programmes will be all that they could wish!

It is quite certain that, before he takes up his work in September, Colonel Dawnay will have given the closest study to the various aspects of his tremendous task. He will almost certainly see the chief officials of the Corporation, not only to make their personal acquaintance, but to discuss with them their own work.

He will find an absolutely first-rate set of men and women, who will loyally help him in his task; but I would venture to suggest that it will be well if he can keep constantly in mind that any one of them could have brought to the new post, to which some at least had a reasonable claim, a larger experience and greater knowledge than himself. And he will be wise if he acts on the sound principle that a good workman is best left to his job.



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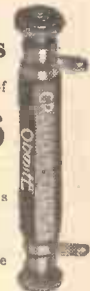
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Ohms	Milliamps	Ohms	Milliamps
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2,000	35	30,000	6.75
3,000	29	40,000	6
Other values pro rata.		100,000	3.5

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## THIS YEAR'S "ECONOMY" FOUR

(Continued from page 603.)

the type of unit whether there is any facility for adjustment. A means of adjusting the voltage is not absolutely essential.

The two G.B. plugs, G.B.—1 and G.B.—2, should be plugged into suitable sockets in the grid-bias battery. Here we are handicapped by not knowing what type and make of valves are to be used.

Generally speaking, G.B.—1 will be about 3 volts, but G.B.—2, which maintains the grid of the power valve at its correct potential, is dependent upon the H.T. + 2 voltage and the type of valve in the V4 valve holder.

The best procedure is to follow the valve makers' instructions, and to use their recommended grid-bias voltage. This will be found either on the valve carton or on the leaflet accompanying the valve.

The wavechange switches are "pulled" for the medium waveband and pushed towards the panel for the long waveband. This also applies to the on-off switch, the knob of which is pushed to switch off and pulled to switch on.

The differential condenser rotates clockwise to increase reaction; and if it should be found that reaction is obtainable only by rotating the knob anti-clockwise, a reversal of the two leads to F1 and F2 will put matters right.

During the preliminary tests it is advisable to work with the knob of the .0003-mfd. pre-set condenser screwed down and then gradually to unscrew it to increase selectivity. When this adjustment is carried out a slight readjustment of the two tuning condensers—particularly the aerial condenser—and perhaps an increase in reaction may be necessary to bring up the volume to its original level.

## THE LINK BETWEEN

(Continued from page 596.)

For instance, if your set is a two- or three-valve, you can tell by reference to this list the appropriate Pertrix battery to use for it. The same thing applies to sets employing four, five or more valves, so that with the help of this leaflet you need not have any doubt as to whether you are buying the most suitable battery for your particular set.

If you use H.T. batteries, take my advice and obtain a copy of this leaflet. Just send the usual postcard to us, and we shall be pleased (No. 43) to do the rest.

### Change of Address.

The British Radio Exchange Corporation, which exists primarily to help home constructors, has recently moved to a new address. Henceforth, correspondence, etc., should be addressed to 18, Ganton Street, Regent Street, London, W.1.

While on the subject, it is opportune to mention the opening of a new branch at 53, Westwood Street, Upper Norwood, S.E.19. Exactly the same facilities will be available at this new branch as at the London address, and it should prove of great convenience to readers living in south-eastern districts.

### "Cruising" at Home.

My weekly pat on the back for originality goes this week to the Columbia Graphophone Company, who, with the aid of their mobile recording van, have just made available a couple of records of the band of the R.M.S. "Homeric."

## 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.

Thousands of people will be taking their holidays this year on this monarch of cruising liners, and there is nothing that brings back an enjoyable holiday so much as recollections of a particular tune, especially when it is played by the actual band on board.

To let you into a little personal secret, that is one of the reasons why I always have a very far-away look about me when I hear that old favourite, "Paradise." It carries me back to a never-to-be-forgotten evening on a similar liner last year—but I think the story had better end there!

As a matter of fact, quite apart from those who are fortunate enough to be able to take their holidays on the "Homeric" the two discs that have just been issued by Columbia—CB634 and CB635—both show up to very good effect on a radiogram, and I pass on the tip for what it is worth.

