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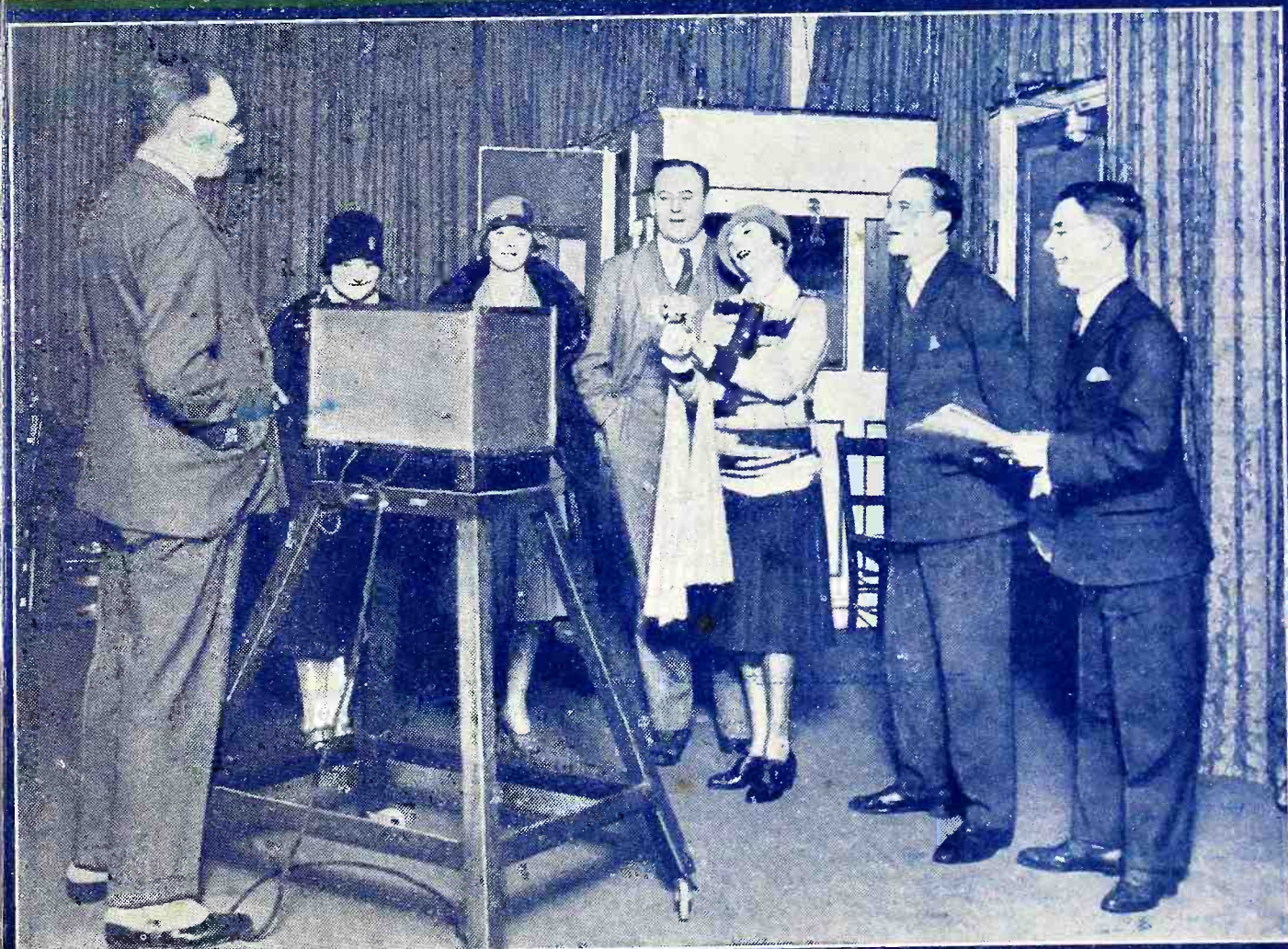
Popular Wireless

Every Thursday
PRICE
3d.

No. 299. Vol. XII.

INCORPORATING "WIRELESS"

February 25th, 1928.



Special Features In This Issue

A New Tuner Unit. Won't Your Set Oscillate?

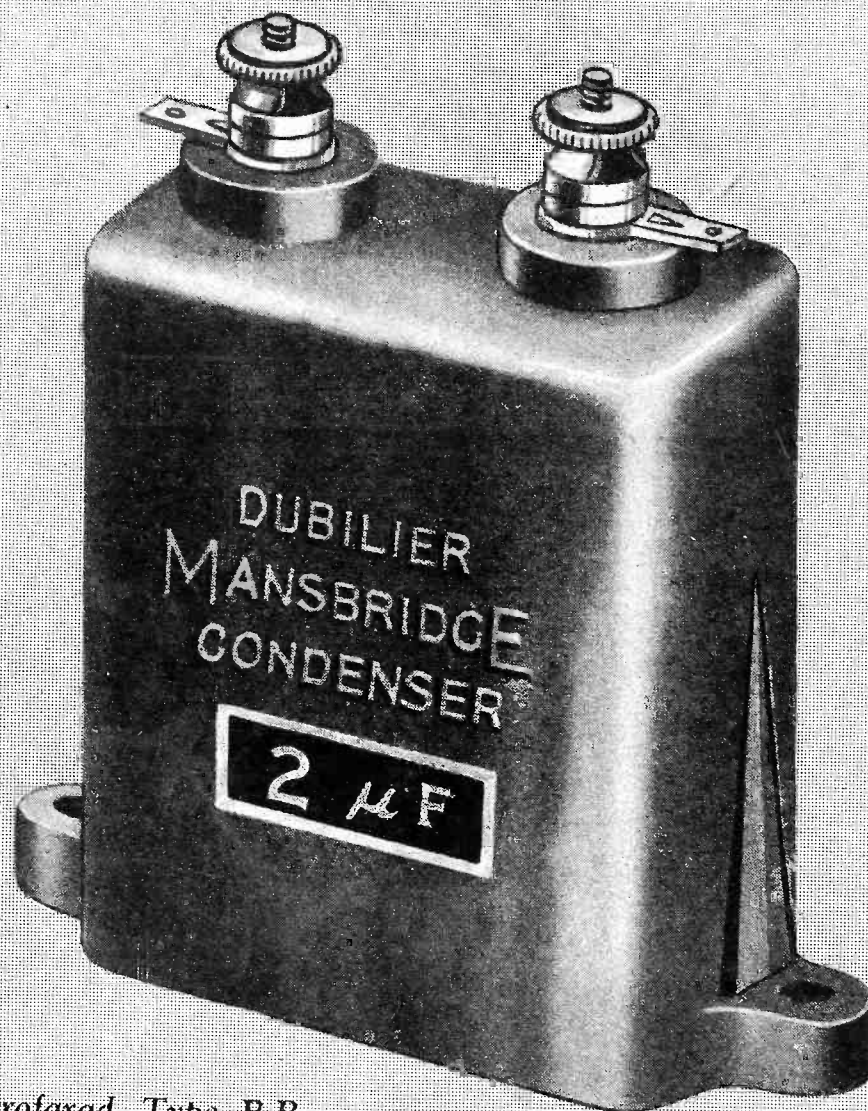
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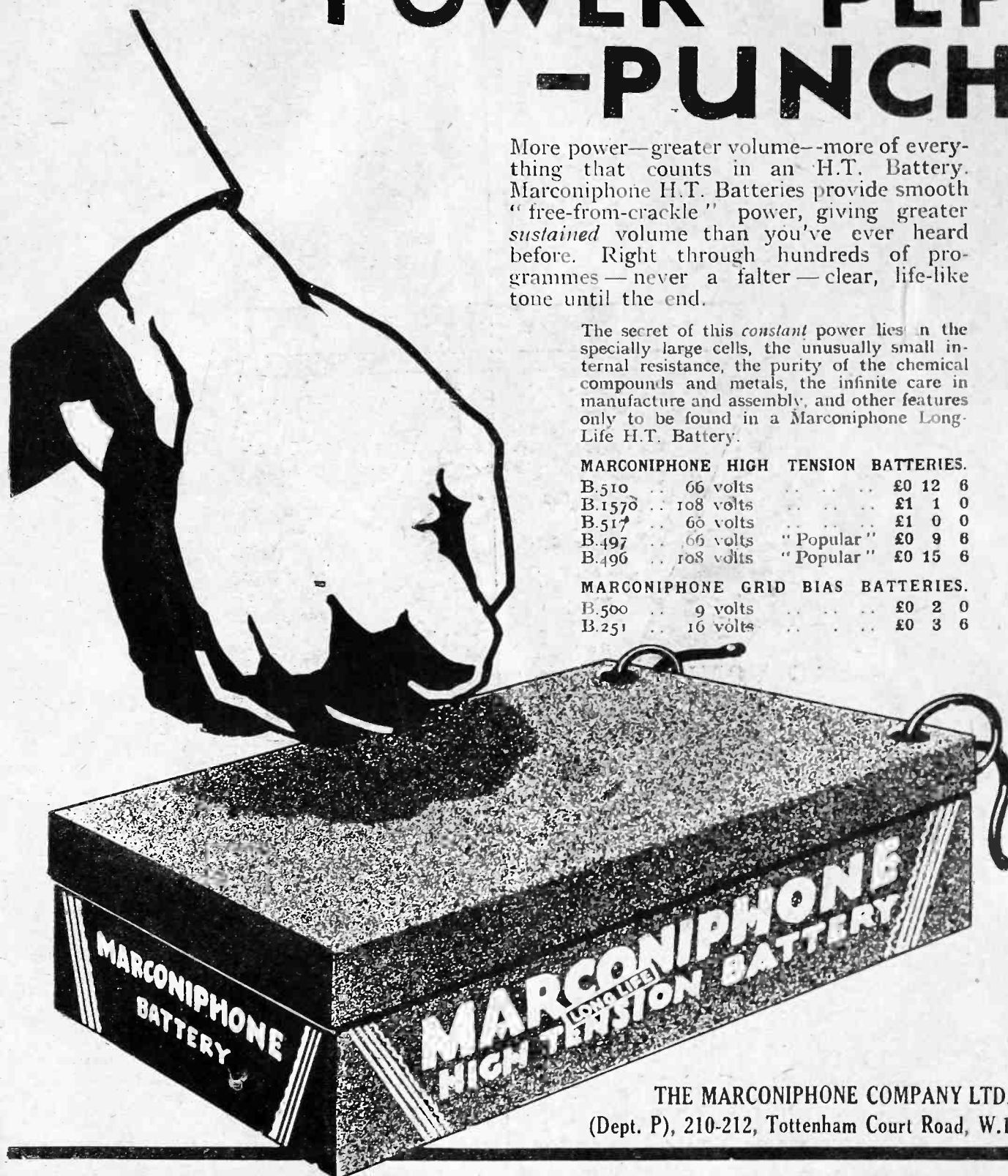
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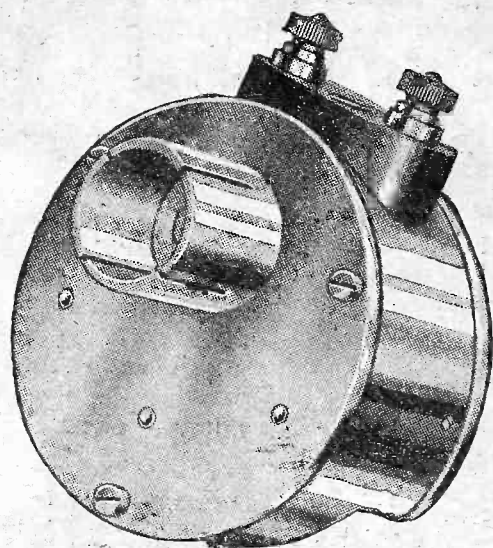
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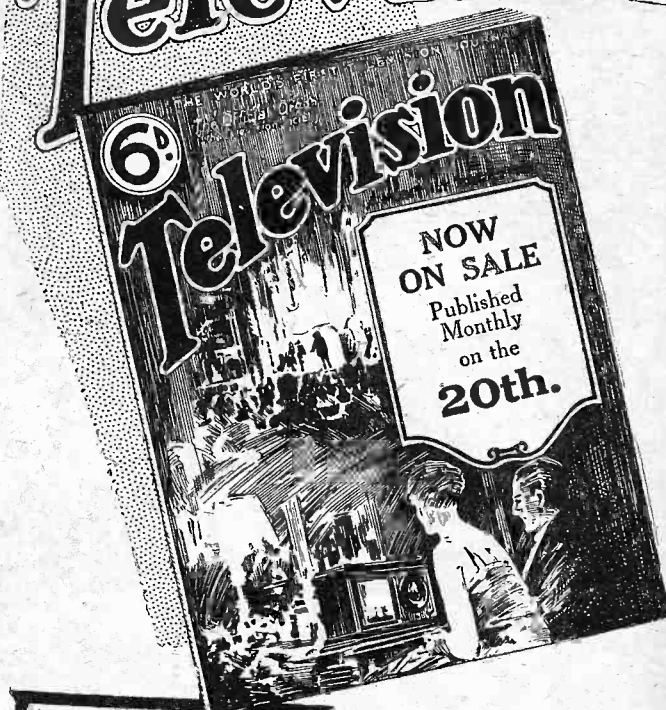
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1883

THE WORLD'S FIRST TELEVISION JOURNAL

Television



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Seeing Across the Atlantic.

How to Make a Simple Televisor.

Television 1873-1927.

Commercial Television. By the Editor.

Optical Projection. By Professor Cheshire, C.B.E., A.R.C.S., F.I.P.

Glimpses into the Future No. 1. "Television in Warfare." By R. Heath Bradley.

How to Make a Selenium Cell.

Light-Sensitive Cells. Noctovision.

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Read what Television means to the world in peace or war. Follow the romantic story of the Light-Sensitive Cell.

"Television" will stir your imagination from cover to cover.

You will look for the second number with impatience. Be one of the first to enter this new world. Get your copy of No. 1 now.

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MONTHLY

Met-Vick Components make the most of a Set

WHETHER you are building the Met-Vick three or four Valve Sets or any other set, you cannot fail to get successful and satisfactory results if your components are Met-Vick. Most of the lines shown here are already well known amongst enthusiastic constructors and listeners; yet for those who have not yet used "Cosmos" Components, here are some details:—

A.N.P. (Astatic - Non - Parasitic) Coils.—These new "Met-Vick" products provide a clever solution of a difficult problem. They overcome, simply and efficiently, the three difficulties associated with H.F. amplification, namely: Magnetic coupling between coils, Stabilisation, and Parasitic Oscillation. List 4117/8.

Resistance Coupling Units.—"Cosmos" ("Met-Vick") Resistance Coupling Units are well known to all wireless enthusiasts. The "V" type can now be obtained fitted with new "Met-Vick" A.C. Valve Holder. The latter is also supplied separately. List 7117/8.

Valves.—"Cosmos" ("Met-Vick") SHORTRPATH Valves for 2-v. and 6-v. battery working are available at most good radio dealers. The new "Cosmos" ("Met-Vick") A.C. Valves are also available. These make possible the operation of a set from the electric-light supply without any of the aggravating "mains noises." A special disc adaptor enables a "battery-set" to be easily converted without re-wiring. Lists 4117/3 and 7117/8.

Battery Eliminators.—"Met-Vick" Battery Eliminators are supplied in two models. The H.T.—G.B. Model can be used on various supply voltages of 40-100 periods. Grid Bias tapping is provided at 5, 10, 15, and 20 volts. A high voltage (up to 250 volts) can be applied to the last valve. The L.T. Model gives an output of 5 amperes at 4 volts without hum. List 7117/8.

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(COSMOS)

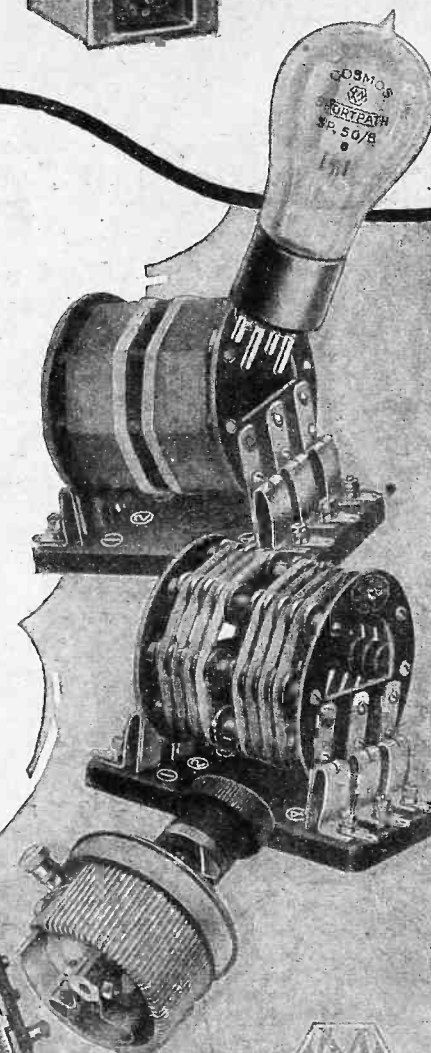
For a complete description of the full range of Met-Vick (Cosmos) Components, ask your dealer for a copy of Booklet No. 4117/6.

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1928

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Battery
Eliminators



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TEAM WORK

SILENTLY and swiftly they swing across the stage. Twisting and twirling, tripping and turning. Four acting as one. Each in perfect unison with the rest. Team work.

Team work is as essential to success in Radio as in ballet. Choose a team of Cossor Valves* and, for the first time, know the full capabilities of your Wireless Set. Because every Cossor Valve is designed to function correctly with its neighbour, your Set will take on a new lease of life. It will give you purer tone, far more life-like reproduction and greater volume—for less upkeep cost, too.

* Your nearest Dealer stocks Cossor Valves for every purpose, for 2, 4 and 6 volts. From 10/6.

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RADIO NOTES AND NEWS.

Sensational News—Interference from Carnarvon?—Our Limerick—The Time . . .—The Place . . .—And the Opportunity—Try Langenberg—Earl Haig and Radio.

Is Criticism Desirable?

A READER, whose letter I esteem because it shows that he is moderate in expression and sees two sides to a question, writes to the Editor suggesting that my criticisms of the B.B.C. are unnecessary and, in fact, petty. My friend does not need to exert himself in order to convince me that the B.B.C. is doing well; I have said as much many times. But on the principle that a good blade is worth a lot of polish, I certainly have been guilty of harping on one or two strings—this metaphor is becoming mixed—because I see one or two indubitable specks on broadcasting.

Faults of a Friend.

CRITICISM, of course, is not necessarily a complaint alone nor praise alone; it is an appraisal of merits and demerits, as the critic finds them. It is a test which any perpetrator of matters submitted to the public taste should welcome. "P.W." has always maintained its freedom of thought and speech, and no lap-dog of any clique or outside organisation. It is a good friend of the B.B.C., but for a discussion of the propriety of being blind to a friend's faults, please see Shakespeare's account of the quarrel between Brutus and Cassius.

Sensational News.

AND mighty good news, too! I understand that the proprietors of the Gilbert and Sullivan copyrights have partially lifted the taboo which they have hitherto placed on the broadcasting of the music of the operas. We shall await with impatience to see what the B.B.C. does about this. Talking of cruel criticism, only to-day I have read in a London evening paper, generally respected for its moderate views, the following, written by its wireless correspondent: "The tears of listeners flow too copiously." Gilbert and Sullivan will dry them.

Interference from Carnarvon?

THERE are still complaints of interference from the high-power station at Carnarvon, and the sufferers have my sympathy. But it is only fair to report that I am reliably informed that

broadcasting can be received on the station itself, without interference, on quite an ordinary receiver plus a simple wave-trap. The station officials have interested themselves in the matter, and I understand they have frequently visited complainants and helped them to overcome the trouble.

Our Limerick.

OUR unfinished Limerick about the young plumber of Aintree ("P.W.", February 11th) appears to have put the poets on their mettle. The winning line, by E. Y. M. (Leyton), is: "So they hung Captain Eck on a plane-tree." This won by half a hair from "Hence the letters, 'Dear Sir, a complaint re'" by W. H. (Poplar).

The Time . . .

THE time is March 1st, the first of that blustery month when hares go mad, and which contains certain mysterious things called "Ides." It is the time for you to secure an introduction to three sets

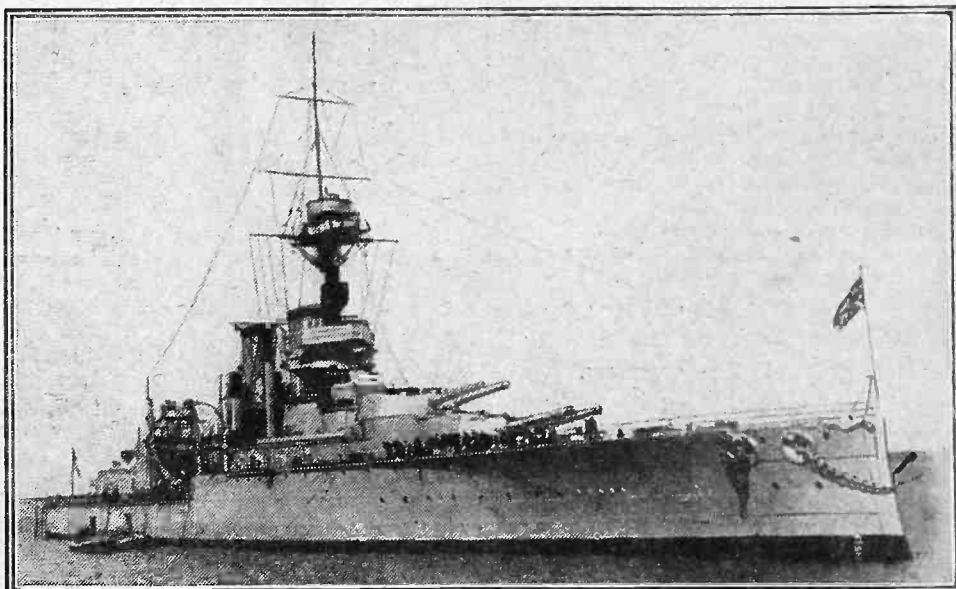
which have been well tried and proven sound—the Ediswan "R.C. Threesome," the Mullard "Master Three," and the Cossor "Melody Maker." These are all three-valve sets with the reputations of the respective three famous manufacturers behind them.

