

CAR RADIO FOR 1934 (SEE PAGE 451)

TELEVISION PROGRESS

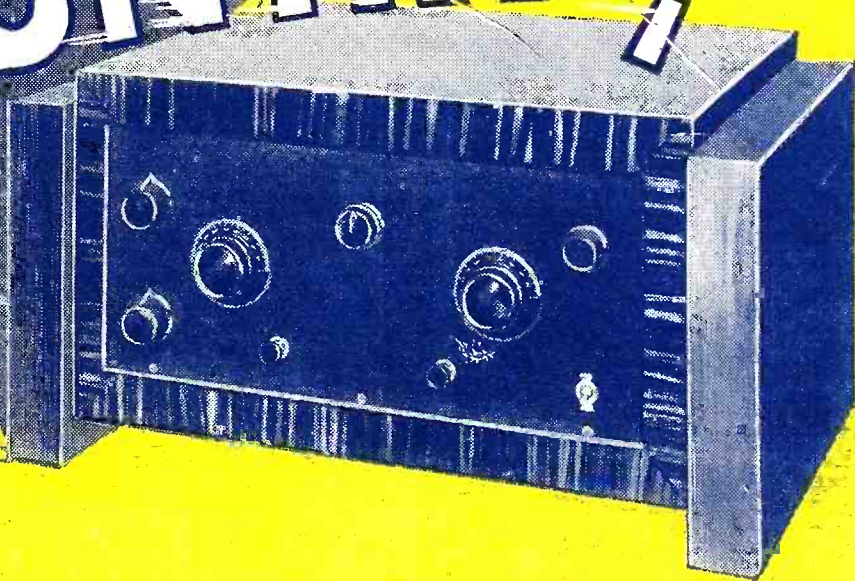
Popular Wireless

No. 597.
Vol. XXIV.
November 11th,
1933.

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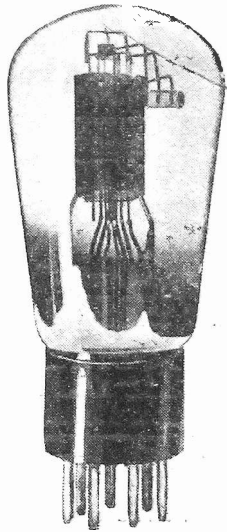
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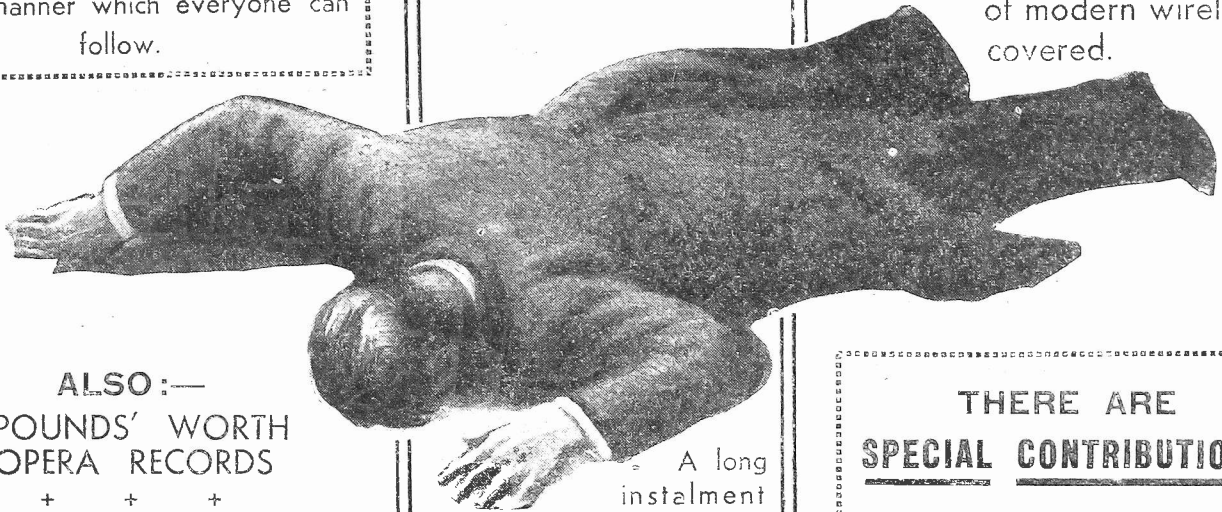
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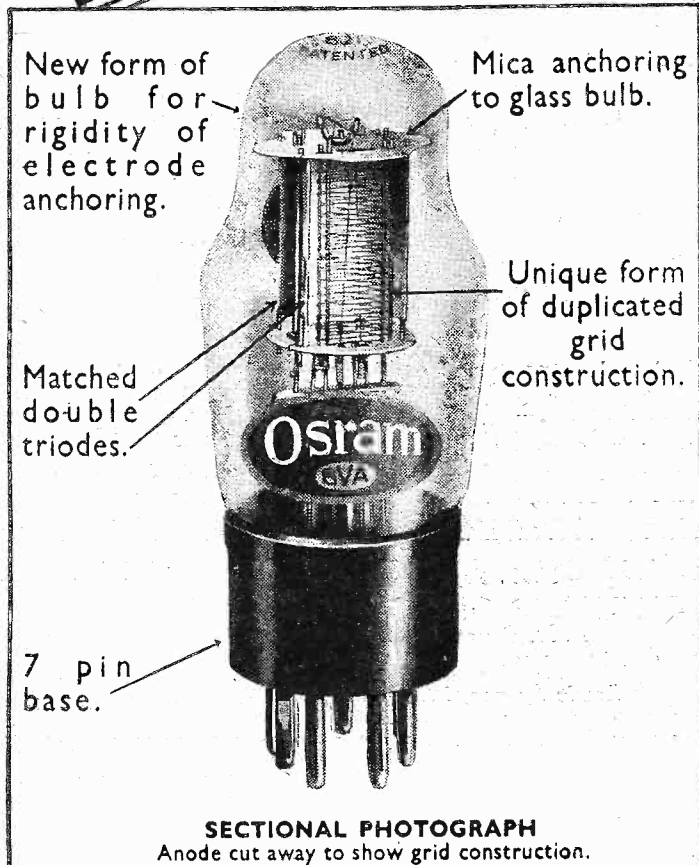


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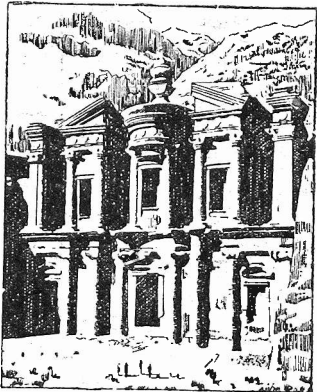
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WONDERS OF THE PAST

PART 2
On Sale
Thurs.,
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Edited by Sir J. A. HAMMERTON



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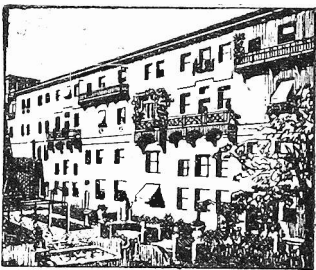
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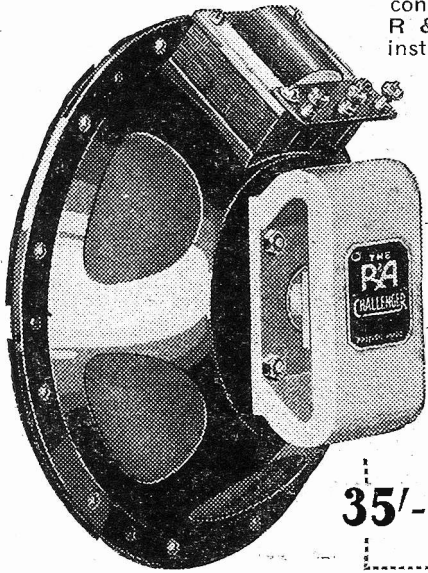
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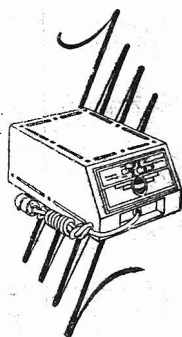
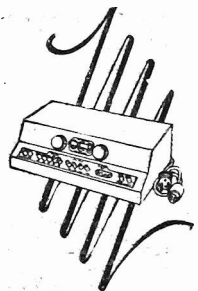


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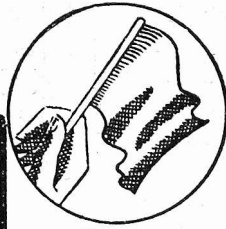
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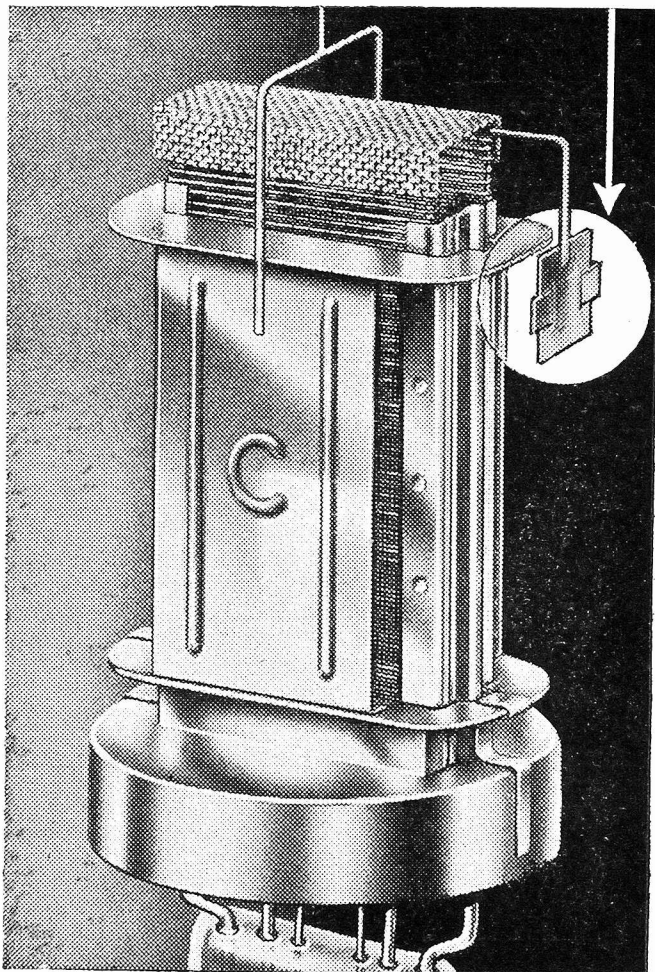
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THE BLESSINGS OF RAIN
 RADIO AIDS TO MARINERS
 MARCONI IN CHICAGO
 A TECHNICAL TIP

RADIO NOTES & NEWS

POPULATING THE EMPIRE
 "ARIEL" ON AERIALS
 ORIGINALITY IN CEYLON
 TRANSPARENT CABINETS

Small Mercies.

LAST Sunday a friend was driving me from his house to mine when a dull, dank morning turned into a pouring wet afternoon. Presently he burst into a series of joyful bellows. Said I: "Great Scott! It is a noxious day; we are late for lunch, and I have a cold in the head. Why these transports of delight?" Said he, with another bellow: "Good! This'll save me watering my 'earth tube.'"

Which reminded me that I have never watered an "earth" and have long since forgotten whether mine is still the plate which was buried in the garden or whether it is now something to do with the casing of our electric-light wiring. Happy go lucky me-e-e!

Ex-Telegraphist Scores Again.

FROM time to time I have drawn your attention to instances of ex-telegraphists, wireless or land line, who have attained high positions.

My latest find is Mr. E. St. P. Iddon, who has been appointed buyer of the radio, gramophone and record department of Selfridge's, in addition to his job in the radio department of Whiteley's.

Mr. Iddon joined the Marconi Company in 1917, and eventually served as a sea-going wireless operator until 1922. By the way, I see from the recently published biography of Andrew Carnegie that he, too, served as a telegraphist at one early stage of his career.

They Say—What They Say.

ALDERMAN YOUNG, of Nottingham, at a luncheon club, said that whilst they did not always see eye to eye with Sir John Reith regarding B.B.C. policy, he thought Sir John had achieved a very high standard of broadcasting in this country. Just the sort of stuff I used to draft for my chief when he wanted to make a fighting speech about the Post Office!

Mr. Dinwiddie (how *did* Dickens miss that name?), Scottish Regional Director, at the opening of the Scottish Radio Exhibition (no mention of luncheon!), stressed the necessity for having good receiving sets to receive good programmes. Very profound thought. Ten thousand Scots at once rushed home to readjust their catwhiskers!

A Basement Bulletin.

THE truth about radio seems to permeate very slowly. Some people evidently think that the programme depends upon the listener. It is credibly reported to me that "Gasper" Gert, our domestic helper, so called because she smokes cigarettes all day, said that she did not like the "Radio Times" and wished that "Mister" (i.e. me) would "take in" a different paper full of Jack Payne and Henry Hall. That's what I get for providing an L.S. extension to the maids' quarters!

Snippets of News.

THE appeal entered by the Marconi Company against Justice Maughan's decision in favour of Philips has been withdrawn.

The Performing Right Society has over two million copyright works to protect, and the B.B.C. programmes contain more than 80 per cent of those works.

Sales of components for the "S.T.500" will probably make the British Empire run short of wire.

America Welcomes Marconi.

FROM details of Marconi's visit to Chicago which are now available, I observe that the American flair for lionising has lost none of its vigour. The Secretary of the Navy sent an extremely kind and cordial message to the illustrious inventor, and Chicago's "Marconi Day" was marked by a "stunt" which was no less than the lighting up of the Exhibition by Italian moonlight.

A luminous impulse from the moon was picked up at the observatory of Arectra, Galileo's last residence, converted by a photo-electric cell into an electrical impulse, relayed from Italy to Chicago, and then used to operate an apparatus which lit the electric lamps of the Exhibition. Great as he was, Galileo would probably have said "Liar!" to that!

"Ariel's" Accumulator Tip.

S. K. (Ely), in a postscript to a letter about next door's broadcasting dog, asks me whether there is any hope for a sulphated accumulator. There's no harm in hoping, but the realisation of the hope depends upon the size and age of the dreaded deposit.

If the trouble is of long standing all you can do is to give the cells a long, long charge; but if you are dealing with new sulphate you can sometimes save the battery by emptying it, filling it with distilled water and washing the liquid about so as to loosen or detach the stuff.

Then empty, put the *old acid* back and give a good, long charge. If, then, the S.G. is low add a little acid and charge again. Probably all wrong by the books, but worth trying.

(Continued on page 471.)

PROGRESS!

CRYSTAL SETS used to be all the rage—and then the best designs for home construction were found in "Popular Wireless."

The Latest Receiver to achieve phenomenal popularity is the S.T.500—it was described in "Popular Wireless" three weeks ago.

TELEVISION is the next great development to watch—there is a fine article about it on page 449.

"P.W." Always Leads!

British Beacons Best.

BRITISH radio "beacons," one of Marconi's little contributions to the safety of life and property at sea, are finding their way all over the world. The most recent countries to adopt them are Uruguay, Rumania and China.

These automatic radio beacons transmit omni-directional signals at the orders of a master-clock, which enable ships fitted with direction-finders to take bearings as and when required.

The signals consist of a characteristic group of dots and dashes incorporating the call-sign allotted to the beacon. Provision is made for continuous calls to be made during periods of bad visibility.

THE S.T. 500 IN

YOU have built the "S.T.500." Or so I am presuming, because I am now going to tell you how to work it.

The operating of the set will take perhaps an hour's practice to get the last ounce out of a variety of widely differing kinds of stations.

But once you know what each control does you will have months of enjoyment before you. The dull, uninspiring operation of a single control gives none of the thrill which comes of having absolute and complete control of your receiver.

Nevertheless, the "S.T.500" can be operated in a dull, unexciting manner, and I advise novices to start using it that way.

A Preliminary Precaution.

There is only one single thing that worries me. And that is that your differential condensers may be wrong way round. Mind you, that will not affect the working of the set, but it will make all my instructions read wrong. The anode coupler and the anode reaction should therefore be made right first, and tests were given on page 339 of POPULAR WIRELESS (dated October 28th).

Briefly, the signals should be weaker if the anode-coupler knob is turned anti-clockwise (even after slight retuning of the right-hand dial). The reaction on the anode circuit should increase when you turn the anode-reaction knob to the right.

Good; I shall now assume your two differentials are O.K. I am very keen on your having these right, because I once received a letter from a Dutchman who was unable to obtain the types of differentials I

Four valves have never been used to better advantage than in the balanced - phase double - reaction system which the S.T.500 employs. No compromise has been made in the number of controls on the panel, and, by correct manipulation of them, results are obtainable which no other circuit can equal. Your guide to the ether via the S.T.500 controls is given below.

*By JOHN SCOTT-TAGGART,
A.M.I.E.E., F.Inst.P.*

used. He said: "I turn your aerial and anode couplers to the left for selectivity and to the right for signal strength, but it makes little difference."

He had the anode-coupler differential wrong way round, and for four months he had failed to get good results because any good effect on one coupler was defeated by the other.

The Function of the Couplers.

I advise you to do all your first tests with aerial and anode reaction at zero (full left). Get the hang of the two couplers first.

Their operation is extremely simple, and each does the same thing, but for a different circuit.

Remember that the "S.T.500" has two compartments, so to speak, and these are operated in exactly the same way. There are two tuned circuits: (a) the aerial circuit and (b) the anode circuit.

The tuning of the aerial circuit is accomplished by the left-hand dial. The current to the circuit is fed through the aerial coupler. This aerial coupler governs the signal strength in that circuit and also governs the general selectivity. The aerial-reaction knob, if used, boosts up the signals and also improves the selectivity.

The anode circuit has exactly similar gadgets. The main tuning is by means of the right-hand dial. The current to the anode circuit is fed through the anode coupler.

This governs the signal strength in that circuit and also its general selectivity. The anode-reaction knob, if used, boosts up the signals in the anode circuit and also improves the selectivity of that circuit.

Dividing the Controls.

In addition, each circuit has its own wavechange switch, and both of these must be either "in" (for long waves) or "out" (for medium waves).

You can imagine a vertical line drawn down the panel just to the left of the anode coupler. This will divide the controls into two similar sections. To the left we have the aerial circuit complete with tuning dial, aerial coupler (top left) and aerial reaction (bottom left).

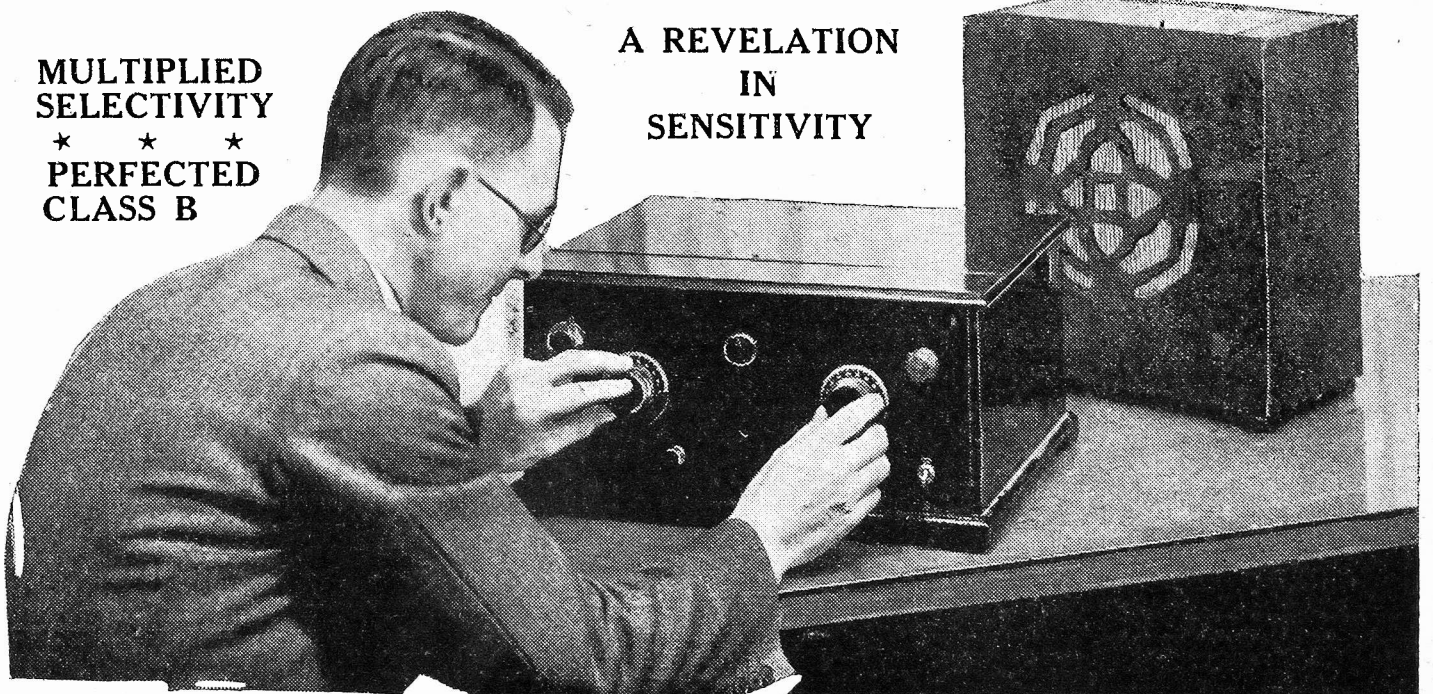
The right-hand half panel contains the anode circuit controls, which are the tuning dial, the anode coupler and anode reaction.

Now these are the effects of the controls on the circuit they govern, whether aerial or anode circuit:

1. The coupler controls the amount of radio current fed to the tuned circuit.

**MULTIPLIED
SELECTIVITY**
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**A REVELATION
IN
SENSITIVITY**



ACTION!

Turn the coupler to the left (anti-clockwise) and you will decrease signal strength. Turn it to the right and you will increase signal strength.

2. The coupler will also control the selectivity, since it varies the "load" on the tuned circuit. Turn the coupler towards the left if you want increased selectivity.

3. The tuning dial tunes its respective circuit. It has the last word on tuning and should be the last thing you touch. Any alteration of the coupler should be followed by a slight retuning of the tuning dial associated with it. Any alteration of the reaction should be followed by a slight "touching-up" of the tuning dial. This is customary on all sets.

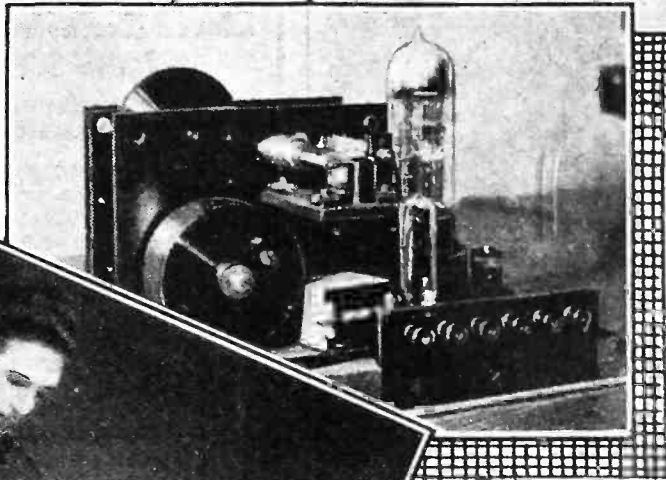
Two Simple Circuits.

4. The reaction knob, if turned to the right (clockwise), will increase signal strength and simultaneously improve selectivity. Any alteration of reaction must be followed by a very slight re-tuning on the tuning dial.

In those four rules, as applied to the aerial or the anode circuit of the set, you have the whole operation of the "S.T. 500."

Think always of the set, not as a conglomeration of knobs, all of which do something, but as two simple circuits, the

ALL EUROPE
AT
YOUR COMMAND



But it is highly likely that sometimes you do not need the full selectivity

of the set. For example, suppose you are listening to a British station during the daytime and you live, say, 70 miles away. Here is an excellent chance to let the set "rip." If you have a poor aerial you will be doubly grateful for my controls.

Instead of aiming at maximum selectivity you can increase signal strength. You can do this by turning each coupler more to the right and increasing reaction.

On the whole, however, I am not too keen, if both reaction controls are to be used, for you to turn the anode coupler too much to the right. There are two technical reasons why you gain nothing in most cases. With the anode coupler full right the inherent reaction existing in every set is at a maximum.

The Better Method.

The real controllable reaction can then only be applied in small doses and is not very smooth. Feeding less H.F. current to the circuit and increasing it with reaction is, in practice, better than feeding more and using less reaction.

The second reason is rather similar, but applies to the aerial circuit. To obtain the best aerial reaction the source of reacting current should be the choke rather than the tuned-anode circuit.

sensitivity and selectivity of each being governed by a coupler and a reaction knob.

The best combination of adjustments is a matter for trial. You can, for example, use a flatly tuned (i.e. unselective) aerial circuit and a highly selective anode circuit. Or you can make the aerial circuit very selective and the anode circuit "flat."

Usually you will operate both circuits so that each has medium selectivity. With that as a starting point, you can improve the selectivity of each by reducing the value of its coupler and, if necessary, by applying reaction.



Our top picture shows the device which reproduces the same tune as the Potsdam chimes for the Deutschland-sender interval signal. Below it is the Budapest "musical box." Cracow's trumpet call is depicted in the bottom picture, below Turin's "nightingale" apparatus.

Knife-edge Selectivity with full-bodied Volume

If the anode coupler is between full left and about vertical the aerial reaction is as near perfect as is possible. Beyond the half-way mark the reaction tends to lose some of its smoothness.

An interesting point for connoisseurs is that as you tune to longer wavelengths (on either waveband) you can use more anode coupler while retaining smoothness of reaction.

Rules for Tuning.

As a matter of fact, the reserves of sensitivity of the set are such that I, personally, never use the anode coupler more than about quarter-way round.

The rules for selectivity and sensitivity are these, and apply to either aerial or anode circuit:

1. *To increase selectivity:* (a) Turn coupler more towards the left, keeping reaction zero, and retuning on the dial. (b) Turn reaction knob clockwise, a little at a time, retuning slightly on the dial.

2. *To increase signal strength:* (a) Turn coupler more to the right, keeping reaction zero. (b) Turn reaction knob clockwise a little at a time, retuning slightly on the dial.

The above rules apply to each circuit, and you will use the couplers first and the reaction if necessary. The slight retuning is no trouble. Since you will probably only alter one circuit at a time, the other will be in tune, and it is very simple to pick up the station you were receiving.

Suppose, for example, you are listening to Poste Parisien, and you can hear a slight background of Breslau. You would reduce reaction and then reduce the anode coupling probably.

This would alter the tuning, but you would, by a slight movement of the right-hand dial, pick up Poste Parisien, and, on applying reaction again, find the station clear of Breslau's interference.

Avoid Overloading.

Why did I reduce the reaction? Because I always do so instinctively on any set I handle—and you probably do so yourself. It is probably because I demonstrate my sets so often that I am rather cautious in avoiding oscillation. I shall never forget a little sniggering girl who gleefully cried to her father: "Ooh, Daddy, he's made it squeal!"

After this had happened once or twice, and I had glanced speculatively at a conveniently near and extremely tempting poker, I gave in. I received the remaining sixty or seventy stations without the whisper of a squeal. That dear, sweet child taught me more in ten minutes about operating a wireless set than I had learnt in twenty years.

A sound rule in operating a receiver,

therefore, is to make no alterations without first reducing the reaction; then bring the reaction up again. This only applies if you are using reaction near the critical point.

There is one general note to be added to the four main rules. Never feed the set with more signal current than is necessary to give full loudspeaker results. The odd thing is that, although you are reading these words, half of you will completely ignore them.

You will use too much aerial coupler and too much anode coupler. You will then try to improve selectivity with either or

signals to handle. Suppose you tune in a loud station without any reaction. Now you reduce one or other of the couplers until you know for certain that the loudspeaker is not giving maximum volume.

Let Reaction Give You Volume.

The spread of the station may be considerable. You therefore apply anode reaction—or perhaps aerial reaction as well.

The spread remains. What are you to do? Write to me? No, please don't. Thousands will, but only because they are skipping this.

The trouble is simply this: that you didn't reduce signals enough. Long before the great selectivity benefits of reaction were reaped the set was overloaded.

You will be on much safer ground if you go to the other extreme if you want selectivity. Weaken the desired station until you can only just hear it; you can do this on the aerial coupler or on both couplers, retuning, of course, on the main dials.

Then, and only then, start applying reaction to both circuits. With critical reaction signals will be enormously louder, but should be a little weaker than you know would be possible if more coupling were employed.

You can increase volume cautiously by increasing the aerial coupling and keeping the aerial reaction well up. But the moment you get signals too strong, "spread" will increase.

I am all for full-bodied volume, and the perfected Class B of the "S.T.500" will give it to you. But if you are out for knife-edge selectivity, get that volume by low values of coupling and more reaction. Unnecessarily large couplings mean more letters for me!

A Final Note.

Please read my articles not just before building the "S.T.500," but also again when you are working the set. You will find the very point I should mention to you if I were at your side.