## THE LISTENER'S NOTEBOOK

(Continued from page 604.)

It cannot be denied that these holiday weeks, though they serve a useful purpose, are rather colourless with their programmes, containing nothing beyond the ordinary mainstays. And when the extraordinary items are only revivals of plays not yet dead, the B.B.C. exposes itself to a certain amount of adverse criticism.

Had "E.U.R." been a new play, I would have awarded it the palm. But, as it wasn't, I must look elsewhere for the prize-winner.

The Constanduros Revue wasn't wholly worthy. A little of Mabel is one of the best things in broadcast comedy, but beyond a certain measure she begins to bore. "Small Advertisements" was all Mabel, and I found that the very things that made me laugh at the beginning of the show irritated me at the end.

I remember I felt the same once when she filled in the gaps of a Royal Command Variety performance.

Shall I choose Lew Stone, broadcasting from the Studio? I think not! I wish his numbers weren't quite so hot. They leave me cold!

The Yorkshire Mummies, then? Certainly, they are well in the running. Theirs is good entertainment.

Or Professor Harold G. Moulton's economy talk relayed from America? Apart from the announcer's accent and his reference to Eastern Daylight time, it was difficult to realise that this talk came from America.

The speaker seemed even nearer than our own from London do. There was nothing of the old-time atmospherics and noise that used to characterise these long-distance relays. This relay was quite a triumph, and I think the palm should go to the engineers responsible for it.

## MIDGET SETS

A Fashion that was set by "P.W."

IT seems very probable that quite a number of midget sets will be on show this year at Olympia. The idea has proved very successful in America during the past year, and "squeakers," as they are called, have been radio's best sellers.

These midget sets are very attractive instruments, for they contain in the one cabinet, no larger than a loudspeaker, such advanced designs as one-knob superheterodynes with automatic volume control.

Their sizes form a striking contrast to the usual rather bulky constructions assumed by British sets. Quite recently we had the opportunity of testing one of the latest American superhets of midget design, and it must be admitted that its results were far from being midget in character!

It can hold its own against almost anything for power, selectivity and quality.

The valves used are themselves of special midget design, and the various components are proportioned accordingly.

If, as appears likely, midgets do in due course dominate the British market, POPULAR WIRELESS will once again have secured an international success, for it was A. S. Clark, of the POPULAR WIRELESS Technical Staff, who, five or six years ago, originated the idea.

No doubt there are still many of his original "Midget" sets being used, for they even then proved extremely popular.

## TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

### Scratch.

I OFTEN get letters from readers telling me that they are having trouble with the scratch from gramophone records, and wanting to know what is the simplest way—"nothing elaborate"—in which the scratch can be got over.

If you have this trouble a high resistance connected across the pick-up will go a long way to overcoming it, and is probably the simplest dodge that I can suggest. The actual value of the resistance depends a good deal on circumstances, particularly on the characteristics of the pick-up, but it should not need to be more than 100,000 ohms.

### An Accumulator Hint.

A reader tells me that he had trouble with his accumulators owing to the fact that when these came back from the charging station they had an acid film on the outside which damaged things it came in contact with. He got over it by making a simple accumulator tray in which the accumulators could stand, so that the film of acid was prevented from touching anything nearby.

It is a well-known dodge to make a tray of thin sheet lead about  $\frac{1}{16}$ th of an inch thick, taking a rectangular piece of sheet and turning it up at the corners and lapping over (without slitting) so as to make a tray about half-an-inch or an inch deep.

The lead sheet is not always easy to procure, however, and anyhow is very easily bent out of shape again. My correspondent says he uses a stout rectangular cardboard lid from a cardboard box, and coats this thickly inside with celluloid varnish.

Having given it one coat and allowed it to dry thoroughly, he gives it a couple more coats until it is thoroughly impregnated and also rendered stiff. After that it is quite impervious to acid and forms an excellent tray and protection.

### Winding Your Transformers.

I often receive enquiries from readers about the winding of small transformers, more particularly, of course, small power transformers for use with mains valves, and although the general principles underlying the question of the relative number of turns and amount of iron in the circuit

(Continued on next page.)

