The Wireless Constructor

6D MONTHLY

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

Vol. III. APRIL, 1927 No. 6

HOW TO BUILD The "RADIANO" SILENCER

IN THIS ISSUE

A Simple and Efficient Wavetrap

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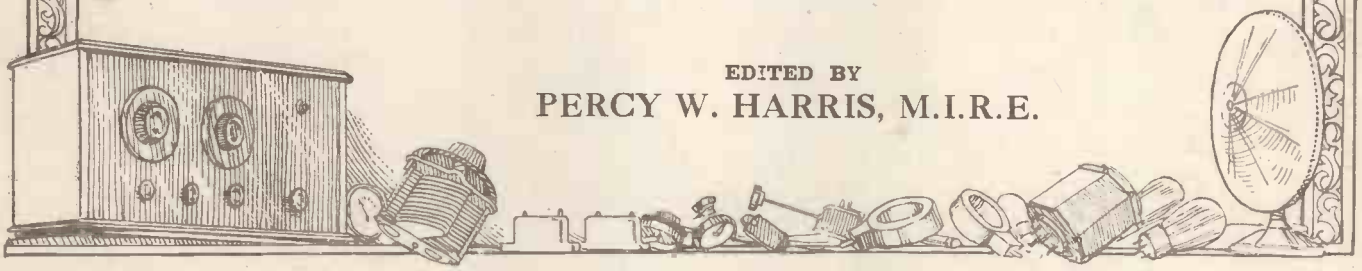

EDITED BY
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The WIRELESS CONSTRUCTOR

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OUR NEWS BULLETIN

Some Notes and Comments on the most interesting News of the Month.

Another League of Stations?

I see that an important International Radio Conference is going to be held in Washington this year—probably in September. In order to solve the problems of heterodyning, overlapping, wave-length pinching, oscillation, and so forth, all the experts are going to get together, together, together—And the more they get together, the better it will be! (At least, that's what the Frothblowers say.)

The Concert of Europe

In spite of all the pessimists' talk about radio going to the bow-wows, 1927 has already shown some surprising developments. One amazing thing is the way in which new stations still keep cropping up all over the world. At no time in the history of radio has the list of prospective broadcasting stations been so considerable as now.

Just over a year ago a new European station was quite an event for listeners, but now there are about one hundred new stations definitely planned—and goodness only knows how many more are in the offing.

5 X X's "Son"

At the time of writing "Daventry Junior" is the most interesting newcomer to watch. This station is getting ready to transmit on about 400 metres, and is to be the official testing station for the B.B.C.'s new regional scheme for alternative programmes. Using moderate power (greatly in excess of that now employed by the main B.B.C. stations, but less than 5 X X uses on 1,600 metres) the range of the transmitter will be about the same as that of the German stations, which, by the way, continue to thump in with surprising vigour.

Radio on the Air Liners. Students at Chelmsford Training College being instructed in transmitting work.

Electricity Bill to Boom Radio

One of the really big developments of the future, which so far seems to have escaped general attention, is that arising out of the new Electricity Bill. If the whole country is to have cheap electric power, and the supply-frequency is to be standardised, think what the result will mean to radio. It will then be possible to design a set that can run direct off the mains without any battery bother whatever, and the set will be capable of working in any part of the country. In fact the new Electricity Bill promises to revolutionise British radio.

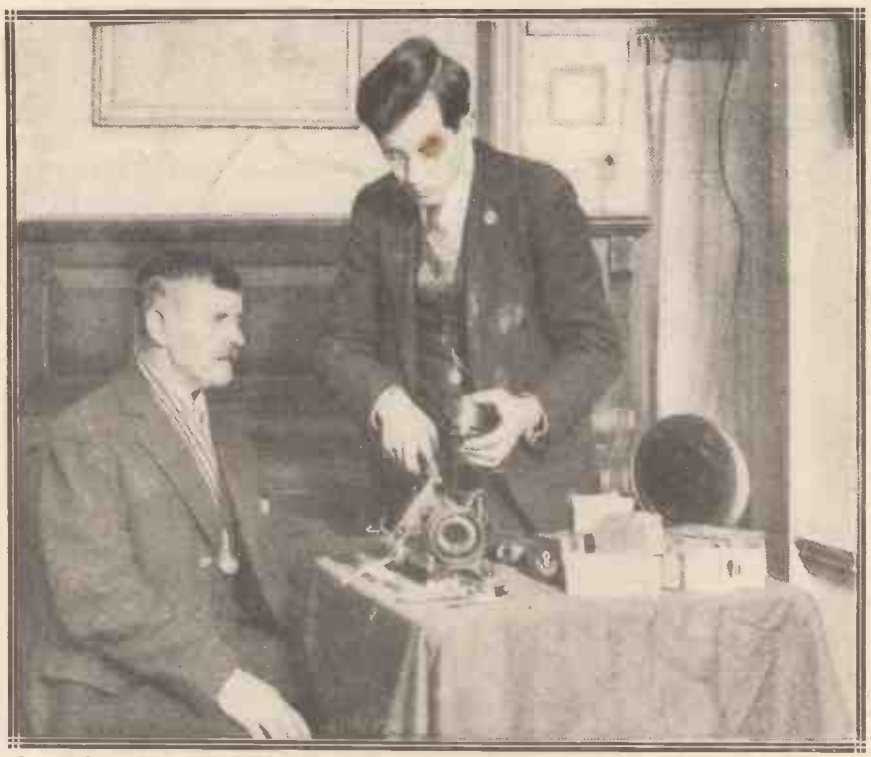
Searching for Programme Liveners

Is the new B.B.C. learning wisdom?

Our News Bulletin—*concluded*

Some time ago they had the gall to announce that some splendid new *talks* were being arranged, and listeners promptly groaned in horror, and ungratefully groused about Grand Guignol programmes.

But now comes the glad tidings that Mr. Jack de Freece has been appointed to comb out the music-halls with a fine comb in search of fluff-stuff and programme-liveners. There must be numbers on the halls who possess unsuspected microphone talent, and if Mr. de Freece can dig them up he will have qualified as a Universal Benefactor, and a first-class High-stepper.



A member of the Tottenham Radio Society making a wireless set for a blind friend.

Empire Broadcasting

I hear that Senatore Marconi is very hopeful about the adaptation of the new "beam" telegraph services to carry telephony, instead of just dots and dashes. It has been suggested that perhaps the Duke of York's speech at the forthcoming opening of the Australian Parliament might be "beamed" over to England and relayed from all stations. Whether or no this comes off, the news that the B.B.C. is now contemplating a short-wave station—to keep remote parts of the Empire in touch with British broadcasting—has been received with tremendous enthusiasm by overseas Britons.

Pleasing the Prince

In one of the happiest speeches he has ever delivered, the Prince of Wales recently paid a high tribute to the success of the transatlantic wireless telephone. Listeners may remember that when the Prince finished his Presidential address to the British Association last year, the hope was expressed that his year of office would be marked by some striking achievement. "And everybody," said the Prince, "looked so hard at me that I began to feel I was expected to do something about it there and then." . . .

Royal Tribute to Radio

Now electrical engineers have fulfilled those hopes of striking developments, and the year has been hall-marked by the triumph of ocean telephony. The Prince confessed to feeling very pleased about it all, and his audience—he was speaking to the Institution of Electrical Engineers—were delighted by this royal tribute to the rapid progress made by radio.

Hale Circuit Successes.

That Hale circuit is proving to be what the Americans call a "wow." Earl Russell tells me that recently he has been trying it (with one-valve L.F. amplifier) at Petersfield, Hants, and has been getting splendid results. London and Daventry come in at good strength; whilst several of the Continental stations, notably Frankfurt, can be heard easily upon the loud speaker.

Bombay Calling

"Uncle Leslie," late director of the Hull relay station, and one-time private secretary to Edgar Wallace, the famous novelist, has been appointed director of the new Bombay station.

This will be the first station operating for the Indian Broadcasting Company, and it will probably be on the ether before August.

Crystals that Blow Candles Out!

Those enthusiasts who maintain that there is more in the good old crystal than meets the casual optic, are delighted with Dr. Meissner. This worthy Doc. was lecturing recently to a scientific society in Germany, when he staggered his audience by announcing that he had trained a crystal to blow out a candle!

"Hoch der Doc.!" cried the excited scientists—or words to that effect—and then the lecturer explained how it was done. . . .

And So To Bed!

Apparently Dr. Meissner had placed a quartz crystal between electrodes excited by a powerful oscillator. When in resonance, air currents are produced at the sides of the crystal, and these are strong enough at times to "dowse the glim" of a small candle!

Moreover, the Doctor states, if in the mood the crystal will sometimes "rapidly rotate" between the electrodes, when the E.M.F. is high enough!

In fact, there seems no end to the possibilities of crystals, and now I should never be surprised to hear of one that not only rotated, oscillated, and blew the candle out—but got into bed as well!

SAVOYARD.

Build the Radiano Silencer!

A SIMPLE EFFICIENT WAVETRAP

by Percy W. Harris
M.I.R.E.

THE Radiano Silencer is a very simple and inexpensive instrument, which, when attached between the aerial wire itself and the aerial terminal of your receiver, will silence the local station and enable you to receive without interference practically any other station within range of your set. By means of the new Radiano system, described for the first time in last month's WIRELESS CONSTRUCTOR, it can be built rapidly and efficiently by even the beginner in wireless, while many more advanced readers will be glad of the design.

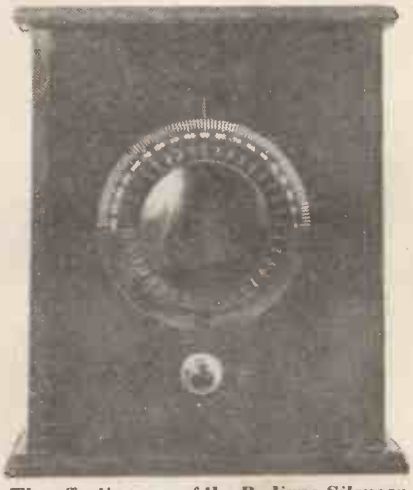
There are many forms of wave-trap, varying in complication, ease of handling, and efficiency, but all are designed with the same purpose—to improve the selectivity of the receiver. A wave-trap will not *increase* the sensitivity of a set, and if your receiver is not already capable of picking up distant stations when the local station is not working, then a wave-trap will be of little value to you; but if, as is frequently the case, you have been able to hear other stations in the intervals of silence of the nearer transmitter, the Radiano Silencer will act as if the local station had shut down at your request, leaving the ether free for the reception of these distant stations.

Extremely Good Results.

For the benefit of the more advanced reader the theoretical circuit is given in Fig. 1, from which it will be seen that an auto-coupled circuit is used, with a centre-tapped plug-in coil. I would like to take this opportunity of referring to the excellent and painstaking experimental work on wave-traps carried out by Mr. C. P. Allinson, M.I.R.E., who, as a regular contributor to WIRELESS CONSTRUCTOR, is well known to my readers. During a lengthy series of experiments on the relative selectivity and efficiency of a number of types of traps, Mr. Allinson found that a circuit similar to that used in the Radiano Silencer gave the best all-round results, and this I can personally confirm.