You need not worry about reaction affecting the quality of reproduction. I have taken care of all that and there is a tone control at the rear of the set which enables you to have your music sparkling or mellow.

No two people ever like exactly the same tonal reproduction. Some prefer a preponderance of the lower notes. Others prefer something less mellow. But many like a different quality on different kinds of music.

Where there is a risk of heterodyne interference, the whistle may be cut out by the tone control. This is the commercial method; but in the "S.T.500" the tone quality can be varied over a wide range in a perfectly smooth manner.

J. S.-T.

Eleven Exclusive Features of the S.T.500

none of which is found in any other designer's sets.

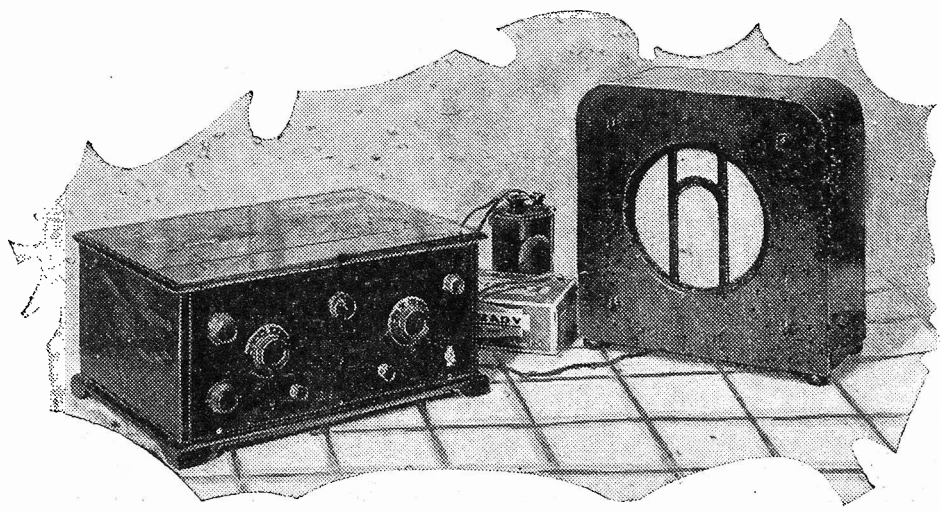
- ★ DOUBLE REACTION
- ★ FULL-RANGE SELECTIVITY ON BOTH CIRCUITS
- ★ BALANCED-PHASE AERIAL REACTION
- ★ LOW-CAPACITY GRID CONDENSER
- ★ EXCLUSIVE COIL DESIGN
- ★ SPECIAL TONE CONTROLS
- ★ PERFECTED CLASS B
- ★ SELECTIVITY RANGE ADJUSTER
- ★ PROGRESSIVELY ADJUSTABLE SELECTIVITY
- ★ DIFFERENTIAL ANODE COUPLING
- ★ LARGE-CAPACITY AERIAL COUPLER

both reactions, and then complain of a wide spread of your locals.

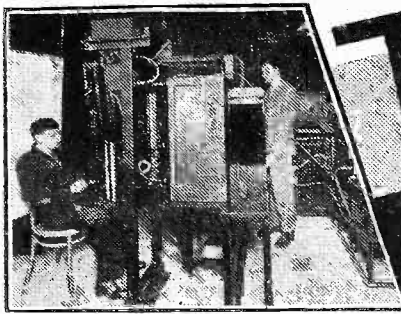
The reason for the effect is simple. You are overloading your set. Overloading means that "quality" will be impaired and selectivity ruined. And it doesn't do a scrap of good; you get no louder results.

The best test for overloading is to reduce slightly *any* one of the couplers or reaction controls. If you hear no weakening of signals the chances are ten to one that you are overloading the set.

Reaction works best if it has weak



HERE IT IS! The first photograph to reach this office of an S.T.500 built by a reader. The satisfied constructor in this case is Mr. Geoffrey Charles, of 10, Rectory Gardens, Beckenham, Kent, and he has built his set into a Peto-Scott cabinet, using a W.B. loudspeaker.



TELEVISION PROGRESS

It has been announced that the B.B.C. is changing the system of Television used in its transmissions and the benefits which the change will confer on "lookers-in" are discussed below

By A. E. SEMPER.

HOT on the heels of Vladimir Zworykin's announcement of his remarkable new cathode-ray system comes the news that the B.B.C. are building two 120-line television transmitters for use on ultra-short waves. Experiments have been taking place since last spring on 7.75 metres, and it is reported that very good results have been achieved.

The international race to achieve commercial television has thus been tremendously intensified during the past few months. In Germany television appears to be making good progress; it is reported that ultra-short-wave transmitters are to be installed in twenty large towns.

A Comparison of Systems.

At the Berlin Radio Exhibition, which was held in August, several firms were showing television apparatus. In France television is not so advanced, but in both countries considerable attention is being paid to cathode-ray systems.

Let us for a moment compare the proposed 120-line transmissions on ultra-short waves with the existing transmissions on the medium waveband. You will doubtless remember that the existing transmissions are 30 line, twelve and a half pictures per second; that is to say, the picture is divided into thirty vertical strips, each of which is scanned by a photo-electric cell, the whole picture being transmitted twelve and a half times a second.

Assuming that the 120-line transmissions

will be at the same rate, it will be seen that the pictures must, of necessity, possess considerably more detail, as each picture will be divided into 120 strips. With the present 30-line transmissions what is known as "aperture distortion" is a disturbing factor, its effect being to blur the picture by softening edges which should be sharply defined.

How Lines Become Blurred.

Exactly how this happens can be seen by referring to Fig. 1, which represents a part of an image as seen momentarily by the photo-electric cell. As the front edge of the scanning hole approaches the dark part of this picture point the photo-electric current, instead of changing immediately from maximum to zero, changes only gradually, since the cell is looking partially at a bright part.

The cell responds to the *total* amount of light which falls on it, so that the actual result in a receiver is a blurring of the line of demarcation.

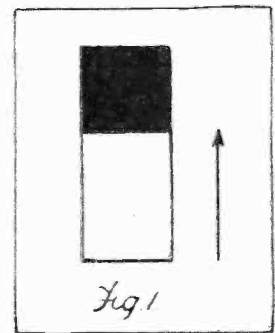
Medium-Wave Drawbacks.

Some of you who have not yet taken up television will doubtless ask why 120-line transmission has not been tried on the medium waveband as at present used. There are two main reasons. Firstly, by international agreement the carrier frequencies of radio stations in Europe are separated by only 9 kcs., so that if a transmitter is modulated with a frequency

higher than 4,500 cycles its sidebands will interfere with the sidebands of adjacent stations.

In practice some interference does occur, as the transmission of music may include frequencies of any value between 30 and 10,000 cycles per second. Strictly speaking, the television transmitter must be modulated by a frequency not exceeding 4,500 per second to avoid interference. The problem is, therefore, how best to get the clearest pictures with this available frequency.

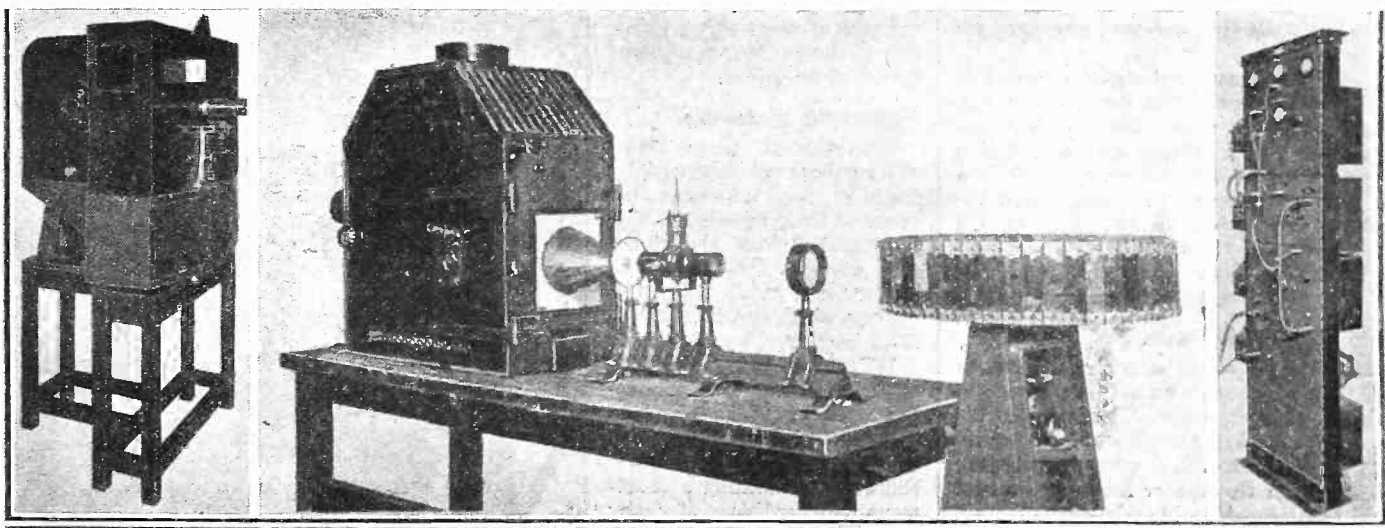
A
DIFFICULT
SUBJECT



A televised image of such a subject as this would be indistinct because the light-cell responds to the total amount of light it receives.

The minimum number of pictures per second is fixed by the effect known as "persistence of vision"—with less than twelve and a half pictures per second the image appears to flicker too much to be comfortable. The number of changes which occur during the scanning of one
(Continued on next page.)

SOME NEW DEVELOPMENTS IN TRANSMISSION AND RECEPTION APPARATUS



One of the latest contributions to television development is the Marconi System. The receiver, consisting of light-chamber, Kerr cell, condenser lens and mirror wheel is shown in the centre picture. A transmitter scanner is at the left with its bank of amplifiers on the right.

MAINTAINING BATTERY EFFICIENCY

If you want to keep running costs down to the minimum it is important to "keep an eye" on your batteries.

IN wireless apparatus, as in a good many other things, appearances are deceptive. Sometimes the most robust-looking components or accessories are really the most vulnerable. Batteries are a case in point, for, although accumulators and H.T.B.'s are so weighty and substantial in construction, they may be more easily damaged by accident, neglect or carelessness than almost any other part of your receiving outfit.

Instruments That Help.

If, therefore, you want to keep running costs down to the minimum—and who does not?—it is important to "keep an eye" on your batteries and take steps to protect them from damage or premature deterioration.

Certain instruments are almost essential to the proper care of your batteries, for you cannot keep an eye on them if you are blindfolded, so to speak, by lack of the necessary meters that are used for measuring high- and low-tension voltages, anode current and the specific gravity of accumulator acid.

A suitable multi-range meter may be more convenient and less expensive than a separate voltmeter and milliammeter of equally reliable make. It certainly does not pay to "economise" by purchasing a cheap and nasty meter, as reasonable accuracy is essential if the readings are

to be any real guide to the condition of the batteries and to the current consumed by the set. So buy the best instrument you can afford.

For measuring the specific gravity of the accumulator acid, you need, of course, an accurate hydrometer with a clearly graduated float. It is advisable to make a point of checking up the voltage and S.G. of the accumulator at regular and fairly frequent intervals, to see that the cells are never discharged beyond a safe point (1.8 volts per cell).

The voltage should, of course, be read when the accumulator is on load, i.e. with the set actually taking current from the cells. Generally speaking, the voltmeter and hydrometer readings should be considered in conjunction with one another, as either reading alone may not indicate the true state of affairs.

Keep The Accumulator Clean.

When testing the voltage, etc., of your accumulator, you will naturally take the opportunity of topping up with distilled water if the surface of the electrolyte has dropped below the correct acid level marked on the case, cleaning any traces of corrosion off the terminals, giving them a smear of "Vaseline," if necessary, and wiping any sprayed or spilt electrolyte off the top of the cells, so as to keep them clean and dry between the terminals.

It is a rather good plan to use a rag wrung out of soda or ammonia solution with which to wipe the accumulator, as the strong alkali serves to neutralise any traces of acid on the outside which tend to corrode the terminals, eat away the covering of the leads, etc.

The high-tension voltage should be read from time to time and the anode-current consumption of the valves checked up periodically. Anything untoward will not escape notice for long if you make a point of this regular and systematic testing.

The grid bias should, of course, be adjusted when necessary to keep the anode current down to its correct value. Always remember to switch the set right off before removing a G.B. wander-plug, otherwise the sudden rise of anode current may do damage.

Test Batteries While in Use.

Provided that the voltmeter has a reasonably high resistance, the voltage of the high-tension battery should always be read when the battery is on load. Readings taken when the battery is off load are apt to be deceptive, as the voltage of a partly discharged battery tends to be recuperated to some extent when the cells are "resting."

The battery circuits should be well protected by proper fuses, rated to "blow" at an appropriate current. You should bear in mind that a single fuse in the negative lead is not necessarily a complete protection of the H.T. battery against damage by accidental "shorting." If there is more than one positive lead the single fuse is no protection at all against a portion of the battery being shorted through accidental contact between two of the H.T. positive leads going to different tappings.

TELEVISION PROGRESS

(Continued from previous page.)

strip cannot reasonably average less than 25—that is, a frequency of $12\frac{1}{2}$. By simple arithmetic we get $4,500 \div (12\frac{1}{2} \times 12\frac{1}{2}) = 30$ approx., which gives us the permissible numbers of strips or "lines" per second.

Another important point is that it is impossible to modulate a medium wavelength transmitter with a frequency higher than 7 to 10,000 without causing distortion of the transmitted signals and consequently a poor image.

It may be argued that short waves of 20 to 50 metres would solve the problem of a picture with finer detail, but this is not so in practice owing to skip distance, fading and echo effects. Echo effects are due to the fact that under certain circumstances the signals travel right round the earth's surface twice or more, the second and succeeding trains of waves striking the aerial at intervals of one-seventh of a second.

Use of Ultra-Short Waves.

The ultimate solution appears, then, to be with ultra-short waves which have remarkable characteristics of their own. We have still a lot to learn about these waves, but it appears that the sky wave is absent; and, although this factor limits the range, it will be of considerable advantage from a television point of view and will eliminate some of the difficulties referred to above—namely, echoes and fading.

But these waves bring problems of their own which require solution. It is found that motor-car ignition systems cause troublesome interference, and obstacles such as hills and buildings cast "shadows" which are far more pronounced than with the longer wavelengths. This will lead to very definite blind spots; for example, if you placed your aerial along one side of the house you might receive next to nothing, whereas at some other point, say in the garden, you might get good reception.

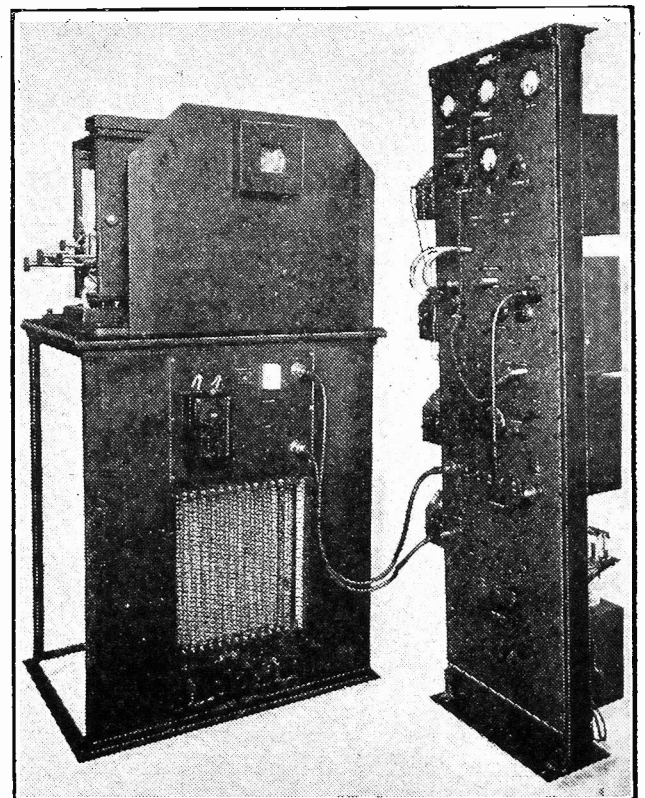
Fundamentally Suitable.

Nevertheless, these ultra-short waves are fundamentally suitable for television because of their extremely high frequencies; and the higher the carrier frequency the higher the modulation frequency which can be successfully impressed upon it.

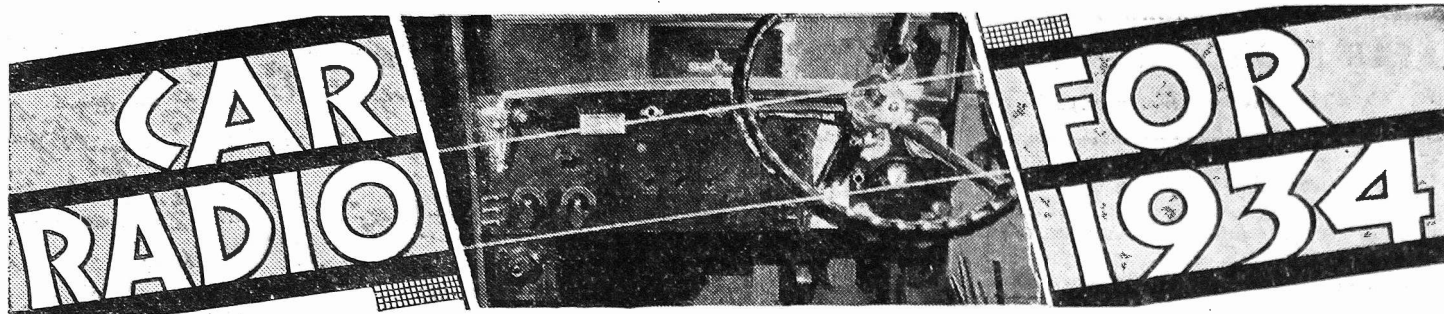
Without being unduly optimistic one can venture the opinion that television is now "coming down to brass tacks"; so if you are thinking of building a short-wave receiver this winter why not make sure that it tunes down to 5 metres. Then, if you think of going in for

television later on you will need only the optical part for a complete television receiver.

COMMERCIAL TELEVISION IN PRACTICE



The complete assembly of the Marconi Television Transmitter



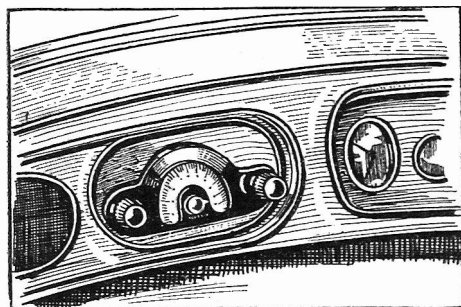
The application of radio to the modern motor-car has demanded the exercise of considerable ingenuity on the part of set designers and manufacturers. Some of the more outstanding examples of car sets, and details of their specially interesting features, are described in this review

By K. D. ROGERS.

I HAVE been having an energetic time lately in a branch of radio reception that is only just coming to the fore in this country. I refer to the car-radio receiver, and my activities have been concerned with testing and investigating many of the various types of commercial sets that are available for the car, boat or caravan owner.

I started at the recent Motor Show at Olympia, that wonderful building which is the home of the Radio Exhibition, and which changes its appearance scores of times during the year.

A FINE INSTRUMENT



The Ekco four-valve superhet A.V.C. receiver is panel operated and fits, complete with speaker, into one of the "cubby holes" in the fascia board of the Austin "Westminster" Sixteen.

For the first time radio has invaded the Motor Show, and it has done it in no uncertain manner. This was soon borne on one as the steady examination of stands proceeded, in spite of the very bashful attitude of the motor salesmen to the new "accessory."

Salesmen's Reticence.

They are very naturally timid concerning radio, for they are motor people, not radio engineers, and so the new addition to the cars is largely an enigma to them. This will pass, and next year, instead of somewhat apologetic reference to car radio, I shall expect to find the new feature eagerly pushed forward as a first-class selling point.

For the present, however, the visitor to the Show had to dig and delve to unearth any of the outstanding points of the various car-radio fitments. The prices were rapidly forthcoming, but there the matter ended unless vigorous probing took place as to the make, nature and method of installation of the set in question. Of the performance nothing could be gleaned.

A great deal of the trouble was undoubtedly due to the fact that at the time of the Show the motor manufacturers who had decided to fit radio as an added

accessory (in every case of a car I believe the radio is an added luxury) had done so more or less at the last minute, and numbers of car models showing fitted radio were very few.

Many cars included aerials in their roofs as standard, but few were really ready to explain to the public what they could do about fitting radio to the car, other than to divulge the price and the fact that it was "quite simple." Literature on the subject—this was completely non-existent, except for very bare leaflets.

However, this state of affairs will be righted in time, and before long we ought to see numbers of radio-equipped cars on the road and to hear them in various parking and picnic places. We are not likely often to hear them going along, for the radio is remarkably quiet outside the vehicle, though it is amply loud enough inside.

Adjusted from Steering Column.

Among the cars at Olympia which were shown completely fitted with radio were certain models of Chrysler, Packard, Dodge, M.G., Renault, Rolls (on which Philco sets were exhibited) Dodge (again) with a Lissen set, Essex with the Majestic six-valve superhet and the Austin 16 "Westminster" saloon with the Ekco four-valve superhet.

In the caravan section of the Show I saw two models with radio equipment—the Essex with a three-valve set, called the Castaphone Essex, and the Cheltenham Caravan Co.'s larger model in which was the Telsen Class B Four.

There is sharp division between the various sets as to the method of arranging the controls. Some, like the Lissen and the Philco, have steering-column control of wavelength and volume, with on-off switch, of course, while the Ekco set fits snugly into the fascia board of the car and has the controls on the panel, like any ordinary set.

Is It Dangerous?

There will be adherents to both types of control, for many will argue that the steering-column method is easier for the driver to operate, while others will say that they see no hardship in the Ekco method, and here the front passenger can be very useful in carrying out tuning while the car is in motion, besides amusing himself if the driver has no objection.

Here, again, there will at first be a great deal of divided opinion, for many now hold that radio in action is disturbing to the driver of a moving car, and that it is likely to be dangerous. It might be if allowed to

continue too loudly and if the driver were inexperienced and lacking in concentration, but not if the volume control is properly employed.

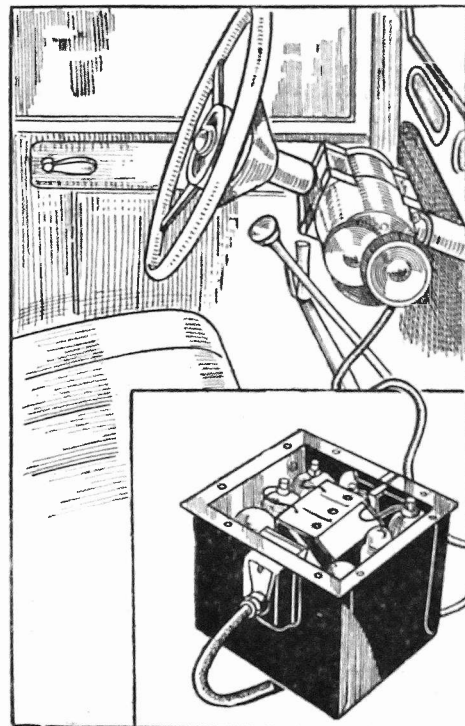
To test this point and the efficiency of good car radio as at present evolved, I went for a run in an Austin fitted with the Ekco four-valve superhet. This contains a pentode mixing valve, one stage of automatic-volume-controlled intermediate pentode H.F., a detector (double-diode triode) and pentode output. So out of the four valves a very great deal of useful work is obtained.

Free from Interference.

A.C. valves are used, together with a low-tension field-energised moving-coil speaker and a high-tension generator, the whole being operated off the car battery. Suppressors were fitted on the car plugs, dynamo, coil, starter, windscreen wiper and even the stop light at the rear, so that the operation of the set is completely interference-free as far as the car is concerned, no matter what is happening.

On a tour round London and the out-kirts
(Continued on next page.)

WITH REMOTE CONTROL



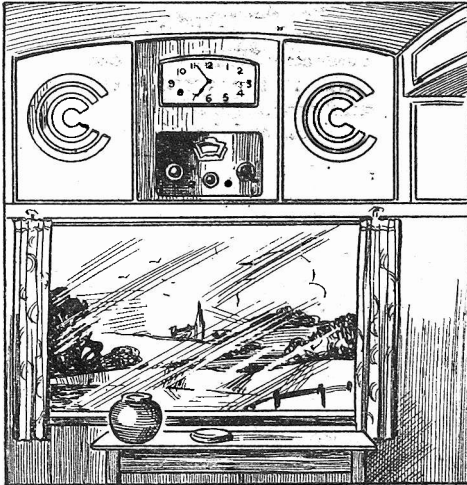
This Lissen battery set is secured under the floorboards of the car, control being obtained by means of a Bowden cable from a special attachment on the steering column.

CAR RADIO FOR 1934

(Continued from previous page.)

in bright sunshine the set behaved perfectly, only giving any sign of a fade on the local and Daventry stations when we passed under railway bridges. At other times the A.V.C. kept the volume at a surprisingly level strength, while the sensitivity of the set was such that stations like the Northern Regional, West Regional, Midland

A STANDARD FITTING



The Telsen Class B Four is a standard fitting in the larger model of the Cheltenham caravan. The loudspeaker is housed in one of the cupboards at the sides, while the batteries are stored under one of the seats.

Regional, Poste-Parisien and Brussels were heard at good strength, the Midland Regional, of course, being very much stronger than the others.

On the long waves three or four stations were available as programme providers besides Daventry, thus testifying to the powers of the set on that wave range. The cost of the outfit, including fitting to the Austin, is £25.

I am convinced that once one has got used to car radio the fact that it is on while the car is in motion will not upset the driver one whit—but it will take a little time to get used to, of course.

Car radio is a thing in which many cannot see any value. All I can say to them is that they should hear it demonstrated before they criticise; one cannot conceive its effect without hearing it, and hearing is to applaud.

Popularity of Distant Control.

But I must get on with the description of the other types of car radio that are now available for the motoring public.

The Philco set is also a superhet, and is energised from an H.T. point of view by a generator driven from the car battery. Unlike the Ekco, the receiver is fitted in a box below the facia board of the car, with the speaker separate (the Ekco speaker is incorporated in the set). Thus this can be fitted anywhere convenient in the car. The control of the set is carried out by means of a fitting on the steering-column of the car. The whole outfit costs £33.

On the Essex cars the Majestic super is available at a cost of 22 guineas. This,

too, has distant control, the control being fitted to the facia board of the car. All Essex saloon cars, by the way, have aeriels fitted as standard.

The Lissen car set is another distant-control type, but it is designed for use from batteries and not from a converter. With the Ekco set it is the only car set that covers the long as well as medium wavebands.

A Six-unit Receiver.

The Lissen installation consists of six parts. There is the set itself, a six-valver incorporating A.V.C.; then there is the control unit which fits on the steering-column of the car; the loudspeaker; a separate H.T. battery container; Bowden wire equipment for linking up the control unit to the set; and special suppressor resistances and condensers for the car ignition.

The set is contained in a weatherproof box, and is meant to be mounted under the floorboards, while the speaker is designed to go under the facia board of the car. The H.T. required is only 120 volts of power type of battery, so that the demands of the set are not great in the way of space.

A caravan is an ideal place to have radio fitted, for the space is ample and the aerial can be more efficient than in the case of the car, where in most cases a wire-mesh aerial in the rear portion of the roof (behind the sliding section) is all that can be conveniently arranged.

Sets for Caravans.

The Cheltenham Caravan Co. have chosen a simple but very effective receiver to include in the front portion of their caravan—in the "dining-room," so to speak. It is the Telsen Class B four-valver that was described in the last "Radiomag," and it fits conveniently into the bulkhead of the front of the caravan, as shown in our sketch. A

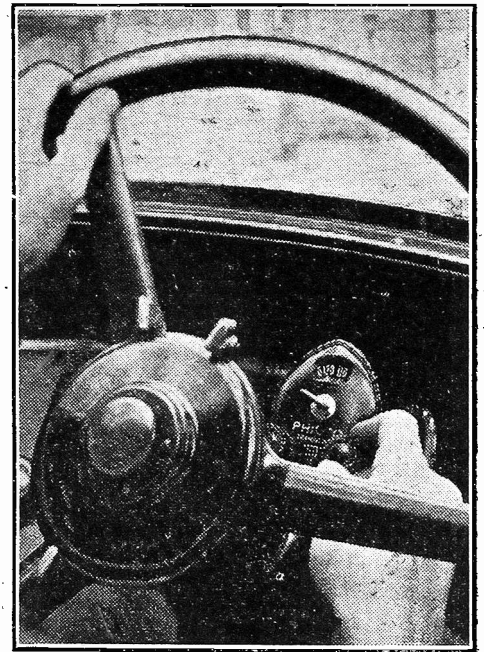
BRIGHTER CAMPING!