## A FIRST ATTEMPT

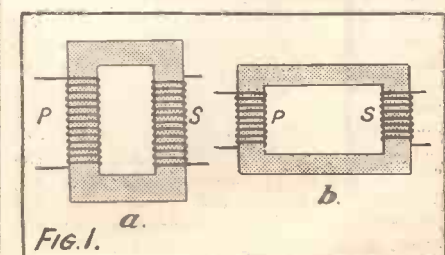


Fig. 1. a. b. Much of the primary flux never affects the secondary at all!



## TECHNICAL NOTES

(Continued from previous page.)

seem to be fairly well understood—indeed, they are very readily obtainable from tables—the actual design of the transformer appears to be one of the points where constructors often go wrong.

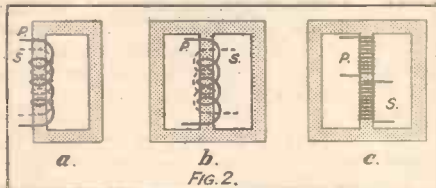
The tables and figures given for the specification of any transformer of this kind are based on the assumption that the transformer is of good or reasonably good design but, of course, if you go in for a design which is very inefficient you will find that the results will depart sadly from those expected from the specification.

### Misleading.

I know all this only too well, because I can recollect my own first attempts at making small transformers, when I did not properly appreciate the fact that the primary and secondary windings are related to one another solely through the magnetic flux. I suppose I had the idea that the magnetic flux would flow around the magnetic circuit—deviating neither to the right nor to the left—in exactly the same way as an electric current. But I can assure you that it doesn't.

If you look for a moment at Fig. 1a you will see what at first sight might appear to be a perfectly good design for a transformer, since it has a closed iron circuit with the primary nicely wound on one limb and the secondary on the opposite limb.

### A CLOSED CIRCUIT



In these arrangements primary and secondary are very close together.

This, if I remember rightly, represents my own first attempt at transformer making and I believe that it was based on a diagram which I saw as a boy in one of the magazines.

### A Question of Efficiency.

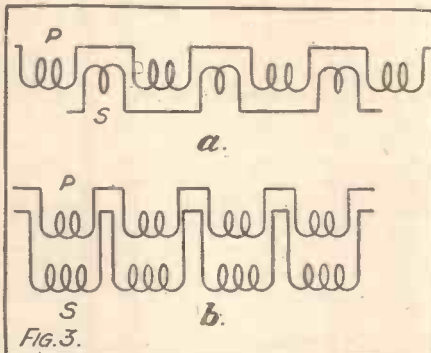
Of course it *does* work, after a fashion, but is extremely inefficient, and the reason it is inefficient is because a large part of the magnetic flux created by the current in the primary winding wanders off into space and never gets into the secondary winding at all. In Fig. 1b you will see the same sort of thing, but still more so, as it were, because the windings are separated quite a distance apart and there is a long magnetic circuit, the "reluctance" of which will account for a very large percentage loss in the efficiency.

One of the essentials of good transformer design is to arrange the primary and secondary windings so that the secondary receives as much as ever possible of the flux created by the primary. Incidentally, I should mention that you will never succeed in getting the secondary to embrace one hundred per cent of the flux, but the smaller the percentage which is lost to the secondary the more efficient the transformer will be.

### Saving the Magnetic Flux.

Now, if you look at Fig. 2a you will see a closed magnetic circuit in which the secondary is wound on top of the primary on one of the limbs. So far as the arrangement of the windings is concerned this is

### WOUND IN SECTIONS



How sections of one winding can be interlaced with sections of the other.

an efficient scheme, but even here the relatively high resistance (in the magnetic sense) of the magnetic paths prevents the efficiency from being as high as it might be. Fig. 2b shows a better arrangement than Fig. 2a, because here the magnetic return path is duplicated. In the same way we could if we wished to go still further have a pair of return limbs at right angles to the plane of the paper. Indeed, an arrangement somewhat of this sort is employed, as you will recollect, in certain types of permanent-magnetic units for loudspeakers.