The Place . . .

THE place is in the March issue of "Modern Wireless," an all-round, reliable and comprehensive shilling radio monthly magazine, a "P.W." grown portly. Whenever I get hold of a new "Modern Wireless" I feel the thrill of the real mag-maniac; pictures and diagrams galore, interesting headlines which arrest the attention, writers with names of weight—that's "M.W." at a glance. A perusal at leisure will convince you that it is "your own magazine." Even the printer's ink smells nicer than is usual. Finally . . .

(Continued on next page.)

WARSHIP WHICH WORKS BY WIRELESS.



Without a single man on board her, this great warship—H.M.S. "Centurion"—can be completely controlled by radio. She has been equipped by the Admiralty as a target-ship, and by means of the marvellous machinery in her hull she is worked by wireless from another ship, which may be miles away.

NOTES AND NEWS.

(Continued from previous page.)

And the Opportunity.

THE great opportunity which will knock at your door on Mad March 1st is that of your being able to acquire a shilling pictorial blue print of the three sets, plus a magazine worth half-a-crown, for one shilling, by buying "Modern Wireless." Being optimists, the "M.W." people are hoping the machines won't seize up before enough copies to cope with the demand are run off. Take this tip: place an order now, and so spare your faithful annotator from the pain of imagining thousands of "P.W."-ites kicking themselves because they are too late. Our Mr. Dowding deals in the magazine most thoroughly with these three famous sets.

The Noble Six Hundred.

AFTER that brief spell of business, pleasure. Radio boys and coming "Lindberghs" might note that the R.A.F. wants 600 aircraft apprentices between the ages of 15 and 16. A number of trades are open to these fellows, including that of wireless operator-mechanic. For a healthy lad with nothing else in view at the moment, this is a matter worth considering. The R.A.F. is a service to be proud of. Join the R.A.F. and learn what it is to be a dicky-bird.

In the Skies.

HOW sad it is that the enthusiastic specialist so often lives in the skies, in a wonder-world of his own conceiving. One would have expected that clever engineer, Captain P. P. Eckersley, to have a fairly good contact with the earth. Yet, according to him, British listening has so far been conducted upon a technique in which the average listener has been content to listen to one programme. If he knows, as all the country knows, that no such content has ever existed, why did he adopt that technique?

A German Neutrodyne.

I HAVE received from G. Schaub, of Charlottenburg, details of a four-valve Neutrodyne receiver, which presents rather novel features. The aerial coupling is aperiodic; there is a neutralised H.F. stage, and Reinartz-reaction coupling. Control is provided by one knob only, and the calibration of the scale is in metres. Tuning from 200 metres to 2,300 metres is possible without change of coils. There is also a key which prevents the use of the set by anybody unauthorised. I do not often worry about foreign goods, but this looks O.K.

Knights! Try Langenberg.

CRYSTAL users need not think that they are limited to this country, for it appears that Langenberg is specially favourable to them. W. O. (Wandsworth Common, S.W.), with an old set, got Langenberg with no effort at all. The tide of practice has set towards the use of valves, but there is no doubt that by a scrupulous nicety of design a crystal set can give much fun and good results. See our "Lo-Loss" circuit.

A Determined K. of the C.-W.

I SHALL never forget H. K. R., of Maw-nan, near Falmouth, because he writes to me with a gimlet or a triple-split goosequill, at an angle of about 30 degrees, counted anti-clockwise. Only my devotion to my job and my correspondents gave me the nerve to plough through his very interesting letter. Well, my friend of the acute calligraphy is an inveterate Knight of the C.-W., and expects to put the valve-makers out of a job. He has brought reception by crystal to a fine art and the Continental stations come in when he whistles. What this man could do with one valve does not bear thinking about.

SHORT WAVES.

A super loud-speaker which can turn the sound from a crystal set into a volume louder than that of the Albert Hall organ has been brought to this country from the Continent. All we can say is—why?—"Daily Herald."

LOGICAL.

"Wireless has come to stay," we read in a daily newspaper. We think this must be so, because we've heard several people remark that theirs simply won't go.

Customer: "Will you allow me something on my old valves?"

Salesman: "Well, we'll allow you to take them home, sir."

We read in the "Daily Express" that: "The house cat may be a source of wireless interference... there is a good deal of electricity generated in the cat's fur, as well as plenty of static when she parades on the backyard fence... The cat thus becomes a potential source of radio interference."

It looks like a hard winter for the household cat.

COLLEGIATE WIT.

Radio Fan: "I picked up W G Y. last night."

Auto Fan: "Huh, wouldn't she give you her full name?"—"Radio News."

The bust of Dante which adorns one of the Scottish B.B.C. stations was recently referred to during the Children's Hour. This troubled one small child very much, and the next day a letter was received asking what had happened to the "busted Auntie."

Dr. Sawbones: "Yes, I know a broken leg is mighty painful; but I'll give you some sort of anodyne."

Radio Fan: "Oh, I can't afford anything so expensive. Better give it just an ordinary set."

ADVANCEMENT.

My mother sang me lullabies

Before an open fire;

Though she had other work to do,
She never seemed to tire.

De Forest and the others have

Relieved maternity.

Now mothers leave their lullabies
To Station 5 G B.

Earl Haig and Radio.

THE lamentable loss of that great man, Earl Haig, reminds me how keenly he valued the services of wireless and wireless men. The Armistice was concluded on November 11th, 1918. You may imagine how busy the C.-in-C. was at such a time. Yet on December 1st he found time to write to the Marconi Company expressing his "very real appreciation of the good services performed by wireless telegraphists throughout the war."

An Historic Valve.

THE radio message sent by Marshal Foch acquainting the troops of the fact that they had to stop the "hate" at 11 a.m. on November 11th, 1918, was intercepted officially for the authorities

in this country by a naval rating under my control. I bagged the valve he was using at the time. I had a clean conscience in so doing, because it was a "try-out" given to us by a Yankee naval officer. I have it still, though I feel that I ought to offer it to some society for preservation. But I cannot bear to part with it.

Loud-Speaker News.

ON February 28th, 5 G B will broadcast a programme called "The Open Road," which appears to deal with all the methods of getting to the seaside. If you have never heard the voice of that human dynamo, Lloyd George, you will be able to do so on March 1st, when a speech by him will be broadcast by 2 LO and 5 X X. On March 3rd, Belfast will present an animal programme in which birds, butterflies, and elephants will take a part. If the B.B.C. can stage an argument between a butterfly and an elephant, I will never mention Chamber Music again.

West-End Note.

LEARN that there has come into existence the Queen's Park and District Experimental and Technical Wireless Club. Hon. Sec., Mr. F. Batho, 37, Enbrook Street, Queen's Park, W.10. Well, a good name is half the battle—and this is a whale of a name. We wish it proportionate success.

Empire Broadcasting.

A. N. F. (N.S.W.), in the middle of listening to 5 SW via 2 FC, takes up his pen to address a few remarks to us on the subject of Empire broadcasts. He does not like the B.B.C. saying that they are not prepared to finance these broadcasts heavily, and suggests that it would be good business for the country if they did. The money paid to the B.B.C. is paid by listeners here and ought to be spent in their service. But I heartily agree that Britain ought to broadcast to the Empire, and I consider it should be a separate service, subsidised by the Governments concerned.

That Electric Boy.

BESIDES making rain the radio waves are now credited with having electrified a boy. Well, if that boy grows up to be a waiter he will be "discharged." According to the report, candlesticks and iron bars exhibit uncontrollable agility in his presence, and I should like to have him around on the days our jobbing gardener comes. All these wonders have occurred since the boy's home got a wireless set. What will happen if they buy an electric-iron beggars the imagination.

Ask Me Another.

HERE is a variant of an old joke, which may, however, be new to some of you. An unwary dealer promised his assistant to pay commission on sales at the following rate: For every set sold, a farthing for the first valve-leg, a ha'penny for the second, a penny for the third, and so on, doubling it each time. The assistant promptly sold himself a seven-valve set for cash and demanded his commission. Would a ten-pound note cover it? Quick! Yes or no!

Beware of the Mmfs.

You cannot be too careful when building a receiver, for even tiny traces of capacity have most startling results when they crop up in the wrong places.

By E. A. ANSON.

these unwanted capacities, let us get some idea of what they look like, for unwanted capacities do not build themselves into exquisite little condensers easy to behold.

Two conductors separated from each other by an insulator have capacity even if they are a mile apart. The closer they are together the larger becomes this capacity. The further apart, the smaller the capacity. When one conductor is charged with positive electricity the other prefers negative electricity.

If a machine that generates A.C. is connected across A B, in Fig 1, it will make first one side positive and then the other. The effect of this is to make it seem as if a current actually flowed through the condenser. Of course, in reality, the condenser is a good insulator and no D.C. can flow through it. But, by a sort of trick, the condenser can be made to pass current as if it were a conductor.

It can be calculated mathematically exactly how much current will flow for any given frequency. Roughly, the higher the frequency the more current flows. Thus, when we come to radio-frequencies, quite small capacities can pass quite appreciable currents. On the fairly short waves that the B.B.C. use, tiny capacities can pass large currents.

Some Condenser !

Incidentally, capacity is measured in farads. Nobody has ever used a condenser of 1 farad capacity, for it would be about as large as St. Paul's and quite unsuitable for one-hole fixing. So most of our condensers are measured in microfarads or micro-microfarads. You generally place a 1 mfd. condenser across your H.T. A microfarad is a millionth of a farad and a micro-microfarad is a millionth of a microfarad. The average tuning condenser has

a capacity of .0005 mfd., or 500 mmfd. The mmfd. system saves a multitude of ohms and is generally responsible for getting the wrong answer when you embark on mathematics.

Now it is these mmfds. that cause most of our wireless troubles. Like vitamins and disease germs, it is our little mmfds. that count. The lower the wave-

length the more they count. Where do these mmfds. lurk in our receivers? How can we minimise them? Well, take an ordinary 1 H.F. detector (Fig 2).

Why the mmfds. are everywhere!

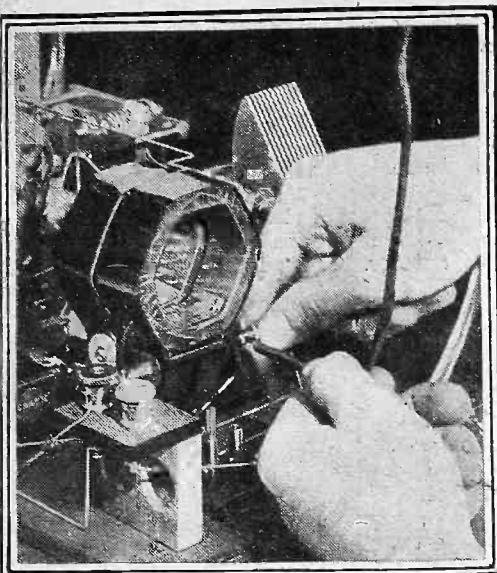
In some places they don't matter, in others they will make you gnash your teeth. Look at the far end of the aerial. There is an egg insulator. One side connected to the aerial wire and the other to the mast. In wet weather this is almost the same as saying that the egg insulator is connected to earth on one side and to the aerial on the other. Thus we have a condenser. At this end of the aerial any condenser will leak away or by-pass away the H.F. voltage in the aerial.

An Aerial Insulator Tip.

If we connect our egg insulator in the normal way, we will introduce a capacity of 2 mmfd. But there is a better way. Connect each eye of the insulator without crossing the connecting wires. This way gives a capacity of only .6 mmfd. At the receiver-end the mmfds. do not matter so much, for they all get lumped in with tuning capacity, but even then they all add up together and make it impossible to get down as low as possible on a given coil.

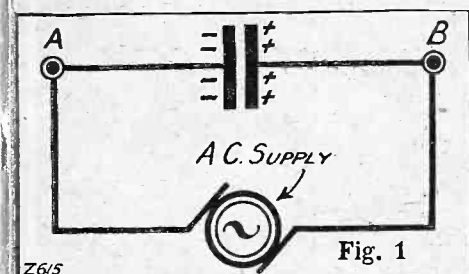
Thus, at the down-lead end, unwanted capacities decrease the minimum capacity of the condenser. So they are best avoided. Most good tuning condensers have a minimum capacity of about 20 mmfd. An average aerial has a capacity of about 250 mmfd. For this reason it is best to keep down-leads clear of all objects and leave them uninsulated, for insulation such as rubber has a greater capacity effect than bare wire spaced in air. In addition, when the insulation

(Continued on next page.)



WHEN we deliberately connect capacity across a coil in the shape of a variable condenser, we have a tuned circuit. We can tune out one station and tune in another. For maximum efficiency we are told to keep the capacity small and make the coil as large as possible, or we always have the choice of a small coil and large capacity or large coil and small condenser.

Unfortunately, capacity is not such a definite thing as we assume. It is impossible to separate inductance coils from capacity. In fact, it is much more difficult than it would seem at first sight to keep this



capacity of ours from getting mixed up in parts of the circuit where we least want it.

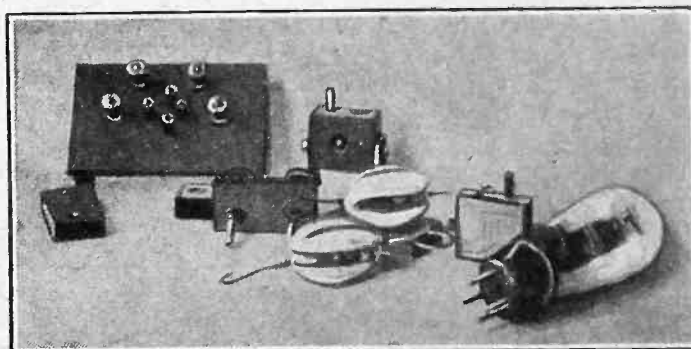
Even tiny traces of capacity have most startling results when they crop up in the wrong places. It is for this very reason that the beginner who starts out quite gaily to build a 4 H.F. receiver will find himself enmeshed in an infinity of curious capacity effects. These effects generally make themselves felt and heard in a multitude of subtle sounds from a mighty rushing wind to the 8,000 p.p.s. whistle of a bat on the wing.

Worried "Wireless Wizards" !

But let no beginner be dismayed, for these very mmfds. have worried wireless wizards before him. When they gaily started out to make 4 H.F. receivers some six years ago, these very capacities made them stop to think.

Indeed, they thought for four or five years—hard. Then came the neutralised circuits. But even then the mmfds. were not beaten. They hobbled up again with parasitical oscillations very difficult to detect.

Before we measure the size of some of



A few examples of the places where stray mmfds. may make a tremendous difference to reception. Aerial insulators, coil holders, and valve electrodes all have inherent self-capacity.

BEWARE OF THE MMFS.

(Continued from previous page.)

becomes wet, it will surely lead to inefficiency.

The tuning coil has self-capacity. Nobody has ever built a tuning coil without capacity, but the smaller the self-capacity the better.

Now we come to the valve itself. Between its electrodes there will be lurking mmfds. Small, but having baffling effects. The following table shows what may be expected here.

It may be interesting to explain how these small capacities were measured, in case others may like to rig up the fairly simple apparatus and make a few tests themselves.

How They Were Measured.

A wave-meter with a calibrated vernier was oscillated at 400 metres. Coupled to it inductively was a simple condenser and coil connected to a valve voltmeter. The

Valve.	Grid to Fil. Mmfd.	Grid to Plate. Mmfd.	Fig. of Merit Grid to Plate	Grid to Plate
D.E.H. 210	4.5	5.5	$\frac{1.27}{2}$	$\frac{.85}{2}$
D.E.L. 210	4.0	4.5	$\frac{1.5}{2}$	$\frac{1.28}{2}$
D.E.2 H.F.	3.5	4.0	$\frac{1.3}{2}$	$\frac{1.7}{2}$
Valve holder	2.0	1.0	$\frac{1.8}{2}$	$\frac{1.8}{2}$

valve voltmeter measured the exact voltage and resonance point.

The capacities to be measured were placed across the terminals of the wave-meter condenser. Then the wave-meter was turned to resonance by adjusting the vernier. The amount that the vernier had to be decreased

in capacity gives the added capacity of the condenser being tested. The vernier condenser gave a capacity of 6 mmfd. for a 180° swing.

If the capacity under test were good electrically, the H.F. voltage before and after inserting the condenser to be measured was very nearly the same. The figure of merit in the table gives the ratio of H.F. voltage before and after. The bottom figure "2" is the voltage before adding the capacity. The top of the fraction gives the H.F. voltage after adding and retuning carefully. The nearer the new voltage is to two the better the dielectric of the capacity under test. Thus a capacity of certain two wires in air was 4 mmfd., and the fraction or figure of merit was $\frac{2}{2}$, showing that the added capacity was a perfect condenser.

Well, to get back to our H.F. valves. A dreadful thing happens due to the capacity of the electrodes. The 4 mmfd. or so couples the grid, and the plate and H.F. voltages are apt to be fed back and cause oscillation. Now we cure this by neutralising and our H.F. valves have come into their own.

Why We Neutralise.

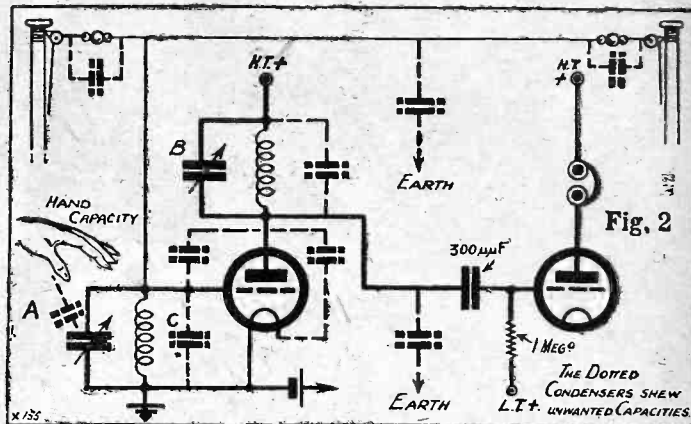
What we actually do is to feed plus and minus electricity to the grid out of step with the plus and minus oscillations due to back coupling. If we feed the correct dose by making our neutralising condenser the right size, the oscillations cancel out and we get no oscillation.

In fact, we have been fighting the mmfds. with their own tools.

But there is still our tuned-anode circuit to consider. In it we have a tuning condenser of about 250 mmfd. Except for added capacity of the aerial our anode circuit is very similar to it. But there is an unwanted capacity when we start to tune. Whilst our hand is on the condenser knob we hear that distant station, but when we remove our hand the station goes with it. All caused by a few mmfds. in our hand.

The problem is easily cured by always taking care to connect the moving vanes to the zero H.F. side of the circuit. In this case to H.T. plus. This capacity trouble applies to almost all circuits, and is generally easily cured. Remember that, provided you shunt your H.T. with a 1 mfd. condenser, it may be considered as at zero H.F. volts. Of course, it may be at any voltage from a D.C. point of view.

Even terminals have capacity one to another. It is advisable to keep the aerial



and earth terminals well apart. The table below shows what to expect as regards terminals. The capacity will vary according to the material in which the terminals are inserted.

Normally it is ebonite. Two Burndept 2 B.A. terminals $1\frac{1}{2}$ in. long were spaced $2\frac{1}{2}$ in. apart centre to centre. This leaves a half-inch gap. The measurements were made just as for the valves, etc.:

Material.	mmfd.	Fig. of merit.	Remarks.
Ebonite ..	1.5	$\frac{1.83}{2}$	
Mahogany ..	1.4	$\frac{1.9}{2}$	
Pine ..	1.35	$\frac{1.45}{2}$	
Deal ..	1.35	$\frac{1.35}{2}$	
Damp paper	1.4	$\frac{1.35}{2}$	
Egg insulator	2.0	$\frac{1.85}{2}$	Normal way
" "	.6	$\frac{1.9}{2}$	Suggested way

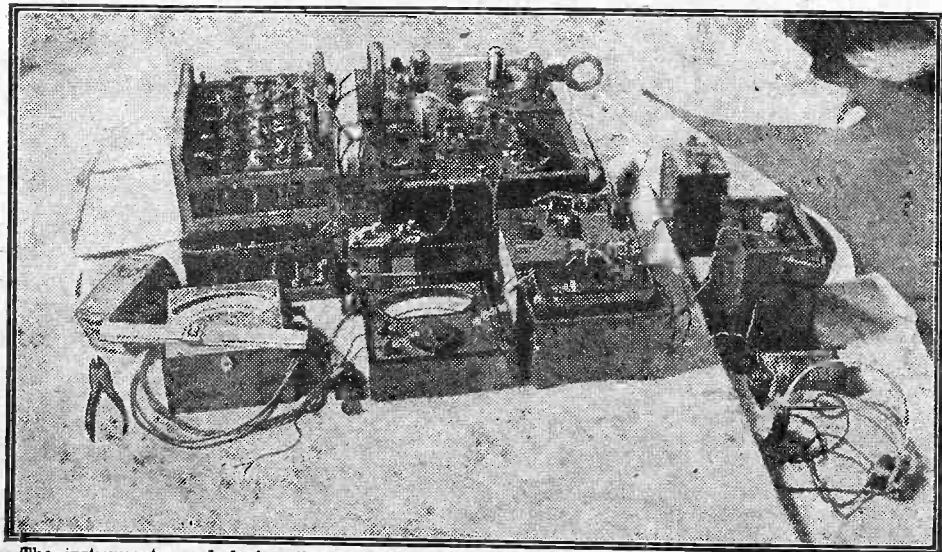
Watch Those Terminals.

Rows of terminals close together may look very pretty, but it is better to keep them apart if possible as these results show. Otherwise the mmfds. may play you a trick or so in the H.F. department of your receiver. It doesn't matter about terminals not carrying radio frequency such as L.T. or H.T. terminals of course.