Two campers listening to a Castophone three-valver fitted in an Essex trailer caravan.

clock is provided above it, and the loudspeaker can be housed in one or other of the flanking cupboards, which have grilles cut in them for the purpose. The batteries

TUNE WHILE YOU DRIVE



Philco favour steering-column control for their superhet, car radio receiver which is designed to be installed under the dashboard.

are housed underneath one of the seats of the caravan.

This radio set is fitted as standard, and is, with the set on the Essex caravan, the only car radio that is not regarded as an extra. The aerial is run along the roof of the caravan, and an earth is made to the chassis.

One of the most surprising homes for radio that I found at the Motor Show (which also included boats) was the Chris Craft Runabout, a speed boat that is capable of something like 35 miles per hour. Where the radio was to be fitted I could not ascertain, nor what the exact nature of the aerial would be, but it struck me that a speed boat was hardly the place for radio listening. Anyhow, if it is required it can be fitted for a matter of £20.

Public Interest.

There is no doubt that car radio has come to stay; and though the apathy shown towards it by the motor salesmen at Olympia this year was marked, the interest in it shown by the public was even more noticeable—and that is saying something. Doubts are sure to arise at such an innovation in this country, but after a season or two of car radio I think it will have obtained sure hold on the imagination of the motoring public.

One thing I would like to assure myself of is that I have made it quite clear to readers that there need be no danger whatever in having the radio set "on" when the car is in motion. In some cases it is possible to have the set going so loudly that the driver is unable to hear the horn of another vehicle, but the judicious use of the volume control enables comfortable listening to be obtained without in any way detracting from the concentration of the man at the wheel on the main job on hand—driving the car.

ECKERSLEY EXPLAINS-



IT may seem irrelevant to mention the Motor Show when writing about wireless, but I have always maintained that the developments of the motor-car and the wireless set have followed very similar lines.

In the beginning motoring was all gadgets, and so was wireless. The early motor-car was a carriage with no horses; the broadcast receiver was a commercial receiver adapted for new wavelengths.

To drive a motor-car one had to be a mechanic and an enthusiast. To work the

that if I want to listen to this and other people in my house want to listen to that, there is no reason why this should not be.

I want to be able to control the volume coming from the set from my chair, and I want to be able to switch on or off when I am sitting down, and I want to change programmes when I am sitting down far away. In fact, I want remote control, because nothing annoys me more than jumping up and down changing programmes—or, usually, switching them off.

It's a grand specification. Let's see what we want in the way of components to make it realisable.

Accurate Calibration.

Tuning, apparently, has to be done on the basis of a strictly accurate calibration. Well, that's done moderately well to-day. But the world's programmes? How am I, with a noisy lift and a steel-frame building, going to get the world's programmes? WANTED—new physics. Perhaps ultra-short waves.

We could postulate the B.B.C. picking up for us all the best foreign programmes and relaying them via ultra-short waves. We could postulate the idea technically, I mean. But . . . Good quality? Well, we've got everything except the loudspeaker, and there are (dual) loudspeakers

in America which do a great deal of justice to a true input.

And with this ultra-short-wave technique we could get quite good quality—I think—perhaps. But—then, again, here's a snag: how can I, in a steel-frame building (and we're all going to live in steel frame buildings one day), get a little baby aerial to work so that my set can be taken anywhere in the house or flat? No! That's a nasty one. I cannot see how we get over that.

A Chance for Inventors.

Then we want another loudspeaker improvement. We want to make it, say, 100 per cent efficient (not more) so that we don't pay for unnecessary watts. The valves will have infinite input impedance and "cold" emitter filaments. They would have a magnification of several hundreds of d.bs., being free from Miller effect and perfectly screened. One valve could do everything, probably—or possibly.

But . . . as to the shape and colour of the set, I suppose art in industry will have its little way; but so far as I can see it won't be the way I want it to be for some time yet. But the consummation of the ideal is not impossible.

Cost—I will resist the subject, only saying that we have seen remarkable changes, and that value for money is given in greater measure to-day than yesterday. Remote control? . . . Pure ingenuity, and engineers are, if nothing else, ingenious.

We seem to be up against just one thing, and that is the physics of wireless. Will ultra-short waves give a reliable indoor aerial magneto interference free constant one-valve set service to all? It is doubtful. It is also doubtful if the national authorities want to give people a wide choice of programmes.

(Continued on page 483.)

What is your idea of a perfect receiver? Our Radio Consultant-in-Chief gives his specification for such a set, and then goes on to deal in detail with the points he raises, showing how some of them require the introduction of new technique before they are capable of consummation.

early wireless set one had to be an empiricist and a contortionist.

Now the motor-car is an automobile. The wireless set is an automatic player of music, a talker—anyway, it's not a wireless set only.

This year's Motor Show revealed tremendous engineering developments. One might have thought that by this time the motor-car was fairly well standardised; not a bit of it: the gear box is revolutionised, for example. Good-bye to the grease gun and hail independent wheel springing and smoother power units! The engine is, in one cr, behind, where it ought to be.

So the wireless set cannot be, and is not, yet standardised. Far from it.

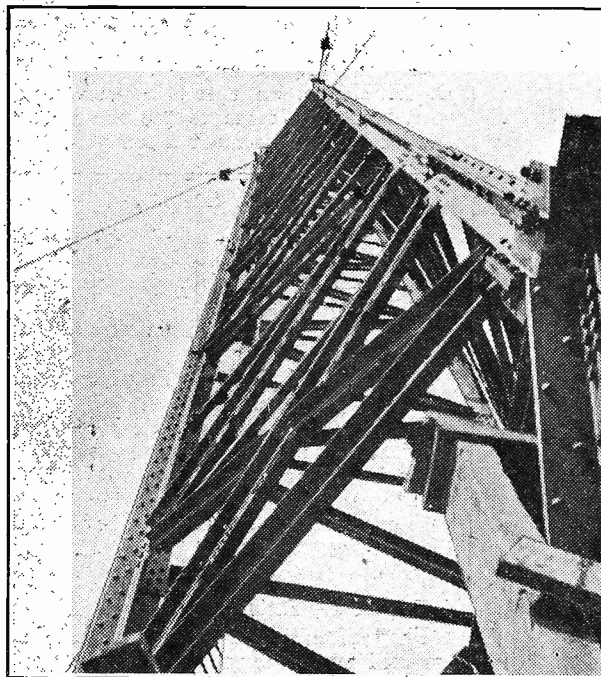
If you had to make a specification for a perfect receiver, what would you write down? I'll tell you what I would write down.

Armchair Control.

A knob or a switch would be to my hand handy. Turning it would give me a choice of all the world's programmes and would indicate to me at once the source of the programme. The noises coming from the speaker would be indistinguishable from the original. The set would be very small.

It would plug in to any electric plug (we shall never defy the "conservation-of-energy" principle), but it will consume next to no current—why should I pay for watts when my sound delivered is measured in microwatts? The shape and colour of the set will not offend me nor quarrel seriously with any decoration. The cost will be such that I can perfectly well afford to have one or two sets, so

FOR THE NEW LONG-WAVER



"The B.B.C. are doing away with the possibility of giving more alternatives than two," says Eekersley. But they are making sure that they will be real alternatives, as witness the new long-wave station now being built near Droitwich, one of the masts of which is seen in this reproduction.

THE MIRROR OF THE B.B.C.

By O. H. M.

THE P.M.G. and THE B.B.C.

Broadcasting at Christmas—Supervision of Studio Arrangements—A Burlesque Broadcast—Important Midland Item.

THE recent visit of Sir Kingsley Wood and Sir Stephen Tallent to Broadcasting House signifies fresh Post Office interest in the B.B.C. I hear that Sir Kingsley is busy preparing to defend the B.B.C. against the threatened attacks in the House of Commons.

Mr. Churchill can be counted upon to rally the forces that are hostile to Broadcasting House. The Labour Opposition is restless because of the feeling of insufficient microphone time compared with the Government. The younger Conservatives, too, have their grievances.

Regional Development.

One good result is already in evidence in connection with the new organisation of the B.B.C. Regional staffs which have been strengthened by the addition of London officials who have now taken up their posts. Apart from the obvious value of this method of exchange in acquainting staff with the problems of the work in different parts of the country, there is no doubt that the programmes generally will improve.

The Christmas Day Broadcast.

What with the King and the bells of Bethlehem straight from the Holy Land, the Christmas Day broadcast promises to be another exceptional transmission. Instead of the "Round the Empire" touch of last year, the scheme this year is for a homeland Christmas party, built round the King's Message and the Bethlehem bells.

A B.B.C. Staff Council.

The idea of a staff council, to protect the interests of the individual and particularly the junior individual broadcaster, which owed its origin to Lady Snowden when she was a Governor of the B.B.C., is being revived. The readjustments involved by the

new division of function between creative and administrative have caused hardship in certain cases, and there is a growing feeling that only a staff council machine can protect the interests of the individual.

A New Scheme.

I hear that a new scheme is being introduced in connection with the general supervision of studio arrangements at Broadcasting House. This work has hitherto been part of the duties of Mr.

was assistant to Mr. Neil Maclean, then the station director at Aberdeen.

Supervising the Studios.

Mr. Munro will have two or three young women assistants who will have to ensure that all studios are ready for use in good time before they are required for broadcasts, as well as for rehearsal and audition purposes.

They will see that artistes and speakers are well settled in their places, waiting for the red light to flick, denoting that they are "on the air," and it will be a further part of their duties to keep the balance-and-control staff up to scratch.

From what I hear, the new scheme will entail a new rota of duties extending throughout the whole of the hours of broadcasting.

The routine work of allocating studios to the various sections of the Programme Department—music, vaudeville productions, talks, etc.—will also be carried out by Mr. Munro and his staff.

"America Calling Again."

Some of the details of "America Calling Again," the second burlesque of the type of broadcast programme to which our U.S. cousins are accustomed, have already been published in our columns.

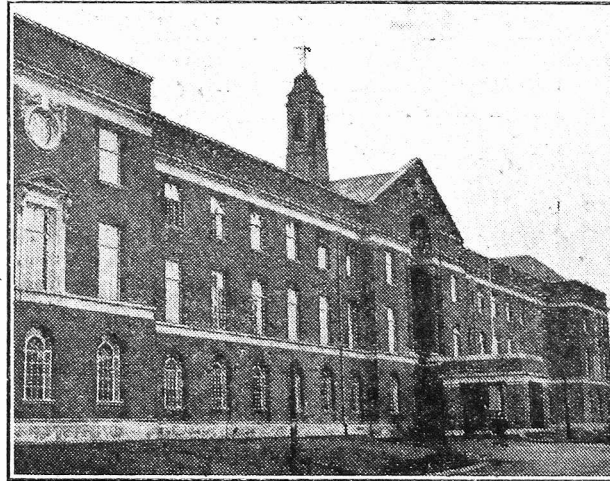
In addition to Eve Becke, Al Bowly, Marie Dayne, Dave Burns, The Moderniques, Burns and Allen, Jack Hylton and his Band will also take part.

Mr. Hylton has been allocated an exacting task, because while the other artistes will only each impersonate single American radio stars, Jack and his Boys will imagine they are Paul Whiteman and his Orchestra, Vincent Lopez and his Orchestra, Duke Ellington and his Band, and finally Guy Lombardo and his Royal Canadians.

A Big Job.

As all these famous combinations have their own distinctive features, Mr. Hylton has a big job on hand. So, too, has Eddie Pola, who will impersonate the
(Continued on page 480.)

THE G.P.O. RESEARCH LABORATORY



A view of the magnificent new G.P.O. Research Laboratory at Dollis Hill, which was recently officially opened.

H. L. Chilman, the House Superintendent, who was also responsible for the studio arrangements in the B.B.C.'s Savoy Hill days.

It will in future be carried out by Mr. D. H. Munro, an energetic young Scot, who, before he came to the Head Office Productions Department a few years ago,

recently have had an opportunity of seeing two others, the Blue Spot Class B Output Stage and the Wearite Class B Unit.

The Blue Spot unit is a complete output stage comprising Class B components, a 45P.M. loudspeaker and an Osram B.21 valve; and sells for the remarkably low price of 43s. 6d. inclusive. I can recommend this unit with confidence.

The Wearite unit does not include a loudspeaker, and is in the form of a constructor's kit, using, of course, Wright and Weaire's own Class B components. A special folder with constructional charts may be obtained through the "P.W." postcard scheme. (No. 62)

A New Battery Factory.

I have often mentioned the fact that there are still many thousands of listeners who use battery receivers. It now appears, in support of my contention, that the demand for high-tension batteries is increasing rather than growing smaller, for the Ever Ready Company have found their present

factories, extensive as they are, insufficient to cope with the orders. Recently a new factory has been opened at Walthamstow, with a floor space of something like 175,000 square feet, which will deal with every stage of dry-battery manufacture. It is the only factory in England, incidentally, in which production is carried out from the raw material to the finished battery, and it is the eighth which Ever Ready have built in London.

Static Suppression Topics.

The Kolster-Brandes "Rejectostat" system needs no introduction at this stage, but
(Continued on page 482.)



BY G.T. KELSEY
Weekly jottings of interest to buyers.

IF proof were needed that "Class B has come to stay," it would be amply provided by the number of manufacturers who are now turning out special units for this form of amplification, either with or without incorporated loudspeakers. I have already mentioned several of these, and

Give Generously for Your Poppy.

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 of the number.

BIG PAY for Trained Radio Men

“Practical Wireless” writes:—
“There is no doubt that the Courses have been prepared in a most masterly fashion by men who know what they are writing about. The Principals of the College are in constant touch with leaders in the radio industry and can, therefore, effect introductions which can be of the greatest assistance to students. A recommendation from the College direct to an employer is not only a guarantee of the student's training but also confirms his determination to qualify for a good position. The student is assured that the College will use its influence to the utmost to help him to succeed.”

“Amateur Wireless,” “Popular Wireless,” “Wireless World,” and other publications also testify to the excellence of T.C.R.C. training.

Fathers! Prepare your Sons for well-paid jobs!

Fathers who are faced with the problem of finding employment for their sons should send for our Prospectus. Radio and its allied industries offer unlimited opportunities for boys and young men who are ambitious. Our training will equip them for well-paid and progressive positions and will provide them with an intense interest to occupy their spare time.

Individual training by experts

Our Chief Technical Contributor, Mr. G. P. Kendall, B.Sc., needs no introduction. He is an authority on technical and commercial radio. Both he and our Director of Studies have proved, by their own achievements, that radio offers wonderful opportunities to trained men. Each student is treated as an individual and the number accepted is limited in order that each student may be given personal attention. All communications are sent in plain envelopes and students study in the privacy of their homes. Age and circumstances are no obstacle—we have students of all ages and in all walks of life. Our fees are extremely reasonable and can, if desired, be paid by instalments. One fee covers the complete training; there are no additional expenses except postage.

**POST COUPON
NOW AND TAKE
THE FIRST STEP
TO SUCCESS AND
PROSPERITY**

Radio offers rich rewards to the trained man. It is a field of tremendous and unlimited opportunities. Broadcasting, television, talkies, cathode ray, air traffic and the whole of the electrical industry, quite apart from the actual radio industry, are becoming vitally linked up with radio science. In less than ten years over 150,000 jobs have been created. Already there are over a thousand men earning more than £2,000 a year and over 25,000 earning more than £500 a year and these men are doing interesting work that you would call a hobby.

YOU CAN QUALIFY FOR HIGHLY-PAID WORK.

Trained men are urgently wanted and we can give you the sort of training that employers demand. The T.C.R.C. Radio Correspondence Courses are prepared and conducted by men who have themselves made good in the Radio Industry and earned four-figured salaries.

FULL-TIME EMPLOYMENT FOR TRAINED MEN.

Our Director of Studies and his colleagues are in close touch with leading radio employers. Every student obtaining over a 70% pass on completion of his studies is guaranteed introductions to suitable employers and is given valuable help in obtaining the sort of work he wants.

TURN YOUR SPARE TIME INTO MONEY.

If you do not require full-time employment, we can train you to earn money in your spare-time. Set Designing, Inventing, Demonstrating, Installation and Maintenance, Servicing, Set Building, Writing for the Press, Mail Order, Accumulator Charging, and many other interesting occupations which will not interfere with your ordinary occupation can bring you in additional money. You can make your hobby pay and derive much greater enjoyment from it. We will teach you how.

ACT NOW! Success awaits you.

We train students of all ages. We can train **you**. Our Prospectus contains full details of the opportunities that radio offers and explains how we can train you quickly to become a radio expert capable of demanding big money. T.C.R.C. Training is intensely interesting—no foreign text-books, no obsolete theory or dull drudgery, no additional expenses. You will enjoy studying.

Our Courses cover the whole theory of radio and include practical instruction. They are always up-to-date and contain instruction on all the latest developments of radio. Every student is treated as an individual, and additional instruction and advice is given him to suit his particular needs.

Send for our Prospectus now. It is free for your asking. It will place you under no obligation. You will not be pestered to enrol. **FILL IN AND POST COUPON NOW.**

**TECHNICAL & COMMERCIAL RADIO COLLEGE,
LLOYDS PLACE, BLACKHEATH, S.E.3**



Mr. R. H. Bradley, Director of Studies.

Mr. W. S. VERRELLS, Managing Director of E. K. COLE, LTD., Manufacturers of EKCO RADIO, writes:—

“There can be no doubt as to the urgent necessity for such a College, and I heartily commend your enterprise in spreading wireless wisdom in this manner. There is a great future in radio and the men who take the trouble to study and specialise will find their progress assured. I know that those who complete the thorough course will be well equipped with the valuable knowledge so essential to the modern radio craftsman.”

ANOTHER LEADING RADIO MANUFACTURER says:—

“I have always experienced the greatest difficulty in finding men with a sound technical and commercial knowledge. Your Courses fill an essential need in the radio field.”

SERVICE MANAGER, writes:

“Technical training on the part of the radio dealer or his assistant has been an advantage in the past. It is now becoming a necessity.”

To: TECHNICAL & COMMERCIAL RADIO COLLEGE, Lloyds Place, Blackheath, S.E.3.

Please send me, free, full details of the T.C.R.C. Radio Correspondence Courses and tell me how I can qualify for highly-paid employment, as well as making money in my spare time.

Name

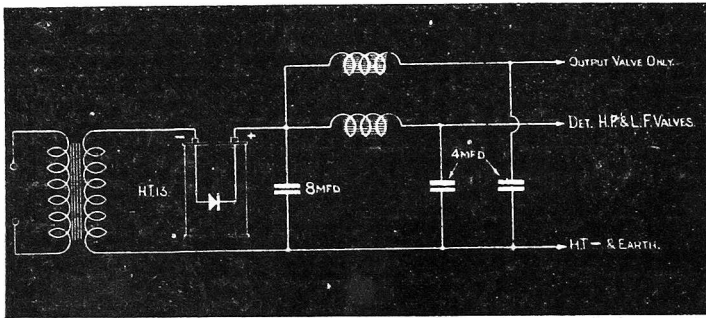
Address

Occupation

Age

Pop. W. 2. (½d. stamp if posted in unsealed envelope.)

A simple ★ class "B" mains unit



★ Excellent voltage regulation *without* using stabilisers or ballast resistances.

Mains-driven Class "B" provides super volume with excellent quality. And here is an inexpensive A.C. Mains Unit which has been specially designed to cope with the wide variations of current of a Class "B" valve and yet provide a nearly constant voltage output.

It is built round the new H.T.13 Westinghouse Metal Rectifier in a half-wave circuit, and no stabiliser or ballast resistance is necessary. The regulation obtained results in a variation of only 10 volts between the minimum and maximum values of anode current required by the Class "B" valve. A full-size blue-print and building particulars are available. Get a copy now!

Westinghouse metal rectifiers

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD.,
82, YORK ROAD, KING'S CROSS, LONDON, N.1

Coupon

NOVAM

Get Your Blue-Print Now!

PLEASE GIVE
GENEROUSLY

Please send me "The All Metal Way, 1934," and blue-print of your Class "B" eliminator for which I enclose 6d. in stamps.

Name

Address

P.W. 11-11-33.



IF You Want a Quality S.T.500

1 Use no Output Choke
(You also Save 8/6)
See P.397 Popular Wireless, Nov. 4 1933

2 Use
ROLA
FR6-PM-23 Class B
(As Specified) **39/6**

NOTE.

Rola make special type Class B Input Transformers because of the special requirements of Class B as to Super-High Inductance, etc. This is why nearly every British manufacturer making Class B receivers uses Rola.

**USED WITH ITS OWN
INPUT TRANSFORMER**
as above, this Speaker will give vastly superior results to any other.

EXTENSION SPEAKERS

Write for list

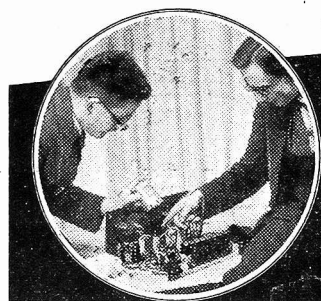


There is a correct Rola Extension Speaker for practically all British Radio Receivers. Rola speakers are used by nearly all British Radio Manufacturers. As it is highly desirable to have the speech coil impedance of the Extension Speaker similar to that of the speaker in the receiver, the necessity for using Rola Extension Speakers is manifest.

Write for List.

THE BRITISH ROLA CO., LTD.,
Minerva Road, Park Royal, N.W.10.
Phone: Willesden 4322-3-4-5.





RADIO STEP-BY-STEP

OUR SPECIAL
SUPPLEMENT for
BEGINNERS

JUST as we measure water in pints, quarts or gallons, sugar, in pounds, coal in tons, and ribbon in yards, so we measure electricity in definite units. The electrician speaks glibly of pressure, current and resistance. He refers to a battery of so many volts and to a current of so many amperes. What does he mean? He uses these words in exactly the same way as you yourself would speak of a pint or a foot.

When electricity flows along a wire, as it does, for example, from a power station to your house, from a motor-car battery to the headlamps or from one telephone to another, it requires a driving force. It will not flow unless there is something, as it were, to push it along.

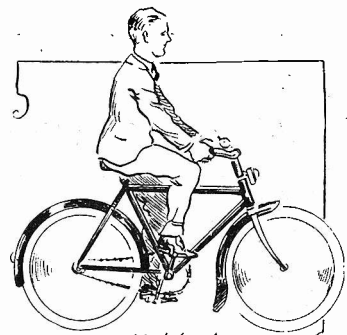
Therefore we sometimes speak of *electromotive force* as that property which produces a flow of electricity. The unit of electromotive force (abbreviated to e.m.f.) is called the *Volt*; hence we hear of a battery having an e.m.f. of so many volts.

The Driving Force.

This is simply another way of saying that so many units of pressure are available for driving a quantity of electricity along a wire or round a circuit.

Everybody is familiar with the ordinary garden hose. In order to obtain a powerful stream of water from the nozzle it is necessary to have plenty of pressure. Given sufficient pressure or force, the nozzle will pass a large quantity of water in a comparatively short time.

But if, on the other hand, the force behind the water is small the result will be little more than a trickle from the nozzle.



No Wind

On a still day a cyclist finds his work easy, because the resistance he meets with is comparatively small.

The pressure behind the water can be obtained in several ways, the most obvious being a pump. A powerful pump would force more water past the nozzle in a given time than a less powerful one.

If the length of the hose is considerably increased the power

Obviously, the amount of water per second passing through the hose will be much greater in the second case. The term gallons alone has little meaning because it does not take time into consideration.

So long as some water is flowing past the nozzle of the

number of amperes flowing along the wire will be increased.

But however great the pressure of electricity (voltage) the flow of current (amperes) along a wire is not unrestricted.

When water flows along a pipe it meets with a definite resistance which depends upon several factors. For example, whether the walls of the pipe are smooth or rough, and also upon the length of the pipe.

In electricity every length of wire has a definite resistance to current flow. This resistance depends upon the length of the wire, the material of which it is made, its cross-sectional area and to some extent its temperature.

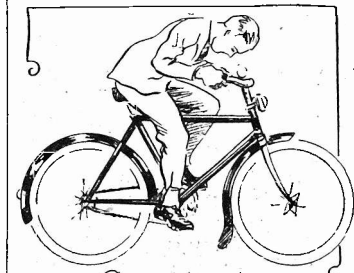
The amount of electricity passing a given point along the wire in one second (amperes) will be less if the resistance is made greater, assuming the pressure or driving force (volts) to be the same.

An Analogy.

A cyclist pedalling along the road on a still day finds his work comparatively easy, because he meets with little resistance (there is always some resistance to his progress—otherwise he would not have to apply pressure to the pedals).

But if he has to pedal against the wind he finds his work much harder. If he continues to apply the same pressure to the pedals as before the effect of the wind resistance is to decrease his speed. Alternatively, he can maintain his previous speed by pressing harder upon the pedals, and so overcome the extra resistance due to the wind.

This is the effect of electrical resistance on the pressure and current (volts, and amperes). Quite simple, isn't it?



Against the Wind

A cyclist finds his work more difficult against the wind. He meets with resistance, and this slows him down unless he presses harder on the pedals in order to maintain the same speed.

ELECTRICAL UNITS

A simple explanation of Pressure, Current and Resistance.

of the pump will have to be increased also, in order to maintain the same flow of water past the nozzle.

Here we have a good analogy for electrical pressure. The pump supplies the pressure which forces the water through the hose.

Similarly it is the pressure or electromotive force which drives the electricity along a wire. And it is the volts that supply the pressure.

Now, the hose analogy is a very useful one. We know that for a given size of hose we shall get more water in a certain time if we increase the pressure. Suppose, for instance, we wanted to fill a tank. We could do this in two ways. One method would be to use just sufficient pressure or force to ensure a small flow from the nozzle and take perhaps half an hour to fill the tank.

The alternative would be to use plenty of force behind the water so as to maintain a powerful stream past the nozzle, thus filling the tank in a third or a quarter of the time.

hose we can obtain as many gallons as we like, if we are prepared to wait.

But if we are told that with a given pressure we can get a gallon a second (or a fraction of a gallon per second) we know where we are.

We can now revert once more to our electrical units. The flow of electricity along a wire is analogous to the flow of water along a pipe or hose, and this electrical flow is known as a *current*. The electrical unit of quantity or amount of electricity is the *coulomb*. This is analogous to the gallon.

But electricians never speak of coulombs!

They are concerned with the rate of flow, or, in other words, how many coulombs flow past a given point in a second (this is analogous to gallons per second past the hose nozzle).

Now, the word *ampere* is used to express a flow of one coulomb per second. If we increase the electrical pressure or voltage we shall force more electricity past a given point per second, i.e. the



In order to obtain a powerful jet from a hose nozzle it is necessary for the pressure of water to be high. If the pressure of water is low only a trickle will flow from the nozzle of the hose.

Special Beginner's Supplement—Page 2.

Aerial.

THIS is the arrangement used to collect the radio energy from space. It can take any one of many different forms, but the most efficient for normal broadcast reception is a single wire suspended in the open.

Height is of greater importance than length, generally speaking, and, in practice, that is really the only vital point to remember.

The actual wire itself should be chosen first for its strength and weather-resisting qualities. Seven-strand phosphor-bronze is excellent material for the purpose. Insulating covering is not necessary, nor does it interfere with reception, but if it provides a good protection against the weather it can certainly be useful if only for that reason.

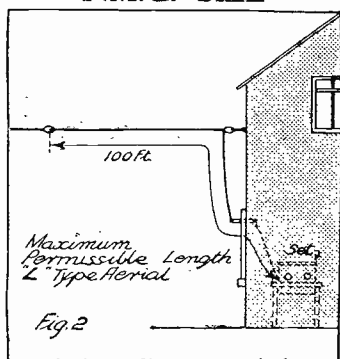
Aerial wires should be kept as far away from walls and trees as possible.

A convenient length is 75 feet, including the lead-in portion which connects to the set.

There is usually no great advantage to be gained by employing the full 100 feet allowed by the P.M.G.

An inverted "L" type, as shown in Fig. 1 and Fig. 2, is slightly directional. That is to say, it will receive best from the one direction, and that is from the direction to which the set end is pointing.

P.M.G. SIZE



The maximum length of aerial permitted by the Postmaster-General is 100 ft. This includes both the horizontal portion and the leading-in wire.

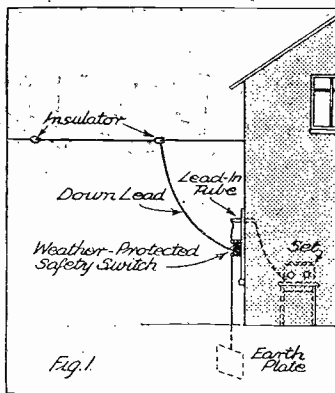
The "T" type (Fig. 3) is, obviously, less directional, but the difference is not one that is likely to affect the average listener to any great extent.

Probably the best type of indoor aerial is a pair of parallel wires suspended in a loft or other roof space (Fig. 4), though good results can be obtained from a wire run around the picture-railing of a room. Special

wire for the purpose is freely obtainable. A superior effect is achieved if the aerial is in an upper room of the house. It should not run round all four walls, but only three, as shown in Fig. 5.

The aerial terminates at the aerial terminal of the set, and that part of it referred to as the lead-in should be kept as short, free of bends,

INVERTED "L"



With the inverted "L" type of aerial the lead-in wire is taken from one end, normally the house end.

nately the selectivity of the set with which it is used can be emphasised, and it is often possible to reduce atmospheric disturbances to a lower level than with an ordinary type of aerial.