Constructional Details.

The inclusion of a simple "on-and-off" switch on the front of the panel of the Radiano Silencer enables the trap to be cut out in a moment. The instrument can, therefore, be left permanently connected up to any receiver with which it is likely to be used. Whenever it is desired to cut out the local station, the switch is pushed in, whereupon the local station disappears just as effectively as if the transmitter had broken down! The sensitivity of the receiver will not be affected, except in the immediate vicinity of the wave-length of the local station (a few metres on either side), although the calibration with some receivers may be slightly altered a few degrees, as will be explained a little later.



The effectiveness of the Radiano Silencer should not be judged by its remarkable simplicity of control.

COMPONENTS REQUIRED

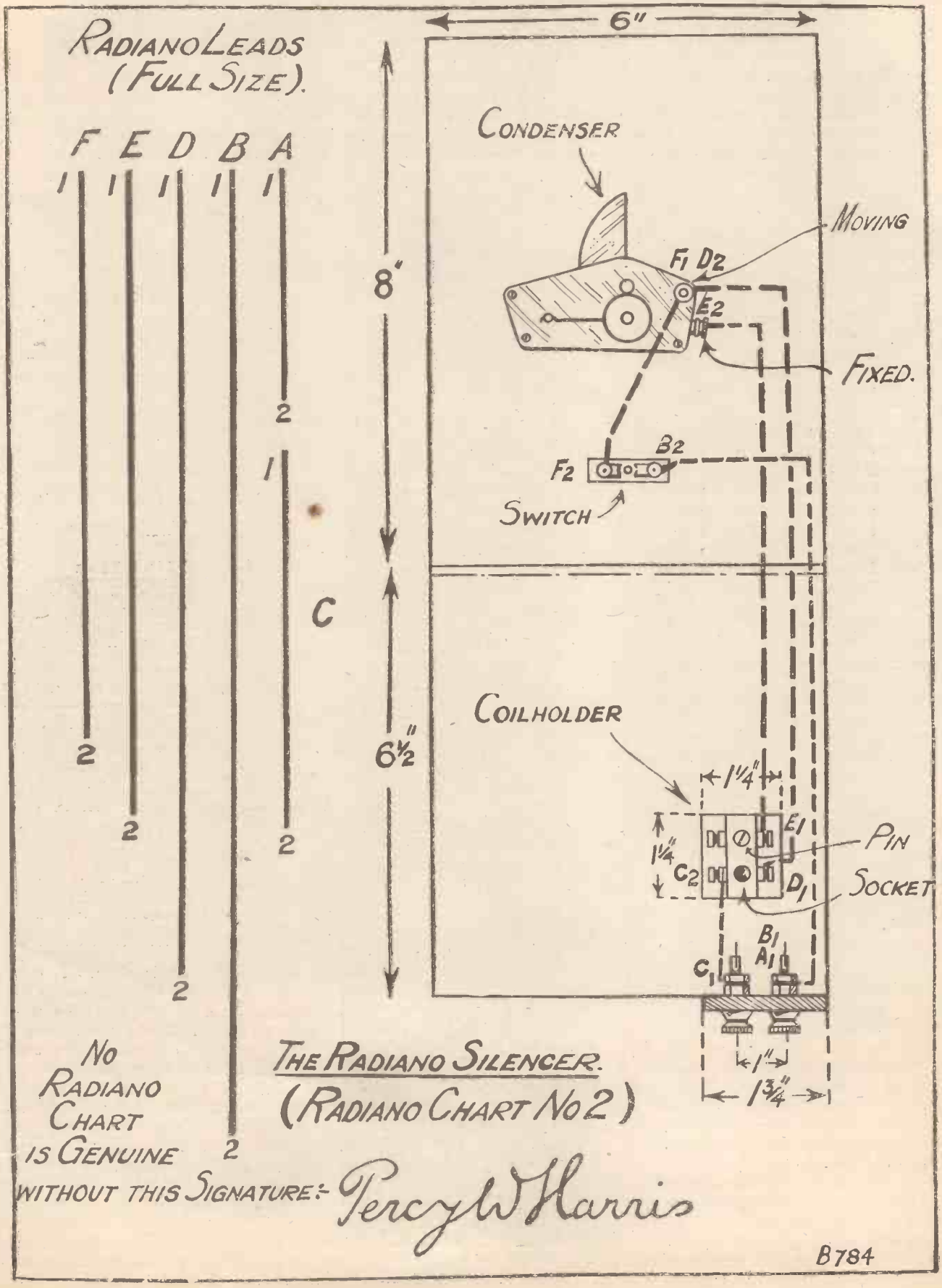
1 ebonite panel, 8 in. x 6 in. x ¼ or ⅛ in., of any good guaranteed make.
1 suitable cabinet for same, not less than 7 ins. deep from front to back.
1 variable condenser, ·0005 mfd., with vernier movement. A Brandes is shown.
1 on-and-off switch.
1 baseboard-mounting coil socket.
Small ebonite strip with two terminals and double nuts.
Centre-tapped plug-in coil. Gambrell centre-tapped C or Lissen centre-tapped, No. 60.
1 doz. pinch-on brass tags.
Baseboard to suit cabinet.
Rubber-covered flex wire for connecting links.

SPECIAL NOTE.

For Radiano construction the various components MUST HAVE TERMINALS, under which the tags can be screwed.

The constructional work could scarcely be simpler. It consists in drilling one hole in the front panel large enough to take the spindle of the variable condenser, two small holes to take the wood-screws for holding the panel against the front edge of the baseboard, and a further hole to take the on-and-off switch. The small ebonite strip carrying the terminals, measuring about 2 in. by 1½ in. deep, is fixed to the back of the baseboard with two wood-screws, and two small wood-screws secure the coil socket to the baseboard.

If you use a Brandes condenser be sure to mount it in the correct


RADIANO LEADS (FULL SIZE).
F E D B A
2
C
8"
6½"
6"
CONDENSER
MOVING
F1 D2
E2
FIXED.
B2
F2
SWITCH
COILHOLDER
1¼"
1¼"
E1
PIN
C2
D1
SOCKET
B1
A1
C1
1"
1¾"
THE RADIANO SILENCER.
(RADIANO CHART No 2)
No RADIANO CHART IS GENUINE WITHOUT THIS SIGNATURE:-
Percy W Harris
B784

Build the Radiano Silencer—*continued*

manner. On removing the condenser from the packing box you will find a screw in the edge of the vernier knob. This should be released, whereupon the vernier knob comes off the spindle, revealing a small nut underneath, which, in its turn, secures the dial to the spindle. Remove this nut and carefully unscrew the dial from the shaft. You will then find

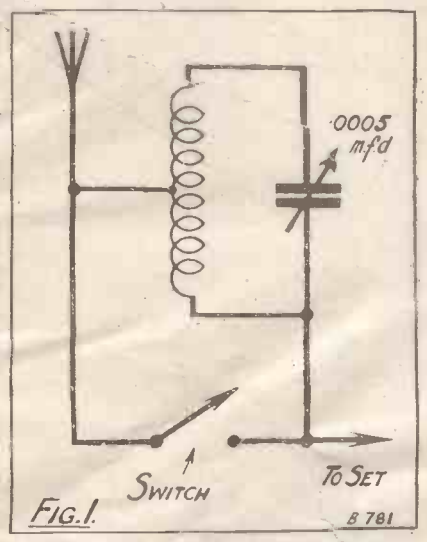


FIG. 1.

a threaded bush on the shaft, and this should be unscrewed and removed, together with the fibre washer, which need not be used.

Probably your biggest drill will be a ⅜-inch diameter. Make the hole of this size and then, with the end of a file or some other means, enlarge the hole so that the bush will just pass through it, allowing the flange to press against the front of the panel. When the hole has been made the correct size to allow clearance for this bush, the latter can be taken out and the condenser spindle inserted from the back of the panel. The bush then is screwed into place and tightened.

Only Six Connections.

The dial is now screwed on to the shaft, but not so far as to bring it in contact with the panel. In adjusting the dial position, see that the figure 180 is vertical and that simultaneously all the plates are in mesh. The securing nut can then be fixed in position, thus holding the dial tight. The final step is to place the vernier knob on the shaft and to secure it in position by means of the grub-screw in the side of the knob.

Other good condensers can, of course, be used, but the tuning is so sharp that without some vernier movement the beginner will find the Silencer difficult to handle. For this reason choose either a condenser with a good vernier motion, or an ordinary type of condenser with a good vernier dial. Either will give satisfactory results.

There are only six Radiano leads to make. These are prepared by cutting off lengths of rubber-covered flex to the dimensions shown on the Radiano Chart, baring ⅜-in. of the wire at each end and pinching on the tags, of which you will need just a dozen.

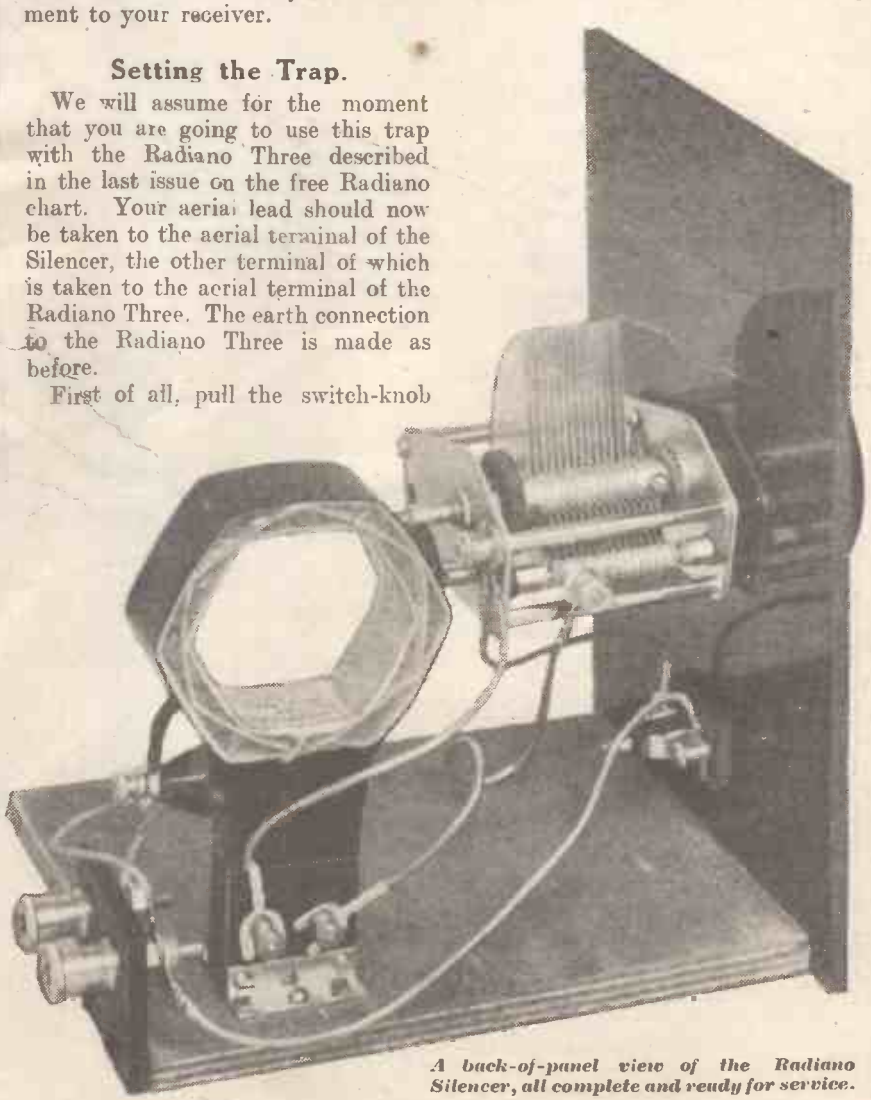
Tag A1 is screwed under terminal A1, tag A2 under terminal A2, and so forth until all leads are in position. The Silencer is now ready for attachment to your receiver.