We all know the saying, "take care of the pence and the pounds will take care of themselves." Well, in wireless it becomes "take care of the mmfds. and the mmfds. will take care of themselves."

Hence the cry of all set designers to space your wiring well apart and use bare wires. Above all, they always beseech you not to break out into a system of point-to-point connection entirely different to theirs. Painful tribulation with the mmfds. has shown them the best way to do it after much practical experience.

In a word, beware of the mmfds.!



The instruments used during the tests described. Among the many meters of various descriptions can be seen the valve voltmeter on the right of the photograph.

It is the practice of quite a number of people to refer to indoor aerials disparagingly, as though they were definitely inefficient. But the fact is that a very good indoor aerial can be better than one of an outdoor type that may look as though it would be good. Take the adjoining houses of two listeners. One has a diminutive garden of which he is inordinately proud. Strung from an upper window across this garden and running to a small pole is his outdoor aerial, the envy of all his neighbours. The other house is quite a bit higher, but has no garden, and the occupant is therefore limited to an indoor aerial.

But making the best of a bad job, he has fixed up an aerial system in the roof space. Now it is quite possible that he is able to receive on his indoor aerial stations that his neighbour could not with a similar set.

The Importance of Height.

There are several reasons for this: in any first supposititious case, the aerial is, at the one end, very badly screened by a big tree, while at the other end the down lead runs parallel and close to a large metal drain pipe. Both these things will cause severe losses and detract greatly from the efficiency of the antenna.

The indoor aerial has a greater height, and height, it should be remembered, is one of the most important things in connection with the erection of an aerial. That it is surrounded with slates and bricks and mortar is of no great consequence, for wireless waves will penetrate through these just as easily as they do through air. That is, except when it rains, and the roof and walls are covered with a film of moisture. This will, to a certain extent, act as a screen, but not as such a damaging screen to radio reception as that large tree that overshadows the neighbouring outdoor aerial.

However, in these examples I have taken a very poor outdoor aerial and an extremely good indoor one, but the "pick-up" qualities of a medium outdoor aerial will be greater than those of a fairly good indoor one. But do you want a very good aerial? And I hope I shall not be accused of a radio heresy if I state that it is quite possible that your purposes will be better served with an inefficient aerial.

That "Background" of "Mush."

A great deal of "background" can be eliminated by deliberately making your aerial less efficient. You may lose ten or fifteen stations, but in so doing you will gain by clarifying the programmes of the half a dozen or so more powerful broadcasters, that you can use at any time for providing alternative programmes. Incidentally, you will also find that your receiver has become more selective.

A good indoor aerial may be all that you need. I am not including a frame aerial in this description, for this is a thing of quite another character. Truly, it is generally used indoors, but, generally speaking, it is so inefficient as an antenna that its use is confined to those who are able to employ a very sensitive multi-valve set.



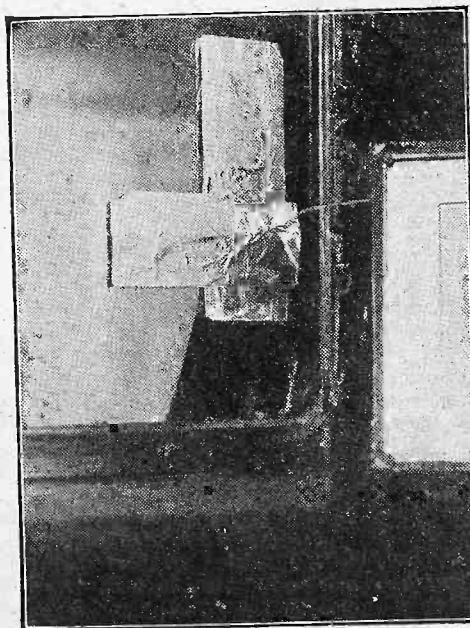
You may not be able to erect an outdoor aerial, but it is possible an indoor variety will serve your purpose even better.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

There are many different ways of arranging an indoor aerial. If possible, it should be fixed up in one of the higher rooms in the house, or in a loft or attic. Height, as I have already pointed out, is the initial requirement, and it must not twist about down stairways and through passages. The best plan is to have the set in the upper room wherein is fixed the aerial, and then from the set run extension leads to the downstairs room for the loud-speaker or telephone receivers.

The Wire to Use.

If you happen to be very close to the local station, and this is the only one from which you desire to receive, then there is no reason why you should not sacrifice a certain degree of efficiency and fix up the aerial in a downstairs room if you so desire and it is more convenient to do so. Prac-



A novel indoor aerial which makes use of the "silvering" of a large mirror. There is a capacity connection to this via the sheets of tinfoil which can be seen.

tically any kind of wire of the insulated kind can be used, although very excellent material specially manufactured for the purpose is obtainable from such firms as Ward & Goldstone, The London Electric Wire Co., Ltd., and others of our advertisers. Ordinary bell wire will serve quite well. No elaborate insulating need be carried out as the wire is to be indoors.

First of all, however, a good earth connection is required. A lead must run directly from the earth terminal of the receiver to some point such as a main water pipe. A buried outdoor earth is a very excellent device, but it is an indisputable fact that for consistency and general efficiency a good waterpipe earth has many claims for general attention. Keeping the earth lead as short as possible, and of stout wire, take it if possible to a main waterpipe; one which does not go to a tank.

Make the Plumber Help.

And here is a tip worth remembering. When the plumber comes along to do a repair, get him to solder the earth lead to the water-pipe. Without a great deal of experience and a proper blow-lamp and tools, you will find it a difficult and even almost impossible task to do such a thing yourself. A good temporary joint can be made by scraping the pipe clean and then very tightly wrapping the cleaned wire round it. Proper earthing clips for making such earth lead joints can be purchased for a few pence each, but these cannot give you the permanence that a well-soldered connection can. Failing a waterpipe a gas-pipe can be used as an earth, but generally speaking this gives only poor results.

The wire can be strung across the room just below the ceiling between two opposite picture hooks, but, unless it is a very large room, the length will prove inadequate. Therefore, four or five separate lengths, widely separated, can be stretched across, the ends terminating in one down-lead at the side nearest the set. The other ends are left free and better reception will be obtained if these ends are pointing away from the station you most often desire to receive.

Helping an Outdoor Aerial.

If this scheme is considered an unsightly one, a wire can be run around the back of the picture rail. But the wire should not be taken the whole distance around the room. From the centre of one wall it can be run around the picture rail until it comes to the centre of the opposite wall, where it must terminate, or an extension be made through the door along a corridor. This extension must be kept in as straight a line as possible, and if it comes to such a point where it has to deviate greatly from a straight line here it should be terminated.

And, by the way, this reminds me that here is a tip worth noting on the part of those listeners having very small and poor outdoor aerials. If you have only a few feet of outdoor aerial, you can try an extension from the point of entry indoor, right across the room. In many cases this will definitely result in an increase of the pick-up qualities of your aerial system.

"GINGERING" THE R.S.G.B.

This interesting letter from the Chairman of the Association of British Radio Societies follows the Editor's recent plea for more life in British Amateur Radio representation.

DEAR SIR,—May I first thank you for your article in POPULAR WIRELESS, February 4th, re the Association of British Radio Societies.

The organisation of an amateur movement is always a difficult proposition, but with Radio Societies it is doubly so on account of the rot that seems to have set in; but I do not believe that this rot is due to lack of enthusiasm in the true sense of the word. I find the Radio Society member of to-day is just as anxious to discuss Radio matters as he ever was; but with the coming of broadcasting he has turned most of his attention to the entertainment side, and I feel that we must therefore find the interest in that branch.

Plenty of Interest.

There is certainly plenty of interest in this particular section, the only thing I am afraid of is the limitations of activities imposed by the authorities and the head-in-the-clouds attitude of the B.B.C. I do not know if the authorities realise the amount of useful work that has been done by amateurs, but as far as I can see they only acknowledge one amateur and give him unlimited license. If it is a question of knowledge and they are quite sure of themselves, then nothing further need be said, and he should be on the G.P.O. staff. If, on the other hand, they are willing to concede equal knowledge to at least twenty other amateurs in the country, then equal facilities should be given for experiments to organised bodies containing those other amateurs.

I do not wish to rake up the amateur transmission controversy in which the G.P.O. showed up so badly.

I have only mentioned these points more clearly to show the need for members of Radio Societies to rouse up and get into this business with every ounce of energy they possess. To them I would say: "It is no use leaving it to your poor, hard-worked secretary, but get in and do something yourself. Talk at your meetings, and air your grievances as well as your knowledge. Take an interest in the experiments we are hoping to put forward in a week or two, and give your results to the secretary. Get into your mind that an association is now formed that will watch your interests and supply you with the basis for discussion and experiments, so that you will be certain of an interesting evening any time you go to a meeting."

"Join a Society."

To the man who is interested in radio and wants to know more, I would say: "Join a society, but not just to get particulars of the set you want to build—stay in, and when you have absorbed the knowledge, be ever ready to pass it on to other new members."

To secretaries I would say: "If you are in troublesome times, write to the Association Secretary, who is a kind-hearted man, with a wonderful experience. He knows all about Radio Society troubles and can help.

Do not forget to send a postcard to L. A. Gill, Esq., Hope House, South Reddish, Stockport, near Manchester, and tell him the name of your society, your address, and the number of members on your register."

In conclusion, may I say to you, sir, as the Editor of a journal that has done much to foster the Radio Society movement, that if at any time the organised Radio Society movement can return all your good wishes and your help, I feel sure they will gladly and willingly do so.

50, Garswood Rd., Yours faithfully
Moss Side, Manchester. J. E. KEMP.

programmes, and should also prove a boon to those who have not as yet experienced the undoubted thrill of receiving America direct.

Again, 2 X A D has been heard making cryptic announcements to the effect that "this is 2 X A D, Schenectady, exchanging programmes with the British Broadcasting Corporation." Still the British Broadcasting Corporation continues to put out its usual programmes and takes no notice whatever of 2 X A D! It certainly is a most peculiar state of affairs.

The writer has just made a single-valve set for the express purpose of receiving 2 X A D and 2 X A F with the minimum of interference, disregarding any loss in strength that may be occasioned by the use of special means of increasing selectivity. It is easy to convince oneself that this is the right track to follow; once a signal, *however weak*, has been received clear of all jamming, it may be amplified "up to taste," and if necessary put on the loud speaker without sounding as badly

THE LOUD SPEAKER AND POLITICS.



What will be the effect of low-frequency amplifier technique upon the electorate? This amusing photograph of two prospective voters suggests that the loud speaker will be "viewed with suspicion."

SHORT-WAVE NOTES.

DAY by day the general "fade-out" on 20 metres or thereabouts is taking place a few minutes later, and accordingly 2 X A D's sphere of usefulness is becoming greater. At the time of writing he is being excellently received on the loud speaker at 8.15 p.m., and has been heard at excellent strength even later. This summer should be an excellent opportunity for transatlantic relays of broadcast

mangled as it would after being brought up to the limit of strength by the use of much reaction. This single-valver will be used in front of the same amplifier that is normally used for broadcast work, and the final output (it is hoped!) put on the loud speaker. There certainly is an unaccustomed thrill even for "old hands" on hearing really distant stations at "filling the house" volume!

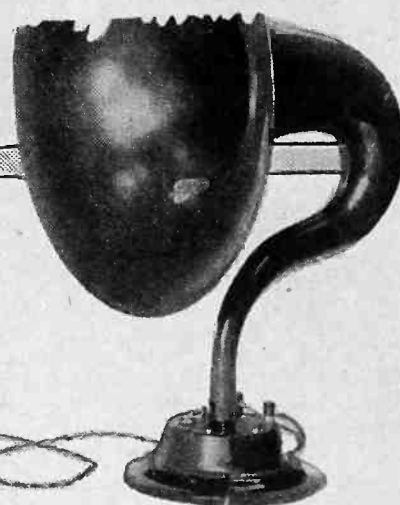
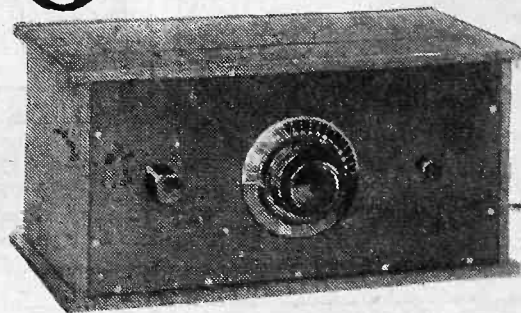
That 20 metres is the wave-length of the future for reliable long-distance communication is being proved day after day. In spite of all that has been said about its unreliability, the writer has been in touch with United States amateurs on this wave-length every night since the tests began (twelve nights in all) at about 6 p.m.

W.L.S.

The "Handyman" Two

A really efficient two-valve set, on the making of which the Handyman can let himself go to his heart's content. Full details in this and the article which follows next week enable the set, coils and cabinet to be made quite easily at home.

By G. P. KENDALL, B.Sc.



The Completed Set wired up and ready for use.

BUILDING a wireless set is becoming so easy with single-hole fixing components, detailed wiring diagrams to work from, and so on, that there is some

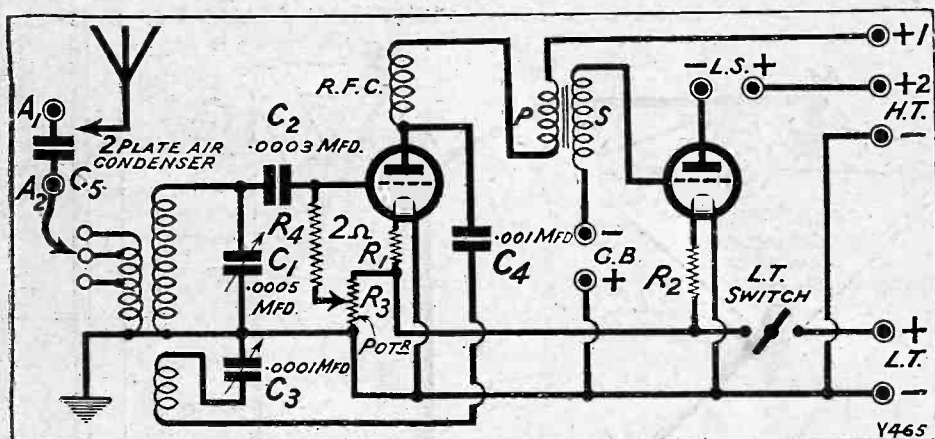
apt to be exactly like scores of others built by different people to the same design. One could at least feel that it was an individual job, and that there was no other

home, simply because so many of the important parts of a set are now being turned out by the manufacturers to a standard of efficiency which in most cases we cannot equal ourselves. Nevertheless, it appears that quite a number of constructors are feeling that things are getting so easy that interest is being lost and that there is not sufficient scope for their skill and ingenuity.

The "Handyman" Two is an effort to meet the difficulty by providing a design for a set in which there is some genuine home construction to be done, without loss of efficiency, but with a very considerable reduction in total cost.

The actual constructional work has been carefully limited to certain parts which rather gain than lose efficiency when made at home with due care and patience, so no one need fear that he is going to lose anything in results by embarking on this set. The main item is the making of the coils, and these when finished will be found distinctly above the average commercial type in efficiency.

(Continued on next page.)



The circuit employed is the popular Det. and L.F. arrangement, with reaction efficiently controlled by a variable condenser.

risk of our becoming a race of "home assemblers" instead of home constructors. How many of us, I wonder, ever really construct any of the parts which are used in building sets?

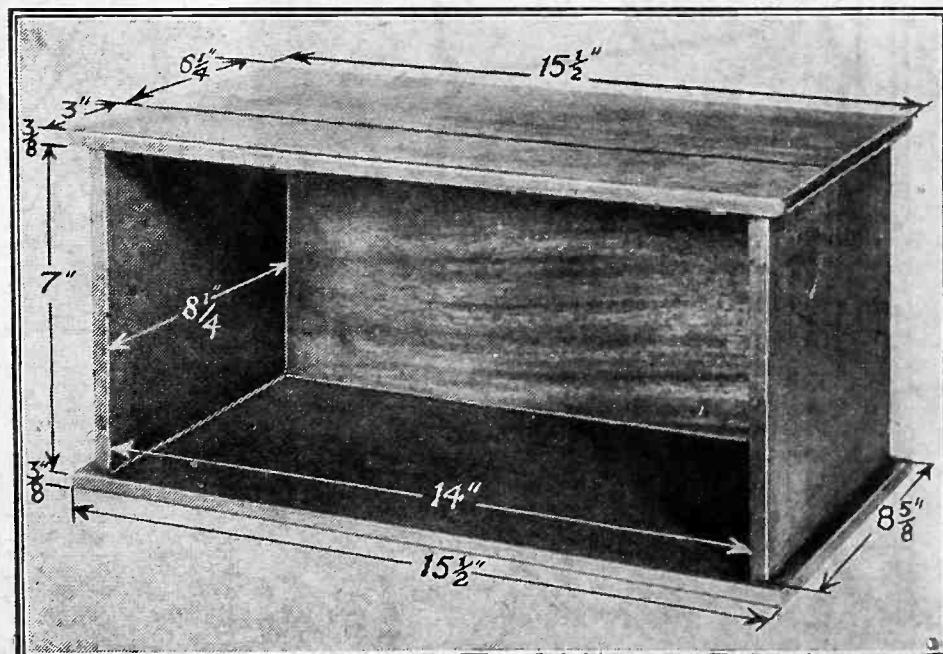
Almost always all that we have to do is to assemble some ready-made components and wire them up, and this is getting so easy a business that there is very little skill required. Yet there was once a time, only a few years ago, when wireless enthusiasts used to perform such feats as building their own variable condensers (from the raw materials, not sets of parts!), winding their own L.F. transformers, and so on! True, the main reason for such works of skill and patience was that bought components were extremely dear, and often of no better quality than those made at home (sometimes they were worse!).

Lost Joys.

As prices came down and finish and efficiency went up, it was natural that almost everyone should start using the ready-made component, but there is no doubt that we miss a good deal of pleasure by so doing.

There was certainly more satisfaction in completing one of those earlier sets, with its numerous home-constructed parts, than one of the present-day type, which is so

like it. Obviously, no one really wants to go back to the days of transformer winding at



Any "Handyman" worthy of the title will be able to construct the cabinet from these details, and those embodied in the text.

THE "HANDYMAN" TWO.

(Continued from previous page.)

actually wound on the "Ebonart" former mentioned.)

An item over which you can save quite a substantial sum is the cabinet, and anyone

who is reasonably handy with simple tools can perfectly well build one of the simple nature needed for this set.

You can obtain a set of cabinet parts from Messrs. Hobbies, and put them together with the aid of the diagrams supplied therewith. This is quite a simple business, and no difficulty will be experienced if you first read through the notes at the end of this article, which have been contributed by the member of my staff

So far as distant working is concerned, the "Handyman" Two will hold its own against any "Det. and L.F." I have tested during the last twelve months, except the "Variactor" Two, which, of course, used a special circuit which was not suitable for short waves.

The detector portion of the set is closely similar to the "All Wave Reinartz One-Valver," a very successful little receiver described in "P.W." No 273, and the coils used are identical. The specification will be repeated next week.

Cabinet Work.

A description of a really home-made receiver, such as the "Handyman" Two, would hardly be complete without details of a cabinet which can also be constructed with a few tools.

The assembly was carried out entirely with $\frac{3}{4}$ in. countersunk brass screws, no glue being used anywhere. It was possible in consequence to put the cabinet together in a period less than three hours, without including, of course, the time taken to stain and polish it.

Should the prospective constructor of the "Handyman" Two consider the time involved worth it, he can purchase the complete set of wood parts from Messrs. Hobbies, Ltd., at any of their branches, or direct from their works at Dereham, Norfolk, price 7s. He will require, in addition to the above, two brass hinges, $\frac{3}{4}$ in. wide on each flange, three dozen $\frac{3}{4}$ in. countersunk brass screws, twelve brass screws $\frac{3}{4}$ in. long for the hinges, and five or six screws about $\frac{1}{2}$ or $\frac{3}{8}$ in. long for screwing the ebonite panel to the baseboard, the whole costing approximately 9s. 3d. The cabinet parts are known as No. 9 at Messrs. Hobbies, so do not forget to mention this number when ordering.

Since a list of instructions, together with all necessary diagrams, are given with the wood parts for the cabinet, there is little need to give full details here. It is well to note, however, that the fitting of the

(Continued on next page.)

The parts before the cabinet is completed.