Fig. 7 gives practical details of a satisfactory frame for broadcast reception of dimensions suitable for an

of electricity in the aerial system. These must not be allowed to leak away, so where it is necessary to secure the aerial at its ends or pass it through a window frame or wall, good electrical insulation is needed.

Aerial Insulators.

The popular and inexpensive "egg" type insulators made of glazed porcelain are perfectly satisfactory. There is no need to cut the aerial wire at the end of its horizontal run. It can be looped through the insulator, carefully tied so that the strain is taken up, not by a knot but by the smooth surface of the insulator, and continued unbroken for the downlead.

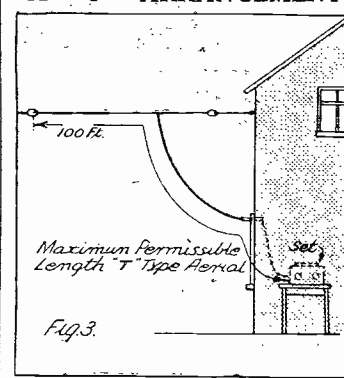
Aerial Lightning Switches.

The chances of lightning striking any one particular aerial are a million or more to one. Nevertheless, the careful listener will want to guard against even those long odds.

Complete protection against lightning is afforded by a safety switch which can be operated so as to disconnect the aerial from the lead-in and join it to a wire which runs direct to earth (Fig. 1 and Fig. 6).

But such a switch must be outside the house and wired to allow the most direct run from the aerial to a good buried earth.

A "T" ARRANGEMENT



With a "T" aerial the maximum permissible length is that of the longer arm plus the leading-in wire.

A substantial, covered switch is needed—one that has been specially designed for out-of-doors use.

Alternatively, there are devices which are automatic in nature and embody "safety gaps." (A very small gap between two pieces of metal, one of which is joined to the aerial and the other to earth. The electrical charge induced in the aerial prefers to jump across this

(Continued on page 461.)

RADIO TERMS

A PRACTICAL REVIEW

BY C.V. DOWDING, ASSOCIATE I.E.E.

This section is much more than a mere list of definitions. It is a complete survey of radio presented in a compact form, giving succinct theoretical explanations and packed with useful practical facts. It constitutes a perfect accompaniment to the other articles in the supplement both by providing summaries of the subjects covered and by building a fascinating bridge between theory and practice.

and as far from walls as possible.

Where severe interference is experienced the expedient of shortening the aerial, perhaps drastically, is often worth trying.

Frame Aerial.

The great advantages of the frame aerial are its compactness, strongly directional properties, and freedom from depreciation as compared with the ordinary outdoor system. But it is not as sensitive.

The directional effect is extremely useful.

The frame aerial is, in fact, the basis of practically all direction-finding schemes. It receives best from the two opposite directions in line with it, and minimum reception results from the two directions at right angles to it.

By employing this property discrimi-

“all-in” type of set. Double silk-covered wire is advised, the gauges being indicated in the drawing.

The two windings are in the same direction. Wave-changing is accomplished by means of a simple on-off switch, which either leaves the medium-wave winding disconnected for long-wave reception or connects it in parallel with the long-wave winding for medium-wave reception.

Within limits the larger the frame the greater its efficiency (fewer turns of wire are needed for given wavebands as with increases in size).

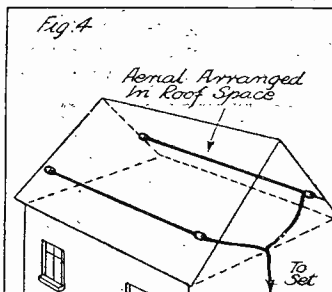
The directional effects of a frame are reduced and its sensitivity increased somewhat if an ordinary earth connection is used with it.

Aerial

Insulation.

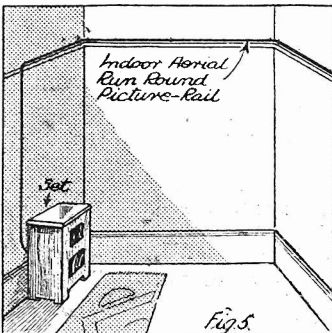
The wireless waves generate feeble currents

UNDER THE ROOF



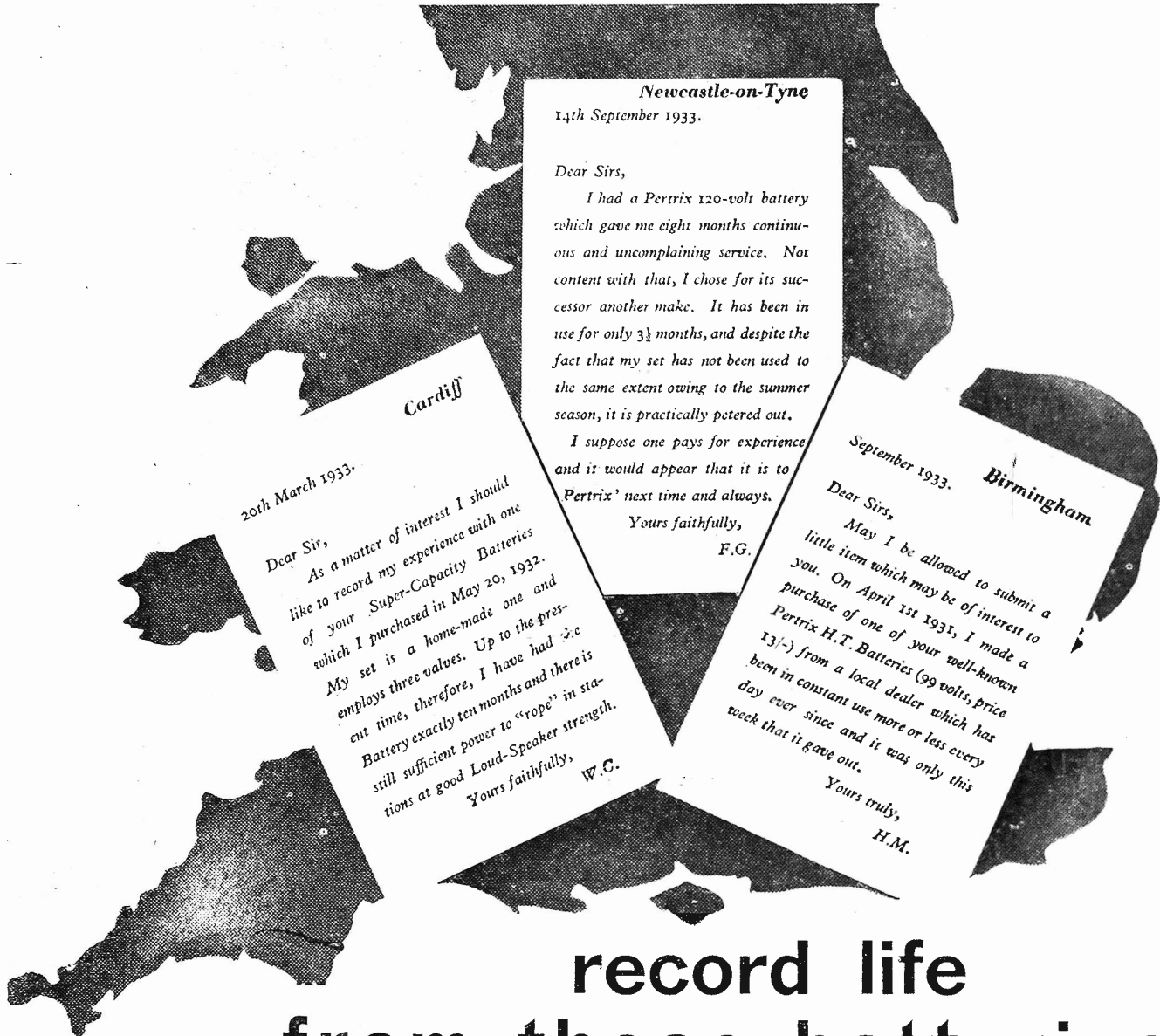
Good results can be obtained with an aerial arranged under the roof. This is probably the best type of indoor aerial.

PICTURE-RAIL TYPE



Those who are unable to erect an outdoor or roof aerial should try the arrangement shown above. The aerial wire runs round the picture railing on three sides of the room.

All over the country



Newcastle-on-Tyne

14th September 1933.

Dear Sirs,

I had a Pertrix 120-volt battery which gave me eight months continuous and uncomplaining service. Not content with that, I chose for its successor another make. It has been in use for only 3½ months, and despite the fact that my set has not been used to the same extent owing to the summer season, it is practically petered out.

I suppose one pays for experience and it would appear that it is to Pertrix' next time and always.

Yours faithfully,
F.G.

Cardiff

20th March 1933.

Dear Sir,

As a matter of interest I should like to record my experience with one of your Super-Capacity Batteries which I purchased in May 20, 1932. My set is a home-made one and employs three valves. Up to the present time, therefore, I have had a Battery exactly ten months and there is still sufficient power to "rope" in stations at good Loud-Speaker strength.

Yours faithfully,
W.C.

Birmingham

September 1933.

Dear Sirs,

May I be allowed to submit a little item which may be of interest to you. On April 1st 1931, I made a purchase of one of your well-known Pertrix H.T. Batteries (99 volts, price 13/-) from a local dealer which has been in constant use more or less every day ever since and it was only this week that it gave out.

Yours truly,
H.M.

record life from these batteries!

Letters beyond number, from all parts of the country, tell how Pertrix Batteries have lasted until they became sources of wonder. If you could read all these letters, you would be convinced that Pertrix Batteries really have put up records for long life. Yet you still wouldn't be any wiser as to *why*. The reason is that Pertrix Batteries are non-sal-ammoniac.

They are the only batteries using a patent *neutral* electrolyte which cannot rot the zinc cells. There is no 'shorting' between the cells—and no resistance crystals to clog the current. Instead of wasting away when the set is idle, a Pertrix actually recovers power. *Now you know how and why, make your next battery a Pertrix!*

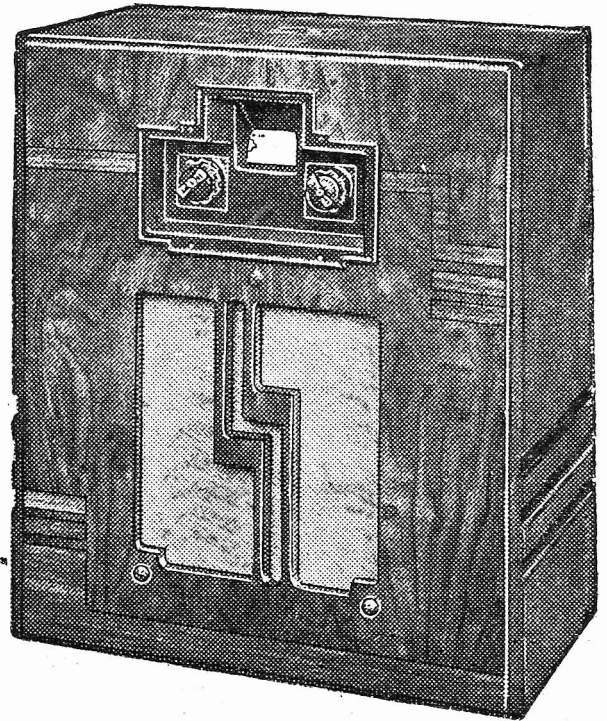
FIT

PERTRIX

TRADE MARK

FOR GOOD

The Finest Portable ever built — by anyone!



A NEW 15 GUINEA PORTABLE RADIO BUILT TO A £100 IDEAL!

The ultimate in Portable Radio is here—the latest “His Master’s Voice” Superhet A.V.C. Portable Grand, Model 462. Into this set has been built all the advancements hitherto obtainable only in all-main instruments of the very largest size and price. Not only is Model 462 a six-valve Superhet Portable with permanent magnet moving coil speaker, giving beautifully balanced reproduction, but it is equipped with:—

(a) Automatic Volume Control. This

means that you can now receive your programme from a portable at constant strength — distant stations coming in delightfully clear with absence of fading.

(b) The simplest of controls. Illuminated scale showing station names.

(c) Provision for the operation of an additional low resistance loudspeaker, and for the attachment of a gramophone pick-up so that your records can be played with the highest quality of reproduction.

Ask your “His Master’s Voice” dealer for a demonstration.

OUTSTANDING FEATURES

- Mains performance from a battery portable.
- No earth; no aerial.
- Delayed Automatic Volume Control which combats fading.
- Perfect grading of volume even on powerful local stations.
- Simplicity of control.
- Station names on illuminated scale.
- Super sensitivity and selectivity.
- Correctly balanced reproduction from moving coil loudspeaker.
- Ample power for additional loudspeaker.
- Sockets for gramophone pick-up.
- Handsome walnut cabinet, designed acoustically.

“HIS MASTER’S VOICE”
“TRUE - TO - LIFE”
RADIO

Special Beginners' Supplement—Page 3.

A CLEAR understanding of what constitutes alternating current is of vital importance to the radio enthusiast. And the best method of gaining this understanding is to start at the beginning and consider the simple generator of electricity.

VARYING VOLTAGE

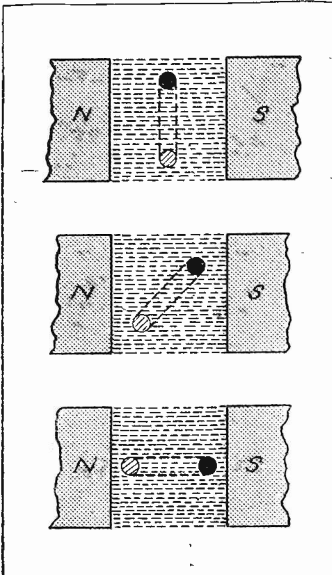


Fig. 1. How a loop of wire revolving in a magnetic field cuts the lines of force. In the top diagram the voltage is zero, and in the bottom diagram it has reached its maximum.

Last week, in the article on "Mysteries of Magnetism," we showed how a length or loop of wire moving across a magnetic field causes a flow of electricity along the wire. This flow of electricity is the result of cutting the lines of force at an angle. This, it was pointed out, is the

WHAT IS A.C.?

The answer to this question is given in a way which everyone will find easy to follow.

principle upon which the dynamo works.

Now let us assume that we have a rectangular loop of wire capable of revolving in the magnetic field produced between two magnet poles (Fig. 2).

In Various Positions.

In Fig. 1 this loop of wire is shown in section in three of the positions which it will take up during a revolution. In the top diagram the loop is vertical, in the second it is at an angle midway between the vertical and horizontal, and in the bottom diagram it is horizontal.

Suppose we commence our revolution from the vertical position (top diagram).

When the loop moves out of the vertical position it will start to cut the lines of force, and immediately it does this a current will flow along the wire and generate a definite voltage between the two ends.

Cutting the Lines.

Now this voltage, which varies with the current flow (see the article on Electrical Units), increases as the number of lines cut by the loop becomes greater. For a given movement of the loop this must depend upon the angle between the magnetic lines and the loop.

Thus in the intermediate position (middle diagram of Fig. 1) the voltage generated is steadily increasing until it finally reaches its maximum, when the loop is moving perpendicular to the lines (bottom diagram Fig. 1).

We can now approach the subject in greater detail. Fig. 1 shows five positions of the loop during one revolution. Directly above these five small diagrams is a simple graph showing how the voltage generated rises and falls, and how it reverses its direction.

The angle through which the loop has passed is indicated in degrees along the horizontal line. To start with, the loop is vertical and the voltage is zero. For the sake of clarity we are only considering the top portion

A REVOLVING LOOP

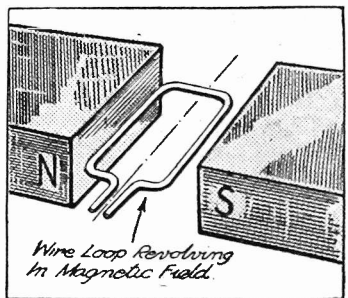


Fig. 2. The voltage rises to a maximum and falls to zero in one direction, after which it carries out the same procedure in the opposite direction.

of the loop, which is shown as a small black circle.

Increase and Decrease.

As the loop moves through the first 90 degrees of its revolution (a quarter of a turn) the voltage gradually rises to a maximum. This is reached when the loop is horizontal.

After this, from 90 to 180 degrees, the voltage gradually falls, until at 180 degrees, when the loop has turned for half a revolution, the voltage is zero.

Then the voltage starts to rise again during the next quarter of a turn, but this time in the opposite direction, reaching its maximum at 270 degrees, or three-quarters of a revolution.

COMPLETE CYCLE

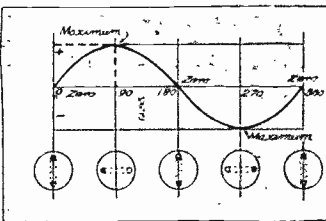


Fig. 3. When a loop of wire revolves in a magnetic field alternating current is generated in the wire.

After this the voltage falls once more, until at 360 degrees, or one complete revolution of the loop, it is zero. This increase from zero to maximum and then back to zero, followed by an increase to maximum and fall to zero in the opposite direction, is called a cycle.

There are two alternations to one complete cycle, viz., the rise and fall in one direction and the rise and fall in the opposite direction.

The first alternation is between 0 and 180 degrees; the second between 180 and 360 degrees—that is, one alternation for each half-revolution of the loop.

This is why we refer to the flow of electricity generated in this manner as alternating current. The number of cycles in a second is called the *Frequency*. Hence, if there are fifty cycles per second the A.C. supply is said to have a frequency of fifty.

RADIO TERMS

(Continued from page 458.)

gap rather than to flash through the devious path offered by the set and so to earth.)

Sometimes such a gap is in-

FOR EARTHING

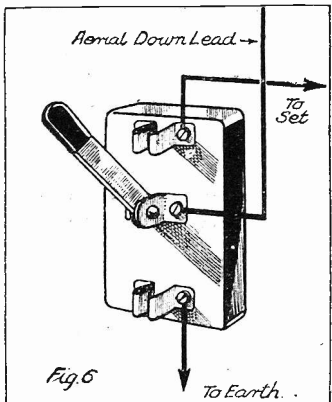


Fig. 6. An aerial-earth switch is connected up in this manner. In one position the aerial is joined to the set and in the other position it goes direct to earth.

corporated in an aerial switch, thus providing a two-fold safeguarding. Also lead-in tubes with safety gaps are to be obtained.

Aerial Lead-in.

The best way to get the aerial into the house is to use a good lead-in tube. This is merely a double-ended terminal well insulated along its shank. Lead-in tubes of different lengths can be obtained.

It is advisable that its exposed metal portion should be of an anti-corrosive character.

The tube can be fixed through a hole bored in the window-frame.

Aerial Screening.

A great deal of the electrical interference which troubles many listeners frequently reaches the set through the aerial. This can be tested by noting whether or not the interference is eliminated or reduced when the aerial is disconnected from the set.

To prevent much of such interference being picked up by

the aerial system, the downlead of the aerial can be screened by means of special metal screening which is now available.

This sheathing is well insulated from the wire, but has to be connected to earth. Ordinary lead-covered cable would not be suitable; the special material must be used or reception may be ruined by the losses introduced.

The earth lead also can often with advantage be shielded, but only that portion of the aerial known as the downlead should be treated in this manner.

The scheme is not likely to prove beneficial if there are no electric power or lighting mains close at hand, for the simple reason that it is to protect the aerial against interfering radiations from them that the screening is advised.

Mains Aerial.

It is a common practice in mains sets to provide for using the mains themselves as an aerial. This is done merely by

connecting the aerial terminal of the set to the mains by means of a small series condenser of the order of .0002 mfd. in capacity.

While this scheme does away with the necessity of more or less unsightly aerial wires, the results are seldom but fractionally as good, and in cases a certain amount of hum will be introduced.

MAKING A FRAME

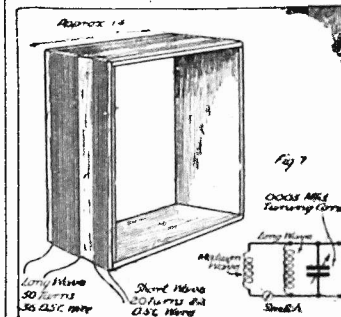
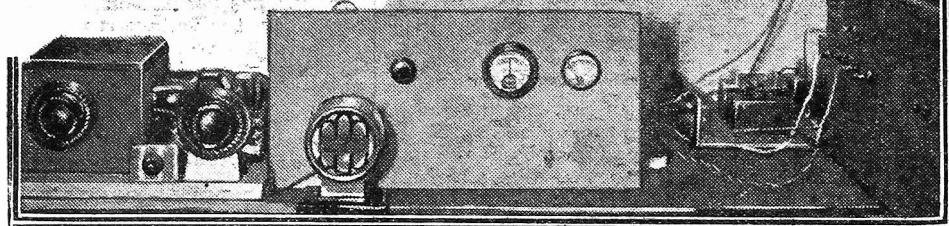


Fig. 7. An effective frame aerial can be made by using the method indicated above.

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



AFTER my several recent comments on the poor show put up by W 8 X K on 19.72 metres, in contrast to his usually excellent strength on 25.27 metres, I was very surprised a night or two ago to find him coming over on 19.72 at such unusual strength that he quite put W 2 X A D in the shade.

For the benefit of any readers who might have chanced to hear the same transmission, one of the items was a somewhat lengthy talk by a lady on the subject of preparing a "Chicken Chop Suey" dinner for a hundred people! Whether "X K" has now got an aerial on that wave that is directional for Europe I have not yet been able to find out; but strength was such that my one-valver, fed into a two-stage radio-gramophone, made him not only audible but intelligible all over the house.

Have You Heard Sydney?

D J B, immediately above him, was giving one of the usual interminable talks, but was not nearly as strong as the American.

Sydney, V K 2 M E, is another station that has improved tremendously. I suppose this will be quite exciting news to readers who have yet to bag their first Australian station. Listen for V K 2 M E on 31.28 metres at almost any time between 7 a.m. and 3 p.m. next Sunday, and you *may* be lucky.

"J. B. M.," of Glasgow, reports reception on Sunday, Oct. 22nd, at 7.18 a.m. (R6), 11.50 a.m. (R5) and 2.30 p.m. (R7). He mentions, too, that V K 2 M E announced that he was also transmitting on 7 metres. Here's a *real* chance for someone to do a spot of record-breaking!

"J. B. M.," by the way, describes some of his previous sets as "Sic transit gloria" (Here th' day an' awa' th' morn!). I'm afraid lots of us have had sets like that, J. B. M.

What Station Is It?

I am absolutely at a loss to account for the various reports that I receive about a Spanish-speaking station just above the 19-metre group. Scores of readers have mentioned this, and I have told most of them that I thought it must be X D A (Mexico) on 20.5 metres.

"A. M." (Glasgow) has completely spoilt this little romance by forwarding me a letter from the authorities at X D A to the effect that they have no stations for telephony service on that wavelength, and that station X D A is used exclusively for international telegraphic service.

The only remaining possibility seems to be the famous little station T I-4 N R H, in Heredia, Costa Rica, working on 19.9

metres. As this is quite a "fly-power" station, however, I find it hard to believe that so many different people should have reported it.

If anyone can clear up this small mystery I shall be very much indebted to him.

Real news, right up to the minute, and of vital importance to all those interested in short-wave reception, is offered by our popular contributor in these notes. He has some exceedingly interesting reports this week, and also comments on his latest receiver.

"G. W. C." (Leicester) reports transmissions on 73.5 metres that apparently emanate from aeroplanes. I didn't realise that the R.A.F. worked on that wave, but it looks very much as if they do, from what "G. W. C." reports. Incidentally, readers picking up this sort of thing should remember the "divulgence" clause in the receiving licence.

REAL PORTABILITY



The little box hanging round the neck of this Austrian policeman is a complete transmitter. The battery is contained in one of his pockets, and he is holding a special Morse key in his right hand.

We can't be stopped from accidentally picking up things that are not meant for our ears, but there is a very rigid rule against passing such information on promiscuously. I have even heard of a case in which a man complained to the G.P.O. about a neighbouring amateur transmitter, quoting some conversations that he had overheard and taken down in shorthand; and the said man was very severely reprimanded for intercepting private experimental messages!

Uses a Pentode Detector.

An amusing letter that I received recently from a foreign amateur contains the beautiful term "bulv" several times repeated. I eventually managed to read it as "valve," but I originally wondered what on earth he wanted a "bulv" for in his set. I think "bulv" is awarded the weekly biscuit.

My most recent receiver, using a pentode detector, is now finished, and will be in the Editor's hands almost immediately. I don't recommend it for reception of amateur C.W., or, in fact, for any headphone work except for weak stations during bad conditions. It does, however, make a very good "quiet" loudspeaker receiver.

The pentode is resistance-coupled to an L.F. stage, which may be another pentode if one is keen on plenty of volume. One of the advantages of pentode detection is that one seems to be able to get the detector into practically any state that one requires by varying the priming-grid voltage. In this particular set I have done this with a potentiometer.

Fine Reaction Control.

This control *can* be used as a kind of fine reaction control; or, when the set is already below the oscillation point, as a volume control. On the other hand, if the detector tends to oscillate fiercely when reaction is controlled by the condenser provided for that purpose, a reduction in priming-grid voltage will put things right.

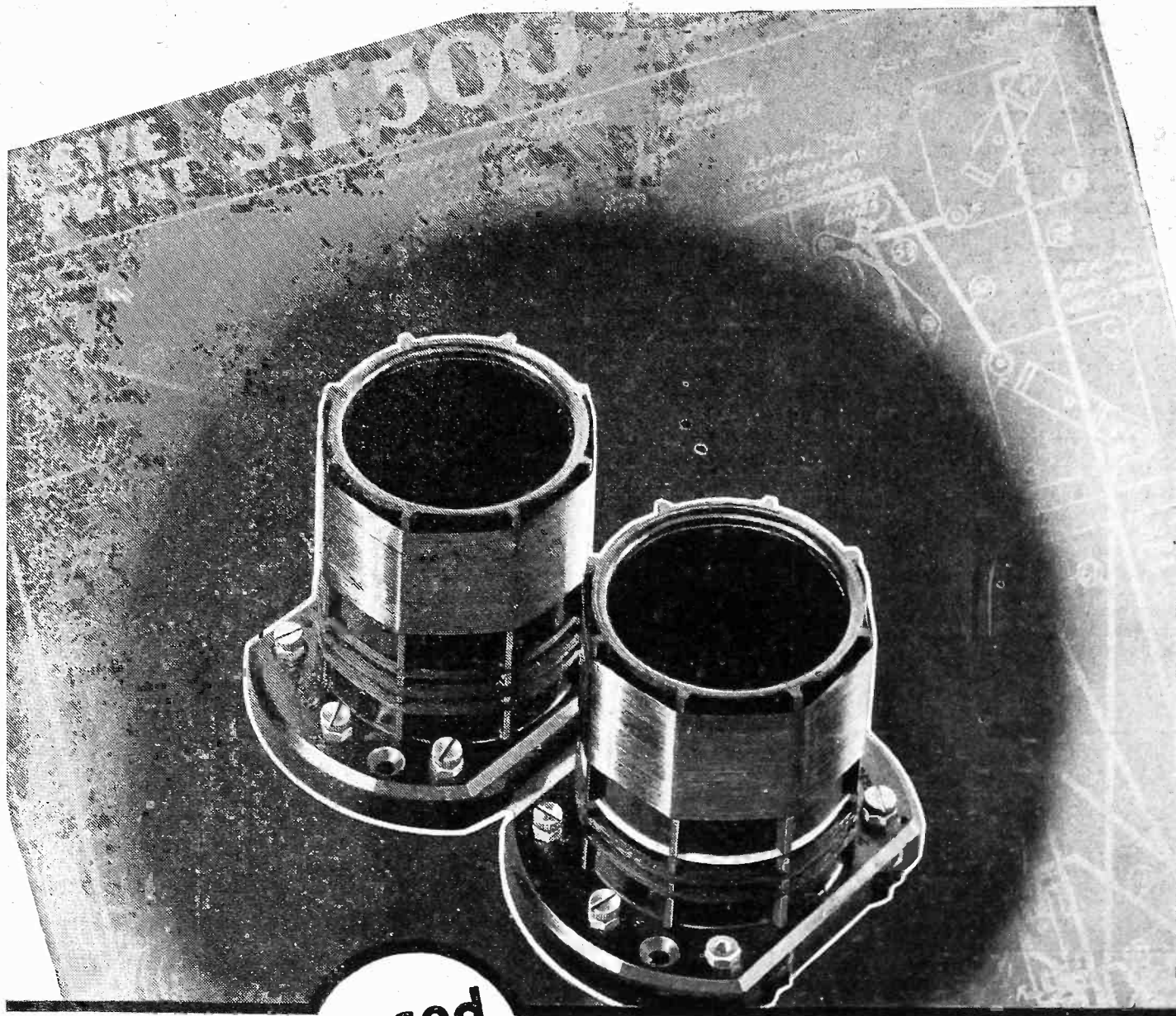
There are a good many single points of view from which pentode detection would not seem worth while; but on the whole I think it is an improvement on the triode as most of us use (or misuse) it.