Setting the Trap.

We will assume for the moment that you are going to use this trap with the Radiano Three described in the last issue on the free Radiano chart. Your aerial lead should now be taken to the aerial terminal of the Silencer, the other terminal of which is taken to the aerial terminal of the Radiano Three. The earth connection to the Radiano Three is made as before.

First of all, pull the switch-knob out. This cuts the Silencer out of circuit and joins the aerial lead straight through to the Radiano Three. Tune your Radiano set as usual—not directly to the local station, but to some position fairly near to it at which the local station is still very loud. Now push in the switch on the Silencer and, without altering the Radiano Three, slowly turn the dial of the Silencer until the sound of the local station completely disappears. You will find this point fairly readily, and you will notice that you can tune right past it and again come into a zone where the local station is heard as before. Turn back again, and leave the trap exactly on the point where the local station is inaudible.

The effect on the Radiano Three will be almost magical. The selectivity

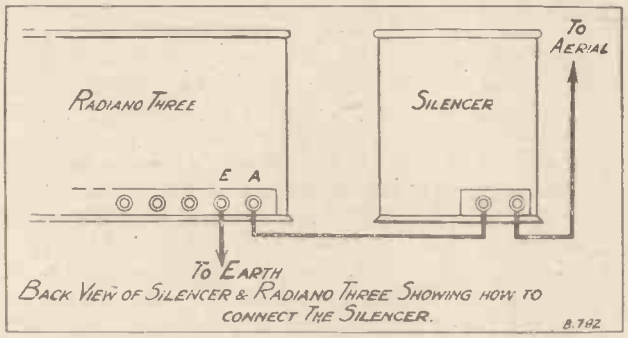


A back-of-panel view of the Radiano Silencer, all complete and ready for service.

Build the Radiano Silencer—*concluded*

will go up enormously, and by careful searching you will probably be able to find quite a number of other stations which either you have not heard before at all—if you live very near to a transmitter—or have only heard when the local station is not working. How close to the wave-length of your local station you will be able to hear other stations depends upon your own position; for example, if you are only a couple of miles from the local transmitter then the Silencer will not be quite so effective as if you were further away, but in any case, and wherever you are, the effect of the Silencer will be to make a huge improvement in the selectivity of your set.

With the Radiano Three the effect of the Silencer on the calibration is very small and will not alter it more than two or three degrees. This means, that if previously without the trap you have heard a station on, say, 120°, but badly interfered with by the local station, you will now hear it on, say, 116°, but with no interference. When the Silencer is used with a direct-coupled receiver the alteration of the calibration may be more marked, but you will always find the station wanted by retuning. The addition of the Silencer will also alter the reaction setting, but you will soon find how much alteration is needed, after a few experiments.



For best results it is usually necessary to keep the silencer a little distance away from the main set to avoid interaction.

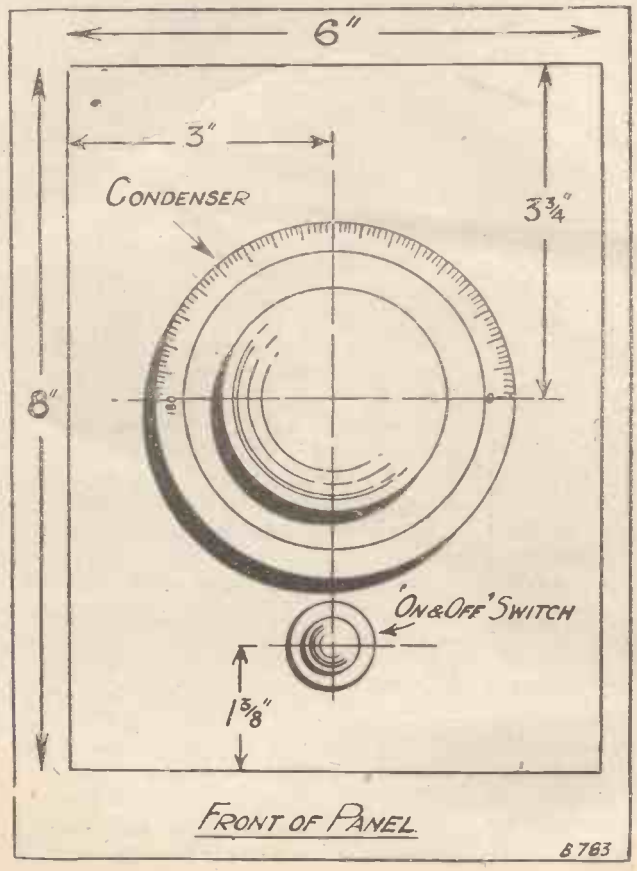
Although it might improve the neatness of arrangement of your instruments do not place the Silencer cabinet immediately alongside the cabinet of your receiver, as if you do so there is a possibility of interaction between the silencer coil and the tuning coil in your set. It is better to keep it away if the maximum selectivity is required.

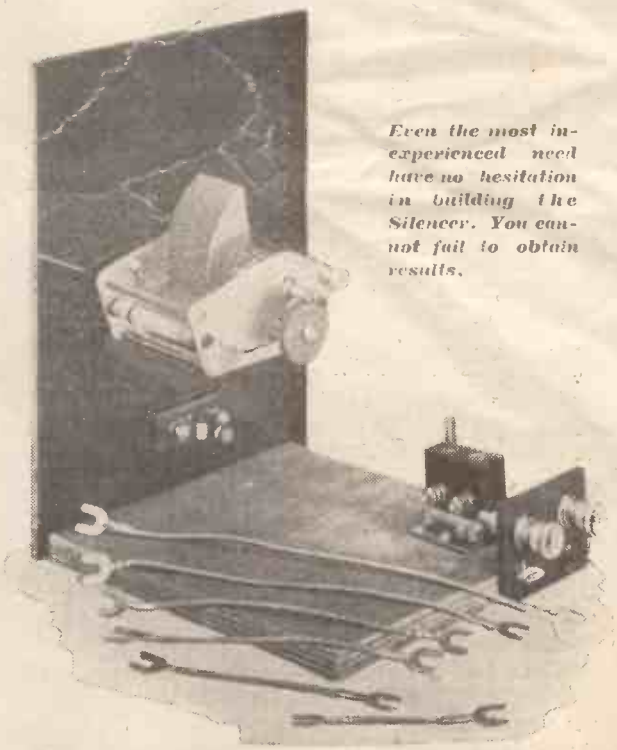
Reports Required.

Readers are always interested in the results obtainable by others in a variety of localities. When you have built the Radiano Silencer please send a postcard, giving your results and particularly stating:

1. Your distance from the local station.
2. The nearest wave-length to the local that you can receive without interference.
3. The nearest wave-length previously received without interference when *not* using the Silencer.

An analysis of the postcards will then enable some very interesting and helpful data to be published.





Even the most inexperienced need have no hesitation in building the Silencer. You cannot fail to obtain results.

With all the leads ready the work of assembly is an extraordinarily easy task.

The Life of the H.T. Battery

An article that will interest every owner of a valve set.

By J. M. McARTHUR.

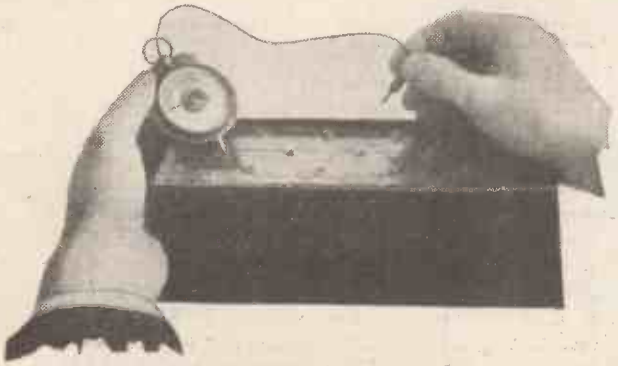
WHEN one buys an H.T. battery of the dry cell type it is something of a speculation. It may be a good one and last twelve months, or it may be a poor one and last only three months, in spite of the fact that the measured voltage at the time of purchase appears to be accurate. Dry batteries in the first place deteriorate with age and though the shopkeeper does all in his power to look after them they are nevertheless depreciating in value upon his shelves, even though they are never connected to a set or made to do other work.

Apart from this fact the life of a given battery is determined largely by the type of set it is connected to. A five-valve set, for instance, will put a bigger load on the battery than, say, a two-valve receiver, even assuming that correct grid voltages are used. For this reason, when purchasing an H.T. battery, the type of set which it is required to work should always be the determining factor as to size, particularly so when power valves are used. Batteries for high tension work are, as you probably have noticed, made in different sizes, apart from voltage value, the difference in the overall dimensions being brought about by the size of cells incorporated; and where the set is of the multi-valve type, H.T. batteries made up with big cells will always give the best service. Further, though the capital outlay may be a little more, the battery will last considerably longer than one made up with smaller cells, and so costs less.

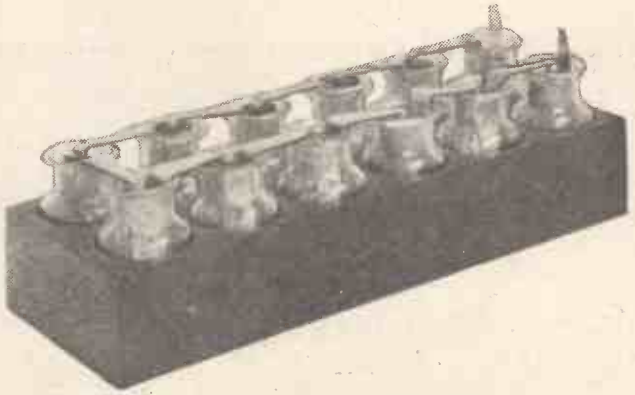
Value for Money

Retailers do not generally carry big stocks of H.T. batteries, because of the depreciation of dry cells, and even though a new battery may show an accurate reading on a voltmeter, putting a load on the battery, (such as connecting it to a set for some hours) may quite conceivably bring about an appreciable drop in voltage. One might at first be inclined to hold the retailer responsible in such a case, but the chances are that he, too, has only just bought the battery and the fault may quite possibly lie within the battery itself (as, for instance, poor chemicals being used in the manufacture). Such circumstances as these are, of course, not likely to arise if good makes are purchased, but unfortunately there are now available large quantities of H.T. batteries bearing no name, and sold at ridiculously cheap prices. If I see one of these products, I avoid it as I would the plague, for to purchase such wares is but to waste money and time.