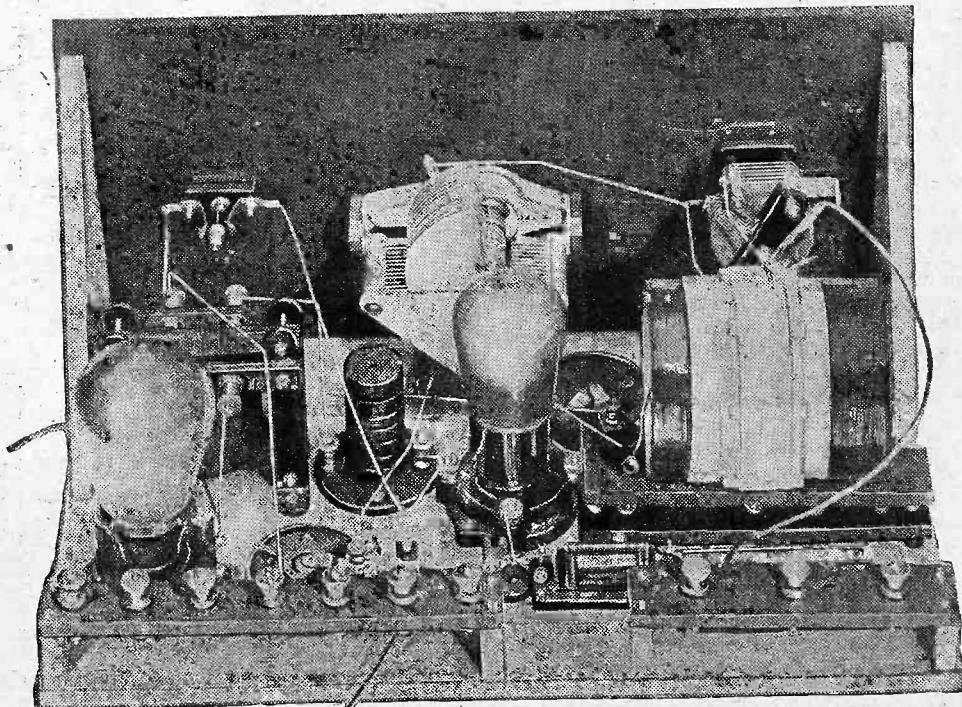
COMPONENTS AND MATERIALS

- 1 Panel, 14 in. \times 7 in. \times $\frac{1}{4}$ or $\frac{3}{16}$ in. (original was a "Red Seal" panel. Any good branded material).
 - 1 Set of parts (Hobbies) or complete cabinet for above, about 8 in. deep, and baseboard.
 - 1 '0005 mfd. variable condenser, with slow-motion mechanism or vernier dial (original is a Utility. Any good make).
 - 1 On-off switch (Benjamin, Igranic, L. & P., Lissen, Lotus, etc.).
 - 1 '0001 miniature type variable condenser (original is an Ormond. Any good make).
 - 2 Sprung valve holders (Benjamin, Bowyer-Lowe, B.T.H., Burndept, Burne-Jones, Igranic, Lotus, Precision, W.B., etc.).
 - 2 Baseboard filament resistors or rheostats to suit valves (Lissen in set. Any standard type).
 - 1 L.F. transformer (any good make, according to the constructor's taste as to price, etc.).
 - 1 H.F. choke of standard make, or one "Ebonart" choke former and 1 oz. No. 36 D.S.C. wire for home winding (Former obtainable from Messrs. Redfern).
 - 1 '0003 mfd. and one '001 mfd. fixed condenser (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., W. & G. etc.).
 - 1 2-meg. grid-leak and holder (Dubilier, Igranic, Lissen, Mullard, etc.).
 - 1 3-terminal and one 7-terminal strip.
 - 1 Insulating tube, 3 in. diameter and 3 $\frac{1}{2}$ in. long, and one 3 $\frac{1}{2}$ in. diameter and 3 $\frac{1}{2}$ in. long (originals were "Super Pirtoid").
 - 1 Ebonite strip, 5 $\frac{1}{2}$ in. by 1 in., for coil socket, and two strips, 5 in. by 1 in., for coil bases.
- Wire for coils, quantities roughly as follows: 4 oz. No. 24 D.C.C., 1 oz. No. 32 D.S.C. 4 oz. No. 34 D.S.C.
- 8 Plugs and 4 sockets for coil fittings (Ealex, Clix, etc.).
 - 1 Potentiometer (Lissen).

who actually assembled the original cabinet.

The circuit chosen for use in the "Handyman" Two is a simple and straightforward one, consisting of a detector valve using a form of the Reinartz circuit followed by one transformer-coupled L.F. valve, which is probably about the best combination possible for a small set.

It enables you to work a loud speaker on your local station with adequate volume so long as the distance is not unduly great, and usually on 5 G B and 5 X X as well, except, of course, in the extreme south-west, west and north of the kingdom, where a bigger set is really needed unless a very unusually efficient aerial is used.



As this photograph shows, the wiring behind the panel is very simple and easy to follow, and there is plenty of room when the valves and coils are in position.

"SEEING" ACROSS THE ATLANTIC.

By THE EDITOR.

IT is perhaps natural that Mr. Baird's transatlantic television experiments should have created so much excitement in the newspapers. Wireless has always been a subject about which the newspapers have revelled. It provides good "copy" and an inexhaustible well for those who delight in dipping into the future. The late Jules Verne made a success by originating a new type of fiction—the type of fiction which forecasts future scientific wonders; and he was followed (much more cleverly and with greater scientific accuracy and detail) by Mr. H. G. Wells.

The Foolish Prophets.

To-day there is still just as much interest in the question of scientifically forecasting the future, and those clever gentlemen who write for the newspapers, airing their views as to what the world will be like in, say, a thousand years' time, are always certain of creating interest if they pick on one or other, or all three, of these subjects: Aviation, Atomic Energy, and Wireless Television.

It is not so many years ago that forecasting a flight across the Atlantic was regarded as extremely ridiculous; and since Sir Ernest Rutherford made known to the world some of his experiments in "exploding" atoms there have not been lacking people who, like Mr. Grindle Matthews, have dealt with the subject of death rays and the control of atomic energy with great effect.

Finally, in the realm of wireless television, the prophets have quite naturally taken up the attitude that it is foolish, in view of past scientific triumphs, not to assume that the crude television experiments of a year or two ago, and the equally crude ones of to-day, will in the very near future be developed just as rapidly and just as successfully as the motor car, the aeroplane, etc.

But television, curiously enough, is a very different proposition when looked at closely. Even in the old days, when the motor-car first made its appearance on the streets, there was definite evidence to justify the supposition that motor-car engineering would steadily develop. The same with the aeroplane.

Still Very Crude.

Both these inventions have more or less followed their original early principles and, by great good luck, although obstacles have been encountered in their development, the development has been more or less unimpeded by the limitations of nature or, if you prefer it, by the limitations of physical science.

When we come to television, it is a different case. Many people, remembering the example of the motor-car and the aeroplane, assume that because certain crude results have been obtained with television, its ultimate perfection is a certainty, and that it is merely a question of time and further experiment before television is, to use that hackneyed word, "perfected." Claims have even been made

that it has been perfected already, but these can be discredited as absolutely unjustifiable.

Television experiments have so far led all those interested in them up a blind alley. Television workers, when beginning experiments, have a series of avenues of approach to their goal to choose from, and the avenues chosen have led to interesting and, in some cases, spectacular results. But so far those avenues of approach have terminated abruptly, due to the physical limitations imposed on the systems adopted. Distance for the televising of a crude image presents obstacles but not insuperable obstacles, and there is nothing very remarkable in the televising of a crude image across the Atlantic. Just as there was nothing very remarkable in telegraphing the Morse Code signals across the Atlantic on the occasion of the famous three dots message by Senatore Marconi. It certainly was spectacular and it indicated, quite rightly, that wireless

moving picture by wireless is by known systems impossible.

"Impossible" is a big word, but we have yet to hear of a scientific man of repute who will definitely state that, for example, the Baird system, or the Belin system, or even the Alexanderson system of television is capable of being developed on its present lines in such a way as to make it possible for moving pictures in detail to be televised.

We repeat again that a million synchronised impulses per second is the minimum for successful television, and that is a radio frequency.

It must not be assumed that the articles which appear in this journal and in our contemporaries dealing with television are definitely pessimistic, but we do feel that it is due to our readers that the facts of the present position with regard to television should be put before them. Undue optimism is stupid, and to indulge in exaggerated and spectacular statements with regard to television would be an insult to our readers.

Why Not Be Candid?

Some people go so far as to say that true television is impossible. That is stupid, but it is not stupid to say that television systems as known at present are not capable of being developed to such an extent that true television will be possible.

A new system may be discovered any day, but so far the scientific brains in the country have been devoted to the subject on and off and have realised that, with present day limitations, both in physical development of apparatus and in knowledge of science, television is as far off as ever it was from the point of view of being a practical commercial proposition.

Undoubtedly the television experiments carried out by Mr. Baird are extremely meritorious, inasmuch as he has explored to the very utmost the avenues of approach open to him. No doubt he will go on and will succeed in giving perhaps larger pictures and even with less crudity, but of what use is it to talk about television unless it is a practical proposition and can fulfil the functions of a public utility service?

Let us be candid and face the facts with regard to television, and not jump to conclusions, because certain highly-ingenuous and spectacular experiments have been carried out both by the G.E.C. of America, Mr. Baird, and others.

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telegraphy was capable of logical development and that it had commercial possibilities. But even in those days Senatore Marconi realised that if he could telegraph a hundred yards there was no reason why he could not telegraph a hundred miles and then a thousand miles, and then across the Atlantic. It was a question of power and the necessary facilities.

The same with television to-day. The present system can be used for televising a crude image across a room or across the Atlantic, but in both cases the great obstacle of detail is present. We will not weary our readers by recapitulating the scientific explanations of the difficulty with regard to televising in detail, except to state once more that to televise a picture in detail so that it can be really termed a

THE "HANDYMAN" TWO

(Continued from previous page.)

various portions together can commence with the sides and back, which can be screwed together and then screwed to the wood base.

The wood strip which goes on top of the cabinet in front of the lid can be then screwed in place by means of the two screws at each end, but not before the lid has been fitted alongside so as to get both in their correct positions. When arranging the hinges, squeeze the flanges together and countersink them level with the top of the back of the cabinet by chiselling pieces out of the wood. These can be fitted about 2 or 3 in. from each side.

(To be continued.)

The soul of the organ



60 VOLTS
(reads 66)

7/11

100 VOLTS
(reads 108)

12/11

9 VOLTS (GRID-BIAS) 1/6

60 VOLTS
(reads 66)

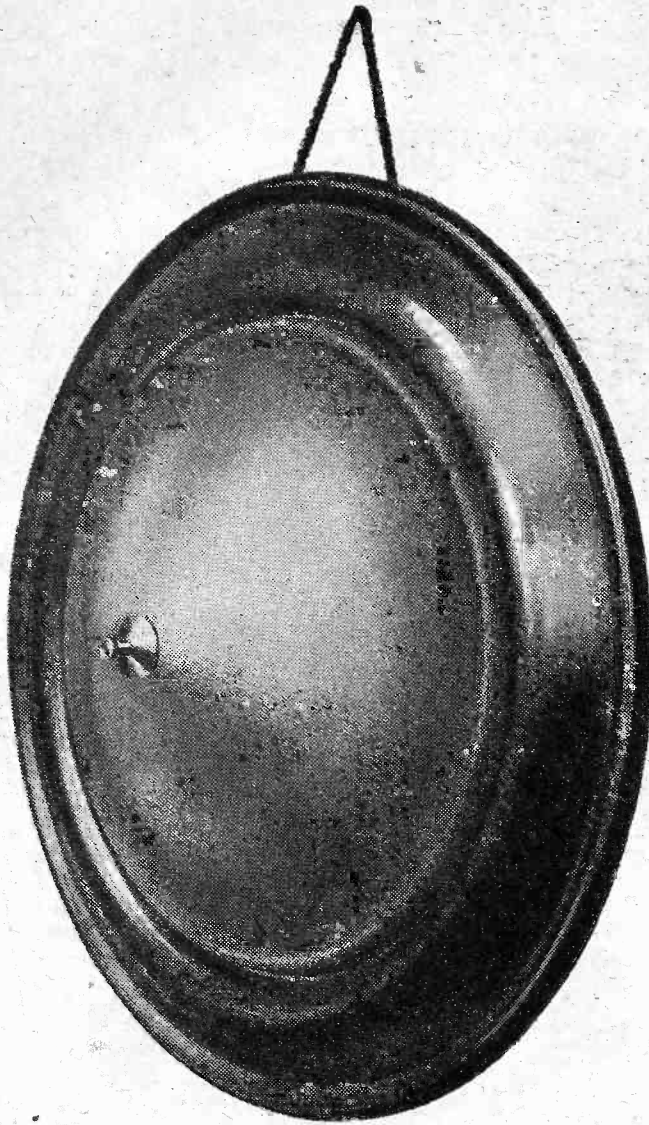
SUPER POWER
13/6

This LISSEN Battery is obtainable at every radio dealer—ask firmly for “LISSEN New Process” and you will be rewarded by an improved tone in your loud-speaker which will be worth the trouble taken in refusing anything offered as a substitute.

POWERFUL, MOVING—WELLING AND SWELLING. You get the real tone of the organ when you use the LISSEN New Process Battery in your set. This is due to the pure d.c. current this battery provides.

And the reproduction of singer, speaker and instrumentalist alike is loud and clear *always* if you use this battery, for it yields its power noiselessly without a sign of ripple and without a trace of hum. The oxygen content of the cells—due to the new process—is so great that you get months and months of use from every LISSEN Battery and very delightful reproduction always.

LISSEN LIMITED, 8-16, FRIARS LANE, RICHMOND, SURREY
(Managing Director: Thomas N. Cole.)

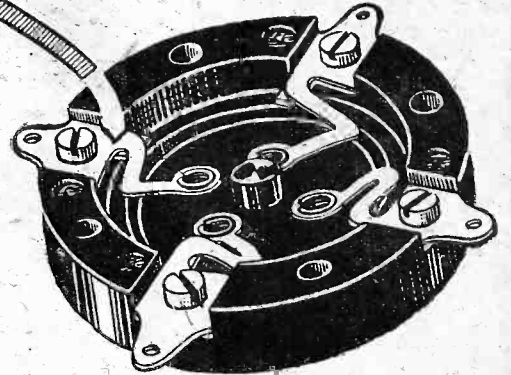


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AMPLION
 Junior
 "Hanging Type"
CONE SPEAKER

Price **37/6**

Announcement of Graham Amplion Limited, 25, Savile Row, London, W.1.

THAT'S THE SECRET



The four nickel silver springs—they are the secret of the Lotus Valve Holder. Look underneath, and you see them supporting the floating platform that holds your valve; supporting it so gently yet with such perfect mechanical strength that the valve does not receive any of the normal damaging shocks. When a valve is put in a Lotus Valve Holder it is automatically secured with a specially perfect connection in each leg socket. Lotus Valve Holders absorb shock, eliminate microphonic noises, protect the valves. They improve any set.

NOTE THE NEW PRICES:

Valve Holder without Terminals	1/6
Valve Holder with Terminals	1/9

All Anti-microphonic Type.

Lotus Valve Holders are used and recommended in the Mullard circuits in "Radio for the Million," and are ideal for use in the Master Three and the Cossor Melody Maker. Use them in YOUR next set.

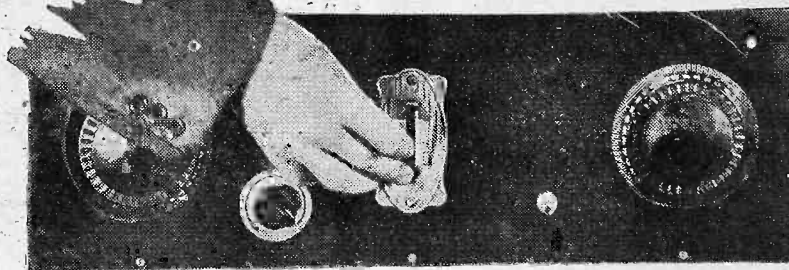
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VALVE HOLDER
 ANTI-MICROPHONIC

Made by the makers of the famous Lotus Remote Control, Lotus Vernier-Coil Holder and Lotus Jacks, Switches and Plugs.

Garnett, Whiteley & Co., Ltd.,
 Lotus Works, Broadgreen Rd., Liverpool

WON'T YOUR SET OSCILLATE?



If your set has lost its sensitivity for this reason this article will help you to put things right.

By D. GLOVER.

ample. And so it probably would be if you had 75 volts on the plate of the detector valve, but you must remember that there is a very great voltage drop through the anode resistance used as an intervalve coupling. An initial 120 volts H.T. is quite a minimum sort of pressure to employ for a detector valve preceding a stage of resistance-capacity coupling.

If you are satisfied that your H.T. battery is large enough and is in good condition, make sure that the L.T. supply is "up to scratch." Even though the accumulator has only just come back from the charging station, this is no proof that it is in good condition. It may be tending to sulphate, in which case it will be unable to hold a useful charge for any length of time.

"Tired" Valves.

Finally, it may be that the valve itself has gone off colour. It is quite likely that a valve purchased a year ago or more is of what is known as the thoriated filament variety. These tend to lose their "pep" in the course of time, and have to be

replaced. So much for the valve itself, and I would like to point out that the majority of the sets which have refused to oscillate, which I have come across, were found to be suffering from faults in the battery supply.

Now let us take the coupling between the anode and the grid circuit. In the swinging-coil system the closer the coils are together and, generally speaking, the larger the reaction or anode coil, the greater will be the feed-back. But it is necessary

that both these coils should be wound in a certain direction, and that the current from the plate of the valve should pass through the anode coil in a certain direction also. It is an unfortunate fact that all makes of plug-in coils are not wound in the same way. It is for this reason that the injunction is made with the specification of so many sets that you should try changing over the leads to the reaction coil on the receiver if it refuses to oscillate. This proviso is not made because the designer is not quite sure that he has his connections correct.

Unsuitable Aerials.

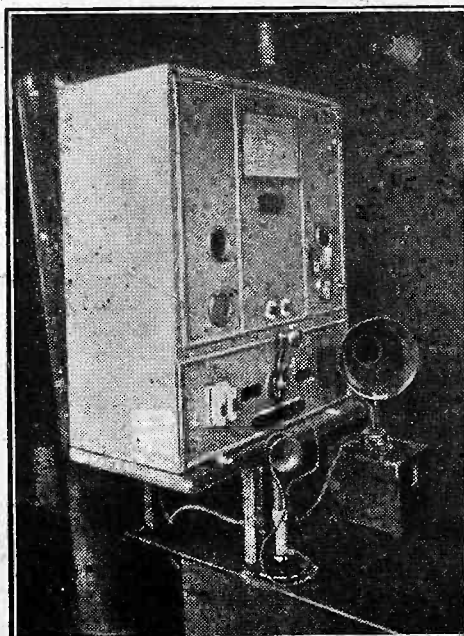
So it may happen that the pair of coils you plug in to cover a certain band of wavelengths do not agree with each other. In this case the advice to try changing over the leads to the reaction coil is sound. If you can make the set oscillate only over the first portion of the tuning dial, then it is probable that your reaction coil is not quite large enough.

Providing the receiver and the coils it uses, in the case of a set embodying capacity-controlled reaction, are according to the designer's specifications, there should be few failures to oscillate. Here, apart from the valve and the batteries, the most common cause is an unsuitable aerial. Remember, a very long, double-wire type of aerial is not at all suitable for broadcast reception. A set will be more lively and more selective when it is attached to a single-wire aerial only some 75 feet or so in length, but the wire must be as high as possible, and kept well away from walls, trees, and other such objects.

Insurance Against Trouble.

There are very many other little things subsidiary to those mentioned above which will cause failure to oscillate. But it would take a whole book to enumerate them all, and I only trust that in your case the trouble will not be due to one of the more obscure little defects. As a sort of insurance against trouble, you can make a practice of periodically running over your receiver. See that all the grid leaks, anode resistances and other such devices are snugly tucked into their clips. Give each a twist or two. This will have the effect of cleaning their end contacts.

Examine all the screw connections, such as the terminals on L.F. transformers and so forth, and see that these are tight, for screws have an uncanny habit of working loose. Make sure that all the valve-pins are making contact with their sockets. Lift each valve up and down in its holder, a cleaning action in itself which will frequently have a good effect.



This Marconi 4-kw. radio outfit, installed on the yacht "Crusader," is entirely self-contained. The handle in the centre of the bottom panel is used to change over from receiving to transmitting. Note the microphone and loud speaker.

WHEN a receiver loses its power to oscillate it becomes "lifeless," and distant stations tend to vanish, but you can easily get it going properly if you bear in mind exactly what the word oscillate means. Of course, you should avoid making the set actually oscillate during broadcast hours, for to do so will cause interference with neighbouring listeners. But to make the optimum use of reaction when working on distant stations, it is necessary to work the set comparatively closely to the oscillating point.

I do not mean that you should be what is known as "right on the edge of oscillation," where the set is bordering on squeals and howls all the time, but, unless you have that power to oscillate at the end of your reaction control, you will be unable to obtain sensitive settings.

To get back to reaction itself, this is a "feeding-back" of energy from the plate circuit of the valve to the grid circuit. This operation generally takes place in the detector stage of a receiver. The feeding-back is sometimes accomplished merely by the coupling effect between two coils, one of which is in the anode circuit and the other in the grid circuit. The magnetic coupling between these two coils is varied by moving them nearer or further apart. This is known as the "swinging-coil" or magnetic method of reaction.

"Two Main Things."

In another system, that generally known as the Reinartz method, and the one which is more frequently incorporated in modern sets, the positions of the two coils are fixed (sometimes they are even wound on the same former) and the degree of feed-back is regulated by a variable condenser. The greater the capacity (or the higher the dial reading of the variable condenser), the more will be the feed-back and the closer you will come to the oscillating point.

Now you will see right away that there are two main things concerned in the obtaining of an efficient reaction control. First of all you have the valve. Secondly you have that coupling between the anode circuit and the grid circuit. If the valve is not operating efficiently it is not developing amplified impulses in its plate circuit which it can pass back. The valve must be of a type suitable for the position it occupies, although there are very few valves indeed which will not operate at all in a detector position, providing it has the L.T. and H.T. current it desires.

Where Voltage Is "Lost."

But obviously if the H.T. or L.T. values are widely wrong, that valve is going to refuse to rectify and amplify and bring itself on the right road to oscillation. Hitherto you might have been getting good results with only a 45 or so volt H.T. battery attached to the detector valve, but it is probable that there was not much of a margin, and a slight voltage-drop might cause the failure to oscillate.

If this detector valve precedes a stage of resistance-capacity coupling, a fairly high H.T. voltage will be essential. You might have a 75-volt supply and think that 75 volts on the plate of a detector valve is quite



By H. BRAMFORD.

This comprises all the material required, unless the coil is home-made, when a piece of ebonite former $2\frac{3}{4}$ in. long by 2 in. diameter and a $\frac{1}{4}$ lb. reel of No. 24 enamelled wire will be required.

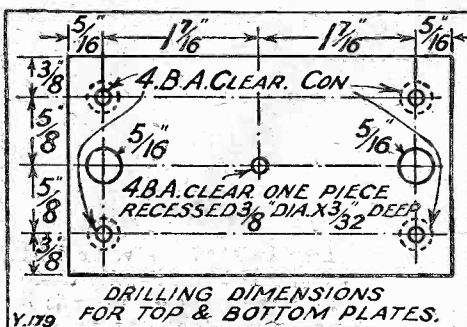
The general details, together with dimensions where necessary, are clearly shown in the accompanying diagrams. First drill the top and bottom

ebonite plates, as shown. The four holes which have dotted lines around them are countersunk on the upper side of the bottom plate, and on the underside of the top plate. The centre hole of the bottom plate should be recessed on the underside. The two $\frac{5}{16}$ in. diameter holes make a forced fit for the $\frac{1}{4}$ in. square slider bars or to suit any other type of bar used.