I hear that exciting things are likely to happen on the ultra-short waves in the near future. Among these are television, Regional broadcasts, pictures by radio, and several other attractive features. Taking all this with the proverbial grain of salt, we certainly have to face the fact that all that space between 5 and 10 metres will most *certainly* not still be empty in two or three years' time.

Utilising the Wavebands.

Our treatment of the gamut of wireless waves rather reminds me of the behaviour of a family of seventeen who move into a house with eight rooms. At first they all insist on living in one room; but in the course of years they spread out over three of them.

Even now at least five of the rooms are untenanted except for an occasional noisy rush in and out again by one of the children (as happened at the Crystal Palace on May 21st, 1933!). One of these days that family is going to be twice as big, and it will be essential for the comfort of all that every room should be made full use of.

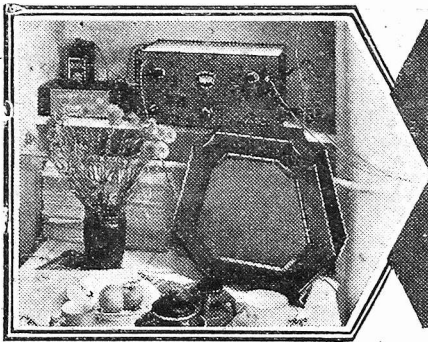


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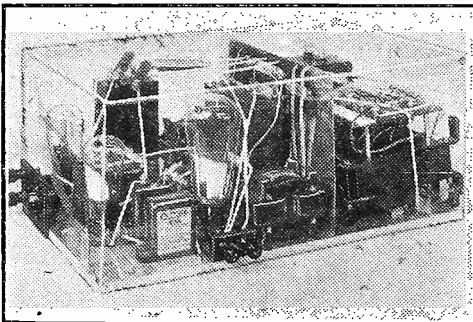
Like most of life's luxuries and necessities, loudspeaker reproduction has to be paid for, and in this entertaining article our talented contributor weighs up all the factors affecting loudspeaker performance and shows how best to get one's money's worth.

By **MARCUS G. SCROGGIE, B.Sc., A.M.I.E.E.**

LISTENERS and motorists are alike in other respects than having to be licensed. The power question faces both. As a motorist you have to balance up speed, hill-climbing and acceleration against first cost, taxation and petrol consumption. As a listener you have to balance up volume and quality of reproduction against initial and running expenditure.

The amount of power a motorist thinks it worth paying for depends, for one thing, on whether he usually drives in Lincolnshire or Devon. Are there any circumstances that decide how much power is desirable in a

A VOLUME PROVIDER



If you can afford it, one way to make a loudspeaker "deliver the goods" is to feed it from a super-mains-driven amplifier with a large high-voltage triode in the output stage.

receiving set? There are. Lots of them. The list looks rather like the form you have to fill up before travelling abroad (colour of nose, number of wives, object in going, name of mother-in-law, etc., etc.). Here are a few of them:

- Size of room.
- Size, number and texture of curtains, carpets, etc.
- Number and dimensions of people present.
- Amount of noise (apart from that due to the loudspeaker).
- Efficiency of loudspeaker.
- Amount of distortion tolerated by listeners.
- Type of programme.
- How many milliwatts?

Many Difficulties.

The difference in this list is that all the items are quite important, although they may not all appear so at first sight. It is even more difficult to calculate from these particulars the power output required than it is to calculate the horse-power that a car needs to give a certain standard of performance. But it is quite useful to have some idea of how the apparent loudness of

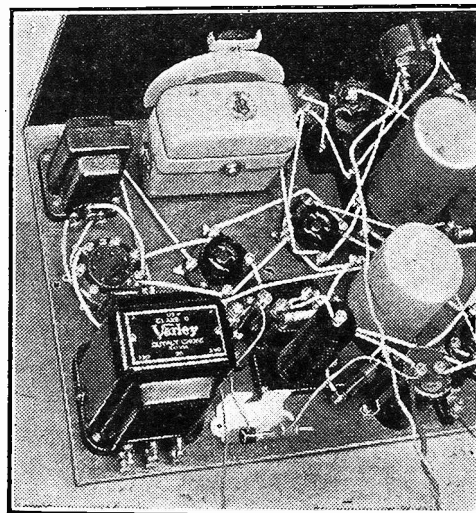
reproduction is affected by the surroundings, so as to avoid disappointment and perplexity when moving from one situation to another.

I used to be in the unfortunate position of having to estimate the capabilities of receivers in a room where there was a continuous rumble of machinery. Being there all day, it was quite difficult to be conscious of this background of noise. But it necessitated just about 10 times the output from a loudspeaker. Traffic noises, a ventilating fan or (too often!) a buzz of conversation, all have an astounding effect on the power needed to maintain a certain level of volume.

Power Comparisons.

The valve's "horse-power" is the milliwatt. The smallest battery-power valves can provide about 150 milliwatts with which to feed the loudspeaker. Larger-power valves give about 300, while 500 or more milliwatts are available from 2-volt

AN ECONOMICAL METHOD



"P.W." always in the van of progress, provided home constructors with the first Class B set, and thus placed economical full volume within the reach of every pocket. Here you see the output end of a "P.W." Class B design.

pentodes and about the same amount from the smallest mains-power valves.

But the most popular mains valve is the pentode, with an output of about 2,000 milliwatts (2 watts). Then there are the luxury valves, capable of 5 or even 10 watts. After that we are definitely in the cinema and open-air sports-meeting class of valves. In contrast to the rather feeble efforts of

the battery valves mentioned we have Class B valves, which can deliver anything up to 1,000 or 2,000 milliwatts.

"Miles per Gallon."

Then, of course, one wants to know the "consumption" of these various types. Roughly it may be said that for each milliwatt output an ordinary triode-power valve requires about 5 to be supplied to it from the H.T. battery or mains unit, a pentode about 3 and a Class B valve about 2 when working "all out." We shall have something to say about that stipulation later.

The number of milliwatts is, of course, got by multiplying H.T. volts by milliamps. Take the 300-milliwatt power valve, for example; 5 times that is 1,500, so if the maximum H.T. voltage is 150 (which it usually is for that class of valve) the current is 10 milliamps. If you work out the same thing for a 500-milliwatt pentode you will find that the consumption is just the same. So the pentode gives more "miles per gallon."

The Class B System.

People who have explained the inner workings of Class B (and Q.P.P. before it) have pointed out how, in the ordinary method of running valves, the consumption goes on all the time, whether it is being used or not, whereas in a Class B system the consumption is regulated to the work done. In other words, a Class B valve is a piece-worker, whereas the others work by time. And as driving a loudspeaker is a very slack job it is obvious which method is more economical from the employer's point of view (yours!).

(Continued on page 482.)

OCCASIONAL POWER



For most of the time an amplifier has an easy job driving its loudspeaker; but when the drums and cymbals are struck there is a sudden enormous power expenditure on the part of the loudspeaker.

THE UNIVERSAL AMPLIFIER

The completion of the grid scheme has by no means solved the problem of the mains set. There are still many districts on D.C., and this state of affairs is likely to exist for some time. Consequently, a great deal of research has been taking place towards the production of universal receivers suitable for operation on either A.C. or D.C. The amplifier described hereunder is an excellent example of developments in this field, and is a product of the "P.W." Research Department.

THE grid system of electricity supply is now complete, we are told, but though the whole country is theoretically linked up on synchronised A.C., it will be a long time before the whole of the nation has that type of power available. Consequently a number of houses that are now on D.C. are in the position that

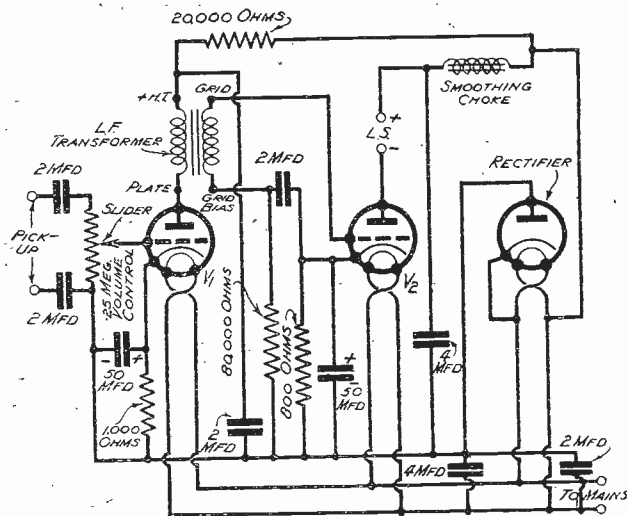
radio receivers and amplifiers are concerned.

To combat the problem a great deal of experiment has been carried out on what

or rebuilding their sets to match; while, additionally, in the case of a universal gramophone amplifier, the fact that it is

SUITABLE FOR D.C. OR A.C.

EMPLOYS FULL-VOLTAGE VALVES



The valves used are of the full-voltage type, and are particularly economical, the heaters taking about 5 watts apiece. It will be noted that no mains transformer is required when the amplifier is employed on A.C., the full voltage of the mains being applied to the heaters of all the valves.

they may go over to A.C. at any time. This naturally causes a great deal of uncertainty among those living in those homes, especially where such things as

Such sets or amplifiers are ideal for those who may have their type of electricity supply altered at any moment, and, who naturally do not want the trouble of altering

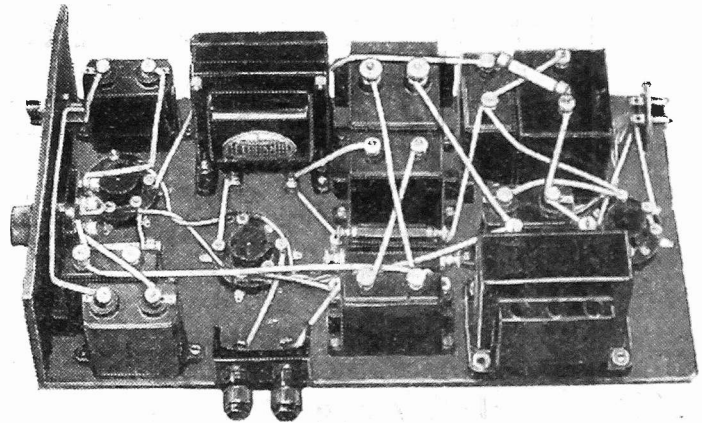
are termed "universal" sets—receivers that are equally suitable whether the power supply is D.C. or A.C., though they derive all their power from the electric light source.

universal enables it to be used anywhere where electric mains are available, irrespective of their type.

Alternative Schemes.

There are two main methods of designing a "universal" set. One is that chosen by us when we made the "Universal Three," published some few weeks ago, and in which 25-amp. series-connected D.C. valves were

(Continued on next page.)



One of the special features of the "Universal Amplifier" is the simplicity of the circuit. Only one smoothing choke is employed, while the power output of the rectifier is pre-determined by the capacity of the condenser across it.

HERE ARE FULL DETAILS OF THE PARTS YOU WILL REQUIRE

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 Ebonite panel, 7 in. × 4 in.	Peto-Scott	Goltons, Permcot	1 1,000-ohm resistance with horizontal holder	Dubilier metallised 1 watt	—
1 Wooden baseboard, 13½ in. × 7 in.	Peto-Scott	—	1 800-ohm power resistance and horizontal holder	Graham Farish power "Ohmite," 3-watt type	Dubilier 1 watt and Dumetohm holder
2 50-mfd. electrolytic condensers	T.C.C. 521	—	3 5-pin valve holders	Benjamin	W.B.
1 4-mfd. fixed condenser	Ferranti type C15	Igranic, Dubilier	1 Smoothing choke	Ferranti B.10	—
1 4-mfd. do. do.	T.C.C., type 61	Telsen, T.C.C., Igranic	1 L.F. transformer	Ferranti A.F.5	—
3 2-mfd. do. do.	Dubilier, type BB	Igranic, Telsen, Dubilier	1 Twin socket strip and plugs	Belling-Lee 1047 (Pick-up)	—
2 2-mfd. do. do.	T.C.C., type 50	—	1 Terminal block	Belling-Lee 1039	—
1 25-megohm volume control	Igranic, "Megostat"	—	2 Terminals	Belling-Lee, type B	—
1 80,000-ohm resistance and horizontal holder	Graham Farish "Ohmite," 1½-watt type	Eubilier 1 watt and Dumetohm holder	1 Mains plug	Belling-Lee 1042	Goltons, Clix
1 20,000-ohm resistance with wire ends or terminals	Dubilier 1 watt	Graham Farish, Varley "Electronic"	3 Yards insulated sleeving	Goltons	—
			4 Yards 18-gauge tinned copper wire	Goltons	—
			Screws, flex, etc.	Peto-Scott	—

VALVES.—Ostar-Ganz A.520, K.3560, E.G.100. (Note.—Specify mains voltage when ordering.)

THE UNIVERSAL AMPLIFIER

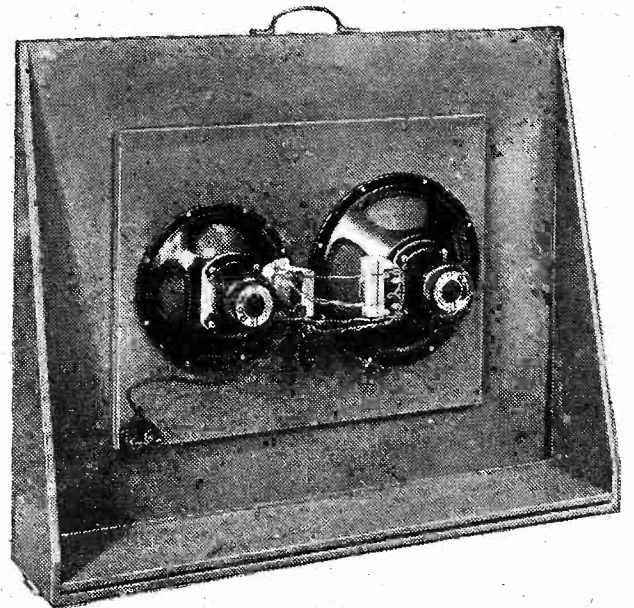
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employed. The other is the use of full-voltage valves such as the Ostar-Ganz indirectly-heated types, which are suitable for either a D.C. or A.C. supply.

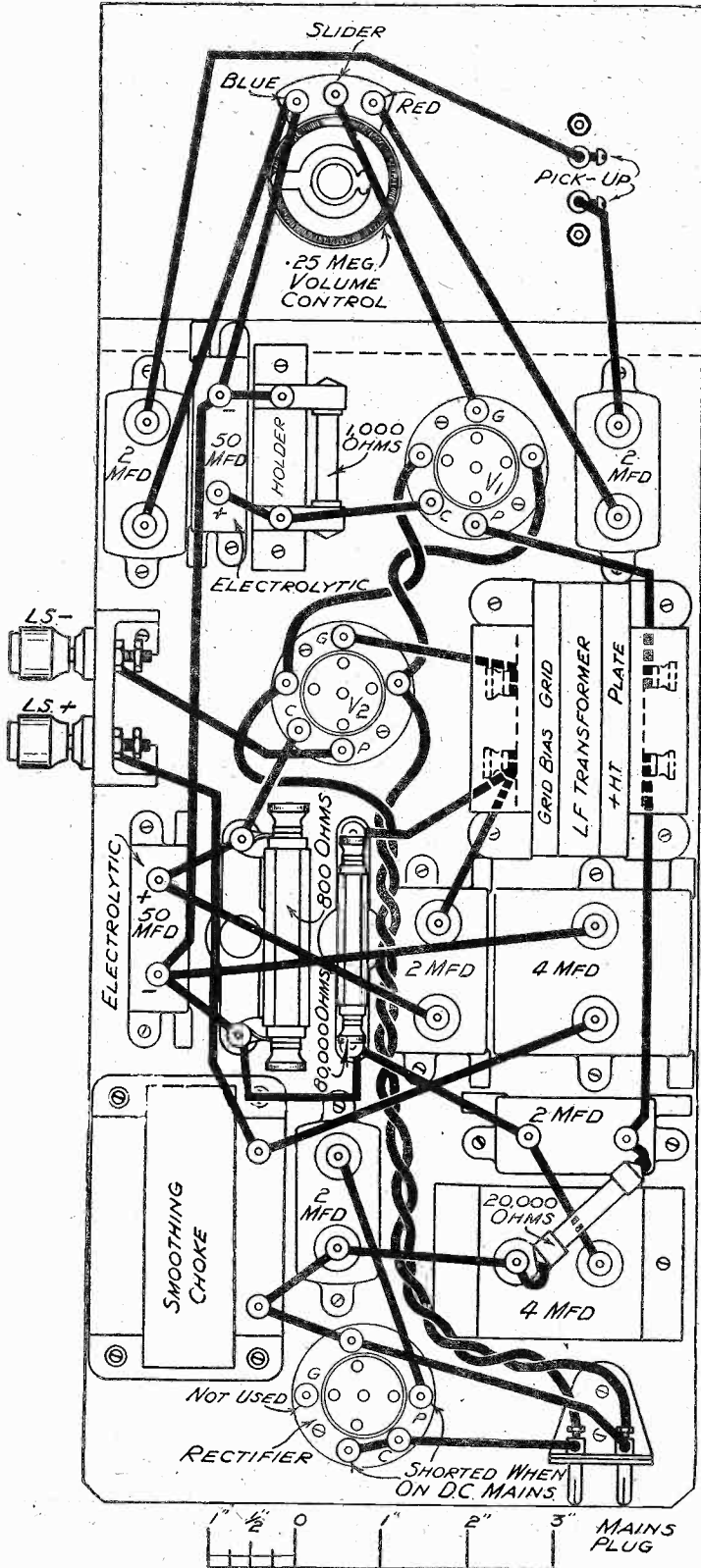
These valves were discussed in an article that appeared recently, and here we place before readers a small but remarkably powerful "Universal Amplifier" which

makes full use of the latest developments in that type of valve.

The "full-voltage" valve is designed to take across its heater the full mains voltage of the supply on which it is to be operated, in the same way as the ordinary electric light bulb is connected across the mains: Thus, the valve heaters are rated according to the voltage of the mains, and you order valves for the amplifier in accordance with the mains voltage of the house.



An easily constructed and conveniently sized baffle on which are mounted the dual speakers which were used during the tests of the Universal Amplifier.



In this amplifier, for instance, there are two essential valves—V1 which is an A.520 type and the other, V2, a K.3560. They are so connected that the full mains voltage is applied to the heaters, and so, when ordering, the mains voltage has to be specified. Those photographed are 240-250-volt valves.

Someone will immediately say that there are three valves instead of two in the set. That is correct—if the set is to be used for A.C., but when employed on D.C. there is no need for the third valve, which is a rectifier, though it can be employed if desired, the D.C. being simply passed through it for the anode voltage of the set.

This rectifier (E.G.100), of course, also has to have the correct voltage heater, this voltage corresponding with the voltage of the mains on which the amplifier is to be used.

WHEN USED ON D.C.

When the amplifier is used on D.C. the rectifier valve which is required for A.C. working is shown completely connected. In the case of D.C. mains this valve can be omitted and the anode terminal of the valve holder connected to one of the filament terminals. This terminal must be the one that is in circuit with the negative H.T.

The whole design of the "Universal Amplifier" is one that has been chosen for compactness and power. The first valve is a normal steep-slope amplifier with a mutual conductance of 2.5 ma/v., while the second is a new power-output type that has just appeared on the market. It has a very steep slope—the mutual conductance is 6 ma/v.—and it is capable of supplying an undistorted A.C. output of something like 5,000 milliwatts, with a mains-supply of 240 volts.

The Input Circuit.

The input from the pick-up is insulated in a D.C. sense from the amplifier, so that no matter whether the mains have positive or negative pole earthed there is no possibility of the pick-up leads becoming "live." From the two condensers in the input circuit the impulses from the pick-up are applied across a volume-control potentiometer, whose slider is connected to the grid of the first valve.

This valve is connected by a transformer to the output valve, normal decoupling being employed in the H.T. feed to the anode circuit of the valve. The smoothing of the set is particularly simple, consisting of one smoothing choke and a condenser in the H.T. circuit of the output valve. The resistance in the decoupling of the first valve acts as adequate smoothing in that case.

The loudspeaker is inserted directly in series with the anode circuit of the output valve, it being intended that the amplifier be situated near the loudspeaker, or else that the transformer of the speaker be attached close to the set. It is not advisable to run extension leads from the amplifier to the speaker if these are to be any great length.

For D.C. Working.

In the theoretical as in the wiring diagram, the rectifier valve which is required for A.C. working is shown completely connected. In the case of D.C. mains this valve can be omitted and the anode terminal of the valve holder connected to one of the filament terminals. This terminal must be the one that is in circuit with the negative H.T.

(Continued on page 484.)

"No Tears with a PILOT AUTHOR KIT"



S.T. 500



The Pilot Kit SERVICE was founded in 1919.

PILOT AUTHOR KIT EXACT TO SPECIFICATION

See the PILOT on the cartoon. It's a real guarantee.

For detailed list of Parts SEE OUR PREVIOUS S.T.500 ANNOUNCEMENTS Oct. 21st and Oct. 28th issues, or sent upon request by return of post.

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OR YOURS FOR 9/6

Balance in 11 monthly payments of 9/6.

S.T.500 CONVERSION KITS

CONVERTS YOUR S.T.300 into the new S.T.500

Comprises: 1 Peto-Scott Baseboard; 1 Colvern S.T.500 Aerial Coil; 3 G.F. '0005 mfd. Condensers; 1 Polar '0003 mfd. Diff. Condenser; 1 J.B. '0001 preset; 1 J.B. '00005 mfd. preset; 1 Telsen Driver Transformer; 1 Telsen Choke; 1 G. F. 7-pin Valve holder; 2 5,000 ohm 1 watt Resistances; 2 10,000 ohm 1 watt Resistances; 1 G.F. 250 ohm 1 watt Resistance; 1 Igranic 2 mfd. Condenser; 2 T.C.C. Condensers; 1 G. F. '0005 Condenser; 1 Lissen '00005 mfd. Condenser; 1 Bulgin S80 switch; 1 B.R.G. bracket—Wire, screws, flex etc. WITH COPY OF "POPULAR WIRELESS"—21/10/33 AND BLUE PRINT. or 6/- Deposit and 9 monthly payments of 5/6.

CASH or C.O.D. Carriage Paid.
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CONVERTS YOUR S.T.400 into the new S.T.500

Comprises: 1 Peto-Scott Baseboard; 3 G. F. '0005 mfd. Condensers; 1 J. B. '0001 preset; 1 J. B. '00005 preset; 1 Telsen Driver Transformer; 1 Telsen Output Choke; 1 G. F. 7-pin valve holder; 2 Dubilier 5,000 ohm 1 watt Resistances; 2 Dubilier 10,000 ohm 1 watt Resistances; 1 G. F. 250 Ohmite Resistance; 2 T.C.C. '005 mfd. Condenser; 1 G. F. '0005 mfd. Condenser; 1 Lissen '00005 mfd. Condenser; 1 T.C.C. 1 mfd. Condenser; 1 B.R.G. Bracket; Wire, screws, flex, etc. WITH COPY OF "POPULAR WIRELESS," 21/10/33, AND BLUE PRINT. or 5/- Deposit and 8 monthly payments of 5/3.

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CASH or C.O.D. Post Free.
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Comprising Peto-Scott Baseboard with Metaplexed Section; Ready Drilled Panel and Terminal Strip;

"S.T.500" Screen; B.R.G. Mounting Bracket with Free copy of Popular Wireless.

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KIT "A" Comprising Mr. John Scott-Taggart's Kit of FIRST SPECIFIED Components, including Telsen "Class B" output Choke, Peto-Scott Metaplex Baseboard and Ready-drilled Panel and Terminal Strip. Less Valves and Cabinet. With FULL-SIZE Blue Print and copy "Popular Wireless," Oct. 21st. Cash or C.O.D. Carriage Paid. **£5-5-0** or 12 monthly payments of 9/6.

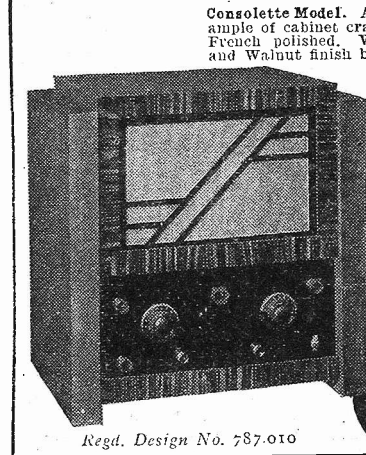
All Kit and Finished Instrument Prices exclude batteries. Recommended "S.T.500" Battery Equipment: 120-volt Drydex, Orange Triangle, Triple Capacity; 9-volt Drydex G.B. Battery and Peto-Scott 2-volt 45 amp. L.T. Glass-cell Accumulator. Cash or C.O.D. Carriage Paid, **£1-11-3**; or add 3/- to First and each Monthly Payment.

KIT "B" As Kit "A" but including 4 Specified Valves. Cash or C.O.D. Carriage Paid. **£7-10-3** or 12 monthly payments of 13/9.

KIT "CT" As Kit "B" but including Peto-Scott Specified Walnut Table Cabinet. Cash or C.O.D. Carriage Paid **£8-9-9** or 12 monthly payments of 15/6.

KIT "CC" As Kit "B" including Peto-Scott Specified Walnut Console Cabinet. Complete with Baffle Baseboard Assembly, but less Speaker. Cash or C.O.D. Carriage Paid. **£8-18-9** or 12 monthly payments of 16/3. If Peto-Scott Permanent Magnet Speaker required add 15/- to Cash Price or add 1/3 to each monthly payment.

PETO-SCOTT S.T.500 CABINETS EXCLUSIVELY SPECIFIED BY MR. JOHN SCOTT-TAGGART

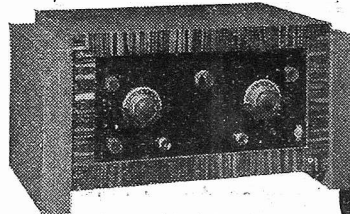


Console Model. An outstanding example of cabinet craftsmanship. Hand French polished. Veneered Macassar and Walnut finish by experts.

Cash or C.O.D. 25/- Carr. & Packing 2/6 extra. or 6/- Deposit and 4 monthly payments of 6/- (including carriage and packing). Baffle-Baseboard Assembly. 3/6 extra.

25/-

Regd. Design No. 787.010



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19/6

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"S.T.500," complete in Peto-Scott Walnut Table Cabinet, exact to Mr. John Scott-Taggart's FIRST Specification. Aerial Tested. Complete with Valves. Cash or C.O.D. Carriage Paid. **£10-0-0** or 12 monthly payments of 18/3.

"S.T.500," complete in Peto-Scott Walnut Console Cabinet, exact to specification. With Peto-Scott Moving-Coil Speaker. Complete with Valves. Ready to Play. Aerial Tested. Cash or C.O.D. Carriage Paid. **£11-5-0** or 12 monthly payments of 21/-.

PETO-SCOTT CO. LTD. 77 CITY ROAD, LONDON, E.C.1. Telephone: Glerkenwell 9406/7. Tel: Holborn 3248.

West End Showrooms: 62 High Holborn, W.C.1.
Dear Sirs,—Please send S.T.500 KIT "A" S.T.500 KIT "CT" me CASH/C.O.D./H.P.: S.T.500 KIT "B" S.T.500 KIT "CC" with/without SPEAKER.

for which I enclose £..... s..... d. CASH/H.P. Deposit.

NAME..... ADDRESS..... P.W. 11/11/33

ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D. CARRIAGE AND POST CHARGES PAID



A NEW UTILITY DRIVE

IT has occurred to me—I claim no novelty for the thought, though I haven't yet seen it expressed elsewhere in print—that there is this danger in supplying condenser scales marked in wavelengths even as alternatives to degree marking; supposing the wrong condenser and the wrong coil are used?

You know, both have got to be exactly right or the wavelength marking will be erroneous. Of course, literature supplied with the slow-motion drive or condenser might, and generally does, cover the point adequately. But leaflets and "books of words" are apt to go astray or to be overlooked, and there must be many constructors who would not realise the essential fixed-capacity-inductance implication of wavelength scaling.

In view of this, Messrs. Wilkins & Wright deserve very special mention for the step they have taken with their new Utility slow-motion drive. The wavelength scale of the one I have has plainly engraved on it "For '0095-mfd. Utility' Mite Gang Condenser with 157 M.H. and 1900 M.H. Coils."

This inscription is hidden when the component is mounted on a panel, but it must be seen in the first place, and it is definite. No mistakes can occur.

The device has other claims to attention, perhaps even more important. For example, it has a full-vision scale with a pointer which, by an ingenious but simple mechanical movement, keeps vertical as it moves along.

You will note from the photo how the marking is arranged in accordance with this system. Also the light moves along behind the translucent scale with the adjustments.

The gearing is just right, and the action of this Utility slow-motion drive is very sweet, there being nothing the most carping critic could point at.

THE ROBERTS MICROPHONE

When one has experienced the difficulties of interpreting human speech with one's head poked out into a 100-m.p.h. gale, and the quality of those speech sounds initially depend upon a microphone, one's criticism of microphones tends to become acute!