As an indication of what a good make of battery will do, I purchased in November, 1925, three large type 45-volt batteries which were subsequently connected in series to give a total of 135 volts. This battery was used during the whole of 1926 for working a five-valve family set with an anode current consumption of



Testing an H.T. Dry Battery with a Voltmeter gives a useful indication of its condition.



One of the many "Wet" H.T. Batteries now being extensively used for H.T. supply.

The Life of the H.T. Battery—*concluded.*

about fourteen milliamps, while at other times it was used for testing various sets when accumulator H.T. batteries were being charged. The measured voltage of this battery *in January*, 1927, was 90 volts. Nearly fifteen months continuous service and still capable of doing useful work!

Comparative Tests

Perhaps the most interesting point of all lies in the fact that even now the battery is not unduly noisy. Each tapping-point in use has a 4 mfd. Mansbridge connected across in the normal way, but even upon removing these the noise is certainly not more than many other H.T. batteries will give after three months' service.

The battery has now definitely reached its end, for during the last few days its voltage has dropped from 90 to 54, and even at that the needle of the voltmeter wobbles, indicating the uncertainty of my old friend.

The old battery has now been replaced by a new one of the same make, size and voltage, and out of interest comparative tests were made first with the old battery and then with the new, a change-over switch being used for convenience.

Improved Purity and Volume

From the point of view of purity the new battery gave superior results, which, after all, is only to be expected. In distant reception many of the weak stations received with the new battery connected were completely inaudible when the change-over was made; it should be understood that by weak signals is meant signals which would not operate the loud speaker.

The receiver used consisted of two H.F. valves, detector and two L.F. stages, and the following results indicate what was done with the two batteries, the new one being 135 volts and the old one an unsteady 54 volts.

New Battery. *Loud Speaker.*	
Barcelona	Munich
Radio-Paris	Glasgow
Hamburg	Frankfurt
Toulouse	Stuttgart
Manchester	Newcastle
Copenhagen	Rome
Daventry	Bournemouth
Hilversum	Leipzig
London	Bilboa
Milan	Elberfeld
Prague	Berne
Radio-Belgique	Stockholm
Milan	Hanover
Madrid	Birmingham
Bremen	Breslau
Strasbourg	Dortmund
Belfast	
Malmo	

Old Battery. *Loud Speaker.*	
Hamburg	London
Copenhagen	Daventry
Radio-Belgique	Radio-Paris
Copenhagen	Hilversum

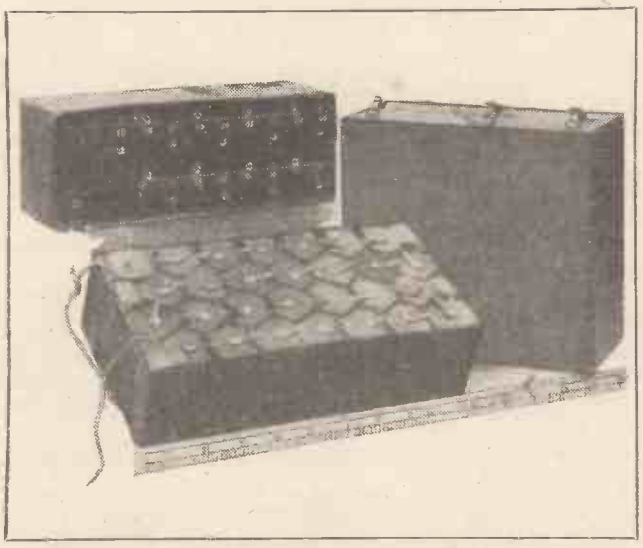
'Phones	
Milan	Munich
Elberfeld	Birmingham
Stuttgart	Breslau
Newcastle	Berne
Leipzig	Dortmund
Prague	Rome
Malmo	Stockholm
Madrid	Toulouse
Bremen	Prague

For purposes of quick reference those stations which were received on 'phones with the new battery have been omitted in the table just given, and whereas all the results with the new battery are loud-speaker results, to receive the same stations when the old battery was connected invariably called for the 'phones.

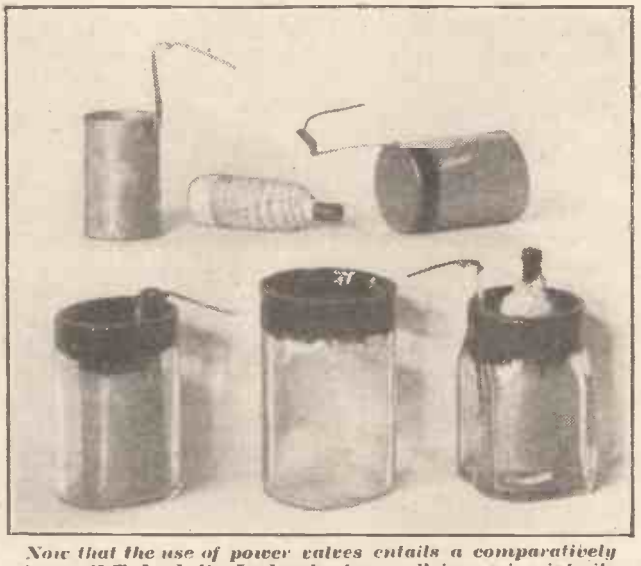
Effect on Reaction

The operation of the receiver when the old battery was in use was considerably more tricky than with the new battery. The reaction control was far from smooth, while hissing sounds produced by the expiring H.T. made telephone reception a very tiring business. This test shows how important a part is played by the H.T. voltage during reception.

In conclusion, it is felt that these results after nearly fifteen months service well indicate to readers the benefit derived by using H.T. batteries of known make and of ample size.



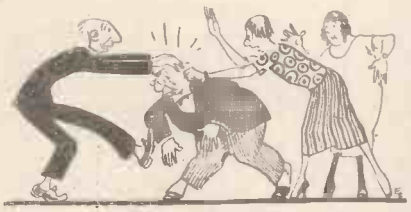
There is a wide dissimilarity in the size and appearance of various types of H.T. Batteries, as shown above.



Now that the use of power valves entails a comparatively heavy H.T. load, the Leclanche-type cell is coming into its own for radio.

"AND now," said Miss Worple—we were holding a kind of informal meeting-cum-tea-fight at her house, in order to try to get things going as quickly as possible—"and now I suppose the first thing that we have to do is to make rules and elect a committee, and do all that kind of thing. Perhaps Mr. Wayfarer, who appears to have had some experience of wireless clubs, can offer some useful suggestions."

Take my tip and never eat muffins at one of these informal meetings.



Sir K. N. Pepper received such a thumping on the back that he complained of lumbago for days afterwards . . .

They are the most embarrassing things that I know. I *like* muffins. I had just shown my appreciation of those provided by Miss Worple by taking a bite that was really worth calling a bite.

"Mmmm," I said, waving my teacup gracefully with one hand and the remains of the muffin equally gracefully with the other. "Mmmm, ah, honk, honk, honk!"

"Bang him on the back, somebody!" cried Miss Worple.

Mudbury Wallow's Wireles Club

Primpleson, Tootle, and Captain Buckett fell upon me with resounding whacks. My cup flew into the air, described a beautiful parabola, and arrived upside down upon Goshburton-Crump's somewhat bald head. The muffin, jerked from my other hand through the force of the blows, sailed across the room into the open mouth of Sir K. N. Pepper, who thus got something on his chest instead of getting something off it, as he had intended.

In a moment I was left to recover in peace, whilst willing hands flew to the aid of the other stricken souls. Under the guidance of the Rev. Aloysius Tosher, the curate of Mudbury Wallow, the ladies of the party flung themselves upon Goshburton-Crump, wiping him down with anything that came handy. The more virile members transferred their attentions to Sir K. N. Pepper, who received such a thumping on the back that he complained of lumbago for days afterwards.

The Subscription

When things had settled down a little, I sprang to my feet and proceeded to tell them exactly what they must do. The first thing, I said, was to choose a name for the club. It was decided *nem. con.* that this should be the Mudbury Wallow Wireless Club. The next thing was to get out a set of rules. After that they had only to fix the subscription, to find a suitable club-house, to equip it with every modern inconvenience, and all would be plain sailing.

Sir K. N. Pepper having been voted unanimously into the chair, the discussion of the proposed rules began. As everybody seemed to have different ideas on the subject, it was at length decided that we should have no rules except one about subscriptions. It was suggested that the annual subscription should be five shillings. I immediately proposed the addition of the words "which sum shall entitle members to a free wireless licence at the club's expense." This, however, did not go through, despite my best efforts. Any member, the meeting resolved, whose subscription is more than fourteen days overdue shall *ipso facto* cease to belong to the club. My suggestion that "years" should be substituted for "days" was well received, but when a vote was taken it was turned down by a narrow majority.

Born Treasurers

We proceeded next to the election of officials, Miss Worple being appointed vice-president and Primpleson secretary. For the post of treasurer there was no small competition, Tootle, Goshburton-Crump, and I each claiming that we were born treasurers. Though I proved to them that I could make an overdraft go farther than any man in Mudbury Wallow, though I demonstrated my powers of obtaining money from people by instancing the way in which I had borrowed five shillings from Sir Moses Aaronstein, our Highland lord of the manor, they decided somewhat foolishly to invite Mr. Glump, the bank manager, to become a member of the club and to undertake the duties of treasurer. I told them that Glump saw so much of money all day that he badly needed a rest from it in the evenings, whilst I saw so little of it in the ordinary way that the treasurer's job would be a positive holiday. But they were adamant.

Arranging a Demonstration

Thanks to the kind offer of Sir K. N. Pepper, it was resolved that a large shed in his garden should be used temporarily as the clubhouse. In this we were to meet on the following Wednesday for the first time. Volunteers to give lectures were called for, and Primpleson's offer to discourse upon rapid fault-finding with practical illustrations was gratefully accepted.

. . . Instancing the way in which I had borrowed five shillings from Sir Moses . . .

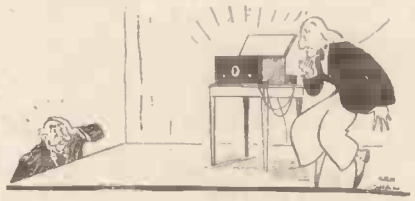
When the great day arrived, Primpleson came round to my house in the morning to ask me to help him in arranging his apparatus on the platform that had been rigged up in the clubhouse with the help of sugar boxes, borrowed from Mr. Miggs, the grocer, and planks, obtained on loan from our leading builder, Mr. Snoopham, whose Christian name quaintly enough is Jerry.

In Lighter Vein—*concluded.*

Primpleson installed several sets—his own and those that he had been able to borrow from trusting friends. In each of these, he confided to me, he was going to arrange for some fault of a common type. He would then show his audience exactly how to trace it and rectify it.

On Second Thoughts . . .