THE tuner unit to be described in this article is designed upon entirely novel lines. It is intended for use in conjunction with a detector valve and any following stages of amplification. Variable condensers have been entirely dispensed with, slider adjustments taking their place. "Clip-in" fixed condensers are used for a purpose which will be explained later. The unit is remarkably compact, and used in conjunction with a valve holder and grid leak and condenser combined, in addition to filament rheostat and choke, would comprise a complete valve receiver. First, however, we will consider the material required in its construction, the whole device being home-made if desired.

Material Required.

- 2 Clip-in condensers (as per photograph).
- 2 G. W. sliders (J. & J. Laker or any suitable type).
- Wound ebonite former.
- Ebonite, 2 pieces $3\frac{1}{2}$ in. \times 2 in. \times $\frac{3}{16}$ in.
- Slider bar, $\frac{1}{4}$ in. square, 2 pieces $3\frac{1}{4}$ in. long.
- 2 B.A. rod, 1 piece $3\frac{1}{2}$ in. long.
- 4 B.A. nuts. Terminals, heads, and piece of flex wire.



Cut two pieces of slider bar each $3\frac{1}{4}$ in. long, and one piece of 4 B.A. rod $3\frac{1}{2}$ in. long. If the coil is to be home-made, cut off a piece of ebonite former $2\frac{3}{4}$ in. long, having an external diameter of 2 in. Wind upon the former 100 turns of No. 24 enamelled wire, close wound, securing the beginning of the winding and leaving a piece free for connection to terminal 1 of the top plate.

Few Connections Necessary.

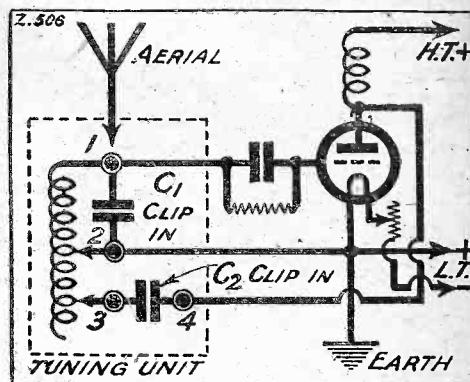
The end of the winding may either be finished off dead or taken to terminal 3 of the top plate. All that is now left to do is to assemble the pieces as shown. First place a slider over each of the bars. Force the bars into the holes in the bottom plate. To do this, slightly warm the ebonite and tap gently in.

The sliders should operate in different directions, one contact pointing up and the other down, as indicated. This is to give full play over the whole range of winding. Place the former in position and also the 4 B.A. centre rod, and firmly fix the top plate over all, securing with the centre terminal head.

Secure the four condenser clips to the top plate by means of four 4 B.A. countersunk screws, nuts, and terminal heads, and insert the fixed condensers.

The only connections necessary are as follow: Flex lead from S_1 to terminal 2, also from S_2 to terminal 3. Beginning of coil winding to terminal 1, and of coil winding (optional) to terminal 3. This latter is to eliminate any possible dead-end effect. If enamelled wire is used, remove the insulation along the paths taken by the sliders.

A circuit is given showing how the unit would be connected up as a Reinartz tuner. It will be seen that terminal 1 con-

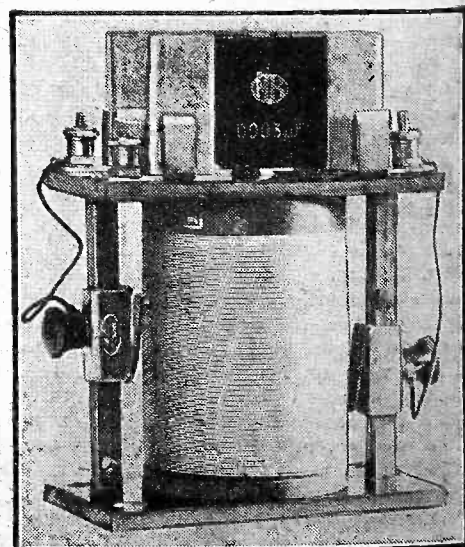
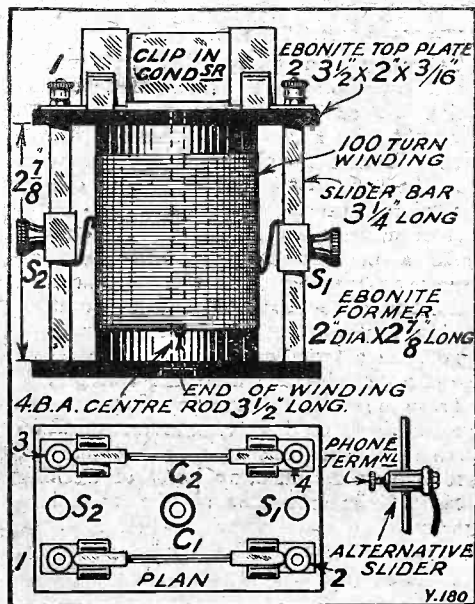


nects the aerial and grid leak and condenser. Terminal 2 goes to filament positive and earth. Terminal 3 is blank, but provides for an alternative aerial connection. Terminal 4 goes to the plate of the valve and one side of the R.F. choke.

A Compact Arrangement.

There are no variable condensers to manipulate, and much space is therefore saved. The unit is, in fact, ideal for use in portable or small receivers. First move S_1 and S_2 down the coil, the contacts of both being approximately opposite until signals are at their best. Then move S_2 down only, thus slowly increasing reaction. Make a final adjustment on S_1 when the best point of reaction has been found.

For local reception a .0005 clip-in condenser for C_1 should be suitable, while a usual value for C_2 would be .0003. Condenser C_1 has been incorporated to allow for a smaller amount of winding to be used, as the greater the capacity in parallel with an aerial tuning inductance, the less inductance or winding is required to cover a given wave-length range.



The completed unit. Note the "clip-in" type of fixed condensers used.

AN L.T. CHARGER FOR A.C. MAINS



This simple unit is both easy and cheap to make. It will save the owner of A.C. mains time, trouble and money.

By J. R. WHEATLEY.

approximately 1.5 amps., should preferably be calibrated in ohms.

Simple to Construct.

Although a 6-ohm rheostat has been employed, 3 ohms would be quite O.K. for ordinary purposes. The mounting of the valve holder completes the construction, and all that remains is to mount the small terminal strip, which is 3 in. by 2 in., and wire up.

The leads from the secondaries of the transformer are so arranged that it is extremely simple to take these direct to the correct points without any extra wire. The connections to the mains call for some explanation. The primary side of the transformer, i.e. the winding connected to the mains, has three wires leading from it.

It will depend on the voltage of the mains in use as to the particular two leads which are connected to the small two-way porcelain connector which fits quite snugly under the positive output terminal. The

(Continued on next page.)

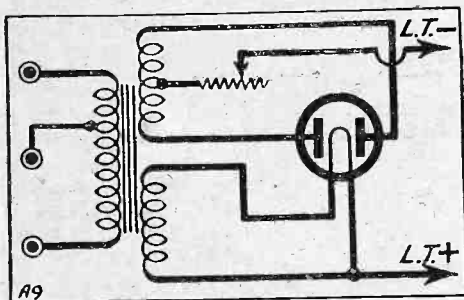
EARLY in 1925 a rectifying valve of a type similar to that employed in the charger about to be described was obtained, and with the aid of a suitable trans-

The construction of the charger is extremely simple; in fact, one could construct the unit from the photographs alone, but perhaps a few additional details are advisable.

The Rheostat to Use.

To the bottom of the baseboard, which is $6\frac{1}{2}$ in. by $6\frac{1}{2}$ in. by $\frac{1}{2}$ in., a thin piece of three-ply, $6\frac{1}{2}$ in. by $6\frac{1}{2}$ in., is tacked, forming a ledge at the bottom of the baseboard. This ledge will prevent the cover from slipping down over the charger should the latter be moved, for it is hardly necessary to screw down the cover to the baseboard.

The rheostat, which will have to carry



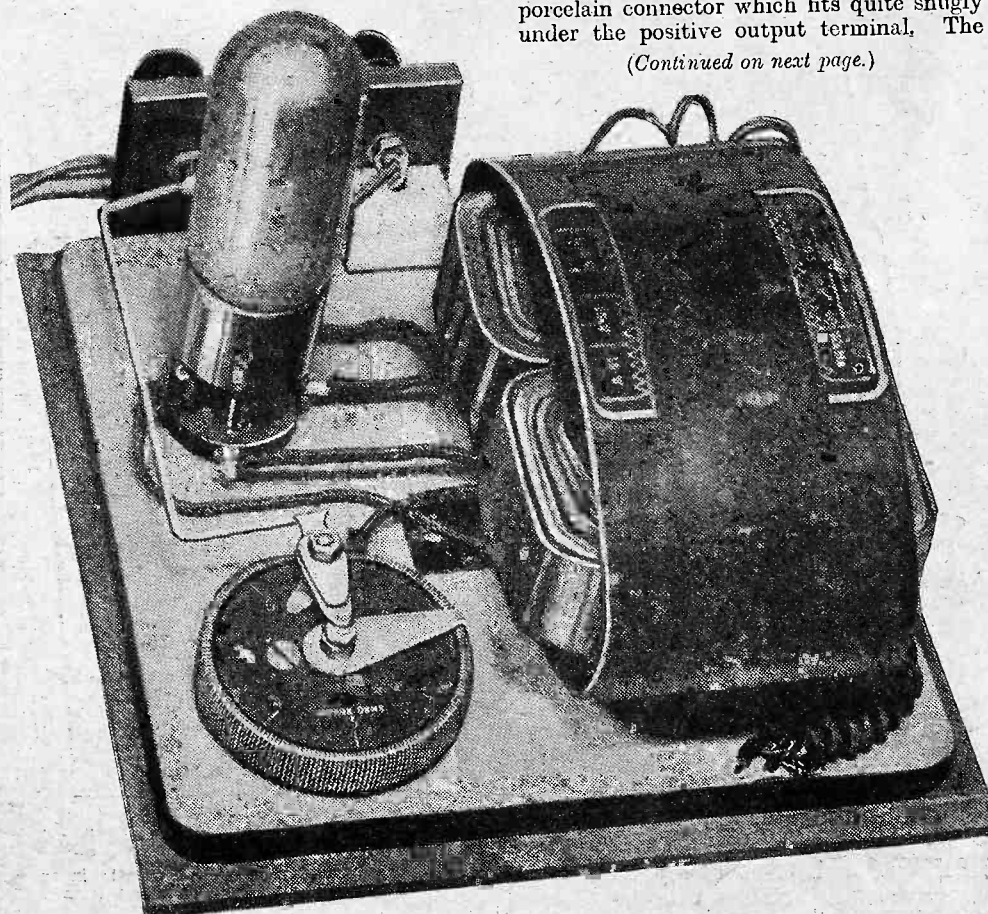
former was put into service for charging three 6-volt accumulators in use on three different sets. After several weeks in use it was decided to check the life of the valve, and the following is the result:

In just over two years the valve has been rectifying for 621 days for 16 hours a day, or in all 9,936 hours. This is, of course, an abnormal life for such a valve, but goes to prove that rectifiers of this type form a practical proposition in every way. The amount of time and expense on maintenance, repairs and replacements has been nil.

Total Cost—About 32/-!

These few figures preceding a constructional article will, I trust, be understood, when one remembers the adverse criticism which such rectifier units have had to withstand during the past few months. The cost of the various parts for the construction of this charger is extremely low, and need not exceed thirty-two shillings, assuming that the constructor has to buy everything even down to the last screw.

The three main components, i.e. the transformer, valve, and rheostat, may be obtained for thirty-two shillings, which for most constructors will be the only expense, for a valve holder is usually to be found in every constructor's scrap-box. Although not absolutely essential, but as a safeguard, the whole unit has been totally enclosed in a sheet-iron container, further details of which will be given later.



When you have connected up the leads from the transformer there remain very few other connections to make.

AN L.T. CHARGER FOR A.C. MAINS.

(Continued from previous page.)

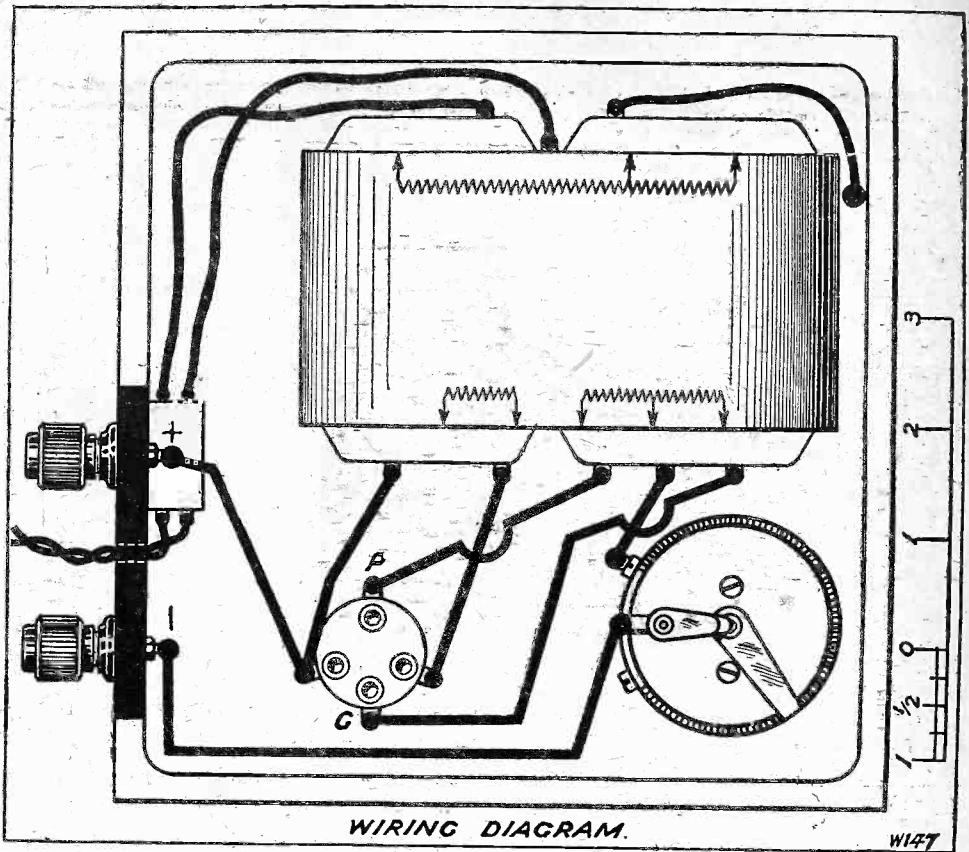
tapping not in use should not be cut, but wound round in a spiral, bound with insulating tape, and the end stuck firmly down to the baseboard with the aid of a little "Chatterton's."

Before connecting the adaptor to the mains, insert the rectifying valve in the holder and examine instructions on the

COMPONENTS REQUIRED.

- 1 Baseboard, $6\frac{1}{2}$ in. \times $6\frac{1}{2}$ in. \times $\frac{1}{2}$ in.
- 1 Mains transformer. Type A2. (F. C. Heyberd & Co.)
- 1 Rectifying valve. No. 451. (F. C. Heyberd & Co.)
- 1 Valve holder.
- 1 6-ohm rheostat.
- 2 Insulated terminals.
- 1 Two-way porcelain wire junction connector.
- 1 Ebonite strip, 2 in. \times 3 in.

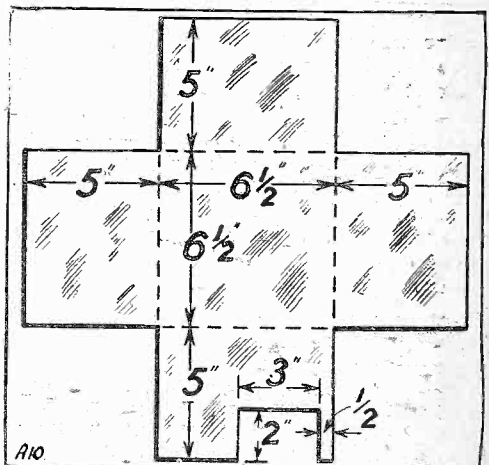
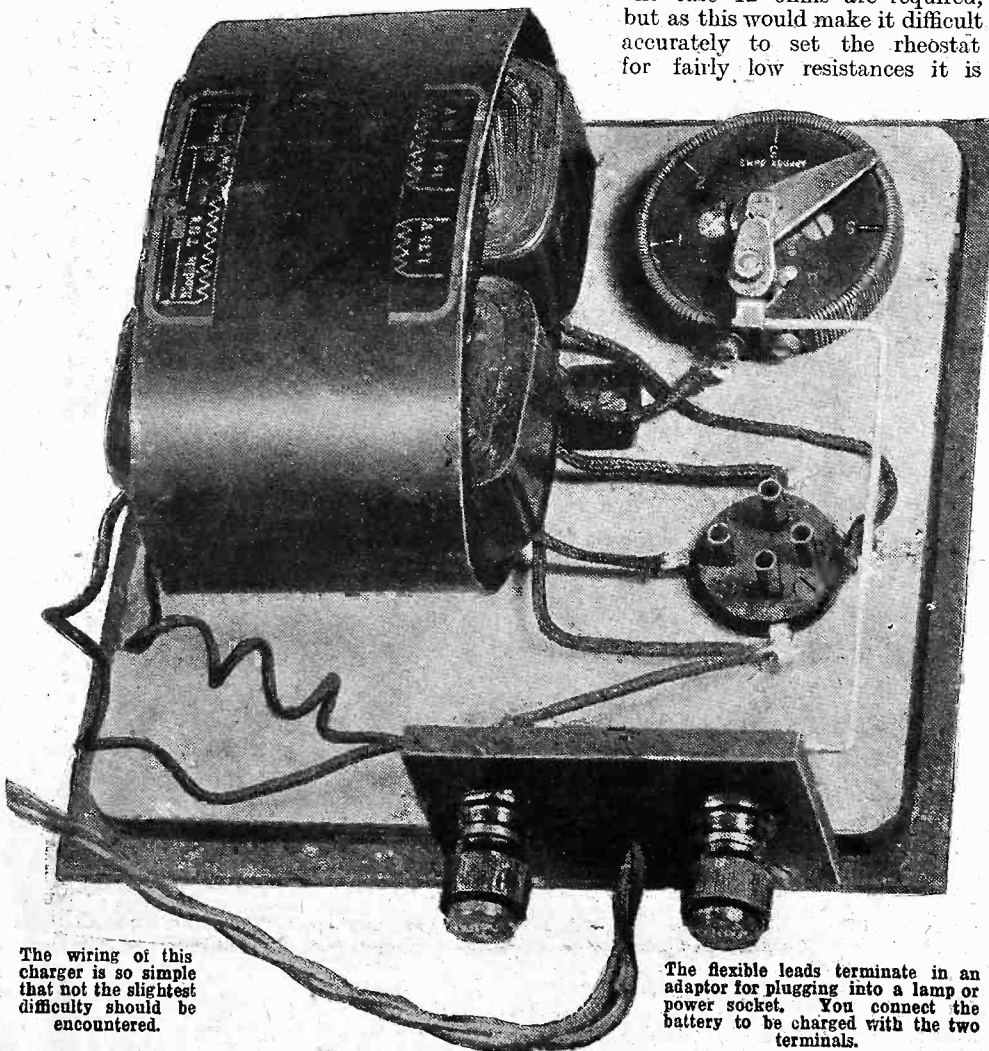
accumulator to be charged. Read the makers' instructions carefully, and you will find that a certain charging rate is specified. We will assume that a 2-volt 20-amp. hour accumulator requiring a rate of 1 amp. is to be charged.



From the data obtained from the valve manufacturer the table in this page has been evolved. It will be seen that in one case 12 ohms are required, but as this would make it difficult accurately to set the rheostat for fairly low resistances it is

advisable, in cases where above 6 ohms are required, to join the extra resistance in series outside the unit.

From the table it is then seen that 6 ohms are required, so the rheostat is set at maximum, the accumulator connected up, and the adaptor plugged in to a convenient mains socket. On closing the switch control-



ling the mains socket in use, a faint blue glow will be seen to appear in the valve, which will steadily grow in intensity until a maximum is reached, after which it will remain quite steady until the mains are switched off.

With the particular accumulator taken it will take approximately 16 to 20 hours to

CHARGING RATE.	ACCUMULATOR		VOLTAGE.
	2 V.	4 V.	6 V.
.5	12 ohms	6 ohms	3 ohms
1.0	6 "	3 "	1.50 "
1.5	3 "	1.5 "	Nil

charge the accumulator fully. The metal cover is easily constructed from sheet-iron from the dimensions given above.

THE NEW BRANDES LAMINATED PLATE ACCUMULATORS.



ACCUMULATOR R.B.10
(10 ampere-hour actual)

5/6

ACCUMULATOR R.B.20
(20 ampere-hour actual)

9/-

CARRIERS for above.

R.B.10 2v.	1/-
R.B.10 4v.	1/4
R.B.10 6v.	1/8
R.B.20 2v.	2/6
R.B.20 4v.	3/-
R.B.20 6v.	3/6

Our complete range of Low Tension Accumulators is now available, and we particularly bring to your notice the addition of the three new types, our W.B.30, W.B.40 and W.B.50 of 30, 40 and 50 ampere-hour capacity respectively.

An advantage of the greatest possible value to slow discharge accumulators.