Like mine did when, into the bargain, it was my duty to see that those microphones for Air Force work were as good as the state of the art then permitted!

Since then, however, there has been considerable

progress. But not quite as much with small and inexpensive microphones for amateur use as might reasonably have been anticipated.

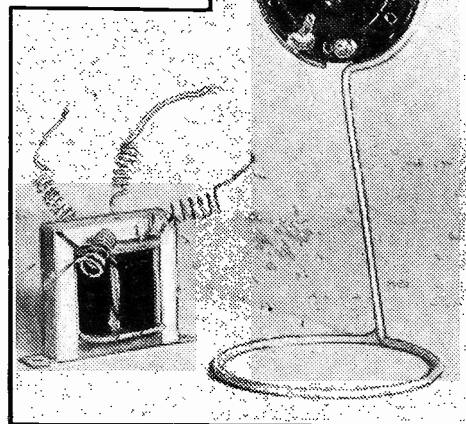
Nevertheless, there is at least one that reaches the standard of the times as typified by the larger (and more costly) varieties. I refer to a new type of microphone made by Captain A. J. Roberts of 89, Wardour Street, London.

He makes it in three models, and there is one for recording and calibration, as well as the model for amateur work.

A non-directional principle is employed in this new microphone. Instead of the usual solid back, there are two diaphragms, both exposed to sound waves, operating on the carbon granules.

Besides the microphone proving practically non-directional, it is claimed that the response to higher

SENSITIVE AND INEXPENSIVE

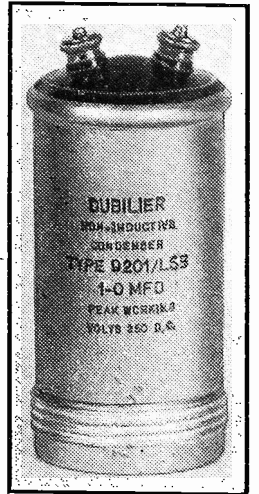


The Roberts microphone is a particularly compact instrument and is designed to be non-directional.

frequencies is increased for the following interesting reason:

"The wavelength of a high-frequency note is only a matter of one or two centimetres. If this note strikes the diaphragm of an ordinary mike at right angles it responds to the varying pressure of the note and is immaterial to the wavelength. If, however, the wave hits the diaphragm from an angle, then clearly we get alternate layers of compression and rarefaction along the surface. With the result that there is a tendency of one wave of compression to be cancelled out by a wave of rarefaction. With the Roberts microphone, however, the note hits two diaphragms, one a definite time after the other. Thus when a wave of compression is reaching one diaphragm the preceding wave of compression is reaching the second diaphragm. This is evident for all directions through which the microphone is tilted."

Well, I have tested the Roberts microphone (amateur model), and I find it very sensitive; its response certainly does justify the claims made for it, especially when its performance is compared with those of similarly compact types.



The new Dubilier non-inductive condensers have a "screw-on" mount, a feature which results in a neat and very secure fixing.

THE LATEST DUBILIER CONDENSERS

Ever been faced by the problem of mounting and connecting one of those tagless, feetless, terminal-less, tubular metal condensers? Such things aren't really intended for home constructors, but for metal chassis commercial sets, though they now and then come the way of the constructor.

And I can sympathise with his attempts to deal satisfactorily with them!

The new Dubilier non-inductive fixed condensers have a tubular, metal-case construction, but what a different proposition!

To start with, there are stout, easy-to-use terminals inclined outwards slightly at the top. (An excellent idea that.) And then there is a patent screw-bottom fixing scheme.

A false bottom screws off and this has two holes in it for screwing to a baseboard or chassis. The condenser itself merely screws into this holder, and a very secure fixing, with no visible "screw-heads," results.

As for the condenser itself... True, I tested a few as a matter of form; but it was hardly necessary, for the name of Dubilier is as synonymous with first-rate condensers as Paris is with good eating.

THE LISTENER'S NOTEBOOK

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

Two new variety artists whom I look forward to hearing again are Gretl Vernon and Donald Peers, alias The Viennese Nightingale and The Laughing Cavalier of Song. I don't question their right to these aliases: they fit them to a T. I like these artists because they are 100 per cent singers.

"Dutch" type is a poor substitute for the scintillating repartee of that young and egregious Hodge, who retires—for all too long a period—into the background while "grandpa" recites his woes.

How very interesting those "What's the News" talks to the schools are!

A man who seems to have captured the hearts of the more studious section of the listening public is Herr Max Kroemer. He fairly makes you learn German. And no one will be more pleased with him than Messrs. Sack and Thompson, whose textbook he uses. They must be reaping a rich harvest.

I hope this enthusiasm for Herr Kroemer won't cause students of the German language to forget Herr Kroemer's predecessor, Otto Siepmann. I think it is true to say that Herr Siepmann is more responsible than any man, alive or dead, for the amount of German spoken or understood by Englishmen to-day.

Have you noticed the extraordinary appropriateness of some of the evening poetry readings of late? Appropriate in the sense that they have had a theme in common with that of the item that has preceded them. "Tewkesbury Road," by John Masefield, was very apt, following, as it did, Howard Marshall's denunciation of some of our by-pass roads.

That excellent ventriloquist, Johnson Clark, has not improved his act by introducing a grandfather into it. The addition may give further proof of Johnson Clark's ability, but sentimentality of the "Dear Old

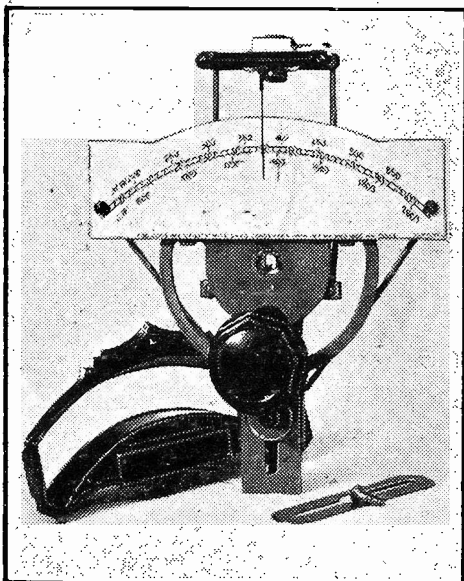
I listened to Joan Woolcombe the other afternoon talking about the "Autumn Herring Harvest," and a very live and colourful talk it was too. If I may say so, I think Miss Woolcombe is wrong to avoid using technical jargon, for, without it, the talk loses a lot of its appeal.

Use all the technical terms, but explain them, is my motto. Children love to ape the expert when they tell their stories, and the story of the Yarmouth fishermen is likely to be retold over and over again this winter.

An interesting thought struck me the other afternoon as I was listening to Professor Lloyd James trying to get boys and girls up and down the country to say, "He had a black cat in a handbag," as it should be said. And it was this: Here we have a man using the microphone for a comparatively short time each week begging, imploring, almost shaming children into saying "handbag" as he says it.

Yet through that same microphone, numerous other people shout "handbag" at them in 101 different ways. Professor Lloyd James can never hope to overcome opposition as formidable as this.

(Continued on page 480.)



Several outstanding features of design are incorporated in this Utility drive, which is calibrated in wavelengths.



The name Drydex is an assurance of generous power and a long life.

It is the battery relied on by Britain's most famous sets.

Drydex

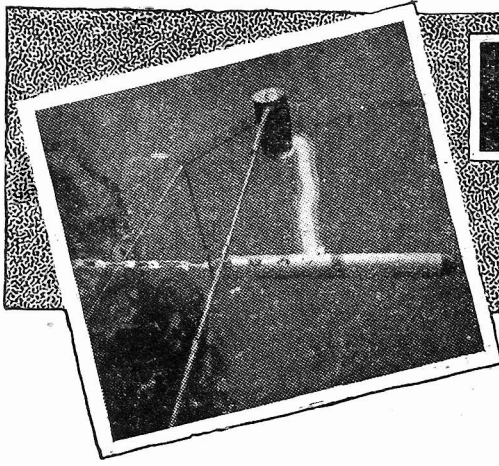
by Exide

DRY BATTERIES FOR WIRELESS

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REMEMBRANCE DAY
PLEASE GIVE A LITTLE MORE FOR YOUR POPPY

Next time, insist on Drydex. Obtainable from Exide Service Stations and all reputable dealers in types and sizes for every set.

EXIDE BATTERIES,
Exide Works, Clifton Junction, near Manchester.



DEATH BLOW to the ATOM

The annual meetings of the British Association, at which leading scientists tell each other and the world about their discoveries, invariably make important references to matters affecting radio progress. This year's Leicester gathering has proved no exception to the rule.

By LESLIE BAILEY

EACH year our most famous scientists meet together and tell each other, and incidentally the world, of their latest discoveries in the realm of science.

Wireless, like all the other famous off-springs of science, was first introduced to the world at such a meeting of the British Association more than three decades ago, and at almost every annual meeting since that time something of interest to wireless engineers has been discussed at the annual conferences.

This Year's Meeting.

A review of the meeting this year at Leicester does not seem to indicate that anything of very great importance has been discovered in the last year, at least in connection with wireless, but then, of course, one never knows. Indeed, brief and more or less incomprehensible statements that Beryllium of a certain mass, when bombarded in a certain way, emits a neutron may lead to some quite new development in the field of practical wireless.

Perhaps one of the most interesting discussions, from our point of view, was delivered by Lord Rutherford on splitting the atom—officially it was known as

has been split and we have found no colossal power, nor has the world exploded in a wrack of helium gas, as one famous scientist who was at this meeting forecast twenty years ago.

Atomic Transmutation.

But, if we have found no tremendous source of energy, the results of the atomic transmutation, as it is called, may give the world even more tremendous inventions and discoveries. We are certainly nearer the time when base metals may be transmuted into gold, but when this can be accomplished comparatively easily gold will itself become a base metal—so that's that.

But we can say with comparative safety that this research into the atom will improve our wireless components and all things electrical. It is a queer thing that some rather dry statement, uttered more or less indifferently by one of the learned professors at these meetings, may lead some day to a tremendous business enterprise involving several millions of pounds of money and the welfare of thousands of men and women.

Perhaps the most interesting item in connection with radio was the demonstration

Although one never knows, light-ray television such as this is unlikely to affect wireless television to a very great extent, and probably its development will lie in the field of the cinematograph.

The opening address by Sir Josiah Stamp, although not connected with wireless in a technical sense, yet involved radio as one of the scientific developments of the age which is rapidly altering the face of the present civilisation. He was concerned with the effect of such developments on the human race: was it harmful or otherwise, progressive or retrogressive? He quoted a very apt example in the case of an imagined world where a million people were employed making boots.

Maintaining a Balance.

Should an invention be produced which would enable the same quantity of boots to be made by half the number of people, for instance, then the other half-million people would be thrown out of work. But if new inventions for the pleasure and recreation of mankind were produced, such as gramophones, wireless, the car and aeroplane, or improvements such as that in the case of the push-bike, then those half-million out-of-works would, in the course of time, be employed.

The problem would seem to be to transfer the workers from a dying invention to a newly born product of science.

Here, at any rate, we of the wireless fraternity can claim to have done our share, for the wireless industry, in one form or another, provides bread-and-butter for hundreds of thousands of men and women.

ABOUT THE VALVONIUM

A reader's novel suggestion for increasing its usefulness.

The Editor, POPULAR WIRELESS.

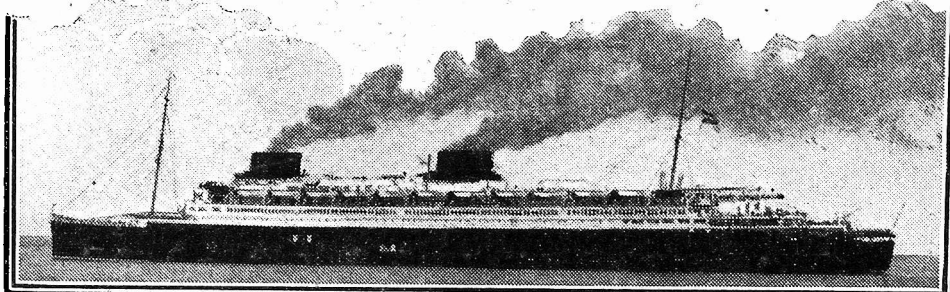
Dear Sir,—Having constructed the "P.W." "Valvonium" in a hook-up form, I thought perhaps other "P.W." readers may be interested to know how it may be used technically as well as for entertainment purposes. If a condenser of a known fixed value is connected in grid circuit where the semi-variable condensers are wired and the tuning note noted, a relative idea may be formed of a condenser whose capacity is not known or as to whether there is any variance of two condensers of supposedly the same capacity. If the musical note heard is of higher key the condenser is less, and if a lower key the capacity is bigger. Also certain resistances may be tested in this manner: that is, larger resistances give lower notes and low resistances higher notes.

Yours faithfully,

H. BRACEGIRDLE.

20, Maple Avenue, Haydock, near St. Helens, Lancs.

WILL ATOMIC ENERGY EVER REPLACE MARINE ENGINES?



"Must, then, all those hopes of driving Atlantic liners across the Atlantic on the atomic energy in a pinch of salt or in a drop of oil be relegated to the limbo of lost hopes?"

atomic transmutation in Section A, Mathematics and Physics.

Alas for those of us who hoped for or believed in the vast resources and terrific energy which might some day be obtained from splitting the atom! In his opinion, "such expectations are the merest moonshine."

Must, then, all those hopes of driving Atlantic liners across the Atlantic on the atomic energy in a pinch of salt or in a drop of oil be relegated to the limbo of lost hopes (scientific)? It would seem so, for the atom

of television along a light beam. The ray or the beam of light was used as the link between the television transmitter and receiver, just as wireless waves or a wireless beam is the link between the wireless transmitter and receiver.

Ordinary telegraphy or telephony has, of course, long been possible by means of light rays; but the use of light rays in this direction is naturally limited to a small distance, and light rays, unlike their wireless fellows, cannot penetrate a brick wall or curve round the surface of the earth.

TELSEN S.T. 500' COILS

for Mr. John Scott-Taggart's

P.W.

S.T. 500'

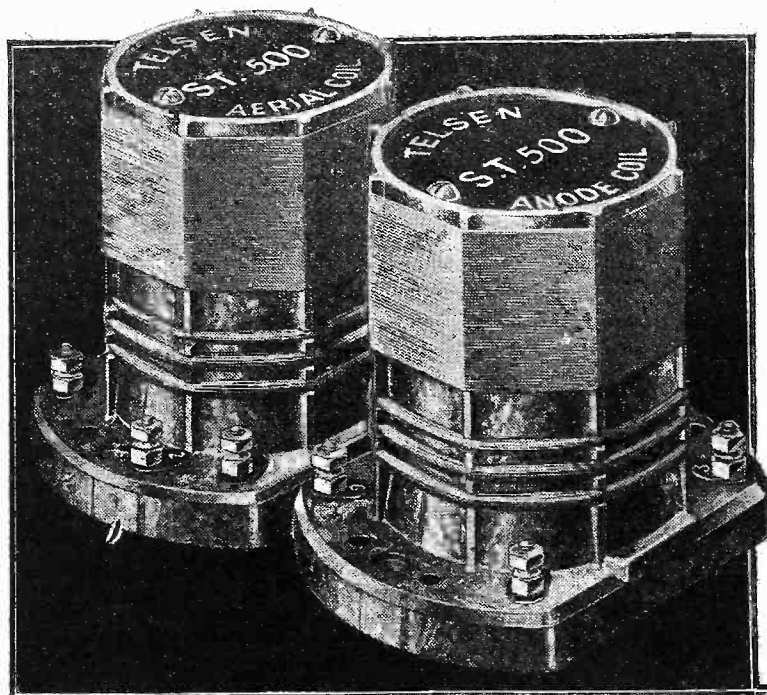
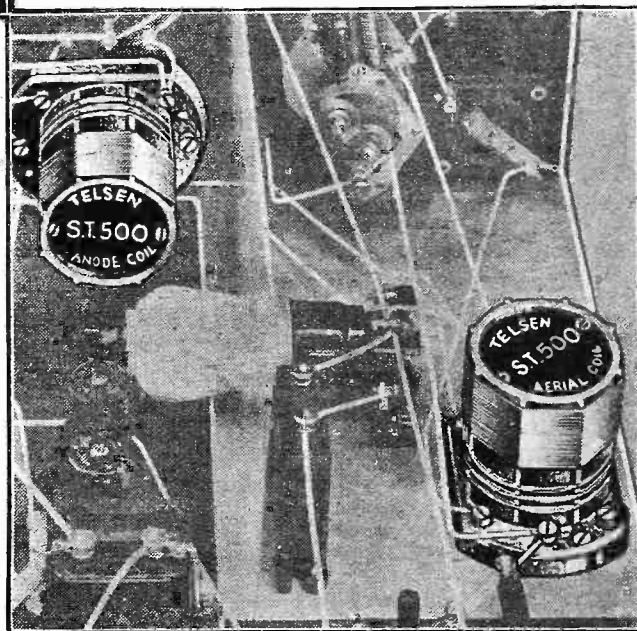


Illustration below shows the position occupied by the Telsen 'S.T. 500' Coils in a built-up 'S.T. 500' Receiver.

RECOMMENDED for use in the S.T. 500 by Mr. John Scott-Taggart, the Telsen S.T. 500 Coils have been specially designed for their purpose, to ensure immaculate performance with enduring efficiency. The Aerial Coil consists of plain long and medium wave windings connected in series, with a separate reaction winding, the Anode Coil having a larger reaction winding connected to the earth end of the main winding. The Anode Coil is supplied complete with two brackets and the necessary screws for mounting.

Price per pair **8/-**



TELSEN FOR EVERYTHING IN RADIO
ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

LADY DOCTORS of 1933

prescribe Daily Sketch—that is if they prescribe their own medicine. For any number of these busy people read Daily Sketch. As one eminent Harley Street woman said, "It's so stimulating, my dear, so well arranged that I can master all the worth-knowing news in a glimpse. Of course, I have to keep the big old-fashioned papers in my Waiting Room—it's expected of Harley Street—but in the few minutes I get to myself after breakfast or even when I manage to snatch a spot of lunch, I just giggle over Jiggs and Pop and Obstinate Artist, and I really learn from Candidus . . . As for Mr. Gossip and D'Alroy, literally they help me with my patients—bring in the human touch—the more modern bedside manner!"

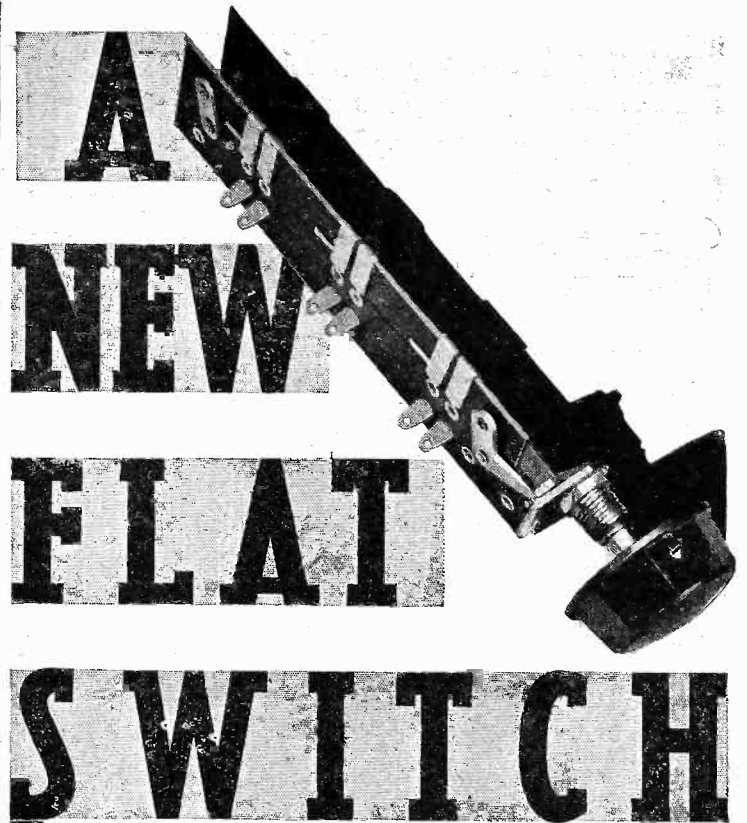


Above all they enjoy those magnificently produced exclusive news-pictures that almost talk as they show them the world at a glance.

Make it a habit... order it NOW

DAILY SKETCH

The Premier Picture Newspaper



This is the most compact switch we have yet produced, and as efficient as any made. It is the ideal switch for matched coil units or any other components requiring a combined change-over or make-and-break.

Nickel silver contacts engage on silver points, avoiding all risks of corrosion, and the sliding action ensures at all times a perfectly clean contact. There is virtually no inter-capacity between the points, thus avoiding the use of elaborate screening.

Any number of circuits can be controlled by this new switch, from a single make-and-break or change-over upwards.

Prices

- 342/1 3 Pole Single Throw ... 1'6
- 342/2 2 Pole Change Over ... 1'6
- 342/3 3 Pole Change Over ... 2'-

From your dealer or post free from the makers.

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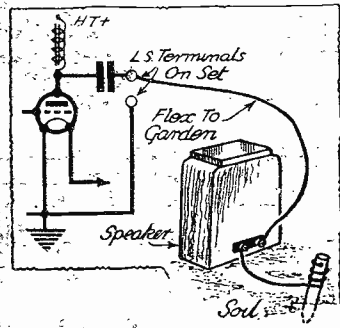
Write for a copy of our new catalogue; it contains full details of our complete range of switches, condensers, and dials



RECOMMENDED WRINKLES

RADIO ON THE LAWN.

WHEN next year's warm weather comes many will wish to take the speaker out of doors while having tea on the lawn, etc. If choke-filter output is used in the set only one connecting wire will be required to the speaker, and a length of single flex will be most suitable. The other



A simple method of using a loud-speaker out of doors.

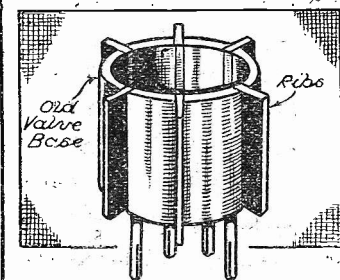
terminal of the speaker should be connected by a short length of flex to an earth spike (any piece of metal rod or tube will do). By pushing the rod farther into the ground or partly withdrawing it, a very useful control of volume may sometimes be obtained.

VALVE-BASE COILS.

VALVE-BASE coils have been used for some considerable time by those interested in short waves, owing to their small field and the fact that they occupy very little space.

With the idea of improving the efficiency of these coils I have fixed ribs to the valve base. This may be done by cutting slots as shown in the sketch, two being cut at a time by running a saw right across.

Thin strips of ebonite or other efficient insulating material are cut for the ribs, inserted in the slots and then glued. The ribs may be fixed to the sides of the base by gluing only, but I have found the slot method to give a more rigid arrangement.



Made from the bases of burnt-out valves.

If the turns of wire are slightly spaced it is advisable to cut small notches in the ribs with a file, to prevent the turns from slipping.

LOOSE CONNECTIONS.

AFTER your set has been in use for some time it may commence to give trouble. It may fade out and then come in again as suddenly as it went out. A continual frying in the loud-speaker may cause you some alarm.

The set may stop suddenly and mysteriously.

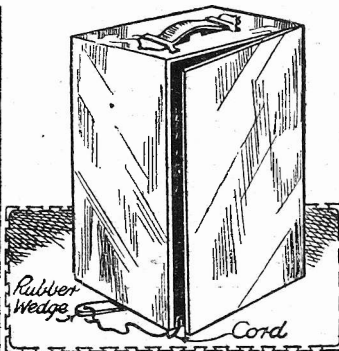
These things may happen to a set in which the connections are soldered, or it may happen to a set which has no soldered parts in it. Sometimes if the set is tapped it will function properly for a time, but later will go silent again.

A connection becoming unsoldered will cause any of the above to happen. A connection which has become loose in the case of the unsoldered set will cause the same results. If every connection is gone over carefully and any loose ones tightened the trouble will stop. So in future watch for the loose connection.

AN IMPROVED I.S. TRANSFORMER.

IN these days of good, inexpensive moving-coil loudspeakers, there are numerous old moving-coil speakers on the market. These can be picked up quite cheaply, often under 10s., but it is generally found that they are minus a transformer.

A very good substitute for an orthodox transformer is an ordinary A.C. bell transformer. On these the secondary is generally centre-tapped, and, consequently, if the primary is



The wedge serves to lock the turntable in the desired position.

apparent fading or for apparent cutting-in.

It is best, then, to keep a portable receiver quite stable, once tuned, by means of a rubber wedge slipped underneath. The wedge can be tied to a cord and tucked inside the cabinet when not required.

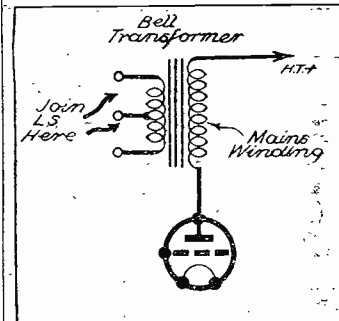
ONE GUINEA FOR THE BEST WRINKLE!

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 last week was sent by Mr. W. H. Grayling, 8, Milton Road, Cambridge, to whom a guinea is being awarded.



A bell transformer does the trick.

inserted in the anode output circuit, two step-down ratios are obtained, usually about 1:15 and 1:20.

These ratios are about right for the majority of loudspeakers, and in practice a transformer used in this manner gives very good results.

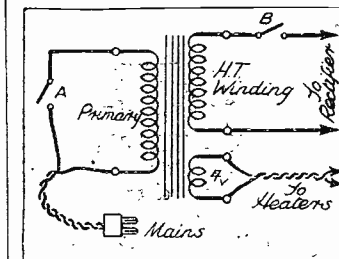
TUNING PORTABLES.

SOME portable receivers swivel on a self-contained turntable, and unless they stand on a level surface they tend to swing out of position after tuning.

This is annoying enough when one is aware of the displacement—for with difficult stations the direction of a frame aerial can be very critical—but it is far worse when the receiver detunes itself, while the listener, all unsuspecting, blames the ether for

SWITCHING A MAINS SET.

IT is well known that a mains unit delivers a very high voltage while the indirectly heated valves are warming up to their task; this is especially so when a metal rectifier is used. It imposes a heavy strain on condensers, valves, etc., and many constructors employ a thermal-delay switch, to avoid it.



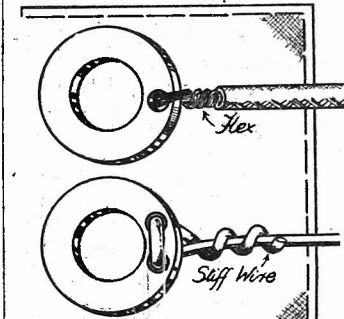
The additional switch allows the H.T. to be applied after the valves have had time to warm up.

Those who cannot afford such a switch, however, can use two ordinary switches, as shown in the diagram, to serve just the same purpose. "A" should be switched on first, followed by "B" when the valves have warmed up; about twenty seconds later, as a rule.

This device is well worth using, as it may save much trouble and expense in the form of broken-down decoupling condensers, blown fuses, etc.

A SUBSTITUTE FOR TAGS.

WHEN the supply of tags runs out an ordinary washer can be soldered on to the end of either stiff or flexible wire in a simple manner. A small hole is drilled in the washer, the



One method of ensuring good connections.

end of the wire is threaded through it and a spot of solder makes it firm enough for the job.

TIN YOUR SCREWS.

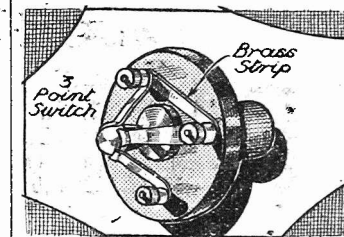
YOU can make your set smart by using pure tin to coat all your brass parts. Melt some pure tin in a spoon and drop it into a pail of cold water to granulate it. Put the tin in a coffee-tin with the brass parts, and cover them well with some cream of tartar.

The screws should be burnished or highly polished first. Fill three parts full with water and boil for half an hour. Take the parts out, rinse in cold water. Polish lightly with a soft rag.

This is the closest to a silver deposit that can be obtained, and the parts being well burnished beforehand helps in the process. The parts can be lacquered, but if cleaned well will last for a good time without.

NO-TROUBLE CONNECTIONS.

HERE is a very simple scheme which will prove useful to many constructors. In very many circuits it is found that at least three leads have to be connected to the L.T. on-off switch, and if the connecting wire used is rather thick there is some trouble in connecting them all to the one terminal.



A strap connection saves overloading the terminals.

An easy way of overcoming this is by purchasing a three-point on-off switch (or perhaps the constructor may have one on hand), and by connecting two of the three terminals together by means of a short, thin strip of brass. This is drilled at either end, then it is clamped between the terminals. Now you will find that as many as half a dozen leads can be connected to the switch, as there are two terminals for the one point on the switch.

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

(Continued from page 445.)

The Autumn Crop.

THE end of the tennis and sunbathing season marks the beginning of my autumn crop of letters. Already the pile has engulfed my spare baccy pouch,



Old Moore's Almanac and my pet pair of scissors.