We finished the work by lunch time, returning to our respective abodes to attend to the needs of the inner man. When I woke up at five o'clock, after the brief postprandial nap of some three and a half hours in which I usually indulge, I found that I was not feeling quite happy about this demonstration business of Primpleson's. On thinking it over, it seemed to me too much of a put-up job. Obviously if the lecturer knew exactly what faults were there before he started to trace them he would have no real chance of doing justice to his great talents. Clearly it was not fair to the audience to deal only with the more common faults, for, surprising as it may seem, what are known as the more common faults never happen to anyone in actual practice. I came to the conclusion, therefore, that I was morally bound to give the audience more for its money and the lecturer a wider scope for his abilities. With these thoughts in mind I placed a box spanner, a screwdriver and a pair of wire cutters in my pocket and set out for the club hut.



. . . There was an instantaneous display of the most beautiful blue flames . . .

The audience was so enthusiastic over the theoretical part of Primpleson's show that I felt quite sure that by the time that he had finished his practical demonstration everyone would vote the evening a thorough success. "And now," he said, "now that we have seen something of the theory of fault-finding, I will show you how we should proceed to put into practice what we have learnt this evening. I have here a single-valve set belonging to our chairman, which I know to be out of action. I will switch on, and will ask those who can diagnose the fault please to hold up their hands."

That Little Mistake.

He touched the switch. There was an instantaneous display of the most beautiful blue flames. Every member's hand went up except that of Sir K. N. Pepper, who leapt from the chair, waving his arms and inarticulate with fury. The smile which had been visible upon what Primpleson calls his face faded out. He explained that he had made a little mistake—the kind of thing that can occur to anyone—over the H.T. and L.T. leads, but that was not the real fault in this case. Having re-connected and inserted another valve, he again switched on. Those who were wearing the several pairs of telephones attached to its terminals announced that the set was now working perfectly. Somewhat puzzled, he told them that he would not waste time over this set, but would go on to the next, a large loud-speaker affair belonging to Glump.

An Unseen Small Boy.

I noticed that he was very careful to examine the battery connections before doing anything else. "When I switch on," he said, "you will find that this set is quite silent owing to a breakdown that we will trace out together." He flicked over the switch. "PRIMPLESON IS AN ASS. PRIMPLESON IS AN ASS. PRIMPLESON IS——" announced the loudspeaker in a voice of brass. The switch went hastily back again. Primpleson was beginning to look distinctly hot and bothered. It is wonderful what you can do with an ancient microphone, a suitable transformer, a length of flex and a small boy previously bribed with a sixpence stationed outside the building.

Primpleson told them that this set was clearly picking up a telepathic transmission from some foe of his, and that since the matter would take too long to rectify, he would pass on to Goshburton-Crump's three-valve neutrodyne. In this case, he said, the fault was a simple and straightforward one that we should have no difficulty in locating. The valves, he told us, would light up properly—they were bright emitters—but no sounds would come through owing to the presence of a disconnection. He would ask us to note carefully the symptoms and to endeavour to deduce from them the locality of the "dis."

The Fault-Finders.

When they had all given up in despair, Primpleson smilingly pointed to the lead between the plate of the rectifier and 1P of the transformer, which had come adrift. Replacing it, he switched on, still smiling. Pale but determined, he announced that some other little fault must be present which he would soon track down if they would give him a few moments. Naturally, I volunteered

. . . Primpleson flicked over the switch, and the loudspeaker began in a voice of brass . . .

to help. We were getting on swimmingly, discovering one queer thing after another, when Goshburton-Crump strolled across to watch. A thoughtful look spread over his face as he saw us tearing out and replacing wire after wire. "Look here," he said at length, "what the blazes have you been doing with my set. You said that you would make one little disconnection, and you appear to have made a cat's-cradle of the whole blessed thing.

Plain Speaking.

Primpleson hotly denied having done any such thing, and told Goshburton-Crump pretty bluntly that if he had had any idea that the set had been wired up by a lop-eared, flat-footed lunatic he would never have borrowed it.

In less than a minute the platform had become a battlefield, but Primpleson was able to crawl out and make his escape. If he had not shown himself particularly rapid as a fault-finder he certainly disclosed a very creditable turn of speed on his homeward passage through the streets of Mudbury Wallow.

The Editor's Chat

NOTE.—All communications, MSS. etc., for the Editor should be addressed to The Editor, "The Wireless Constructor," Fleetway House, Farringdon Street, London, E.C.4.

In this article Mr. Percy W. Harris, M.I.R.E., discusses "modernising," the "Radiano" System and other topics of vital interest.

THE response to my request for postcards stating which sets readers would like to have "modernised" has been so overwhelming that it is difficult to know just where to start! An analysis is now being made of all cards received, and the detailed requirements carefully noted. As a magazine of such large circulation as THE WIRELESS CONSTRUCTOR must go to press some time in advance of the publishing date, and as readers' postcards are still filling the postbag, it has not been possible to include any analysis in the last or present issues; but as a preliminary analysis showed that many WIRELESS CONSTRUCTOR readers are asking for a modernised form of "The Anglo-American Six" receiver, this set was dealt with in our last issue. In view of the wide variety of sets on which modernising information is required, I have thought it better this month to deal with points applicable to as many sets as possible, reserving till next month particulars of the modernising of one or two specific receivers, well known to WIRELESS CONSTRUCTOR readers. In this way the largest possible number of readers will be served at the earliest date.

The Radiano System.

The Radiano system shows every sign of being one of the greatest successes in modern radio. This page goes to press soon after publication of the March issue, and it therefore is impossible in the present issue to publish many readers' results with the "Radiano Three." Next month I hope to be able to give representative reports from all over the country. Meanwhile if you have not yet sent *your* report, please post it as soon as possible. Reports on postcards are very welcome, as they are so readily sorted and classified.

This month I am able to present the "Radiano Silencer," a simple and efficient wave-trap constructed on the Radiano principle with only six connecting leads! Placed alongside of the "Radiano Three," it will give you a selectivity which, I venture to think, will prove a real surprise. Fortunately, the design is such that the "Silencer" can be applied to many other sets, and reference is made to this in the article "New Lamps for Old" on modernising your existing receiver.

SATISFIED WITH SAMSON!

"SIR,—It is with the greatest pleasure that I write thanking you for particulars of your wonderful circuit. 'The Samson Two.' As I sit writing these notes, the set is working admirably both as regards tone and clarity. From the 'Home' Station—a distance of five miles, the volume is too great at full strength. My aerial is 40 ft., indoor, and poorly insulated.

"I am using R.I. transformer—old type, in first valve circuit, Liberty permanent detector, Igranic transformer in output circuit.

"First valve, Cleartron, 25 B, 25 amp., at 6 volts.

"Second valve, B.T.H. B.4., 25 amp. at 6 volts.

"Wishing you and 'Wireless Constructor' every possible success in the future."

Yours faithfully,
J. W. TIPPER.

56, Allens Croft Road,
Kings Heath,
Birmingham.

British Set Designer's Difficulties.

The three complete receivers, of which constructional details are also given in the present issue, are all distinctly above the average, and a detailed study of the articles will well repay every reader whether he desires to build a set or not. The "Anyvalve Four," Mr. Leslie's contribution to our pages, successfully solves a difficulty which has been facing set designers for some little time—the efficient use of the wide variety of valves now available to the British public. In this connection I would like to point out how difficult is the path of the English designer compared with that of his American confrère. Studying American radio literature, one cannot fail to be struck by the simplicity of many American sets, and at first one might be led to draw quite erroneous conclusions. Before forming a judgment on the matter, it must be remembered that, first of all, the American designer has the immense advantage of catering for the shorter wave-lengths only—he has no "Daventry" problem—and, secondly, there are for all intents and purposes only two types of valve in general use, one of the 60-milliampere class, and the other the quarter ampere small-power valve, which is used for all purposes, high-frequency, detector, resistance capacity coupled, and transformer or choke coupled, amplifiers. True, within the last few months special low impedance power and super-power valves have been introduced, but in H.F. portions of the circuits—the most troublesome portion to design—practically only one valve is in general use, that corresponding with the Osram or Marconi D.E. 5, Mullard D.F.A. 1, etc.

Lack of Valve Uniformity.

In this country every valve manufacturer supplies a special H.F. valve, and, unfortunately for the set designer, scarcely two makes have the same characteristics. For this reason a H.F. transformer which works efficiently with one make of valve may give a very poor showing with another. Prophecy is a very dangerous game, but I venture to predict that before long the valve manufacturers will agree among themselves to a fairly close standardisation of characteristics. Spending, as I do, a large portion of my time in the laboratory, I am realising more and more the absurdity of this lack of uniformity. Imagine the confusion

(*Continued on page* 528)


THE WIRELESS ENTHUSIAST IS WEARING A VERY WORRIED LOOK THESE DAYS.
SOMETHING IS WEIGHING ON HIS MIND
I CAN'T EAT
I CAN'T SLEEP
MORNING — NOON AND — NIGHT —
ONLY OVER MY DEAD BODY!!!
THE SIMPLE REASON IS THAT THE WIFE HAS THREATENED
TO SPRING CLEAN HIS WIRELESS DEN!!!
SHAW

The Baby Giant

by

S. G. RATTEE, M.I.R.E.

THE name of the "Baby Giant" was first given to the set to be described by an interested listener to its performance, and without undue laudation the set really is deserving of such a name. Though no more than three valves are used, the results which may be obtained are indeed very encouraging.

As a point of interest, after the work of wiring up, etc., had been completed, the set was connected up in the ordinary way with a view to tuning in the local station as a preliminary test. It was of course realised that, providing the set behaved as it should, signals from the local station would be uncomfortably loud, and for this reason a loud speaker was used instead of telephones.

Hamburg like the Local

In the operation of tuning a really strong transmission of band music was picked up, and, thinking that this might be the local station, it was tuned in to its maximum strength, and its call-sign awaited for confirmation. Soon this came, and with it came the pleasant surprise that Hamburg had been mistaken for the local station!

Though subsequently, when the local station had been found, the comparative signal strength made one wonder how such a mistake could be made, on terms of comparison the signal strength of Hamburg—and of

RESULTS OBTAINED WITH THE "BABY GIANT."