A new type of slow discharge accumulator which will hold its charge over long periods without sulphation, and is thus eminently suitable for the increasingly popular Dull Emitter Valve. It introduces the laminated plate which, besides retaining the charge for weeks, even months, is proof against most of the abuses which rapidly destroy the ordinary plate. For instance, a Brandes R.B.10 can be fully charged in 8 hours as against the usual 2 days required for the electrolyte to penetrate the thick plates of the ordinary slow discharge accumulator. With the Brandes Accumulator, the plates, although possessing the ability to hold their charge over long periods, are open to permit the acid to flow freely through their laminations. With the stout girder-like construction of the plates, buckling is unknown, and even a direct short circuit does not harm them.

For further particulars apply to any
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(30 ampere-hour actual)

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ACCUMULATOR W.B.40
(40 ampere-hour actual)

14/6

ACCUMULATOR W.B.50
(50 ampere-hour actual)

17/2

CARRIERS for above.

W.B.30 2v.	2/6
W.B.30 4v.	3/-
W.B.30 6v.	3/6
W.B.40 2v.	2/6
W.B.40 4v.	3/-
W.B.40 6v.	3/6
W.B.50 2v.	2/9
W.B.50 4v.	3/3
W.B.50 6v.	3/9

W.B. 30, 40 and 50 are, like the R.B.10 and R.B.20, of the 2-volt type, and are prepared under the special Oldham Activation Process, but unlike the latter, are not already dry charged from the Works.

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INDIA. Bombay Radio Co., Ltd., 73-75 Queen's Road, Opp. Marine Lines Station, Bombay.
MALTA. Muscat's General Stores, 270 Strada Reale, Valletta.
EGYPT. Electra Radio, 30 Cherif Pacha Street, Alexandria.
BELGIUM. La Radiophonie Belge, 23-25 rue Van Helmont, Brussels.
FRANCE. Cie. Nationale Radioelectrique, 5 Rue Tronchet, Paris.
HOLLAND. N.V. Technische Handel-Mij, "Detha," Damrak 62a, Amsterdam.
DENMARK. Nordisk Elektrisk Apparatfabrik, Haraldsgade 6, Copenhagen.
NORWAY. A/S Diplomingenior Nicoll, Bogstadveien 5, Oslo.
SWEDEN. A.B. Stern & Stern, Regeringsgatan 9, Stockholm.
ITALY. J. B. Bignamy, Via dell'Orto 6, Bologna.
CZECHO-SLOVAKIA. Radio Lucerna, Stepanska 57, Prague 11.

TECHNICAL NOTES.

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

SHORT-WAVE BROADCASTING

A SOLDERING HINT—WIRED WIRELESS.

Short-Wave Broadcasting.

WHILE the use of short-waves of below 200 metres for broadcast transmission and reception has for some time been a much debated subject (with the negative side rather stressed), there is a good deal of indication that several of the broadcasting stations in the United States are anxious to adopt regular short-wave broadcasting. Some of the stations controlled by the National Broadcasting Company and the Westinghouse Company have been conducting experiments in transmission, quite apart from those which have been made public.

Some of the peculiarities of short-wave transmission are, of course, well known. We find in some instances that reception is good at a point of 2,000 miles from the transmitter, whilst it may be very poor at a point 200 miles away. We are able to cover extraordinary ranges with quite low power short-wave transmission, but often unable to communicate over comparatively short distances.

Extra Channels.

The importance of short waves in providing a solution to the congestion of ether is not commonly realised. Apart from highly-selective methods of reception as already adopted, one of the greatest hopes of solving the problem of interference, or the jumble of transmission between signals from different stations, lies in the further exploration of the short-wave region. When we consider that almost all the long-wave transoceanic telegraph stations of the world are crowded into a frequency band about 15,000 cycles wide, whereas the available short-wave field below 100 metres includes approximately 30,000,000 cycles, we have some indication what the future may perhaps bring in the way of additional facilities for radio communication.

A Soldering Hint.

When soldering very small objects it is generally most convenient to hold them by means of a pair of pliers as, if they are very small and light, they are apt to stick to the soldering iron the moment the solder touches them. When you are holding the work in the pliers, of course, one hand is entirely occupied, and you have only one hand to work with.

It is often very useful, therefore, to have the work held automatically in the pliers (in the absence of a small hand-vice), and this can very easily be accomplished by taking a strong elastic band and slipping it over the handles, doubling the elastic band if necessary to get sufficient force. The handles of the pliers are forced *apart* against the tension of the elastic band, and the work is inserted in the jaws of the pliers. The action of the elastic band then makes the pliers grip the work, and it is much easier to do the soldering.

Wired Wireless.

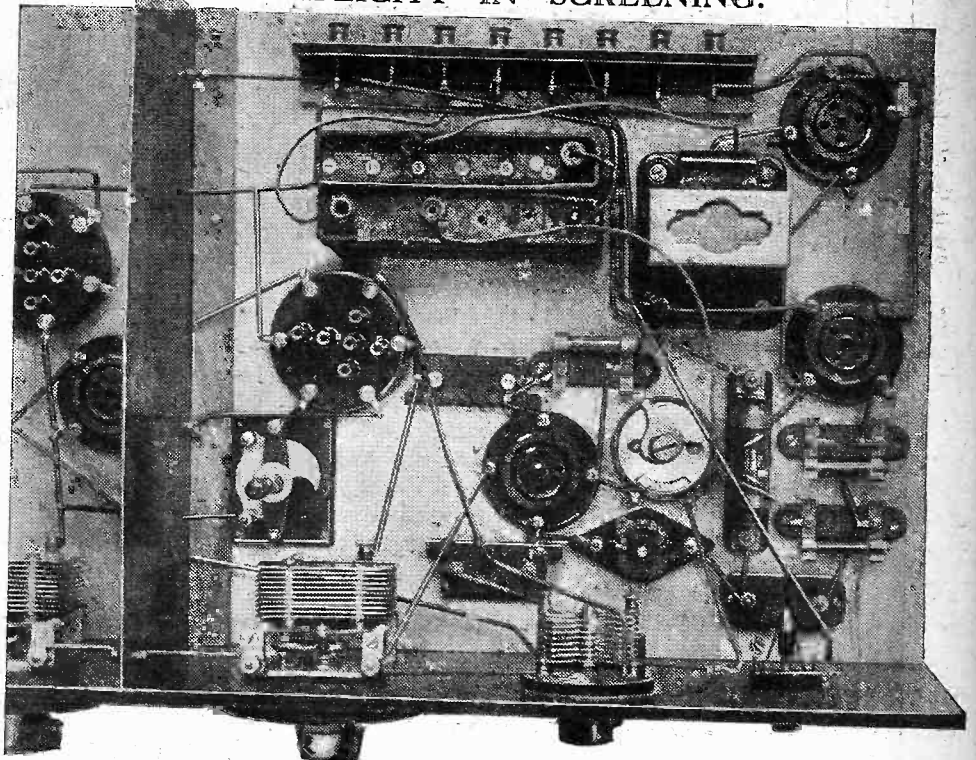
Wired wireless, which was for a long time regarded as of very limited use, and then perhaps only applicable for government service or commercial purposes, seems to be finding increasing popularity in the United States and on the Continent. It is

now being used as a means for distributing programmes over the telephone line or the electric-light wires, instead of by broadcasting through the ether in the ordinary way.

The term "wired wireless" is as paradoxical as the term "limited broadcast," which is also used in connection with the same system. The fact is that in wired wireless the signals are really distributed by means of wireless waves generated by a wireless transmitter in more or less the ordinary way, but they are caused to "adhere," as it were, to definite conductors and, therefore, they arrive at the various points to which those conductors lead, which explains the term "limited broadcast."

(Continued on page 1292.)

SIMPLICITY IN SCREENING.



To prevent inter-action between two stages of high-frequency amplification, it is now usual to insert a metal screen between them. An easy and efficient method of doing this is illustrated above. The set is the "Economy Five," a constructional blue print of which was recently presented free to every reader of "Popular Wireless."

NEWS FROM SAVOY HILL.

FROM OUR OWN CORRESPONDENTS.

NEW RELIGIOUS FEATURES

VISCOUNT ASTOR'S PLYMOUTH APPEAL—AN ELLEN TERRY BIRTHDAY PARTY.

New Religious Features.

TWO new religious features are being introduced during Lent into the programme from London and 5 G B. That from London consists of a series of addresses by the Rev. W. H. Elliott, Vicar of Holy Trinity Church, Folkestone, entitled "The Seamy Side of Life," which are to be given between 3.30 and 3.45 p.m. on Thursdays, immediately following the service from Westminster Abbey.

The 5 G B transmissions are the Thursday Dinner Hour Service at the Parish Church of

Birmingham. St. Martin's Bull-Ring, when the speakers, and the dates of their appearances will be as follows: March 1st, Rev. Pat McCormick; March 8th, Sir Harry Verney; March 15th, Dr. Herbert Gray; March 22nd, Dr. Peake; March 29th, The Rector of Birmingham; April 5th, Canon Rust.

Viscount Astor's Plymouth Appeal.

Viscount Astor is visiting the Plymouth Studio on Sunday evening, February 26th,

(Continued on page 1291)

How to use your wireless set to amplify your gramophone

AN ordinary gramophone with an ordinary horn and an ordinary sound box will not reproduce notes below middle C of the musical scale. Now with the new LISSEN Electrical Pick-up your gramophone will not only reproduce the low notes on your records as you never heard them on your gramophone before, but will amplify your gramophone music to any degree of loudness to fill a large room or a large hall for dancing—you can make one gramophone supply every room in the house with music—you can use your old records, long discarded, because needle-scratch is now largely eliminated. Your new records, too, will play better because needle noise is largely subdued.

TO ELECTRIFY YOUR GRAMOPHONE

The Lissen Pick-up not only largely eliminates needle scratch, but brings out the low notes on a record which no ordinary sound box is capable of reproducing.

INSTRUCTIONS.

Put on the new Lissen Electrical Pick-up in place of the sound box on the tone-arm of your gramophone—take the connection from the Pick-up to the grid terminal of the Lissen Pick-up Adaptor (sold separately and having plugs and sockets corresponding to those of an ordinary valve-holder) and take another connection from the Pick-up to the negative filament terminal on the Adaptor (trial on each of the filament terminals in turn will clearly show which is negative). When the Adaptor is used in the way just explained, care should be taken that no connection is made to the plate terminal on the adaptor, otherwise the H.T. battery will be short-circuited.

Alternatively, a connection from the Lissen Pick-up, instead of going direct to the negative filament terminal on the Adaptor, can be made to the negative terminal of a grid-bias battery. A connection should then be made from the positive terminal of the grid-bias battery to the negative filament terminal on the Adaptor.

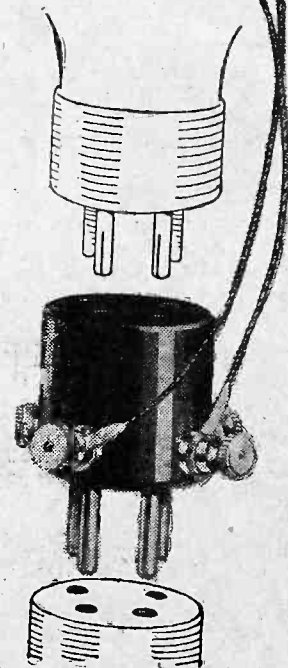
The connected Adaptor, with a valve fitted into it, should be plugged into the detector valve socket of a two- or three-valve set. Volume can be controlled by the round milled nut on the Lissen Pick-up.

Lissen Electrical Pick-up 15/- Adaptor for same 1/6

Obtainable at most dealers, but if any difficulty send direct to factory, no postage charge. Or can be sent C.O.D.

LISSEN LIMITED, 8-16, FRIARS LANE, RICHMOND, SURREY.

(Managing Director: THOS. N. COLE.)



PLUG-IN CENTRE-TAPPED COILS.

By O. J. RANKIN.

CENTRE-TAPPED coils have many uses in modern radio receivers. For instance, they figure in H.F. neutralising circuits. The one end of the coil is joined to the plate of the H.F. valve and the other end to the neutralising condenser. The central tap from the coil is taken to H.T. plus.

The component can also be used as an aerial coil, the aerial lead being connected with the centre tap. This enables a fairly high degree of selectivity to be obtained.

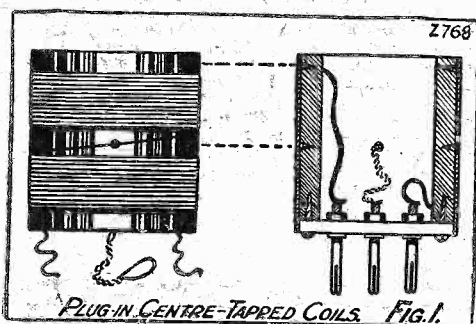
Simple Construction.

The accompanying sketch and photograph show the simplest possible method of arranging single-layer centre-tapped coils on the interchangeable principle. Each coil is wound on a 3-in. diameter cardboard former in the manner already described in an article entitled "More About Centre-Tapped Coils"; i.e. the centre tapping loop is passed through a hole in the former, which is then plugged with a piece of match-stick, or filled with a sealing compound, and taken down inside the former together with the beginning and end of the winding, as shown on the left of Fig. 1.

A Rigid Support.

Two pieces of wood, each about $\frac{3}{4}$ in. by $\frac{3}{4}$ in., and equal in length to the length of the coil, less the thickness of the ebonite used for mounting the pins, are screwed to the inside of the former with their top edges flush with the top of same. (See sectional sketch.)

The screws should be inserted in the positions shown by the dotted lines between the two sketches in Fig. 1, so that their heads do not foul the winding. The



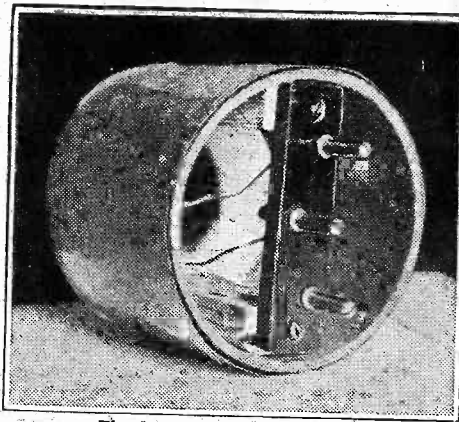
ebonite strip is fitted with the three pins and drilled at each end so that it may be screwed to the lower ends of the wooden supports. Thus, in effect, we have a rigid frame-like support to which the coil is attached.

The three wires are soldered to their respective pin shanks before fitting the ebonite, and the top of the coil is provided with a cardboard cap containing a small celluloid or mica window which obviates the usual groping with the pins when blank discs are fitted. The window is $1\frac{1}{2}$ in. in diameter and, providing the ebonite strip is not more than $\frac{3}{4}$ in. wide, one has a good view of the sockets on the holder when

inserting a coil, even when the holder is placed inside a fairly deep cabinet.

Cardboard bands, equal in thickness to the diameter of the wire on the coil, are glued round the extreme upper and lower ends of the former, so that a length of American cloth may be attached to same in order to protect the winding.

The general arrangement of the coil is clearly shown in the photograph. It should not be necessary to add that the pin setting on all coils should be identical.



The base of the complete coil.

and that a template will be required for marking off the ebonite strips, and also for marking the positions of the sockets on the holders.

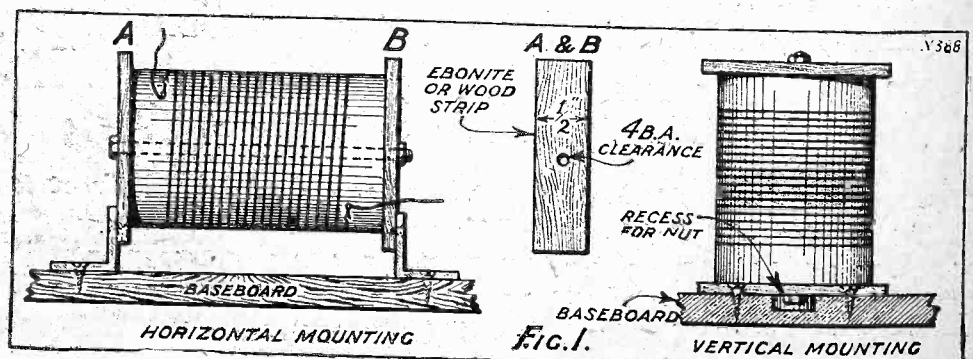
"UNIVERSAL" COIL MOUNTING.

CYLINDRICAL coils are easy to wind, but not so easy to fix in the set.

When you have taken a lot of trouble in putting a bare wire-spaced winding on an ebonite former, you do not want to spoil a good job by mounting the coil so that the wire touches the baseboard of the set. Fitting brackets on the former involves rather tricky work with a drill, and a risk of splitting a thin-walled former.

Easily Made Holder.

If you make up the fitting shown in Fig. 1, you can mount your coil in any position. A and B are two strips of wood or ebonite, $\frac{1}{2}$ in. wide, slightly longer than the diameter of the former, and of any convenient thickness. Clamp the former between the strips by means of a 4 B.A. rod down the centre. Mount horizontally by attaching two brackets as shown.



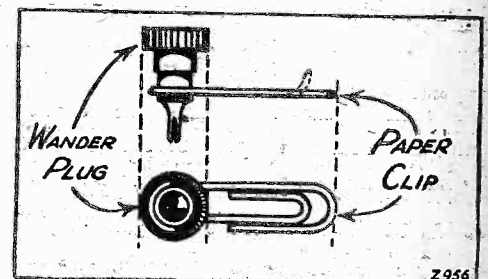
Mount vertically by screwing one strip to the baseboard (with a recess cut in the latter for the nut). Put on the coil and clamp with the top strip and nut. Any oblique angle of mounting may be obtained by fixing a wedge-shaped piece of wood under one end of the bottom strip.

A PAPER CLIP DODGE.

THERE are times when it is desired to try out two or three different high-tension batteries on a wireless receiver, the set itself being already connected up to either a multi-way battery lead or separate leads terminating in the usual form of H.T. wander plugs. While a large proportion of high-tension batteries are provided with tapping sockets, it occurs frequently that they are not, and it is a nuisance to have constantly to remove and replace the plugs from the leads according as to whether junctions have to be made to sockets, terminals, connecting links, pocket battery strips, etc. When occasions like this arise in my own case I find it saves a lot of time to adapt the plugs for all contingencies simply by the addition of wire paper clips.

Great Saving of Time.

The sketch will show all that is necessary. Just remove the insulated head of the plug and slip one end of the paper clip over the screwed portion. Replace the head and screw home tightly. Now, with the aid of



the clip either kept out straight or bent at right angles half way along its length (shown dotted in sketch), efficient electrical connections can be made to terminals or the clip sprung over connecting links or metal strips as desired. Of course, the use of the plugs in the normal manner for inserting into H.T. sockets is in no way affected. Simple dodges such as this are responsible for a large saving of time to the constructor and experimenter and are thus worth noting.

e Editor, POPULAR WIRELESS.

Editor, POPULAR WIRELESS.
Dear Sir—Can I claim to have done well—
making wireless? I decided yesterday that I
was tired of plugging and unplugging coils when
I wanted to receive on different wave-lengths, and
I thought I would try and arrange for switches instead.
Normally, there is nothing out of the way in this, but
I wanted to include the short waves; anyway, I
thought I am at the moment listening to 2 X A
day 5 X X, Chelmsford, with very little fading.
Considering that W G Y had got to pick it up first,
this was the peculiarity of listening to 5 X X via
2 X A D which decided me to write. The set works
perfectly in every way.

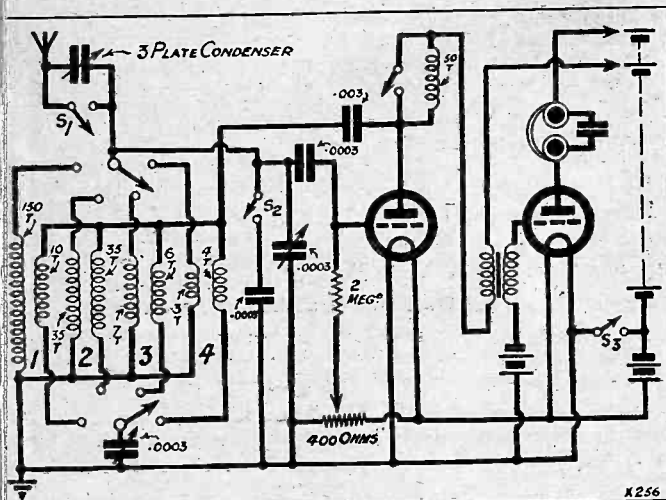
Since drawing the accompanying diagram I have
 itched over to the No. 3 coupling (2 X A
 me on No. 4), and almost immediately tuned in
 D K A, but the reception is very distorted except
 speech. Practically all this winter the distortion
 K D K A has been unbearable. I have had just
 ordinary reception on Nos. 2 and 1.

ordinary reception on Nos. 2 and 1. I do not claim anything original in being able to receive these American stations, but hitherto I have only been able to by taking out one coil and putting in another, disconnecting the aerial and placing it elsewhere, whereas now I simply use switches. Actually, I was very much surprised to get my oscillation on the short waves with so much capacity around. The family can now tune in American

Yours faithfully,

J. G.

Charlton, S.E.7.



NATURAL REPRODUCTION.

The Editor POPULAR WIRELESS.

Dear Sir,—I should like to make a few remarks on the subject of wireless reproduction as viewed from the highest possible standard. I have frequently read and heard it said that it is now possible to reproduce the studio performance, with such realism that no difference can be discerned. Now as one who has made a thirty-years' intensive study of tone in all its classifications I may possibly be fastidiously critical about what I hear, but I can assure you that the day of exact reproduction has not yet arrived. I make this statement after the most careful study of every known type of receiving apparatus from detector to telephone. Assuming that the design of the transmitting station is really excellent and that no distortion is occurring in the successive links between studio and receiver, I think that there is much still to be done in perfecting the latter. My quarrel is not against the modern valve or modern components, but against the *design and adjustment* commonly practised by radio engineers who are not expert in tonal and musical science.

Unless a man knows more than a little

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about "harmonic proportion," and is moreover capable of analysing the hundred and one varieties of *timbre* which distinguish one musical instrument from another, he is literally groping in the dark when designing a low-frequency amplifier and speaker. Before he can say with conviction that a loud speaker is capable of reproducing the studio performance with absolute fidelity (or, if you like, with apparent fidelity), he ought to know within a little what the real thing is. We all remember Sir Thomas Beecham's famous indictment, and some of

CORRESPONDENCE.