Now the crank lifts his pen to bore me with his sad stories, but these are leavened by many a thoughtful and helpful letter from some unknown

chum who has been digesting these Notes during the greatest summer of all summers.

Believe me, almost all that a journalist lives for is a "scoop" or a decent letter from someone who has read his "stuff" and liked it well enough to blue one of the P.M.G.'s best three-ha-penny's to say so.

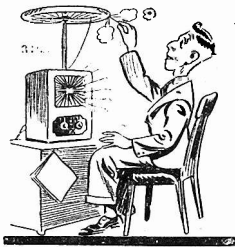
Humble Suggestion.

THIS country has many young men and women who are unemployed. This British Empire has many thousands of square miles yelling for development. Could not the B.B.C. organise a series of talks showing how our young people could develop this Empire?

We have an embarrassing proportion of the earth's surface under our control, and it ought to provide work for more people than are out of work to-day in the United Kingdom. Why should not the Government and the B.B.C. conspire together to attract our men and women into the Empire's great open spaces?

The "Push-Bike" Three.

KNOWING of my interest in the man with the bedstead aerial, A. H. T. (Acton) has told me about his experiment with a bicycle wheel attached to the



aerial terminal of his set. The volume was improved and the selectivity "much improved," especially on short waves.

When he deflated the tyre the results with 2 X A D were astounding. He wonders whether the deflation allowed "the waves to get to the spokes more freely." Nothing to do with the air in the tyre, of course. Speaking frankly, I cannot explain it; indeed, I can hardly believe it—unless his usual aerial is very inefficient. Any theories?

Is the B.B.C. Subsidised?

E. H. (Whitefield, Lancs.) very mildly queries my accuracy in referring to the B.B.C. as "Government subsidised." Under its Charter the B.B.C.

is authorised and empowered "to receive all funds which may be granted annually or otherwise by the Legislature in furtherance of the purposes of this Our Charter."

Actually, the B.B.C. is granted only a certain portion of the fees collected by the Post Office in respect of the P.M.G.'s licences for the establishment and working of wireless stations for reception in this country. These fees are levied by the Post Office, not by the B.B.C., and were so levied before broadcasting was thought of.

The Edinburgh Radio Show.

THE Radio and Music Exhibition held at Edinburgh during October 11th-21st was a marked success. It was the first combined Radio and Music Exhibition ever held, and was patronised by the Scottish Radio Retailers' Association, the Scottish Music Merchants' Association

Broadcasting on Wheels.

IT was only a few days ago, when a copy of "Tune In," a little monthly DX radio magazine issued by the New Zealand DX Radio Association, came into my hands, that I learned that in Australia there is a broadcasting station, 3 Y B, which moves about on the railway.

Its first tour, unique in the history of radio, was made in October, 1932, the coach used being that which had been built about 30 years before for the King and Queen when as Duke and Duchess of York they visited the country. This station transmits each week-night from 6.30 p.m. to 10.30 p.m. on 1,060 kc., and is a great favourite with bush dwellers and sheep farmers.



SHORT WAVES

One man is said to have written over five hundred letters to the B.B.C. His wireless licence should be endorsed for exceeding the speed limit.—"Humorist."

"I cannot get a proper earth lead for my crystal set. May I use a jam jar filled with soil near the set?" asks a young Londoner in the "Daily Sketch."

Why did the valve howl?

Because the electron passed round the plate and found it 2MT.

Radio-frequency, writes one of our contemporaries, is a term applied to the appalling number of times a broadcasting station can put over a dud number.

It has been suggested that the well-known B.B.C. conductor who was recently fined for exceeding the speed limit was beating time as usual.

ROMEO ON THE WIRE.

The tendrils of my soul are twined
With thine, though many a mile apart;
And there in close-coiled circuits wind
Around the magnets of my heart.

O tell me when along the line
From my fall heart the message flows,
What currents are indeed in thine?
One click from thee will end my woes.

and the W.R.A. of Great Britain and Northern Ireland.

The Lord Provost, Magistrates and Council of Edinburgh gave a civic reception to the exhibitors, and arranged for the floodlighting of the famous old castle. Scots all over the world (or wurruld) will read this with interest and a pang of regret for the awfu' waste of electric light on a castle which doesn't earn its "overheads."

Caught in the Net.

WHILST looking through a host of overseas radio journals I was charmed to see that of seventeen stands at Radiolympia described by the "Bombay Radio News" that of the Amalgamated Press was one, and though we were referred to as "the Press of the Amalgamated magazines" my pleasure and gratitude was no whit diminished.

And in the "Ceylon Radio Times" I discovered two proofs of originality on the part of the broadcasting authority in Ceylon, which happens to be the Post and Telegraph Department. Firstly, a talk by a twelve-year-old native boy; secondly, a talk by the German Consul, entitled "Hitlerism as an Historical Phenomenon."

Sets in Glass Cases.

AFTER much thought I have failed to appreciate what attraction is presumed to reside in a receiver built into a transparent container. I wish that someone would enlighten me. There are no moving parts except rheostats and condenser vanes, and inspection of those terrific engines does not amuse or enlighten.

No one wants a glass-enclosed gramophone or telephone. So why make transparent cases for radio sets? Perhaps there may be some Yoga-like virtue in staring fixedly at a transformer, but even much staring will not reveal its ratio or whether it is burnt out.

Reply to a Postcard.

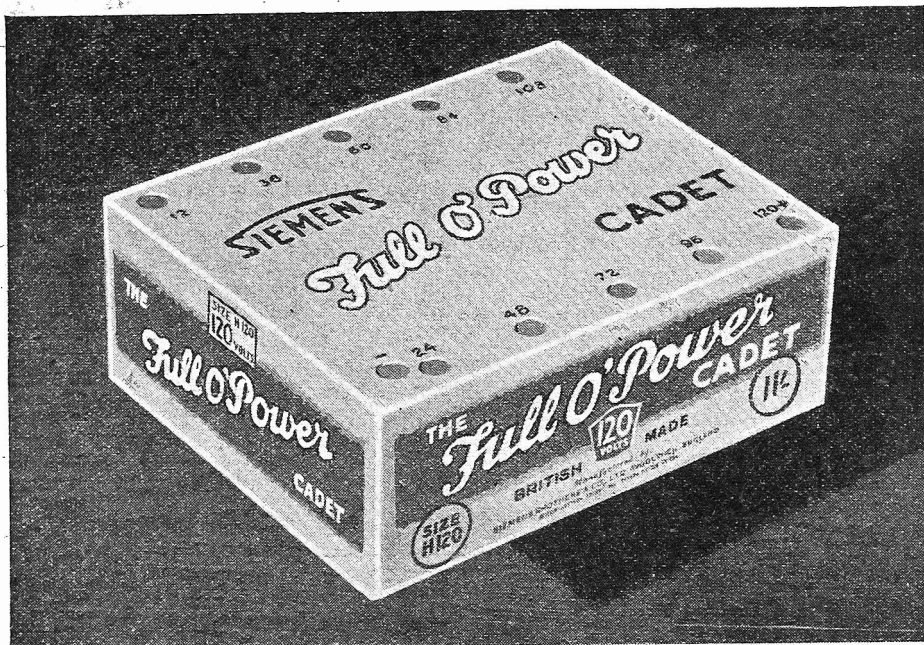
L. B. (Halifax), in a p.c. in which he addresses me variously as "Ariel" and "Dear Earth," appears to be suffering from a sense of wrong because I mentioned the lovely lady who accompanied her portable on a banjo. Now, why should I not—as unofficial observer of radio in all its branches and all its effects upon people?

The anecdote proves that radio can produce a state of detachment in the female of the species which allows the subject to experience pleasure apart from observing the costumes of other lady persons. A striking piece of research, I call it.

My dear L. B., do, please, unbend slightly whilst reading my columns; there are small beer and skittles, as well as profound technicalities, in the world of radio!



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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

A "BURN-OUT" WITH THE H.T. DISCONNECTED.

L. J. F. (Newbury, Berks).—"Two beautiful valves gone west! That's my trouble. And the makers say they have lost emission ('burnt out'), although there was no high tension connected to the set at the time.

"The set is a plain detector pentode, working fine at the moment, with its two new valves. I had only had the old valves about four months, and I still can't see why they went, although I have found one thing out-of-the-ordinary about the set. That is that the metallised coating of the detector is connected to L.T.+ instead of to L.T.—, which is usual, I understand.

"All I did to the set when the valves were ruined was this: First, to pull out the H.T. negative plug (I am absolutely certain I did this first, as recommended so often by 'P.W.'). Next, to pull out the grid leak from its clip and squeeze this latter up a bit with my fingers, as it did not seem to be gripping very tightly.

"Finally, I took off the lead from G.B.— (18-volt battery) to grid leak and replaced it

by a new one. When all was O.K. I switched on L.T., connected up the H.T.—, and found the set as dead as a coffin nail. How did those valves go when the H.T. was off?"

We are afraid that the answer is "grid-bias battery"—a culprit very easy to overlook!

When we switched off the L.T. and the H.T. you still had G.B.+ connected to L.T. negative filaments, hadn't you? So if through some mischance the G.B.— end of the battery connects up with the positive filament leads you would have the full G.B. voltage across the filaments.

No doubt what happened was that you just touched that negative G.B. connection on the positive filament line somewhere, probably on the detector valve itself. If its metal coating was connected to L.T.+ it gave a direct metallic connection to the positive end of the filaments.

As the G.B. battery already had its opposite end connected to the opposite end of the filaments, the full voltage would be impressed across them.

(Incidentally, it was a pity that L.T. was off, because then the *only* path for a current was through the filaments themselves, whereas had the L.T. been on there would have been a parallel path of low resistance through the L.T. battery itself.)

"This Year's Economy Three."

T. I. R. (Berkhampstead, Herts).—"I want to make up 'This Year's Economy Three' published in 'P.W.' dated June 24th, 1933, but using a Colvern T.D. coil for aerial and a Goltone G.G.R. coil in the anode circuit.

"What are the connections when these coils are used instead of those shown in the diagram?"

(Continued on next page.)

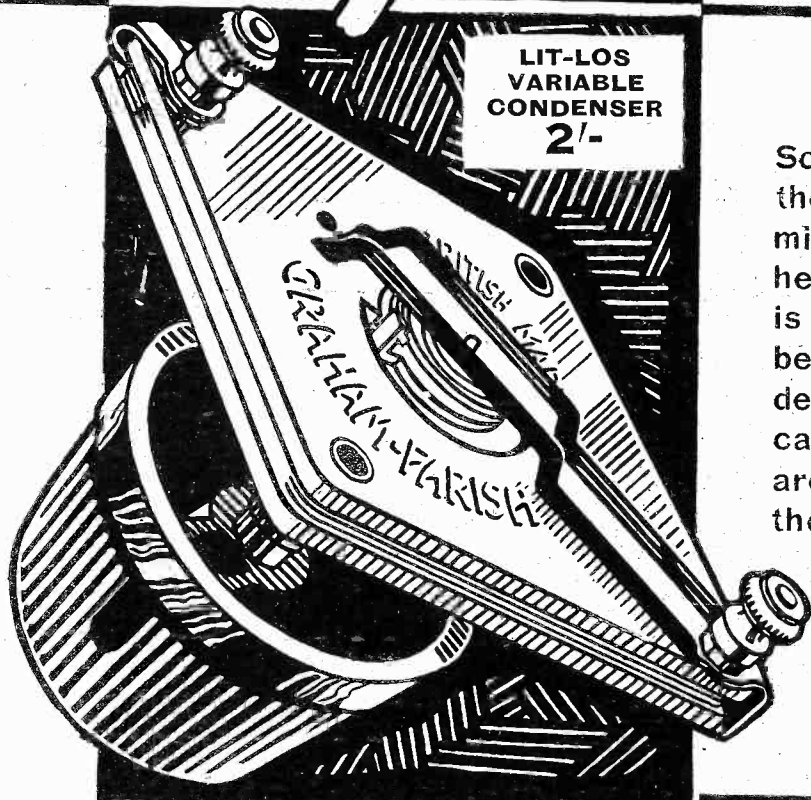
"P.W." PANELS, No. 143.—RADIO PARIS.

Originally known as "Radiola," the Radio Paris station is one of the oldest and best of Europe's long-wavers. It works on a wavelength of 1725 metres.

The original station at Clichy was recently superseded by a 75-kw. transmitter at St. Rémy l'Honoré. Its power can be increased if necessary, and probably will be raised again under the Ferré Plan. (This is the name given to the French "Regional" Scheme.

The abbreviated call commonly used is "Ici Radio Paris." Closing tune, a few preliminary bars of "La Marseillaise."

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Scott-Taggart stakes his reputation on the S.T.500. Just as surely do I stake mine on the Graham Farish products he advises you to use. And, because it is a point of honour that every product bearing my name shall be as efficient and dependable as human skill can make it, I can promise that, no matter whether they are first specified or alternative choice, the more Graham Farish products you use in building the S.T.500, the more certainly will results delight you.

Graham Farish

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

When the Colvern T.D. coil is used in place of the aerial coil shown, it will be necessary to use a three-point wavechange switch, in place of the two-point switch originally specified.

The three-point switch terminals should be respectively connected to terminals numbered 3, 7, and 8 of the T.D. coil.

The lead shown connected to terminal 4 of the Lissen coil in the original diagram should be connected to either 1, 2, 4 or 5 of the T.D. coil. These four terminals give varying degrees of selectivity and the most suitable for your own requirements should be found by trial.

The leads shown connected to 1 of Lissen coil should be connected to 6 of the T.D. coil. The lead shown connected to 2 of the Lissen coil should be taken instead to 3 of the T.D. coil.

This completes the aerial coil alterations. As regards the G.G.R. (Goltone), which is to be used in the anode circuit, the connections are the same as for the Lissen coil shown in the diagram, except that some of the terminal numbers are different. The numbers correspond as follows:

Diagram (Lissen) terminal 1	is equivalent to G.G.R. 1
" " " 2	" " " 2
" " " 3	" " " 5
" " " 4	" " " 6
" " " 5	" " " 4
" " " 6	" " " 3

MEASURING THE CAPACITY OF AN AERIAL.

"CAPACITY" (Wembley, Middx.).—"Is there any easy way in which the capacity of an aerial can be measured?"

Through the kindness of an acquaintance, I have the opportunity of borrowing an accurate wavemeter, and should like to measure my aerial's capacity with it, but do not know the method. I am told it can be done with the wavemeter in conjunction with ordinary wireless apparatus, and if this is so, I should greatly appreciate details."

Besides the wavemeter you really need a calibrated variable condenser; but if you have a good one

of the straight-line-capacity type this will do, because the method depends upon the amount of capacity required to bring a coil into tune, and this amount is very easily calculated from a straight-line-capacity condenser.

The actual experimental work is very easy. All that is needed is the following:

Connect the aerial to one end of an ordinary tuning coil, and its other end to the earth lead. This coil should also be connected across a simple detector valve with a milliammeter in its plate circuit to act as resonance indicator. Now place the wavemeter at a little distance from the aerial coil, and adjust it slowly until the indicating milliammeter 'kicks' violently, indicating that the instrument is now in tune with the aerial-coil-earth circuit.

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) Which long-wave station often announces itself as "Polski Raadio"?

(2) If the two halves of a band-pass tuner are coupled by a condenser common to both the circuits, would the coupling be stronger or weaker if the capacity of the condenser were increased?

(3) How does the American announcer pronounce the letters of the call sign of the Boundbrook Station, W J Z?

Leave the wavemeter at this adjustment, and take the aerial and earth leads off the coil, replacing them by leads from the respective sides of the straight-line-capacity condenser.

Adjust this condenser until the milliammeter again indicates resonance. The capacity of the condenser is then replacing that of the detached aerial-earth, and the value of the added capacity is, therefore, equal to that which it is desired to know.

With a calibrated condenser, the capacity can be read straight off. With a straight-line-capacity condenser it will be approximately equal to the proportion of the total capacity—i.e. if half of the

condenser is being used the capacity will be half the total; which in the case of a .0005-mfd. condenser would be .00025 mfd.

Similarly, if the dial showed one-fifth of the total the capacity would be one-fifth of .0005 mfd., viz. .0001 mfd.

TROUBLE WITH A TRIMMING CONDENSER.

"W.Y." (Harlesden).—"In the hope that I can save some other 'P.W.' readers from tearing out handfuls of hair, I should like to tell you of my spot of bother," says W. Y., of Harlesden, N.W. And the following extract from his letter shows with admirable clearness what a lot of trouble a little thing can cause.

"When the set was first switched on it didn't seem too bad, the London Regional coming through at fairly good volume, with dance music. But when I tried to tune in other stations I began to dance myself, with rage! It was terrible.

"The tuning was as flat as overnight beer, and apart from the London stations nothing seemed to have any power behind it at all.

"The longer I listened the more evident it became that something really serious was wrong, in spite of my care in wiring and checking.

"To cut a long story short, I went over everything again. And after a solid hour and a half I had to confess that everything was in order, except the results. And they were putrid.

"What would have happened in the end I don't know, for I was getting desperate. But in lifting the set bad-temperedly by the gauged control I was rewarded by a sudden liveliness, which lasted just long enough to convince me that I was on the track of the fault at last. And then I couldn't find it for another half hour.

"Perhaps you can guess what had happened? The insulation between the H.F. trimmer plates wasn't insulating, and the

(Continued on next page.)

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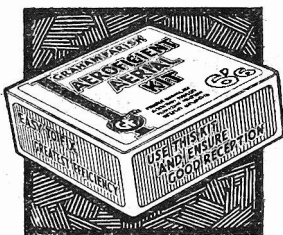
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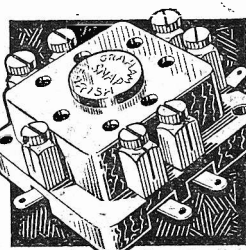
BASEBOARD PRESET
CONDENSER - 1/-



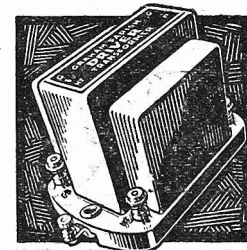
AEROFICIENT KIT 6/6



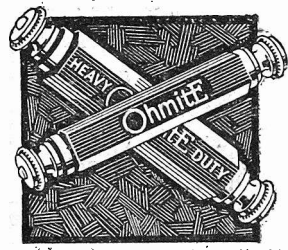
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3 watts 2/3

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

two sides were touching one another. When I opened them out that set opened out like a volcano!

"I suppose the high-frequency stage was not working at all when the trimmer plates were touching, and I wonder now how it gave as much power as it did. Directly I opened up volume was enormous, selectivity perfect, and everything in the garden lovely.

"What made it so hard to find was the fact that I could see the mica insulation between the trimmer faces, but, of course, I

IS YOUR SET BEHAVING ITSELF?

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 Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you 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.

could not see that it was not completely separating them. So, if any other of your readers get similar disappointment from an S.C. stage of a ganged set, tell them that even if there is mica in the trimmer, it doesn't always mean that the moving plate is separated, as it should be."

A DECOUPLING QUESTION.

J. C. M. (Eastoft).—"Why is it that decoupling works so well, although the original circuit through the battery is only altered by putting a resistance in it?"

"I always thought that a condenser offered a fair impedance to low-frequency currents, and yet these apparently choose the 2-mfd. condenser route rather than the battery circuit when this latter has 20,000 or 25,000 ohms put in it.

"Surely the condenser's impedance, also, is pretty high at low frequencies? And surely motor-boating is a very low frequency indeed?"

You raise an interesting point here, J. C. M., but you drag a red herring across the trail when you suggest that the decoupling condenser has to deal with motor-boating frequencies.

What the condenser has to do is to "accept" the ordinary low frequencies of speech and music, and so not allow them to flow round via the battery circuit. If it does this the circuits are decoupled, and the very-low-frequency motor-boating will not arise.

A comparison of figures will show that the decoupling condenser offers very much less "resistance" to L.F. than the decoupling-resistance-and-battery route.

The formula: $\text{Reactance} = \frac{1}{6.28 \times f \times C}$ gives the reactance of a condenser, in ohms, where f = frequency and C = farads. And, if we assume a frequency of as low as fifty, we get, for a 2-mfd. condenser,

$$\text{Reactance (ohms)} = \frac{1}{6.28 \times 50 \times 0.00002} = 1,600 \text{ ohms (approx.)}$$

This, you will see, is very, very much less than the impedance offered by the decoupling resistance

which, it must be remembered, is in series with other impedances. So, virtually, all the low-frequency current is diverted from the battery.

A SAND-FILLED LOUDSPEAKER.

H. Y. (Bötley).—"I am told that in POPULAR WIRELESS you recently described a novel loudspeaker cabinet, the sides of which were hollow and filled with sand, to prevent boom and 'box-resonance.' Just what I want!

"Please say when this was described, and whether full, how-to-make details were given.

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 477 ARE GIVEN BELOW.

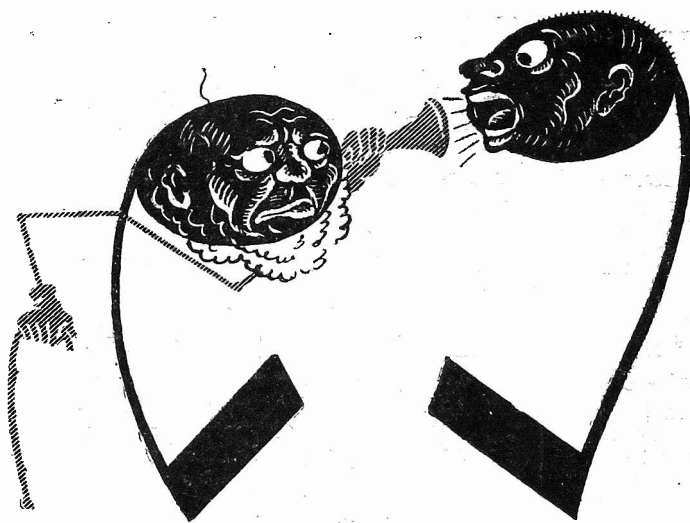
- (1). Warsaw, on 1411 metres. The word "Polski" means Polish.
- (2). An increase in the capacity of a condenser placed thus results in a decrease of the coupling.
- (3). In America Z is not pronounced "Zed," as in this country. It is called "Zee." This often confuses British listeners, as W J Z, when pronounced as "W J Zee" sounds more like W J B or W J C to English ears. Remember this when listening for the States.

DID YOU KNOW THEM ALL?

If so, where to write for the back number?"

The Non-Boom Baffle, as it was called, was described in "P.W." dated October 14th, 1933, No. 593. Full constructional details, for two styles, were given, and the devices have the further merit of being easily constructed and quite inexpensive.

If the back number is unobtainable, locally write direct to the Publishers, The Amalgamated Press, Ltd. (Back Number Department), Bear Alley, Farringdon Street, London, E.C.4. The price is 4d. per copy, post free.



The rude young Note, shouting: "I said Tungram SYMPHONIC valves, you old chump! Tungram's latest discovery for rejuvenating old sets! I reckon you could do with a course of them yourself!"

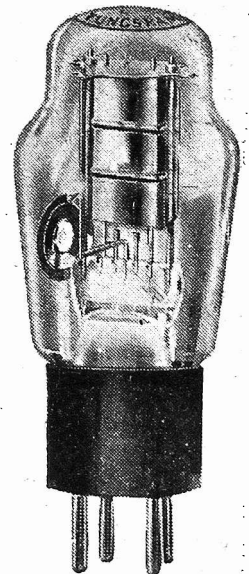
TUNGSRAM introduce their **SYMPHONIC** valves

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|-----------------------------|----------|
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| Symphonic V/M Screen Grid | AS 4125 |
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| Symphonic V/M H.F. Pentode | HP 4105 |
| Symphonic Detector | AR 4101 |
| Symphonic Multi Grid Output | APP 4120 |

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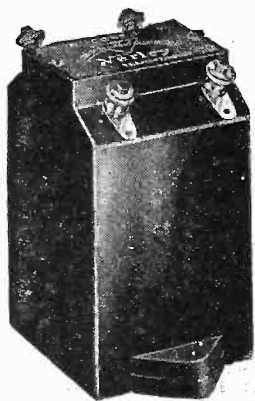
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Primary Resistance. 750 ohms.
Ratio 1 : 3.5.
D.P.21 - - - **7/6**

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Primary Resistance. 175 ohms each half
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Primary Resistance. 1,000 ohms.
Ratio 1 : 1
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| 1 | S.G. Choke. | B.P.26. | - - - | 4/6 |
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| | | Electronic 1 watt type (no holder required.) | | |
| 2 | 5,000 ohms resistances. | | | |
| | | Electronic 1 watt type | | |
| 2 | 10,000 ohms resistances. | | | |
| | | Electronic 1 watt type | | |
| 1 | 250 ohm resistance. | | | |
| | | Electronic 1 watt type | | |

Write **NOW** for the latest Varley Catalogue.

THE MIRROR OF THE B.B.C.

(Continued from page 454.)

American announcer, and whose show it really is.

"Midland Composers."

Chris Edmunds, whose music will be played and sung in the eleventh of the series of "Midland Composers' Concerts" on Tuesday, November 14th, was chorus master at the Birmingham station in the early days of the B.B.C.

Before then he had become a member of Sir Granville Bantock's composition circle and professor of the piano and theory at the Midland Institute. He has just completed an octet for strings, and this will be played for the first time on November 14th.

"The Lady of Shalott."

Other items will include the cantata, "The Lady of Shalott" (to Tennyson's words), for women's voices and orchestra, and his Sonata in E minor, in which Constance Bee will be the violinist and Margaret Ablethorpe the pianist.

Frank Cantell will conduct the Studio Orchestra and Edgar Morgan the sopranos and contraltos of the Studio Chorus.

For West Regional Listeners.

To be able to see the funny side of one's own weaknesses is an attribute that goes a long way towards keeping us sane, especially when it is applied to a nation as well as individuals.

Welsh people will be the first to admit that they have—shall we call it a fondness?—for sending deputations to Government

departments in London. That such a serious characteristic cannot be without its humorous side will be shown in a programme entitled "Dirprwyaeth Llanarfon." (which being interpreted means Llanarfon's deputation) for West Regional listeners on Friday, November 17th.

Done for Good Fun.

Of course, it will all be done in good fun, and we shall hear how, when the villagers of Llanarfon have become fed-up with sending letters, telegrams and deputations, they

NEXT WEEK

MULTIPLE CONTROL—THE REASON FOR THE S.T.500 SUCCESS,

BY

JOHN SCOTT-TAGGART

ALSO

HOW TO BUILD AN ALL-BAND SHORT-WAVE RECEIVER

decide to "take over" the West Regional station in their determination to get a place on the map. Once in possession of the microphone, there is no better way of achieving their object than to give listeners the type of programme to which they are accustomed in Llanarfon.

We need not go into details, apart from mentioning that they are great believers in parodies, whether on Welsh songs or Welsh poetry, and that when they have no harp they are not averse to their singing being accompanied on the mouth organ.

THE LISTENER'S NOTEBOOK

(Continued from page 468.)

The B.B.C.'s treatment of "The Blue Boar" was hardly just. By robbing it of its libretto (which I understand is witty) and substituting in its stead a hastily read résumé of the story this light opera became no more than a recital of Roger Quilter music. As such it was still very enjoyable, but it forfeited its claim to be the outstanding broadcast of the week.

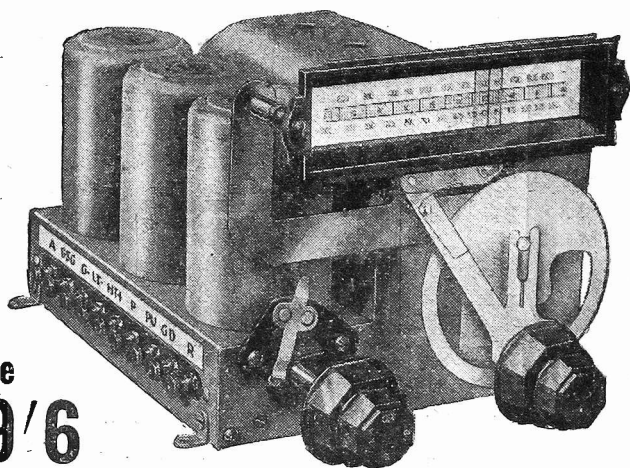
To me it was no more than, say, "Curtain Up" was on the Regional, and certainly merited no more publicity in the official programmes than was given this programme of Theatre music. In fact, I enjoyed it less than I did "Curtain Up," for in the latter case there was a variety of well-selected music.

No! the finest broadcast of the week was the Black Watch anniversary play. This was extraordinarily well written and produced. There was much Scotch in it, of course, but all was easily followed. Perhaps the little Gaelic wasn't without its difficulties, but this was essential to the character of the play.

I liked the way the story was unfolded by the two men stranded in the shellhole. The fade-out that preceded and succeeded each episode was most effective. The loss of the Birkenhead was realistically done, and the noises seemed better controlled than usual. An outstanding performance!

In the advertisement of the British Radiogram S.T.500 kit of parts on page 403 of last week's "P.W." the prices of the two conversion kits were inadvertently transposed. The prices, so B.R.G. tell us, should be 45s. for the S.T.300 to S.T.500 and 37s. 6d. for the S.T.400 to S.T.500.