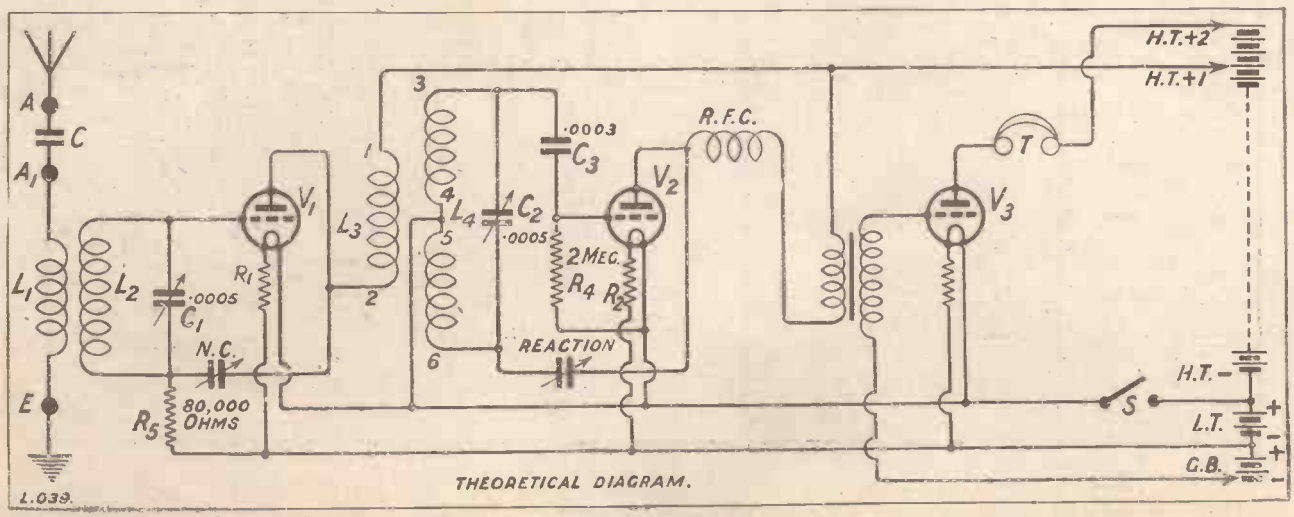
Though a host of stations have been received during the last two months, it has not been possible to identify them all. The stations listed below, however, have actually been identified by items in the programmes and from announcements.

Names bearing an asterisk may be taken as being stations which have been received on the loud speaker in south-east London during the evening transmission of the London station.

Hamburg *	Radio Toulouse *
Oslo *	Birmingham
Newcastle *	Radio Milan
Stuttgart	Radio Barcelona *
Bournemouth	Frankfurt
Copenhagen *	Leipzig
Petit Parisien *	Radio Belgique *
Breslau	Elberfeld
Munster *	

COMPONENTS REQUIRED.

Panel, 16 in. x 8 in. x $\frac{3}{16}$ in.
Cabinet, with baseboard, 16 in. x 9 in. x $\frac{1}{2}$ in.
Ebonite strip, 8 in. x 2 in. x $\frac{3}{16}$ in.
2 ·0005 S.L.F. condensers.
"Midget" condenser (Claude Lyons).
Push-pull switch.
3 fixed resistors, to suit valves.
3 valve holders.
2 baseboard mounting coil holders.
Neutralising condenser.
Anode resistance, 80,000 ohms, with base.
·0003 fixed condenser.
H.F. choke.
Grid leak and condenser unit, 2 meg. and ·0003 respectively.
Low frequency transformer.
Fieldless coil and standard six-pin base.
12 terminals.
Pair panel brackets.
Quantity of connecting wire, wood screws, etc.



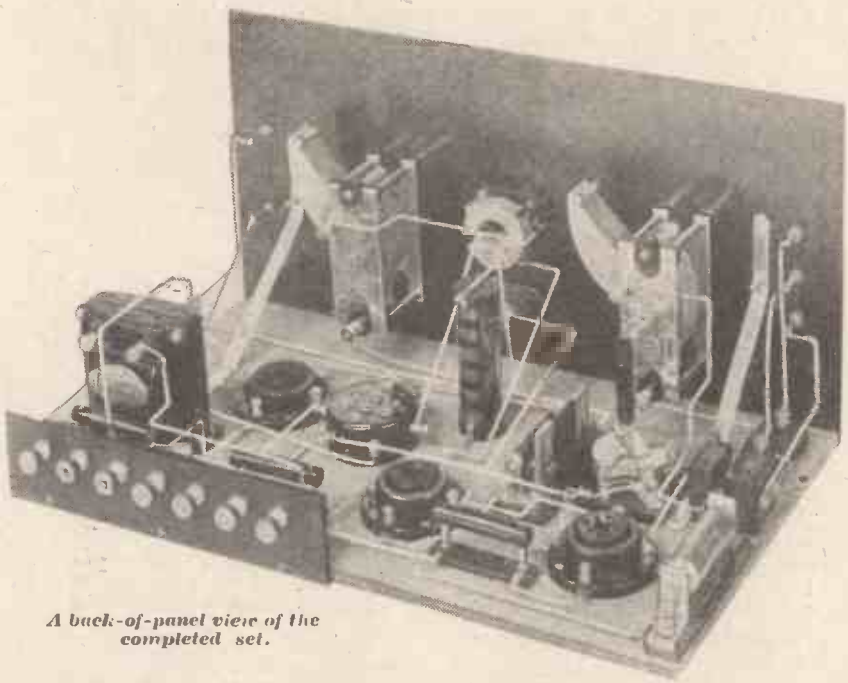
THEORETICAL DIAGRAM.

The "Baby Giant"—*continued*

others—was well above the average given by a three-valve set of this type.

The circuit used does not possess any outstanding novelty; it is, in fact, a well-tried friend incorporating a neutralised high-frequency stage, a detector and note magnifier.

The form of neutralising the H.F. stage is one which may be adopted without the use of a centre-tapped coil, and was, I believe, first described by Mr. C. P. Allinson; results show that the arrangement has much to commend it.



A back-of-panel view of the completed set.

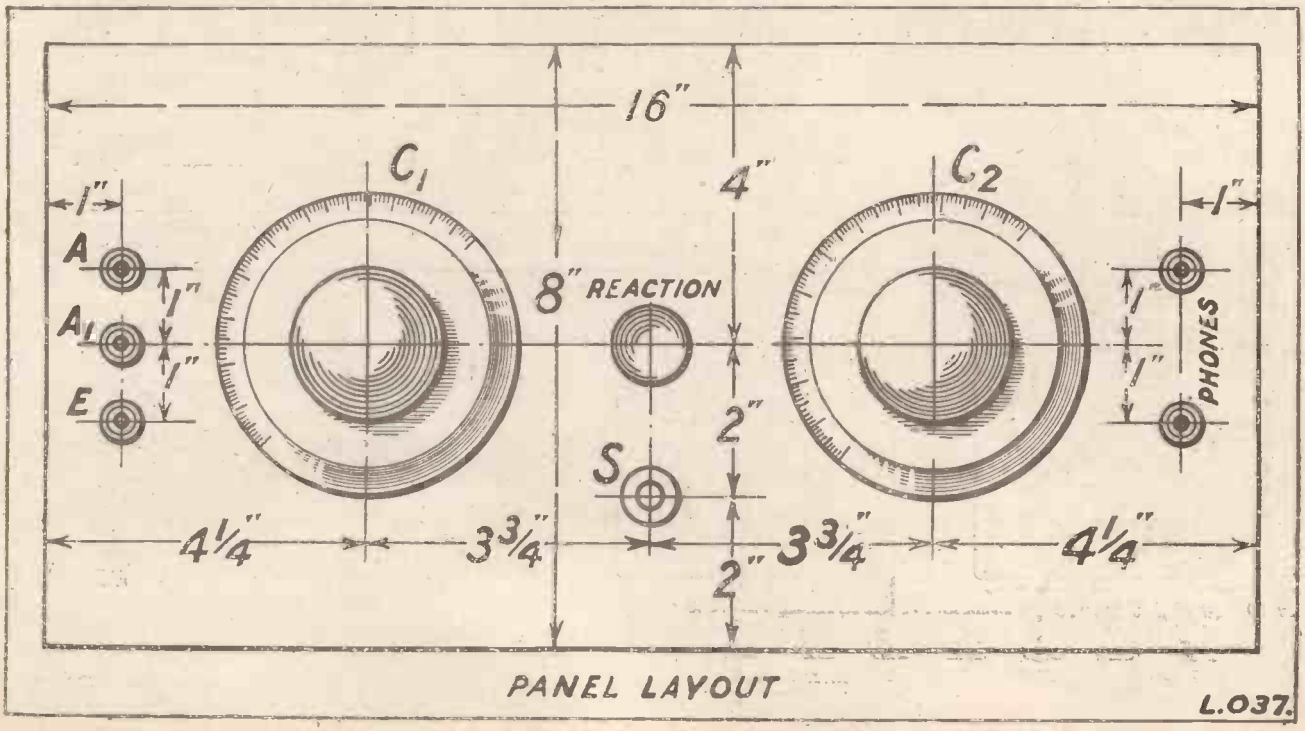
Ordinary plug-in coils may be used for this portion of the circuit, and since no doubt there are a large number of listeners already in possession of such coils, the total expenditure in components may be low.

The general behaviour of the receiver is good; that is to say it is selective without being unduly difficult to operate, and is at the same time capable of giving good signal strength.

The Layout and Coils.

The general arrangement of the circuit will be seen in the theoretical drawing, and whereas plug-in coils are used for L1 and L2, a "fieldless" type of transformer is used for L3 and L4, the tuning of the latter circuit being particularly sharp. A standard six-pin base has been chosen as the mounting for the H.F. transformer, and should the constructor therefore desire to try other types of standard split secondary H.F. transformer he may easily do so.

The popular type of American cabinet has been used, all components, valves and so on being enclosed out of harm's way; the two tuning and reaction coils, together with an "on-off" switch and terminals for aerial, earth and 'phones, are, however, situated on the front of the panel.



The "Baby Giant"—*continued*

The terminals for the battery connections are situated on an ebonite strip at the back of the set in the conventional manner.

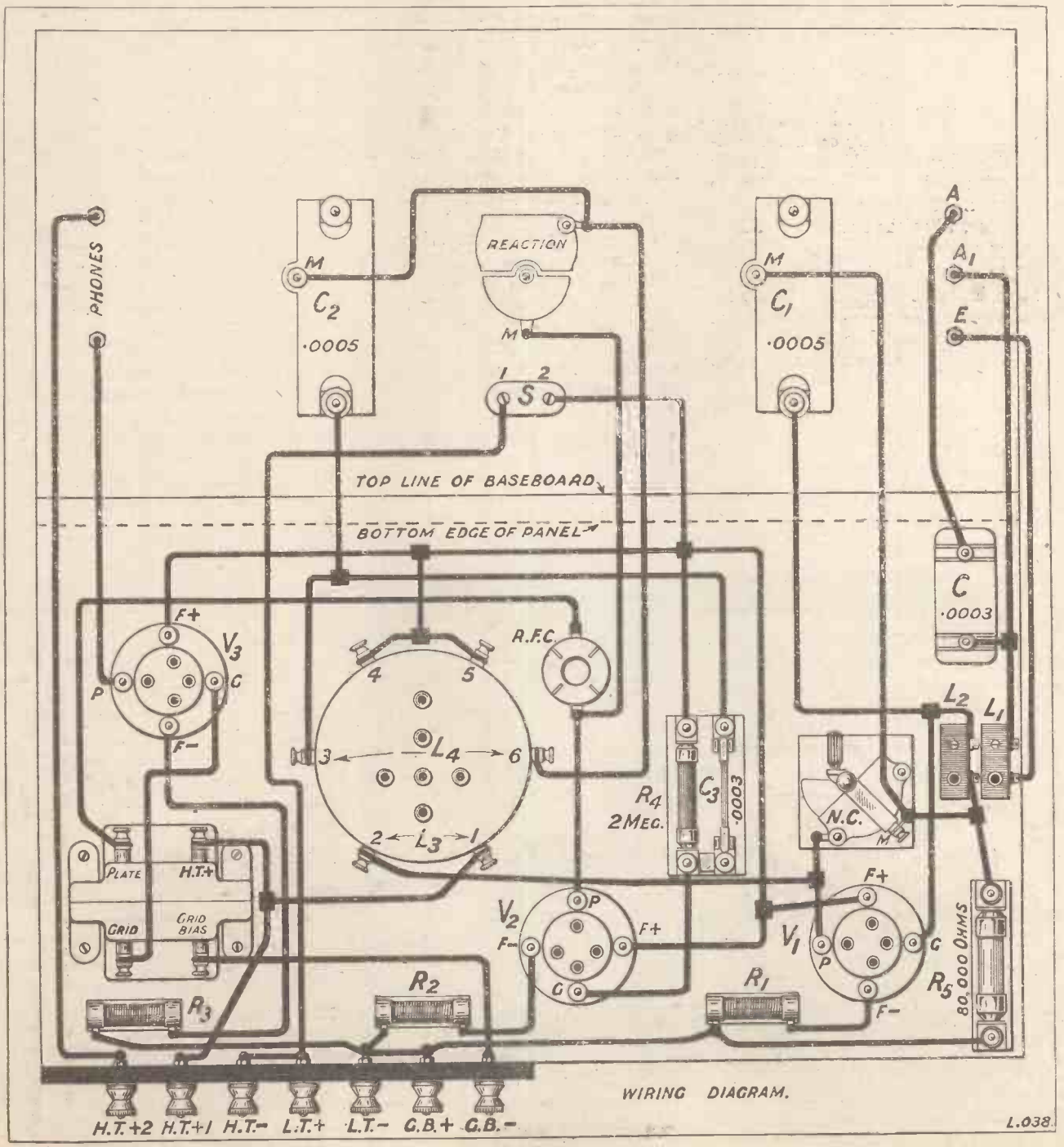
It will be seen from the circuit diagram that a condenser, C, is included in series in the aerial circuit, the capacity of this component being ·0003.