ELIMINATING PLUG-IN COILS

**NATURAL REPRODUCTION—A VOICE
FROM INDIA.**

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed ; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

us are now saying that had he heard a properly-designed receiver and a coil-driven free-edged cone speaker he would have been compelled to retract his words. I gravely question whether the great conductor would have done anything of the kind. The difference is still palpable to a musician of refined discrimination. I gladly acknowledge the

whereas the method of suspending the edge is subject to wide variations in design. The tendency is to curtail the freedom of the cone to such an extent that a large percentage of the superiority of the Rice-Kellogg principle over other types is lost. There are many other features which are making present-day coil-driven speakers entirely unsuccessful as natural reproducers, and this is all the more tantalising to the musician who realises the capabilities of the type.

The musician who rears the capabilities of one type. With regard to present-day receiving apparatus, design and artistic finish is strangely lacking if the desideratum is a faithful reproduction of music. The very best that engineers have to offer apparently is some form of anode-bend detection followed by two or three L.F. stages, with super-power valves in parallel in the last stage fed by umpteen volts and passing umpteen milliamps, with suitable values of grid bias. The alternative is a stage of push-pull amplification. Given a steady milliammeter needle and a suitable output filter, the set is said to be as near perfection as can at present be attained. There has been much discussion in these columns as to the relative merits of the various known types of L.F. coupling, in which I myself took part. I then spoke very highly of battery coupling. But there are great disadvantages with this, and none of the systems at present in use are capable of delivering the goods. *A new method of coupling is necessary.* This does not mean the scrapping of transformers, chokes and resistances, but the introduction of a new combination in which these components will take their proper places. The time is coming when the demand for transformers will be greater than ever, but their connections will be entirely different.

In conclusion, I believe it is quite possible to arrange the design of both receiver and speaker so as to secure real fidelity

of reproduction. This cannot be accomplished without a complete understanding between engineer and musician. I have at my house an experimental receiver and speaker which is an indication of what can be done, though I should not wish to claim that it is the last word. The most difficult things to reproduce in wireless—the organ and the orchestra—are certainly reproduced with more realism than is usually associated with radio, and I need hardly say that interested visitors are always welcome.

(Rev.) NOEL BONAVIA-HUNT.
(Organ Consultant.)

96, Broadhurst Gdns., West Hampstead, N.W.6.

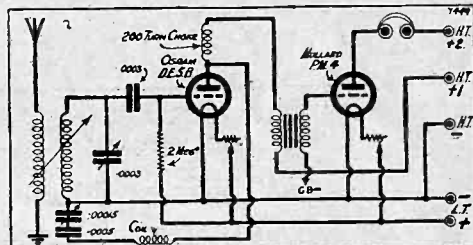
A VOICE FROM INDIA.

The Editor, POPULAR WIRELESS.

The Editor, POPULAR WIRELESS.

Dear Sir.—Being a regular reader of your valued paper I take the liberty to write you a few notes on wireless as received here by me in S. India. Firstly, short-wave reception. I have read with interest your notes from time to time regarding short-wave work and how the B.B.C. have lagged behind in this matter despite successes of P.C.J.J. and other short-wave stations. Anyhow, I'm glad the B.B.C. have moved at last, and it may be of interest to you to say that their transmissions relayed from the Albert Hall on Armistice Night were most successfully received here between the hours of 1.30 and 3.30 a.m. Indian time on Saturday. I picked up the carrier wave at 1.40 a.m., and was soon able to tune in the speech of H.R.H. the Prince of Wales, and also the community singing which followed, which included the old favourites of the war, also hymns, life and drums, bagpipes. The reception on the whole was very good indeed, not quite as much volume as P.C.J.J. and the Australian stars, but still it was very good. One point of the transmission was that it had a very marked pulsating or surging effect, which came in regular waves about every half-minute, this effect is noticeable from all short-wave stations on telephony, but the B.B.C. was much more pronounced. I have reported to them direct.

I get excellent results here on my shortwave set, which is a two-band (D and L.F.) Reinartz circuit, a diagram of which is attached. I receive 2 N.M., Mr. G. Crause's station, also P C J J, Sydney, Perth, American stations, and of course Morse stations by the score, and most can be got without an aerial or earth. I normally use an outdoor single aerial of 90 ft. length and 30 ft. high. A photo of my set is enclosed, it may be of interest to you. It shows from left to right (1) A double-power amplifier. (2) Short-wave

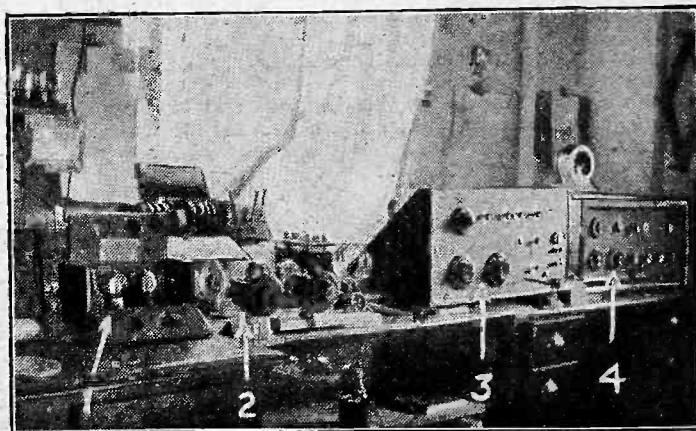


set. (3 & 4) Five-valve sets for longer waves. I use five-valve set, straight circuits, 2 H.F. (transformer coupled), detector, 2 L.F., last being a power valve. The results on longer waves have also been good. I can get any night Moscow (on loud speaker), also Turkish station (Stamboul), Paris, Langenberg, but Davenport I've only got once, but hope to get it again this cold weather season. There are several other Continental stations coming through, but have not identified them as yet. The two Indian and Colombo stations of course come through fine on loud speaker, and Bombay is about 600 miles, Calcutta 1,000, Colombo 600, and it's no trouble to get them. All my sets are built up by myself. Trusting this will be of interest.

I am yours truly,

J. P. WILLIAMS (Capt.)

17, Cambridge Road, Bangalore, S. India.



Captain Williams' outfit—(1) A double-power amplifier; (2) short-wave set; (3 and 4) long-wave five-valve sets.



AN ELECTRIC SOLDERING
IRON—AN EXCELLENT
MILLIAMMETER—A WET
H.T. BATTERY—
CHEAP GRID LEAKS

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

AN ELECTRIC SOLDERING IRON.

THE golden rules for successful soldering are that the iron should be kept clean and at a correct and constant temperature. No more easily are these rules carried out than with an electric soldering iron. With such the work is greatly facilitated. Although soldering is never essential in the construction of a radio receiver, it is always advisable and in any case amateurs should cultivate the art, inasmuch as it is capable

of useful applications in the house for other purposes. An electric soldering iron need not be an expensive item; for instance, we have recently received from Messrs. Knowles & Son, of 87, Wardour Street, London, W.1, one known as the "K.N.," which retails at 12s. 6d.

We have found it quite suitable for light work, such as that which is met with in the assembly of radio sets. It is supplied complete with two bits which are interchangeable

able in a simple manner, and 5 ft. of twin flex fitted with a specially moulded patent lamp-socket adapter. Its consumption is very low, being approximately 75 watts, and it is supplied suitable for operating on 100 to 110 volts, or alternatively on 220 to 250-volt mains. It is also guaranteed for the period of one year, which is certain to recommend it to the discriminating amateur who has had experience of badly designed electric equipment.

As mentioned, it is supplied with interchangeable bits, the one straight and the other of right-angle form, so that it can be used in the most awkward places.

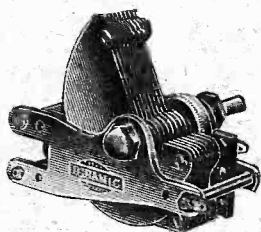
AN EXCELLENT MILLIAMMETER.

We have frequently advised constructors to cultivate the use of meters. With such you can keep your receiver in perfect running order and track down distortion to its source, and before it becomes appreciably audible. But if a milliammeter, for instance, is to give good service in the anode circuit of one of your valves, it must be properly designed for its task. It should have a fairly large scale and a moderately dead beat and accurate movement.

The Ferranti meters appear adequately to fulfil all these requirements. We have recently had one reading from zero to 15 milliamperes on test. We particularly like the design of the needle and this alone stamps it as a high-class job. This needle is of skeleton construction, is light, has practically no inertia, and its point is knife-edged and permits extremely close readings to be taken. Incidentally, if it swings hard over on the passage of high

(Continued on page 1290.)

These Plates cannot Touch.



There is no danger of shorting out the H.T. Battery when you use the Igranik "Lokvane" Variable Condenser. Both the moving and fixed vanes are accurately spaced and securely locked in position so that they cannot get out of place. It is an instrument of permanent accuracy.

The Igranik "Lokvane" Variable Condenser is the only condenser giving such high precision at such a reasonable price. It is a triumph of ingenious design enabling economical high speed production to be combined with precision manufacture. The secret lies in the unique method of spacing and locking the vanes with slotted oval bars, a method which automatically ensures accuracy while yet allowing rapid assembly. Smoothly working adjustable bearings and low loss design go to complete a condenser which satisfies the most critical tastes.

00015 mfd.	Price 8/6
0003	"	..	" 9/6
0005	"	..	" 10/6

Send for the complete
catalogue of Igranik
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Works: Bedford.

The Aristocrat of Transformers.

Nothing has been spared to make the Igranik L.F. Transformer, Type "G," the most perfect it is possible to manufacture. It is designed by some of the foremost Transformer experts after years of research work and manufactured from the highest grade materials it is possible to obtain.

The Igranik L.F. Transformer, Type "G."

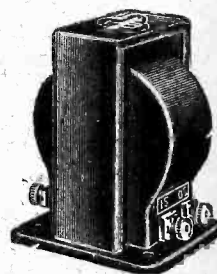
gives the results that should be expected—wonderfully high and even amplification of all the audible frequencies resulting in absolutely life-like reproduction.

It is specially designed to give a straight amplification curve under ordinary working conditions. It must be recognised that perfect curves obtained under ideal laboratory conditions are utterly useless as an indication of its performance in a set.

Made in two ratios:

3:6:1 for first and single stages (to follow 20,000 to 30,000 ohm valves).
7:2:1 for second stages (to follow low impedance valves).

Price 30/-



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FOR BATTERY ELIMINATORS
and
H.T. BATTERIES

SALIENT POINTS



Type C1.

C1T (soldering terminals).
C1S (screwed terminals).

Capacity: 2 mfd.

Price 7/6

1. Dielectric losses negligible.
2. Capacity is effective at high frequency.
3. Wound with pure foil and not with metallised paper.
4. All sealed in and completely non-hygrosopic.
5. C1 tested at 1000 v. D.C. and quite safe for use on 500 v. continuously.
6. C2 tested at 500 v. D.C. and quite safe for use on 250 v. continuously.



Type C2.

Capacity: 2 mfd.

Price 4/6

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

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

QUESTIONS AND ANSWERS.

THE "PROGRESSIVE" ONE.

H. H. P. (Penge, London, S.E.20).—"I have had a crystal set for some time (and, as you know, 2 L.O. shows get rather boring at times), so to get a change of programme at times, I decided, as a first attempt, to try the 'Progressive' One. Now comes the trouble. I can't understand what is wrong with it. London comes in almost too strong (good

tone); 5 G.B. strong, but always a pinch of 2 L.O. with it; Stuttgart, just comfortable to listen to, but again more 2 L.O. That is my 'log' as far as ordinary hours go. To-night (Sunday) at 7.30 I tried to tune in to some foreign stations, and got Stuttgart, also Langenberg ('Merry Widow' on at time), then Leipzig. This I held till Big Ben chimed 8, when of course 2 L.O. overpowered it, as did 5 G.B. to Langenberg. (These three stations at fair strength.)

"My parts are as follows: '0005 variable S.L.F. (wave-master), '0003 variable S.L.F. (Ormond), '0003 fixed, grid leak, H.T. choke, resistor (all Lissen), valve holder (Lotus). The set is wired and coil wound exactly as Mr. Dowding explained it. Aerial 20 ft. high both ends, 50 ft. span, 20 ft. lead-in.

"Now I have one confession to make (this may be the whole point). Several of above parts were given me as Christmas presents. One of the non-radio members of the family presenting me with a valve, this being a Triotron (Austrian) 2-volt '05 G.P.

"Three friends have given me advice. One says 'Buy a valve!' Well, perhaps I ought. But does a valve make a set selective? No. 2 says 'Put your aerial up 10 ft. and cut it 10 ft. shorter. (Here we are screened, and I think it would need a 50 ft. mast to get into the open.) No. 3 says 'Get a slow-motion dial.' As a novice, I should put the whole trouble to the aerial. Would an indoor aerial be efficient? If so, what size?

"In conclusion, I should like to say I built the Lo-Cost crystal set on Thursday night in under half an hour, and was getting Charlot's Revue at real good strength. Thanks for it. It is a topping stand-by set."

It does not, by any means, always follow that a valve of the exact type recommended will increase selectivity to a really marked extent. Your friend No. 2 comes very near the truth in recommending a

(Continued on page 1286.)

ATTRACTIVE RADIO! OBTAINED BY USING A TROLITE PANEL

YOU can make your radio set as attractive as the most expensive shop set—at no extra cost! Trolite panels have a mirror-like surface, yet there is no surface leakage. They are beautifully finished in five different designs. Black polished. Mahogany polished. Walnut polished. Wavy design. Cube design. So you can choose the design that harmonises best with your cabinet. All the same, efficiency is not sacrificed to effect. Insulation resistance is exceptionally high. Drilling, sawing, and machining is easy. Joints can be made with acetone.

Use a Trolite panel for your radio set!

PRICES, per square inch:
Polished Black Mahogany, Walnut, Cube, Wavy
1/2 in. ... 2d. 1/2 in. ... 2d.
1 in. ... 4d. 1 in. ... 4d.

Ask your radio dealer also for Trolite Dials, Coil Formers, Coil Mounts and other radio mouldings. In case of difficulty write direct to:

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204-206, Great Portland Street, W.1.

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Manchester Office: 185, Princess Street Telephone: City 3329

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An Announcement concerning the COSSOR MELODY MAKER | MULLARD MASTER THREE

and the

TOREADOR P.M. RECEIVERS

A LARGE number of people wishing to construct these popular receivers are anxious to use Bowyer-Lowe components. They feel that by using products of proved performance and quality they can be sure of the best possible results. In deference to these wishes we have satisfied ourselves that, by wiring up according to the published instructions, the following components give complete satisfaction. We are therefore now in a position to give immediate deliveries of the parts listed below.

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"Whiteline" Valve-holders, No. 282 ..	2 3
Low-frequency Transformer 3-1 ratio, "Popular" Model, No. 297 ..	1 0 0
Panel Switch, No. 298 ..	1 6
Variable Resister, 5 ohms, No. 289 ..	3 0
Ebonite Front Panel, 21 x 7, drilled and polished, No. 299 ..	16 0
Ebonite Terminal Panel, 21 x 1½ ins., No. 300 ..	4 0

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Low-frequency Transformer, 3-1 ratio, "Popular" Model, No. 297 ..	1 0 0
Panel Switch, No. 298 ..	1 6
Broadcast Coil, No. 304 ..	7 6
Long-Wave Coil, No. 305 ..	8 6
Universal H.F. Choke, No. 288 ..	9 0
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Music and speech from the "Gem" is sparkling and brilliant—not muffled and lifeless. When you have a "Gem" Speaker, you do not have to make excuses to visitors about quality of reception—they, like everyone who listens to a "Gem," will say "Marvellous!" Cease torturing music; get a "Gem" on your way home.

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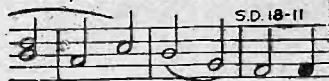
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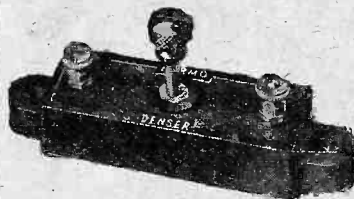


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See WIRELESS CONSTRUCTOR (CURRENT ISSUE) For Full Page Advt. also

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**SET OF THE SEASON
COSSOR MELODY MAKER
COMPONENTS FOR SAME
Post £4. 10. 0 Kit. Extra**

2 Ormond .0005; 2 Do S.M. Dials; 6 T.C.C. Condensers, .001, .002, two .0003, .0001, 2 mfd.; 2 Grid Lk. Clips, E.B.; 1 Var. B.B. Rheostat; 3 Dubilier Leaks, 25, 3, 4 meg.; 3 Lotus V.H.; 1 Ferranti A.F.3; 2 Pane Switches; 1 Cossor Melody Wound Coil; Terminals, Name Tabs, Glazite, 9-v Grid Bias (all as specified)

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The lot post free 42/- nett.
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2 Strips, 1 Coil Base, Screws, Bush, Flex, Spades, 8 Plugs, J.B. S.L.F. .0005, J.B. .00035, Climax H.F. Choke, 3 Valve Holders with Terminals, Panel Brackets, Set of Junit A.B.C. Master 3 Coils, On-and-Off Switch, R.I. Varley L.F., Ditto E.C. Unit, .0003 and 2-meg. Leak, and 3 Mullard P.M. Valves.

ABOVE KIT £6 17 6
FREE GRID BIAS, 9 VOLTS
100 VOLT H.T. (BRITISH)
with above. **ALUMINIUM PANEL, 18" x 7"**
AMERICAN CABINET, with Kit of parts.
Special prices 12/6, 15/-, 18/11. Carriage 2/- if cabinet ordered.

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Come to LEICESTER SQUARE TUBE
This address is back of Daly's Theatre.
Phone: Gerrard 4637.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1284.)

higher and shorter aerial. It would in all probability make a marked difference.

A slow-motion dial is a great help towards fine tuning, but the absence of such a dial is not the cause of 2 L.O. "trespassing." As you have already proved—from the fact that your one-valve "Progressive" pulls in the programmes from 5 G.B. Stuttgart, Langenberg, and Leipzig—the set is a wonderfully sensitive one. And consequently, when 2 L.O.—which is "only just across the river" from Penge—starts up on full power, your sensitive set seems almost "too strong." But you must remember that to get long distance it is essential for the sensitivity to be there; and, furthermore, that good as the "Progressive One" is, it will only become a real "reacher-out" when the H.F. stage (described by Mr. Dowding in his second "Progressive" article) is added.

Scores of readers have remarked upon the great increase in selectivity as soon as the H.F. amplifying valve is added to the one-valve set; and of course its programme-range is enormously increased by the addition of the high-frequency amplifier.

If, however, you are not able to add the second valve at the moment, we should seriously consider the question of a wave-trap. The "P.W." Standard Wave-trap, for instance, is easily made up, and it was designed for just such a purpose. Particulars of its construction are given in "P.W." No. 297, February 11th issue.

THE GRID CONDENSER.

L. S. D. (Whitechapel).—"I am mounting the new set in the old cabinet and upon the panel I have already got fixed a .0003 mfd. variable condenser. It used to be the tuned-anode condenser, but now I shall not want it and I wondered if I could use it for a grid condenser. Would it be all right and, if so, what would be the effect of "tuning" or varying it?"

It will be quite O.K. for you to use the variable instead of a fixed condenser as a grid condenser. For ordinary reception you will probably find that a variation of this condenser from "all in" to about "half way in" makes very little difference, although when turned all out or nearly all out results become unsatisfactory owing to grid choking, which leads to distortion. If, however, you intend to use the set for long distance it is quite likely that you will find that variation of the grid condenser will be of material assistance in strengthening up a weak station.

2-VOLT VALVES FOR THE "TOURIST" TWO.

T. BARKER (London).—"Only the R.C. and the H.F. valve in the 6-volt class were given in the description of the 'Tourist' Two which appeared in POPULAR WIRELESS, No. 278. Can the same class of valves be used from the 2-volt series? If so, what variable resistance for the 2-volters is required?"

It will be quite all right to use a 2-volt H.F. valve for the first position and a 2-volt detector for the second position. Corresponding to those in the 6-volt class which have been named, you could use in the Mullard range a P.M.1A or a P.M.1H.F. for the first valve, and for the second valve a P.M.1L.F. Similarly, the 2-volt Cossors would be 210R.C. (blue band) for the first stage, and a 210 Detector (black band) for the second stage. If you decide on the Marconi or Osram valve the first one should be a D.E.H.210, and the second one should be a D.E.L.210.

Speaking generally, any good "H.F." valve in the 2-volt range will give good results in the first position and any good 2-volt "detector" in the second.

Regarding the variable resistance to be employed for these valves, it is becoming quite common with valve manufacturers to place such reliance in their filaments that variable resistances are unnecessary. When the filaments of valves were very delicate it was essential that they should be run at exactly the right temperature or there was grave risk of destroying them. This objection does not now apply and most valve makers claim that their valves will run as well from a newly-charged accumulator as from a partially discharged one, the slight variations in voltage between these two states making very little difference to the efficiency of the valve. If, however, the manufacturer you have in mind specifically recommends the use of a filament rheostat we should use one of quite low resistance, say, having a maximum of 5 or 6 ohms.

THE VOLTS ON THE VALVE

T. H. (West Ham, London, E.15).—"I have built up a three-valve set, Detector and two L.F., from the Blue Print No. 20. It is working

quite satisfactorily. In the last stage I am using a Cossor power valve with 100 volts on the plate, but what I cannot make out is this. When I measure this last valve and test the voltage with a high-resistance voltmeter it registers only 60 or 70 volts. If I disconnect the loud speaker and short circuit the two terminals then it registers 100 volts. So this means that the loud speaker absorbs 30 to 40 of my volts. Is this quite O.K.? There is just the same drop of voltage when I use a pair of headphones."