It gives a 3-valve set a performance like a SUPERHET!



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Multitone, who are the first to introduce Class "B" transformers, are now distributing a new complete Guide to Class "B." It explains the theory of Class "B" amplification and gives details of circuits and components. Write to Dept. B. for a free copy.



TOCO The ONLY true TONE CONTROL TRANSFORMER Ratio 1/4 Price 17/6 (saves an extra 30% H.T.) Graded Potentiometer Price 3/6

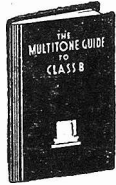
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CLASS "B" CONVERTER UNIT Those who do not wish to interfere with the wiring of their present set can buy this simple unit. Just plug in adaptor to last valve stage and enjoy Class "B" advantages. Price 37/6 (less valve)

OR IN KIT FORM Price 27/6

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POWER IN PLENTY

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WIRELESS BATTERIES IN YOUR SET

THESE FOR THE COSSOR S.G.3.

Owners should fit Ever Ready Batteries: H.T. Winner 120; G.B. Winner 9—both made specially for it. If not, simply ask your dealer for the Ever Ready List, showing all popular makes with their special Ever Ready batteries. Your set will be powered perfectly by its appropriate Ever Ready batteries.

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ALSO PLAYER'S 'AIRMAN' NAVY CUT
DE LUXE AT 11^D PER OZ.

THE E. S. D. OF LOUDSPEAKER RESULTS.

(Continued from page 464.)

The slackness of the job is rather an important point to grasp. If you have a powerful car your foot is very seldom right down on the accelerator; most of the time the engine is running at only a fraction of its full power, which is kept in reserve for the few occasions when it is needed.

In just the same way it is necessary to distinguish quite clearly between the average power your output valve is called upon to deliver, and the maximum power, which is what we have been talking about in figures. Consider a piano or a drum—or any instrument that is made to sound by being struck. At the instant of striking the power sent out as sound is enormous; but a fraction of a second later it is quite small, being just a sort of remnant caused by the string or diaphragm continuing to vibrate on its own.

The Need for a Safety Margin.

So while 100 milliwatts may give ample volume on the average sounds broadcast, it is essential that the valve can handle much more than that amount—actually 1,000 milliwatts may be none too much. What happens in the case of a 150-milliwatt valve is that the margin in hand is often not enough and all the "peaks" may be distorted.

Therefore the type of valve to use, even for a definite and moderate volume, depends on how much distortion you are prepared to tolerate. A critical listener likes to have a

valve that can give 10 or even 20 times as much power as the average requirements. But there aren't many people who can afford to pay a day's wages for half-an-hour's work, so the Class B valve is the only reasonable solution where battery power is used.

Class B for Mains Sets.

Mains power is so cheap that the ordinary wasteful Class A system is quite satisfactory for most purposes. But you may be interested to know that in America it is considered necessary to provide at least 7,000-10,000 milliwatts in reserve to give a mere 500 average for ordinary domestic use; and as that would put a strain even on the pockets of a "plug-in" listener if the consumption ran on all the time, they have developed their Class B chiefly from the high-power mains point of view.

The important thing to get hold of is that, while the current you have to pay for in Class A working is 3, 4, 5, etc., times the maximum output the valve can give, in Class B working it depends mainly on the average output required to provide a comfortable volume in your room. And as we have just seen that for distortionless reproduction the average is only a tiny fraction of the maximum, it is easy to see where Class B scores.

THE LINK BETWEEN

(Continued from page 454.)

there are still quite a number of people who don't know how easy it is to adapt to any set. The addition of two small units, one near the horizontal part of the aerial and the other near the set, joined by a metal-sheathed twin cable in the place of a down

lead, are all that is necessary. The results really are good, and noises from mains, passing transformers and so on are eliminated in practice as well as in theory!

Readers who are troubled with man-made interference and are in doubt as to whether the "Rejectostat" system will help them should drop a line to Kolster-Brandes at Cray Works, Sidcup Kent.

Clocks for the Mains.

I have lately had several letters from "P.W." readers asking where electric clocks for use with radio receivers can be obtained. These and other readers who wish to copy in home construction what many of the commercial-set manufacturers are making standard will be interested to learn that negotiations have now been completed whereby the Edison Swan Electric Co., Ltd., will in future be marketing battery and all-mains Bulle clocks. Stocks of all models will be available at local dealers, and illustrated lists can be obtained from 155, Charing Cross Road.

Similarity of Cabinet Design.

When a manufacturer of a commercial set finds a really distinctive cabinet design he is very tempted to try to standardise it through all his models as a kind of trade mark of his own brand of set. When for example, a table-model design has proved popular there has been an attempt to transfer it to console or radiogram cabinets, usually without any regard to the artistic balance of the original design.

There are some notable exceptions, of course. The Ekco Model 74, which I mentioned recently, has just made its appearance as a console model, and the cabinet is based on the design which made such a sensation at this year's radio exhibitions. There is certainly a sharp contrast between the black bakelite of the console and the grained satin walnut of the console; but the "family likeness" has been maintained so faithfully that, even though the layout is totally different, there is no mistaking the Ekco set. In this case the transferring of the design has been a brilliant success.

"S.T.500" COILS.

We have received for test from Messrs. Amplion a set of their new "S.T.500" coils, and Class B components. These have been tested in a model of the "S.T.500" and were found to be perfectly satisfactory in all respects.

OSTAR-GANZ

"UNIVERSAL" HIGH VOLTAGE MAINS VALVES

As used for the "UNIVERSAL" AMPLIFIER described on page 465.

There's no need to scrap Ostar-Ganz valves when your electric supply is changed over from D.C. to A.C. They work efficiently on either. **There's a complete range for all purposes.**

It is easy to build ALL-MAINS sets or CONVERT Battery Sets to ALL-MAINS with Ostar-Ganz high voltage valves. **NO BARRETTERS—NO TRANSFORMERS—NO RESISTANCES needed.**

KITS supplied for the First "UNIVERSAL" SUPER-HET on the market. Ostar-Ganz valves made this possible. **SET KITS**, 3 Valve, £5 15s.; 4 Valve, £8 15s., and **AMPLIFIERS**, £5 5s. FREE Blueprint with first order.

Write for full list "P" to sole Agent for Great Britain. District Agents Wanted.

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Phone: Temple Bar 8608.

UNIVERSAL MODEL SETS

One Set for both D.C. or A.C.

Work on any mains supply without alteration.

'HIGHMU 3' 9 gns. 'HIGHMU 4' 12 gns.

Economical in current consumption.

HIGHLY SELECTIVE—HUM-FREE.

Ferrocart latest type nickel iron core coils.

Polar full vision illuminated dial.

Ferranti transformers

Dubilier condensers.

Magnavox mains energised m.c. speaker in ultra-modern attractive cabinet and, of course, fitted with the famous latest type **Universal High Voltage Valves.**

Full particulars in Leaflet "P.S." Free.

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RADIOGRAM CABINETS FOR 1/6 WEEKLY

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Specification: Soundly constructed of well-seasoned timber and beautifully polished rich walnut shade with ebonised mouldings.

SIZE OVERALL
Height, 3 ft. 3 in. Width, 1 ft. 8 in. Depth, 1 ft. 4 in. Allowing ample room for all pick-up turntables and sets with baseboards up to 18 in. by 14 in. and 7-in. panel, also speaker and all accessories. Hinged motor board for easy use. **SEND FOR LEAFLET.**

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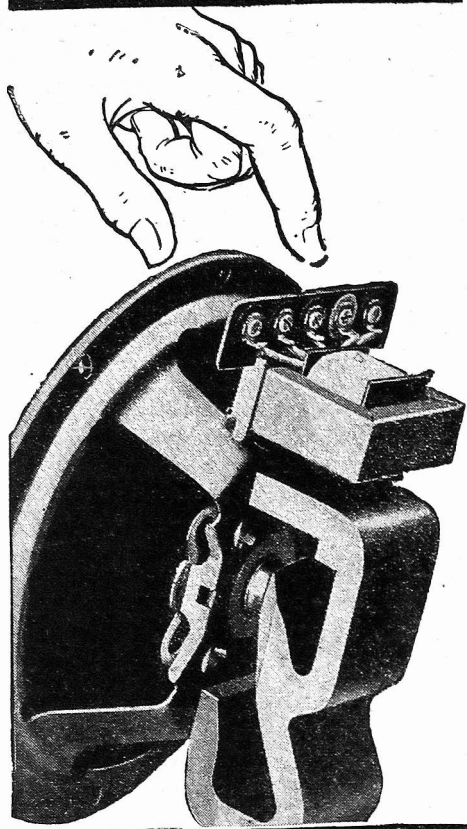
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5 Valve SUPERHET
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A.C. All Mains. Variable-mu screened-grid valve, power grid detection and corrected Pentode output, and Mazda Valve rectification. Receives signals 200-2,000 metres. Magnetically coupled band-pass tuning with illuminated calibrated dial. B.T.H. Mains-excited Moving-coil Speaker. Line Voltage Regulator with safety fuse incorporated. Garrard Electric Motor, Automatic stop. B.T.H. pick-up. Special gramophone tone corrector. Walnut cabinet. Triple gang condenser controlled by single knob. The finest value in the world. Honestly worth double. (Also D.C. Model, 16 gns.) Write immediately for illustrated booklet, and particulars of 3 days trial.

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THE more we see of the wonders of the Ancient World the more we respect the men who could conceive and produce them. In recent years the uncovering of these treasures of the past has gone on with extraordinary rapidity, and it has hitherto been difficult to obtain any clear and complete record of archaeological achievement.

A work has, however, been prepared which gives us all we ought to know on the subject, and gives it in such a way that we are not only staggered but delighted with the magnificence of the feast provided.

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In "Wonders of the Past," edited by Sir J. A. Hammerton, we are provided with a full description of hundreds of the marvels that the men of the past created.

"Wonders of the Past" is the kind of work that is usually issued at a prohibitive price, but this is placed within the reach of all, for it is issued in 52 weekly parts at sixpence. There are 2,000 illustrations, and 60 superb colour plates, and the book is one of the most beautiful and exhaustive works of its kind ever issued. Ask your newsagent for a copy of Part 1 of "Wonders of the Past," on sale to-day, and order the remaining parts so that you may receive them as they come out. You will certainly be delighted with this great work.

SELECTIVITY AT WILL

A simple but useful tip.

BY using a length of lighting flex as the connection between the set's aerial terminal and the aerial lead-in tube, it is possible to arrange for the inclusion of a series-aerial condenser at will. This is very useful for cutting down the strength of the "local" while keeping it free from interference from other stations.

One end of one lead of the flex is joined to the lead-in tube terminal. The end of the other lead remote from the tube goes to the set's A terminal. Connection between the aerial and the set is then via the small capacity of the flex.

If the free end near the set is then equipped with a crocodile clip, direct connection of the aerial to the receiver is obtained by merely clipping on to the A terminal.

ECKERSLEY EXPLAINS

(Continued from page 453.)

Hitler doesn't, Mussolini doesn't, and the B.B.C. are doing away with the possibility of giving more alternatives than two. But that's not a technical problem; it's just a problem.

One thing seems certain: that the specification could be fulfilled if you used wires instead of wireless. That's a solved technical problem, but to do it is—well, just a problem.

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NEW GOSSOR MODEL 341, S.G., Detector and Pentode, and Balanced Armature Speaker, complete with Cabinet. Cash or C.O.D. Carriage Paid, **£6/7/6**. Balance in 11 monthly payments of 11/9. **Send 10/- only**

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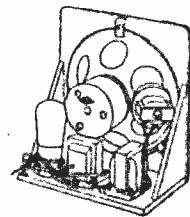
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PETO-SCOTT "CLASS B" SPEAKER-AMPLIFIER KIT Complete Kit comprises B.V.A. Class B Valve, Peto-Scott Permanent Magnet Moving-Coil Speaker, B.R.O. Driver Transformer and Output Choke, Seven-pin Valve Holder, Peto-Scott Baffle and Baseboard Assembly, all necessary Wires, Screws and Plug-in Valve Adaptor, with full-size Diagrams and Assembly Instructions. CASH or C.O.D. Carriage Paid, **£2/15/0**, or Balance of 11 monthly payments of 5/-.



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VIEW CAMERASCOPIES. BROWNS, double lens, fold-2 1/2 in. Telescopes. Cooke monocular prism R.F. with 9-mile distance scale, 7½ in. long, weight 3½ lbs., 17/6. Naval Gun Sighting Telescopes, internal focus ring 24 in. long, 2 in. dia., magnification 6x for short and long range, weight 6 lbs., magnification 12x, for short and long range. Cost £25. Sale, 17/6. Smaller Spotting Telescopes, 17 in. x 1½ in., 25/-.

CHASSIS for Set Builders: All-Metal Base Chassis, fitted 2 valve holders, all drilled for Brown components, 3/6. **Loudspeaker Fret Silk**, 12 in. x 12 in., 1/-; 24 in. x 24 in., 3/-.

THE BATTERY SUPERSIDER makes H.T. from your L.T. 100 volt battery, rectified and smoothed. Gives 3 tappings and lasts indefinitely. A boon to those who are not on the mains. Reduced from £3/15/- New and 37/6 LT.

PARCELS of experimental odd coils, magnets, wire chokes, condensers, switches, terminals, etc., post free. 10 lbs., 7/-; 7 lbs., 5/-; 1,000 other Bargains in New Sale List "P.W."

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THE UNIVERSAL AMPLIFIER

(Continued from page 466.)

There is nothing out of the ordinary in the construction of the amplifier. It is built on the usual panel and baseboard principle, and can be completely constructed in a very short time. In use the connections to the pick-up are taken in the usual way, while the loudspeaker is connected as previously described.

For those who are desirous of using a special loudspeaker with the amplifier we have indicated in the illustrations an attractive baffle containing a dual loudspeaker unit with which the original amplifier operated extremely successfully. This unit is the Rola dual type, with mains-energised pots, and is ideal for use where D.C. is to be used as a general rule. In cases where A.C. mains are to be employed it will be necessary to use either P.M. speakers or mains-energised types with the necessary rectifier and smoothing condenser.

Regarding Polarity.

The connection of the amplifier to the mains is carried out in the usual way by means of an adaptor plug in the electric light or power circuit. In the case of D.C. mains it is necessary that the plug be inserted the correct way round as regards mains polarity. This is easily checked by the fact that when in one way no results are obtained, and when the other way is tried the amplifier comes to life. With A.C. no such polarity check has to be made, for the plug can be inserted either way round.

It will be noticed that no on-off switch is incorporated in the amplifier. This is because it is felt that in many cases it will be desired to fit the unit in a gramophone cabinet, when a separate switch controlling the mains input will undoubtedly be fitted in some convenient position. When used external to a cabinet the amplifier can easily be controlled by the mains switch governing the point into which the plug is inserted.

A TIP FOR FIVE METRES

READERS who are interested in the ultra-short waves, particularly the 5-metre band, where at the moment there is great activity, will find the following tip very helpful. It concerns aerial systems: When receiving on normal wavelengths it is fairly true to say that the larger the aerial the better. But on the ultra-high frequencies the same rule does not apply.

The writer's experience indicates that best results are obtained on a short vertical aerial, 15 or 20 feet long. It should be erected as much in the open as possible, and the lead-in should be really short.

So great an improvement is this arrangement over others that it is possible to hear signals at good strength, which, on an ordinary broadcast aerial, are quite inaudible. No earth connection is necessary, and coupling to the grid of the detector is obtained through a small neutralising-type condenser.

F. B.

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TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Multi-Mu Virtues.

SO much has been said about the virtues of the multi-mu valve that many people jump to the conclusion that they have only got to fit a multi-mu valve to their set and they will get a lot more stations and a general increase in the efficiency.

Perhaps this impression is excusable at first, but it is not really true, because the actual amplification given by the multi-mu valve is not greater than that of an ordinary screened-grid valve; in fact, to be precise, it is sometimes rather less. A good deal depends on whether you want to use the highest magnification you can get—with a low grid bias or with no grid bias at all—or whether you want distortionless volume control and to get away from overloading the high-frequency amplifier.

If you want the former you do not really gain any great advantage from the multi-mu valve. If it is the latter that you are after, then by all means go in for the multi-mu. But I want to make it clear that the multi-mu is designed for the special purposes which I have just mentioned above, and is not a sort of "general improver" of the whole set which you just stick on any way. Like a pentode and many other components in the receiving set, it will give you great advantages if you happen to want just what it is intended to cater for, but will be of little or no use to you otherwise.

Calculating Wavelength.

It is often convenient to know the wavelength to which you can tune by means of a coil of a given inductance and a condenser of known capacity. The wavelength of a closed circuit composed of the inductance and capacity is obtained by multiplying the capacity (in microfarads) and the inductance (in micro-henries), then taking the square root of the result and multiplying this by 1,884.

You will easily see from this formula that if the capacity is made very small the wavelength will be made small also, whilst the longest wavelength for the circuit will be given when the capacity has its maximum value—that is, assuming that the value of the inductance is constant.

Grid-Lead Interference.

Pick-up leads are very liable to cause interference, owing to the fact that they receive all kinds of stray electrical effects and, being in the grid circuit, are at the most sensitive spot. The question of shielding the pick-up leads is really rather tricky, because you don't want to do more shielding than you can help, since this may tend to reduce the efficiency. Sometimes you will find that a pick-up will work quite well without the leads shielded, whilst in other cases even the same leads will pick up all sorts of interference and crackling.

(Continued on next page.)

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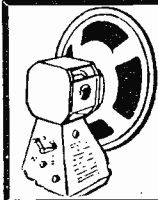
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TECHNICAL NOTES

(Continued from previous page.)

Armoured Cable.

I have generally found it best to use sheathed wire at the outset, because this really does save you a lot of trouble and uncertainty. You can get ordinary braided wire or you can use wire which is not only metal sheathed but also armoured. Personally, I prefer this latter kind of wire, as it will stand quite a lot of knocking about without damage.

Earthing and Efficiency.

Having used sheathed wire, the question arises whether the outer shield should be connected to earth. This is a point that can only be determined by actual trial. Sometimes you will find that the mere sheathing is in itself sufficient to stop any trouble, whilst sometimes you will find that you cannot get rid of interference until it is connected to earth.

On this point I would say that it is better to try *without* earthing in the first instance, as generally you get greater sensitivity when the sheath is not earthed. You will see this for yourself, because the outer sheath, especially if connected to earth, forms a condenser of quite appreciable capacity with the inside leads.

If the grid and bias leads are covered with an earthed sheath, this may also be connected to any metal shield which is used under the motor-board so that a single earth connection can be used for the two.

Grid Current.

People often assume that the grid in a valve—in an ordinary three-electrode valve, for instance—serves the purpose merely of a "potential control," as it were, and that it does not actually pass any current. As a matter of fact, the grid must always pass current, although in normal circumstances with a three-electrode valve this should be very small.

With the more recent valves, such as the screened-grid variety, the grid may pass quite an appreciable amount of current. In a screened-grid valve the screening grid is at a fairly high positive potential, and so quite a considerable amount of the electron stream must reach it.

Semi-Automatic Control.

This grid current can, however, be turned to useful account. If you put in a high resistance between the screening grid and the H.T. positive you can get a kind of semi-automatic control of signal strength, rather like that which you get by using a multi- μ valve.

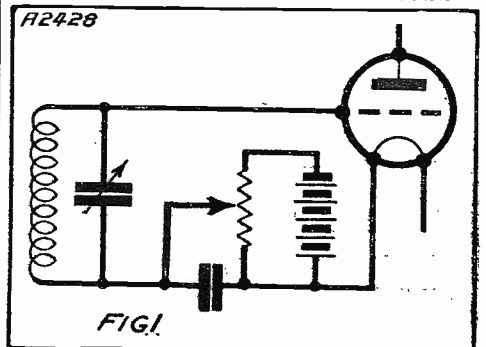
If the signal strength increases, the current passing in the screening grid is increased, and so the potential gradient across the above-mentioned resistance is increased. The result of this is to lower the effective bias on the screening grid, and so the efficiency of the valve is reduced.

Conversely, if the signal strength falls, the positive bias on the screening grid is increased, and so the efficiency of the valve is increased. In this way you will see that there is a natural tendency, when this resistance is used, for the output to be "governed" and to keep at a fairly constant level, notwithstanding that there may be appreciable variations in the strength of the incoming signals.

Anode-Bend Detection.

When you are using the anode-bend method of detection it is very important to have the grid bias applied to the detector adjusted to the correct value. In the ordinary way you only get variations in the amount of the grid bias by the 1½-volt steps of the grid-bias battery,

FOR FINE ADJUSTMENTS



A potentiometer enables accurate adjustments of grid bias to be made to the grid of an anode-bend detector.

but this is really not fine enough if you want to get the best results with anode bend and it is advisable to provide for more accurate adjustments if possible.

In the arrangement shown in the figure the grid-bias battery has a high-resistance potentiometer shunted across it, the voltage tapping for the grid being taken from this potentiometer. If a wire-wound potentiometer is used with very fine wire—as it will have to be to get sufficiently high resistance for the purpose—you can get a much finer adjustment than by simply tapping on to the different cells of the grid-bias battery.

I need not say any more on that point as it is fairly obvious, but some people raise

(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

the objection to this method that it runs down the grid-bias battery too quickly. If the potentiometer has a total resistance of, say, 100,000 ohms the current through it with a 9-volt grid-bias battery will be less than one-tenth of a milliampere; which represents one milliampere-hour every ten hours or, say, roughly 2 milliampere-hours per day, whether the set is working or not.

It has been argued, on the other hand, that a minute current like this, so far from shortening the life of the battery, actually improves it and that a battery in these conditions will last longer, owing to the reduction of polarisation, than a battery which is standing idle.

Of course, you can, if you wish, easily introduce a switch in series with the potentiometer, so that it is only shunted across the grid-bias battery when actually required.

That Echo Effect.

There seems to be quite a lot of difference of opinion on the question of how much of the "echo effect" should be introduced into broadcast items. We all know the old "padded-cell" effect that was so usual in items broadcast from the studio a few years back, whilst, on the other hand, broadcasts from theatres, halls and so on were apt—and are still sometimes—to be much too "echoey," so much so that it is sometimes difficult to make out the words of the artistes.

A Natural Tone.

With the very great improvements in the equipment of the B.B.C. studios the echo effect can be regulated to a nicety, and I think most people agree now that a slight amount of echo, provided it is not overdone, adds greatly to the naturalness of the programme items. Personally, I hate that dead, "padded" effect, and it must be awfully difficult for the artistes to "put it over" effectively in those conditions.

Adds "Life."

The echo effect adds "life" to the reproduction, and it has been compared to the stereoscopic effect in photographic pictures, where you get a sort of three-dimensional effect instead of simply a dead, flat effect.

After all, this is only to be expected, because, when you hear sounds direct in the ordinary way, you always get, added to the sound, the various echoes from walls and so on, and, if in transmission through a microphone these effects are cut out, the sound is bound to seem dead and unnatural.

L.F. Instability.

I said something a week or two back about decoupling, and several readers have pointed out that low-frequency oscillation, howling, etc., is very liable to crop up when you use an H.T. mains unit unless you take special precautions for decoupling.

This is only to be expected, because you have to remember that the H.T. unit includes resistances which are really large compared to the internal resistance of a good H.T. dry battery or of an H.T. accumulator battery.

(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

The moment you have resistance in the H.T. circuit you are looking for trouble with instability due to back coupling, as I have pointed out before. Of course, the trouble may be made much worse by such things as bad placing of the components in the set or by wiring which crosses over and leads to interaction between one part and another.

I am assuming, however, that you have already attended to these latter points, because they will cause trouble anyway, apart from the H.T. unit.

Choke-Filter Output.

If you are bothered with this low-frequency oscillation you might try better matching up of transformers; this often does the trick.

But really the best of all remedies is to use a choke-filter output. This keeps the low-frequency component due to the power stage away from the H.T. unit and will almost certainly give you stability, quite apart from the other well-known advantages of this form of output.

You might also try a condenser across the H.T. mains unit, this condenser being of one or two microfarads or even more, and being connected from the detector positive tapping to the negative terminal of the unit. The condenser will act as a decoupler and should help greatly in reducing instability. But the choke-filter output is the thing, really.

Milliammeter in Anode Circuit.

A milliammeter is a very useful component in the anode circuit generally, and particularly in the detector plate circuit. You can find out by trial what sort of reading is given on the meter when the low-frequency stage and the loudspeaker are receiving what we may call a reasonably full load.

Having once discovered this, you then know that this reading should not be exceeded, no matter what station is being received, and that if, in fact, the reading on the meter is exceeded, then you will get distortion.

Anode Bend and Overloading.

To take an example: If you use a leaky-grid detector and, say, a single stage of L.F. or two stages of push-pull, and you get a drop of, say, half a milliamperes in the anode current, when properly tuned this should give you plenty of volume for all ordinary purposes, whilst if there are a couple of stages of low-frequency amplification you may, in fact, work with much less coming through the detector. On the question of detector load, by the way, the anode-bend detector will stand a good deal more than the leaky-grid type before showing obvious symptoms of overloading.

Have You Worked This Out?

Has it ever occurred to you to work out what you pay for your high-tension current from an H.T. battery per unit as compared with what you pay when you draw this from the electric light mains? A very simple sum in arithmetic will show you some illuminating results! Let us assume—a fairly optimistic assumption in many cases—that an H.T. battery will last six months when running a set on an average four hours a night, seven nights a week.

Anyway, call this for simplicity 28 hours a week and 25 weeks, which gives a total of 700 hours. Suppose the average current is 5 milliamps, that is 5 multiplied by 700, or 3,500 milliampere hours, in other words 3 1/2 ampere hours. Now 3 1/2 amps. at 100 volts (supposing it is a 100-volt battery) is 350 watts, and 350 watts for one hour is 350 watt hours, which is just about one-third of a unit.

If the battery costs you 10s. this works out at the rate of 30s. per unit. A fair price for electricity on the electric light supply is 5d. per unit, whilst on the power meter 1 1/2d. or 2d. will be plenty. So you see how enormously dearer the current is from the H.T. battery compared with the mains.

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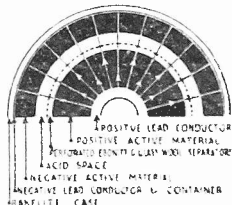
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MODERN factories courageously scrap any machinery, however new, that can be improved. It is an economy. Think of your accumulator this way. It can be improved out of knowledge. A section is shown here through the plates of your accumulator. Current naturally concentrates round the good-conducting (but inert) lead grids, so that the active material itself receives only a very uneven charge. That is why battery technicians have explored every means of eliminating these grids. To-day, in the modern Block cell, active material is formed round the interior of a lead cylinder,



A cut through the plates of an ordinary accumulator. The grey tone represents concentration of current round the grids (black).



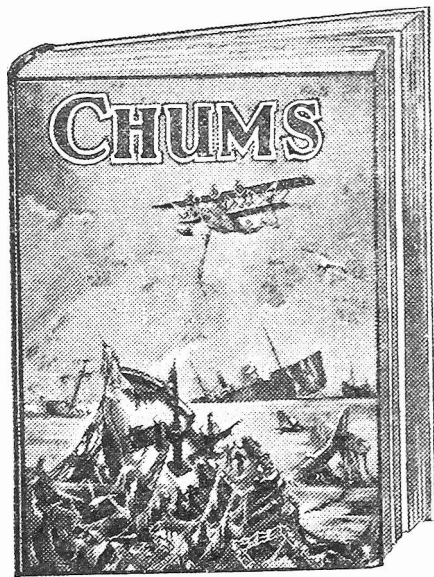
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tough as a rock, without any grids at all. The improvements are obvious — (1) you ensure really complete charging (2) you increase the proportion of active material available

(3) you save a lot of weight and space. It is not surprising that this new kind of accumulator lasts twice the time on each charge (a saving in money and bother that is alone worth while). A plan section of the new accumulator is shown here. One hundred thousand people are already benefiting from the new accumulator — not only has it double capacity, but it is far stronger and does not run down when inactive. Why not think this over?



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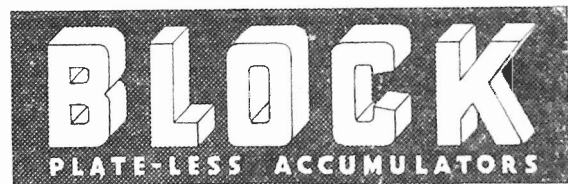


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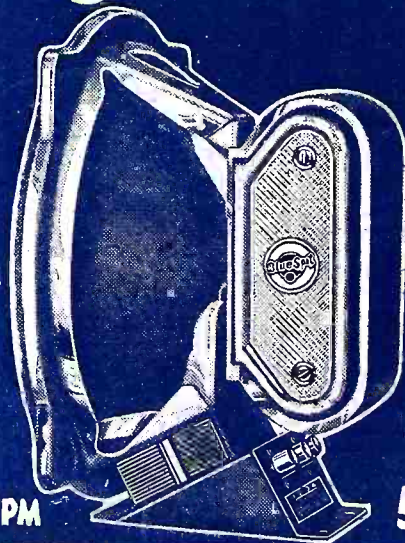
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