With a given coil for L1 different results will be obtained by connecting the aerial first to terminal A and then to A1, and whichever terminal gives the better results from the particular station it is decided to receive is the terminal to use.

Aerial Connections.

Results will, however, vary according to individual aerial conditions, the size of coil used for L1, and the wavelength of the station that is being received.

With a No. 35 coil for L1, it may generally be observed that the best results from stations using wavelengths below 400 metres are obtainable, by using terminal A; whereas for stations working on wave-lengths above 400 metres terminal A1 may be



The "Baby Giant"—*continued*

judged the better. In all cases the aerial should be tried first upon one terminal and then upon the other.

Choosing Components

The actual components incorporated in the original receiver will be recognised from the photographs which accompany this article, and though other suitable makes may be chosen, under no consideration should the constructor use values different from those named.

In many cases—not all, of course, are critical—the values of condensers, resistances and so on have been decided upon only after careful experiment, and mistaken ideas of economy should not lead the constructor to choose a ·0003 tuning condenser, for instance, when the author specifically states a ·0005.

The probability is that the author in such a case designed or chose his coil to cover the wave-length range of 250–600 metres when tuned with a ·0005 variable condenser, and if the constructor uses a ·0003 the wave-length range covered by the same coil is entirely altered.

The Coil Mounting

After the panel has been drilled (see the panel lay-out) for receiving the components which are to be mounted thereon, the panel brackets should be fitted and the baseboard secured ready for fixing the various components in position.

This latter work should be carried out in such a manner that the disposition of the various components is the same as that indicated in the practical wiring diagram and photographs; more especially should these instructions be observed with regard to the coils, for if by any chance a coupling effect is brought about between L2 and L3 in such a way as to make the receiver unstable in spite of any adjustment of the neutralising condenser, the set will be practically useless, even for reception of the local station.

A Wiring Tip

As regards the wiring, this should be carried out with some care. The H.F. leads should be as short as possible, a condition which has been made extremely simple by careful arrangement of the components, and wherever possible connections should be carefully soldered. It is a good plan to connect up the H.F. circuits first of all, for then the baseboard is free from obstructing wires.

All other leads, such as filament lighting, and so on, can, when the more essentially short connections have been made, be bent over the H.F. leads to give sufficient clearance without any ill-effects.

WIRING IN WORDS.

Join terminal A to one side of C; other side C to pin side L1 coil holder and to terminal A1.

Join other side of L1 coil holder to terminal E.

Join pin side L2 coil holder to fixed vanes of C1 and G. of V1.

Join other side of L2 coil holder to one side of R5 and M of N.C.; same side of N.C. to moving vanes of C1.

Join other side of N.C. to P. of V1 and 2 of six-pin base.

Join 1 of six-pin base to "H.T. +" of L.F. transformer; same terminal of L.F. transformer to H.T. + 1 terminal.

Join G. of V2 to one side of C3; same side C3 to one side of R4.

Join other side of C3 to 3 of six-pin base and fixed vanes of C2.

Join F + of V1 to F + of V2 and to other side of R4; same side of R4 to F + of V3, and 2 of S.

Join 4 and 5 of six-pin base together, and thence to 2 of S.

Join 6 of six-pin base to fixed vanes of the reaction condenser; same side of reaction condenser to moving vanes of C2.

Join P. of V2 to one side of R.F.C. and to moving vanes of reaction condenser.

Join L.T. — terminal to G.B. + terminal, and to one side of R2.

Join same side of R2 to one side of R1, and to one side of R3.

Join same side of R1 to the other side of R5.

Join the other side of R1 to F — of V1; the other side of R2 to F — of V2, and the other side of R3 to F — of V3.

Join H.T. — terminal to L.T. + terminal, and thence to I of S.

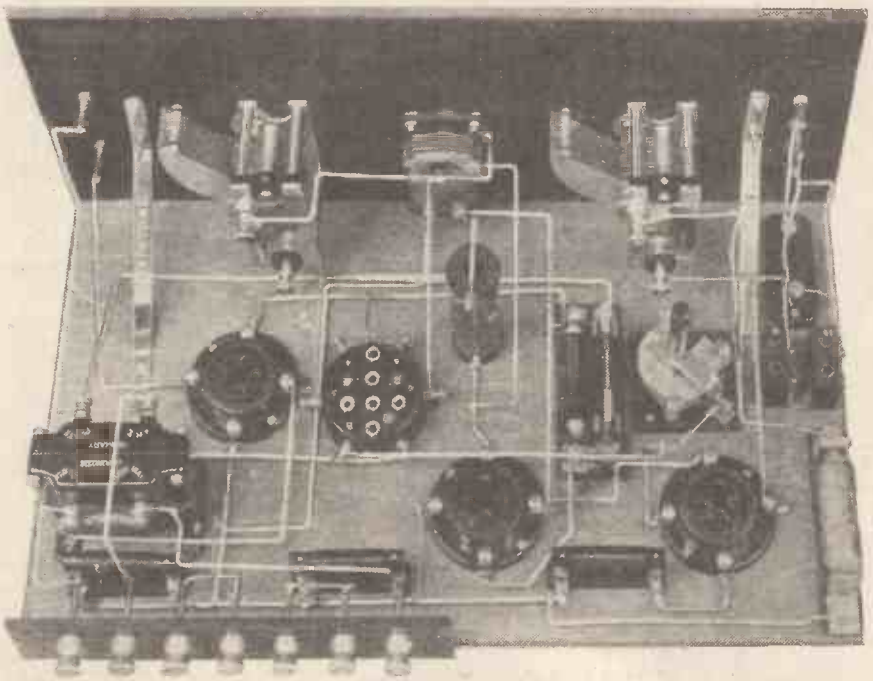
Join "Plate" of L.F. transformer to other side of R.F.C.

Join P. of V3 to lower telephone terminal; remaining 'phone terminal to H.T. + 2 terminal.

Join "Grid" of L.F. transformer to G. of V3.

Join "Grid Bias" of L.F. transformer to G.B. — terminal.

After all the H.F. leads have been soldered into position it is a good plan to then connect the L.T. positive terminal to the switch S, following this work by connecting the L.T. negative to one side of each of the resistors. This will simplify, to some extent, the placing of these leads before any other wires make the operation difficult; it will also be found a wise move to connect one side of the radio-frequency choke to the "plate" terminal of the L.F. transformer in these early stages.



Another back-of-panel view of the "Baby Giant" which clearly shows the disposition of components and the wiring.

Resistor Values

If a grid condenser and leak are chosen of the make shown (McMichael) it will be found that at one end of the unit the leak is permanently connected to the condenser, the connection terminating in a single terminal, which should be connected to G. of V2.

Coupled with the choice of valves is that of resistors, the value of which is, again, dependent upon the voltage of the accumulator to be used, and some consideration must be given to

(*Continued on page 53*)

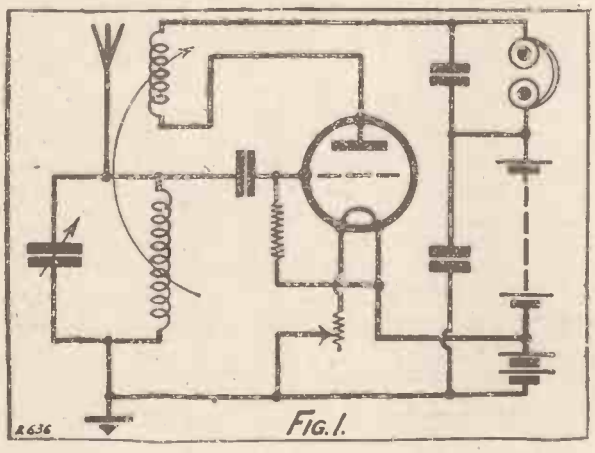
GRID OR PLATE RECTIFICATION?

The question as to which of the two popular methods of valve rectification should be used often presents a difficult problem to the radio constructor. In this article our contributor discusses the main points for and against each method.

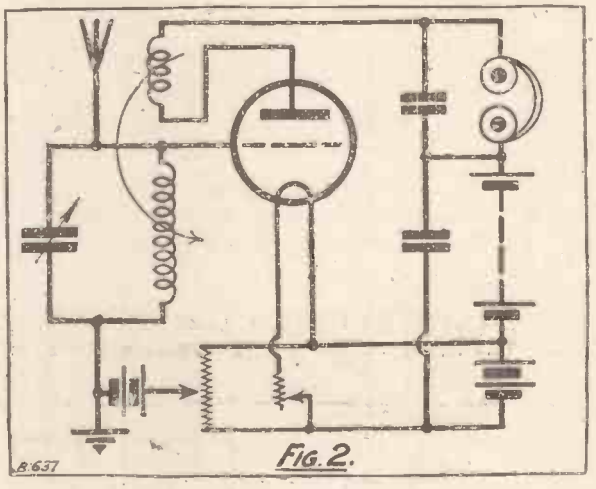
By R. W. HALLOWS

MANY wireless enthusiasts are puzzled at the present time over the vexed question of valve rectification, finding themselves unable to decide between the rival merits of the grid-leak-and-condenser system and that which makes use of the lower bend in the grid volts-anode current characteristic. When valves first came into general use the anode-bend system of rectification was used since no other was known; when, however, the "leaky grid" "cumulative grid" or grid-leak-and-condenser system was brought out it leaped at once into wide popularity for several excellent reasons. It was found to be distinctly more sensitive to weak signals, whilst it was simpler to use, since it required neither potentiometer nor tapped battery; and once it had been wired up with a grid leak and condenser of suitable value the circuit remained permanently adjusted. A couple of years ago it is probable that not one valve receiving set in a thousand employed for broadcast reception any other means of rectification. Then grid-leak-and-condenser rectification began to be criticised, experts attacking it upon several grounds, and a revival of the anode-bend method followed.