Yes, it is quite O.K., T. H., and it happens in every case that the full voltage of the H.T. battery is not applied to the plate of the detector valve. This is not generally realised, but your test with a voltmeter shows it up clearly. In order to get the 100 volts effective upon the plate you would have to use a battery of more than 100 volts, in order to overcome the effect of the resistance which is in series with the valve.

It is because there is a voltage drop in the circuit that it is generally possible to increase the maximum voltage from a battery above that which the makers recommend for the particular valve in order to get best results. According to Ohms law, the voltage across the valve itself can never be the full voltage of the H.T. battery while there is any resistance in series in the same circuit, and, of course, the loud-speaker or the telephone winding represents a pretty high resistance, so that it is inevitable

Have You Built The COSSOR MELODY MAKER

or the
R.C. THREESOME
or the

MULLARD MASTER THREE?

If you have you can be sure
you will find a

PICTORIAL BLUE PRINT of one or all of these sets extremely useful.

YOU CAN HAVE ONE FREE
with the issue of

MODERN WIRELESS

Together with a long instructive article
on the above sets.

ON SALE - MARCH 1st

that there should be an apparent large decrease of the voltage actually applied to the valve itself. Consequently a valve rated at an anode voltage of 80 may work best when the battery plug is at a much higher figure.

THE NOVEL ONE-VALVER.

R. J. W. (Market Harboro', Leics.).—"Whilst I was staying with a friend in London we called at another friend's house and listened to his wireless set. It was only a one-valve set, but in the short time that we were there it tuned in both English and Continental broadcasting, and it seemed easy to handle and more efficient than my own set, which is a two-valver. I was so struck with its performance that I would like to build it for myself. On enquiry I find that the circuit used was the "Novel" One-Valver that was described in POPULAR WIRELESS

(Continued on page 1288.)

* LORDS OF THE LONG BOW *

For lying on the grand scale the palm must be awarded to Dr. Frederick Cook, the American explorer, who, in the year 1909, became the temporary centre of attraction for the whole civilised world as "discoverer" of the North Pole.

Stories of men who have tried to hoax the world are many and varied. Some of the most noteworthy are being related in a short series beginning in the current issue of "The Weekly Telegraph." They make capital reading. Pride of place is given to Dr. Cook.

RESULTS PROVE

OVERWHELMING SUPERIORITY OF "NEGROLAC" AERIAL.

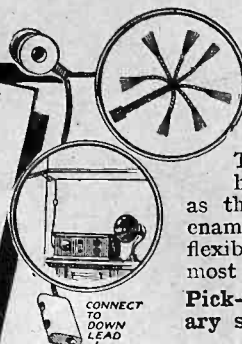
"GOLSTONE," "NEGROLAC" (Regd.) AERIAL is the outcome of a long series of experiments and research in Radio reception. Unprejudiced reports and experts tests establish the following results:—

25% increase in volume of reception.
Selectivity improved beyond measure.
Distant stations, hitherto unobtainable, brought in at loud-speaker strength.
Constant tuning.
Immunity against acid and chemical-laden atmosphere.
High insulation and protection against surface leakage.
Easier to handle than 7/22 Aerial Wire—will not kink.
Prices: Coils of 50 ft., 9/-; 80 ft., 15/-; 100 ft., 18/-. From all leading stores. REFUSE SUBSTITUTES.

Extract from "Popular Wireless," February 4th, 1928.

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Each Aerial complete with Reel Insulators and insulated connection for down-lead.

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The Saxon 3-Valve Loud-Speaker Set is the finest 3-valve set that money can buy. Very few 4-Valve Sets can equal the performance of the SAXON 3, either for purity, volume, range or selectivity. 48 stations at our Works (more than half at good loud-speaker strength). Daventry on loud speaker 1,200 miles away, 20 stations in Devonshire, 35 in Torquay, and over 20 stations on loud-speaker in the Orkney Islands have actually been received.

All latest improvements are incorporated—no coils are required, as the new SAXON all-wave tuner covers all wave-lengths from 200 to 2,000 metres by merely turning a knob.

Easily built by any beginner in two hours, all panels are drilled and most of the components assembled ready for wiring. No soldering required.

24-page instruction book and wiring diagram 3d. post free.

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A WONDERFUL 3-VALVE LOUD SPEAKER SET

OVERNIGHT BATTERY CHARGER

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WHICH COST ONLY **31/6**

Write or call to-day for full details as described by Mr. J. R. Wheatley in "Popular Wireless," page 1275, Feb. 25th.



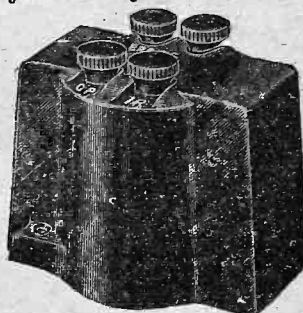
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which are destined to be the New Valves for the New Year. It is the Valve you've long been waiting for. It is the *really long life* Valve. It guarantees perfect reception at minimum cost and consumption. Filament Volts 1.6-1.7 Filament Amps. 1 Price 6/6. Also made to take 4 volts at same price. Other types available. New K. Type made with ebonitesockets 2volts. Now use only 2 instead of 3. Price reduced from 4/11-4/6. All valves sent Post Free or C.O.D. Plus 6d. Full particulars on request.

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New Prices: Jars, 1/3. Sacs, 1/2. Zincs 11d. Sample doz. (13 volts), complete with electrolyte, 4/3. post 3d. Sample unit, 6d. 16-page booklet free. Bargain list free. AMPLIFIERS: 1-valve, 19/-; 2-valve, 30/-. 2-valve ALL STATION SET, £4.-P. TAYLOR & Studley Rd. Stockwell London



KAY'S CABINETS
This Cabinet, 36" x 15", for panels 18" 19" or 20" x 9", can be adapted to other sizes at slightly extra cost, or supplied with shelf to house your set. Strongly made of Oak and polished rich Jacobean

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Quotations for "Specials" by return.
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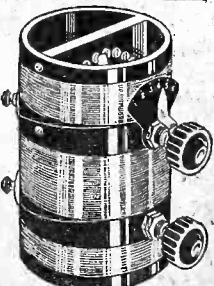
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To all purchasers of our "All-Wave" Ebonite Tuner, wave-length 180-2,000 metres. Combines a six-point switch with a variable reaction, wound with silk-covered wire, brass parts nickel-plated, size 4 3/4" x 3 1/4", two-hole fixing. The smallest, neatest and most efficient tuner on the market. Satisfaction guaranteed or money returned. Price only 15/-, post free. Cash only 15/-, post free. O.O.D. Send now direct to the maker.

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RADIOTORIAL QUESTIONS AND ANSWERS

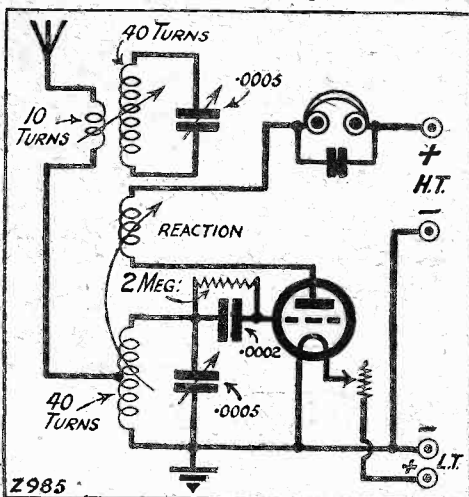
(Continued from page 1286.)

some time ago. As I do not understand diagrams, would you mind telling me the connections of this set in words? And also if any parts besides the following are required? Coil holder, '0005 variable condenser, grid condenser and leak, valve holder and valve, rheostat, telephones, and the usual batteries."

All the components necessary to build the set are named in your list, and the point-to-point connections are as follows:—Aerial to one side of the single coil holder, to the plate circuit of the valve holder, and to one telephone terminal. Remaining telephone terminal to H.T. positive. H.T. negative to L.T. positive and to rheostat. Other side of rheostat to one filament of the valve holder. Other filament leg of the valve holder to L.T. negative to one side of the variable grid leak, to earth, and to one side of the variable tuning condenser (.0005 mfd.). The remaining side of the tuning condenser (.0005 mfd.) to the remaining side of the single-coil holder and to the grid condenser (.0002 or .0003 mfd.). The

A SELECTIVE ONE-VALVE SET.

(With Wave-trap.)



The correct connections of a selective one-valve set are shown above.

In the "What is Wrong?" diagram last week the aerial lead was earthed instead of being connected to the grid coil. The grid leak, the grid condenser, and H.T. negative were omitted, and the absence of a by-pass condenser might have given rise to a failure to oscillate.

(Note.—The next "What is Wrong?" diagram will appear next week.)

final connection is from the grid socket of the valve holder to the remaining side of the variable grid leak and the grid condenser.

THREE FAMOUS SETS.

P. J. W (Lowestoft).—"I find one of the biggest troubles in wireless is to know *which set to build*. The recent article on the 'Master Three' was a great help in this respect, but the trouble with some of these sets is to find out what circuits they employ, as some of the makers don't say on their literature."

If you have the "Cossor Melody Maker" or the "R.C. Threesome" in mind, as well as the "Master Three," you will find full circuit details of all these popular designs and a free pictorial Blue Print of them in the March number of "Modern Wireless" (on sale March 1st, usual price, 1s.). Mr. Dowding, our popular Technical Editor, has written a long article on these receivers, and he includes operating and constructional hints as well. You should make sure that you obtain this March issue of "Modern Wireless," for it will prove of peculiar interest to you in the circumstances.

Back Numbers of "Popular Wireless" are obtainable from The Amalgamated Press Ltd., Back Number Dept., Bear Alley, Farringdon St., London, E.C.4. Price 4d. per copy, post free

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A Balancing Condenser Capacity Reaction Control and Vernier Condenser.

The Gambrell "Neutrovernia" combines all these uses and gives equally excellent results in either capacity. It cannot short. Capacity approximately 2/38 m/mfds. Dustproof. Uniform increase or decrease with each turn of the knob. Can be mounted on panel, baseboard, or through panel. Used and Recommended by many eminent designers.

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A PERFECT WET H.T.

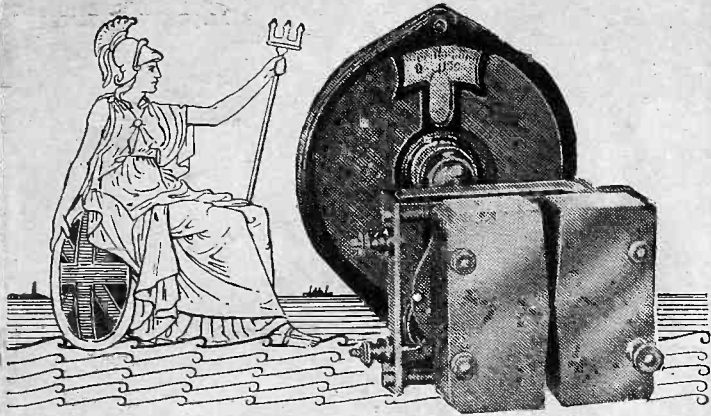
Obtained with our Insulating Liner, which eliminates all "Local Action." Price 4d. doz. Self-Charging Cells. 3 Doz. 45 volts Minimum. Packed in Special Divided Carton. Suitable as Container. Post Free 10/- Double Capacity 13/- with terminal top Sacs 2/3 extra. Liners included Free. Send 6d. for Complete Cell Instructions, Particulars. We stock Goodman's Cone Parts and Units. Cossor Cabinets, Mahogany Finish 17/6 only.

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RIPAULTS LATERAL ACTION CONDENSERS

These are the Condensers specified for
THE "ECONOMY FIVE"

Fully described in "Popular Wireless" of Feb. 11th, 1928.

Note the big differences in the construction of this condenser over all others. The usual swinging plates, needing so much space on the panel, are eliminated by a cam moving the plates with a lateral action, thus saving a great deal of space. Space occupied at back of panel is only 3½" by 2½".

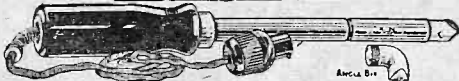
The Slow-Motion Dial scale reads to 360 degrees, which gives exceptionally wide spacing on the lower wave-lengths. Ripaults' Lateral Action Condensers allow a very minute variation of capacity for a single degree on the dial, and permit of an assembly that eliminates loss and self capacity.

In up-to-date Sets Lateral Action is the secret of the skilful tuning that brings in Stations "all round the Dial." Witness the fact that many Sets designed by the Technical experts of the Wireless Journals are specifying Ripaults Lateral Action Condensers where great selectivity is required.

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In this envelope—obtainable at all bookstalls, price 1/6—will be found full constructional details of a magnificent and inexpensive receiver, called

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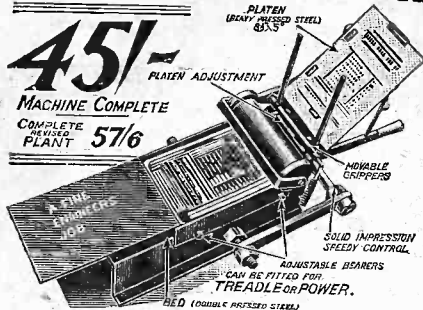
Made of standard parts, all easily obtainable, it is a highly-sensitive long-distance set, giving powerful reproduction of wonderful quality. Covering both long and short wave-lengths, with a switch for 3 or 4 valves, it is essentially a set to enjoy, both in building and operation.

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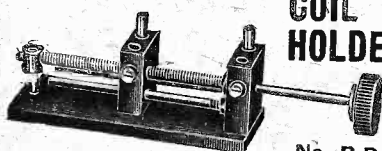
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Parallel working. Fine adjustment. Worm driven. Coils cannot fall. Easy movement. Perfect finish. Of all high-class radio dealers or by insured post 4/6, from Sole Makers:

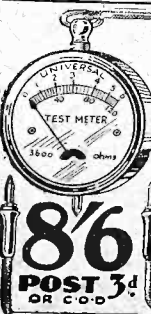
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This water-cooled, automatic feed, plated META pocket Burner No. 20 is ideal for soldering wireless parts. Gives a clear flame—no smoke. Complete as shown, 4/6. **FREE.** If you cannot obtain META Products locally, send for generous trial of META Solid Fuel, and descriptive booklet, stating dealer's name.

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APPARATUS TESTED.

(Continued from page 1282.)

current it does not bend. It is very easy to over-run a milliammeter. You take out one of the grid-bias plugs and over swings the needle.

In many cases this has the effect of bending the needle, and after this a meter is, if not totally useless, quite unreliable. The Ferranti milliammeter is in every way a sound design. It might be slightly more expensive than many on the market, but it should be remembered that it is a precision instrument. And, additionally, it is a precision instrument capable of retaining its accuracy under adverse conditions.

A WET H.T. BATTERY.

The Wet H.T. Battery Co., of Brownlow Street, London, W.C.1, recently sent us one of their larger types of wet H.T. batteries. It consists of 60 of their No. 3 Standard Cells and gives 90 volts. This battery was tried out under normal radio reception conditions. It was employed in conjunction with accumulator H.T. to operate a powerful five-valve set employing a super-power valve.

The H.T. current required by this set when working properly is 25 milliamps. For a few days after placing the battery in operation there was a certain amount of fluctuation, current dropping from 25 milliamps after a period of about one hour to 23 milliamps, and then rising to about 24. But after about a week the outfit settled down to its work and delivered a steady 25 milliamps for the periods of three and four hours that the set was in use. Since then there have been no appreciable variations, and the battery has continued silently and steadily to function. A wet battery of this nature appears to be an ideal solution to the H.T. problem where large sets are in use, and where there are no electric-supply mains or charging facilities.

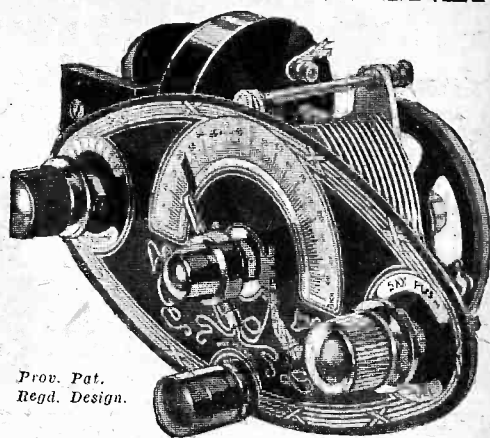
CHEAP GRID LEAKS.

It is not so very long ago, comparatively speaking, that grid leaks cost as much as 9s. 6d. each, and many amateurs were compelled to make their own with pencil lines and paper, seldom with satisfactory results. As a commentary on present prices we have the new Pye grid leak, due to the well-known Cambridge firm of this name, which retails at 1s. A range of seven values from .25 megohms to 3 megohms is available at this price.

The component is of the conventional tubular type with metal end-caps, but, additionally, at each end is a short length of soft copper wire. These wires can be soldered directly on to terminals or other leads or can be twisted with the fingers into loops so that they can be slipped under terminals. A very ingenious scheme, and one which will commend itself to amateur constructors.

These very cheap grid leaks also appear to be perfectly efficient and the ones submitted to us for test were found to have values substantially as stated. If every one issued is similarly reliable and accurate Messrs. Pye should do a roaring trade in these "bob" grid leaks.

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12x 10, 3/-	14x 10, 3/5
14x 12, 4/-	16x 9, 3/6
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ARE USED IN ALL THE
BEST SETS

INCLUDING THE
FAMOUS

'IMPERIAL TWO'

(LOUD SPEAKER RECEIVER)

NEWS FROM SAVOY HILL.

(Continued from page 1278.)

to broadcast an appeal on behalf of Virginia House Holiday Camp, which is held annually during August at Maker for some 200 children living in the poorer districts of Plymouth.

Szigeti at Sir Henry Wood's Concert.

Though he has lived and played extensively in this country for a good many years, Szigeti, the famous violinist, to whom Sir Hamilton Harty dedicated his one and only violin concerto, has never appeared before the microphone. That he will do so on Friday, March 9th, will make the National Symphony Concert, which Sir Henry Wood is conducting at the Queen's Hall, all the more interesting, and indeed important, particularly as the piece chosen for him is Beethoven's Concerto.

The novelty of the evening will be a new suite of four impressions, inspired by scenes depicted in stained glass windows, to which its composer, Ottorino Respighi, has given the title "Vetrata di Chiesa." Another work of outstanding interest in the programme is Frank Bridge's Symphonic Suite "The Sea," which was first produced in 1912 at the Queen's Hall "Proms," and is published in the Carnegie Collection of British Music.

An Ellen Terry Birthday Party.

To commemorate the 80th birthday of Ellen Terry, a special programme, consisting of Shakespearean scenes in which the great actress excelled during her stage career, is being arranged by the Dramatic Department of the B.B.C. on Monday evening, February 27th, when it is hoped several members of the Terry family will take part. A musical programme will also be broadcast under the direction of John Ansell, this being a repetition of that given at a Festival Dinner in Honour of Miss Terry at the Hotel Cecil on June 17th, 1906, when Mr. Ansell was the conductor.

Herman Scherchen for March 4th.

A Symphony Concert, under the direction of Herman Scherchen, who, it will be remembered, conducted one of the Albert Hall National Concerts last season, which was incidentally his first British appearance, has been arranged for London listeners on Sunday afternoon, March 4th. The outbreak of the War found Scherchen occupying the post of conductor of the Symphony Orchestra at Riga, with the result that he was imprisoned in Russia.

On regaining his freedom in 1918, he founded the New Musical Society in Berlin, and four years later was appointed conductor of the Frankfurt Museum Concerts. To-day he is regarded as one of the leading German musicians. The programme on March 4th will include a novelty in England, the Hindemith Concerto for Orchestra and Delius' Cello Concerto played by Beatrice Harrison.

Curios in 2040 !

Mr. Richard Hughes, the radio dramatist, will talk on Friday evening, March 9th, on antiques and curios in the year 2040. This talk will, of course, be somewhat of a fanciful nature, and one which even the youngest of our listeners can hardly expect to test as to the accuracy of Mr. Hughes as a prophet.

BRITAIN'S CHOICE for BRITAIN'S FAVOURITE 3
(Amateur Wireless Jan. 28th.)

In this set ease of construction is the keynote, with great purity and considerable selectivity. Naturally, the designer specifies Benjamin Valve Holders.

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(Modern Wireless, January)

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THE SUPER SIX
(Amateur Wireless January)

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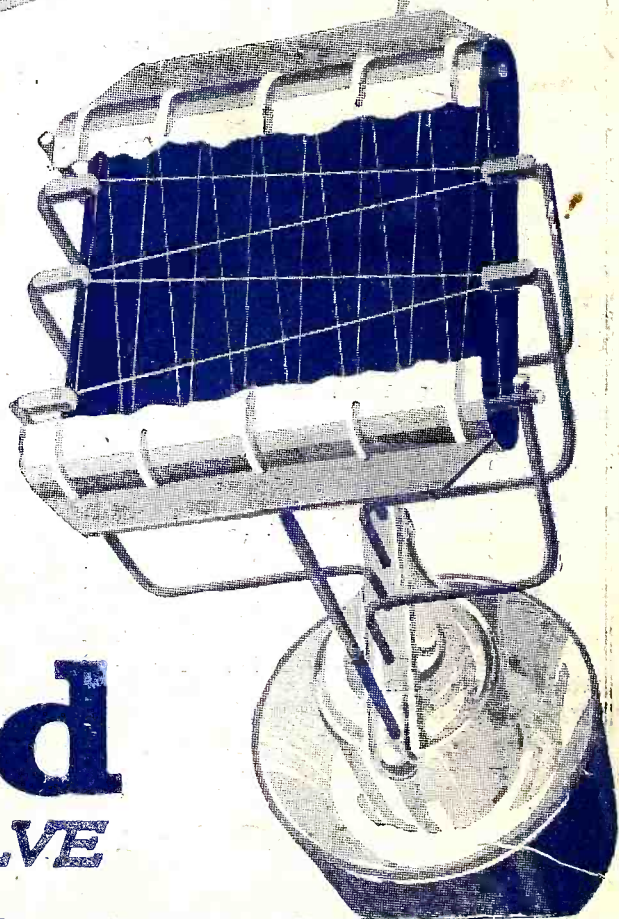
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