### Sectioned Windings.

Fig. 2c shows the same sort of thing but with the primary wound on one part of the central limb and the secondary on another part, the two windings being thus side by side; this is not so efficient as winding the one over the other. In Fig. 3a is a schematic arrangement of primary and secondary windings sectioned so that the sections of the one are alternated with the sections of the other. If the windings are divided up into a sufficiently large number of sections and these are placed relatively close together this arrangement can be very efficient, although it is in some ways inconvenient in manufacture. A sectioned bobbin or former is often used, more particularly with speech transformers (such as inter-valve transformers and output transformers) in order to keep the self-capacity of the component to a minimum. However, as I am talking more particularly about power transformers and the question of power efficiency, we need not worry in this connection about the question of self-capacity.

I think you will appreciate from the foregoing remarks and the diagrams the paramount importance of keeping the primary and secondary windings together so that the secondary gets as much as possible of

(Continued on next page.)



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## TECHNICAL NOTES

(Continued from previous page.)

the flux. Any deviation from this arrangement is bound to mean loss of efficiency. In a case such as that shown in Fig. 1b, for instance, it is not at all unlikely that the output from the secondary might be as low as 20 per cent or even 10 per cent of what you would expect from the ordinary calculations.

### Interaction.

You hear a lot about the interaction of different components in a set, and you are often advised to shift components, such as coils and transformers, into various positions in relation to one another, and in relation to other components, so as to avoid this interference effect. Sometimes a constructor is at a loss to know how he can change about the position of, say, a transformer in order to find the one in which it causes least interference.

This difficulty is got over very neatly and simply by connecting sufficiently long flexible leads to the transformer, and then shifting it about before screwing it down; after you have found the best position it is a simple matter to fix the transformer and then to make proper short connections, the longer flexible leads being regarded as merely temporary ones.

## TWO NEW VALVES

For S.G. and "Class B."

**F**OLLOWING the success of the first "Class B" valve, the Cossor 240B., the famous Highbury valve makers have produced another type of "Class B" amplifier of a somewhat "smaller" type and taking less filament current. This is the 220B. It takes but 2 amp. for its filament, but with an H.T. voltage of only 120 it will give up to 1.25 watts, with an average H.T. current consumption of about 7.5 milliamps for the whole "Class B" stage.

The maximum output power attained at this consumption is, of course, that reached on peak modulation during an ordinary programme. It must not be thought that the full power is being produced all the time, such as might be the case with the tuning note, tuned fully in all the time. In such a circumstance the average anode current would also be the maximum, and the total consumption would be very much higher.

The output circuit of the 220B. should have a load of 12,000 ohms, plate to plate, while the D.C. resistance is recommended to be less than 400-ohms total. The driver transformer should be chosen to suit the

driver valve, which will be of the order of the 215P. or the 210L.F.

With all "Class B" amplifiers the correct choice of driver transformer is most important, and the makers of the valve, or of the transformer, should be approached if there is the slightest doubt as to the model or type to be used.

Another new arrival among the Cossor ranks is the 220V.S., a screened-grid valve of the multi-mu variety. This has an impedance of 400,000 ohms and a slope of 1.6, and is calculated to give a magnification factor of 640 at zero grid volts.

On test these figures were very closely approached with the several models of the valve we have tested, and the stage gain obtained from the valves in use was of a very high order.

With high-efficiency coils it is possible to get a gain of some 400 to 500 per stage.

## CHANGING SHAPES



A new shape and new characteristics are features of the valve on the left, the 220B, "younger brother" of the 240B.

while the extremely low self-capacity of the valve enables excellent stability to be maintained.

The 220V.S. is not an expensive valve to run, for it takes a mere 3.5 to 4 milliamps anode current at the maximum H.T. voltage of 150, and the screen current is quite low. This figure is taken with zero grid bias—that is, while the valve is operating at its most sensitive condition. With 1.5 volts negative bias the current drops to below 2 milliamps.

The 220V.S. is a short grid-base valve and needs only 9 volts bias for the potentiometer control of its mutual conductance, and is, of course, a battery two-volter falling in line with the other battery valves in the Cossor range.

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