One of the reasons why leaky-grid rectification was attacked is that it cannot take place without a flow of grid current, which is liable to cause damping and therefore to lead to loss of selectivity. Fig. 1 shows grid-leak-and-condenser rectification in its simplest form. The actual process in this instance is a complex one, the generally accepted explanation being as follows: Owing to the position of the grid leak, which is connected to the positive end of the filament battery, the grid is set normally at a steady positive potential.



B.636 FIG. 1.



B.637 FIG. 2.

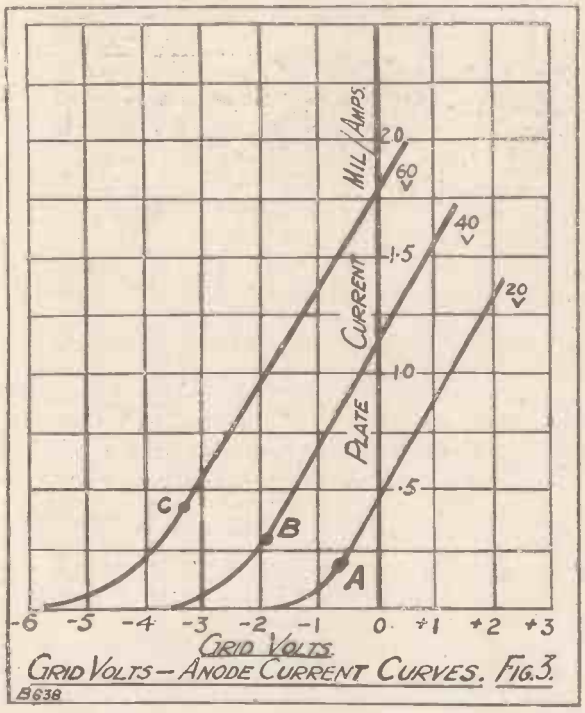
Effect of Grid Current

Electrons drawn from the filament are attracted to the grid owing to its positive charge. There is thus a flow of current from the filament to the grid and thence back through the grid leak to the battery. When no signals are coming in the grid-filament resistance remains constant and the valve is in a stable condition, the grid being set at a definite positive potential. An incoming positive half-cycle causes an increase in the flow of electrons from the filament, which rush to the grid in order to neutralise its charge. The positive half-wave is therefore largely damped out. The succeeding negative half-cycle dams back somewhat the stream of electrons, but many continue to reach the grid. The net result is that at the end of one complete wave the grid is slightly more negative than it was to begin with.

During succeeding waves an increasing negative charge builds up on the grid, causing a steady reduction in the plate current. If it were not for the grid leak the valve would eventually "choke," as can easily be verified by removing the leak temporarily. When this is done a signal is heard for a moment much as usual, but presently its strength declines, and in a brief space the set becomes entirely mute. Should the receiving set continue to function when the grid leak is removed, probably the valve is

Grid or Plate Rectification?—*continued*

soft or there is a high-resistance leakage path from filament to grid owing to faulty insulation. The grid leak allows the accumulated charge which has built up on the grid to leak away and so enables the valve to continue to do its work. It will be observed that with this system use is made of the negative half-cycles to cause an audio-frequency drop in the plate current which represents the average values of a train of high-frequency oscillations.



GRID VOLTS—ANODE CURRENT CURVES. FIG. 3.
B638

A good idea of the way in which anode-bend rectification takes place can be obtained from a study of these curves.

In multi-valve sets incorporating one or two stages of tuned high-frequency amplification, one drawback to the use of this system of rectification is, that owing to damping caused by the flow of grid current the condenser setting required to tune the grid circuit of the rectifier to a given wave-length, differs slightly from that needed for the high-frequency valves, even when matched inductances and variable condensers are used. It is partly for this reason that the anode-bend method has lately had a revival.

The Anode-Bend Detector

A circuit using this latter method is seen in Fig. 2. A potentiometer is wired across the filament battery, and between its slider and the grid of the valve is placed a small battery. By means of this arrangement it is possible to set the grid at a steady negative potential, and to make use of the bend which occurs at the lower end of the grid volts-anode current characteristic. An idea of the way in which anode-bend rectification takes place may be obtained by a glance at the curves shown in Fig. 3; it should, however, be remembered that such curves do not represent quite faithfully the action of the valve in the receiving set, since under working conditions there is always an impedance in the plate circuit. They are, in fact, static and not dynamic curves. If the valve is set so that the grid potential is that shown at the points A, B and C, according to the plate voltage, the working-point will be near the beginning of the bend. A positive half-cycle will take the working-point on to the straight portion of the characteristic and will thus lead to a large increase in the plate current; on the other hand, a

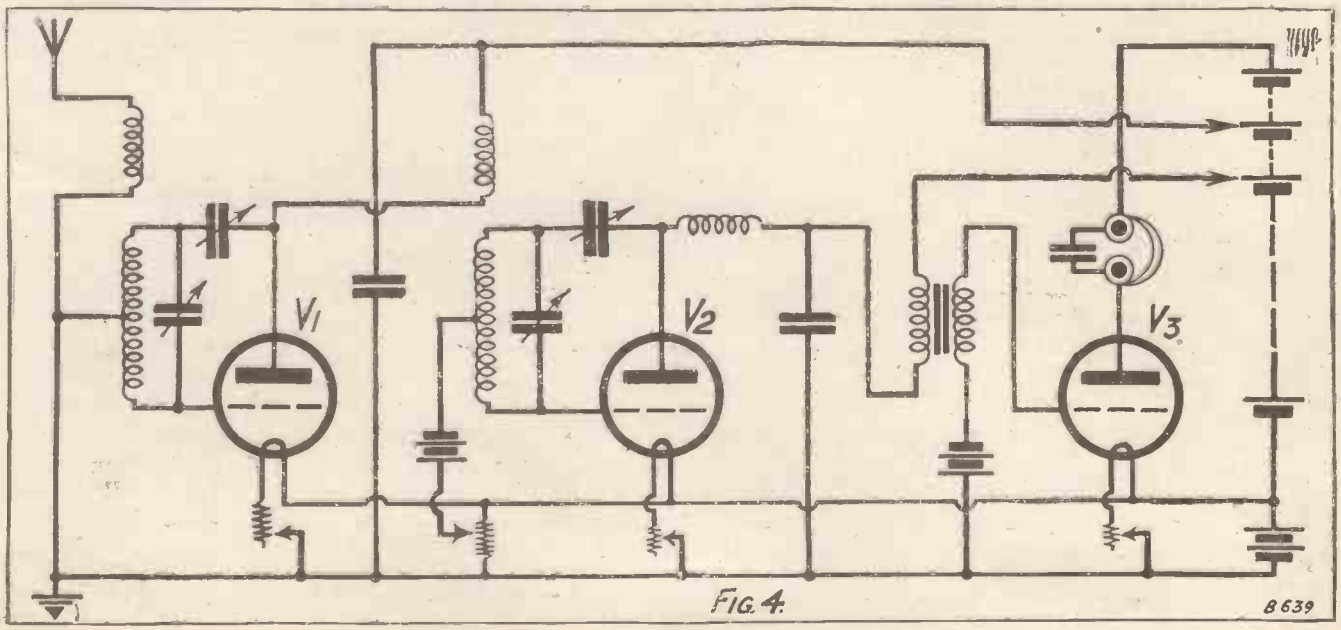


FIG. 4.
B639

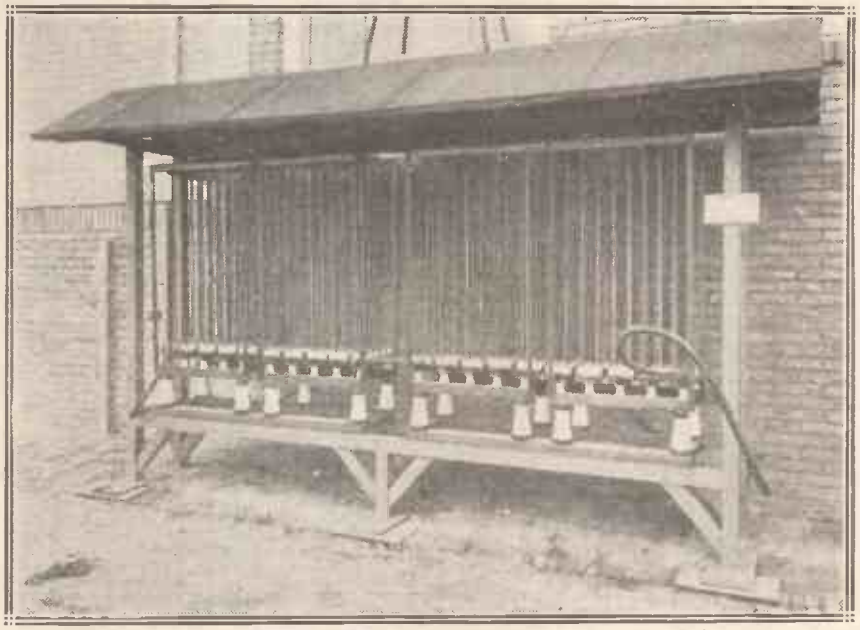
Grid or Plate Rectification?—*continued*

negative half-cycle will carry the working-point down on to the bend, so that a much smaller decrease in the plate current will occur. The net result is that at the end of one complete wave the plate current is increased and that a wave train causes an audio-frequency build up and decline to normal. With the grid and anode voltages properly adjusted, no flow of grid current takes place; much less damping is therefore introduced than by the grid-leak-and-condenser method, with a certain increase in selectivity. Further, the condenser setting required to tune the grid circuit of the valve to a given wave-length will not differ from that needed for a preceding high-frequency valve, unless the grid coil of the latter is coupled to the aerial inductance. With anode-bend rectification, therefore, it is possible to reduce the number of tuning controls required for a set using three high-frequency stages to one or two by means of multiple variable condensers.

The Question of Quality.

It is also claimed on behalf of anode-bend rectification that it is superior in point of quality to the grid-leak-and-condenser method. Actually a small amount of distortion of wave forms must occur when a grid condenser is used, largely because the impedance of any condenser is not constant, but varies; the higher the frequency the lower the impedance of a condenser of given size, and vice versa. Strictly speaking, therefore, to obtain distortionless reproduction by this system we should require a condenser with a capacity varying to correspond with the received frequency! Actually, however, the distortion introduced, provided that the condenser, the grid leak, the valve and the plate-circuit impedance are all properly suited to the purpose in hand, is very small indeed, and it is probably not evident to the average human ear,

(*Continued on page* 534.)



A peculiar artificial aerial, made of resistances, erected at the Philips radio works in Holland.

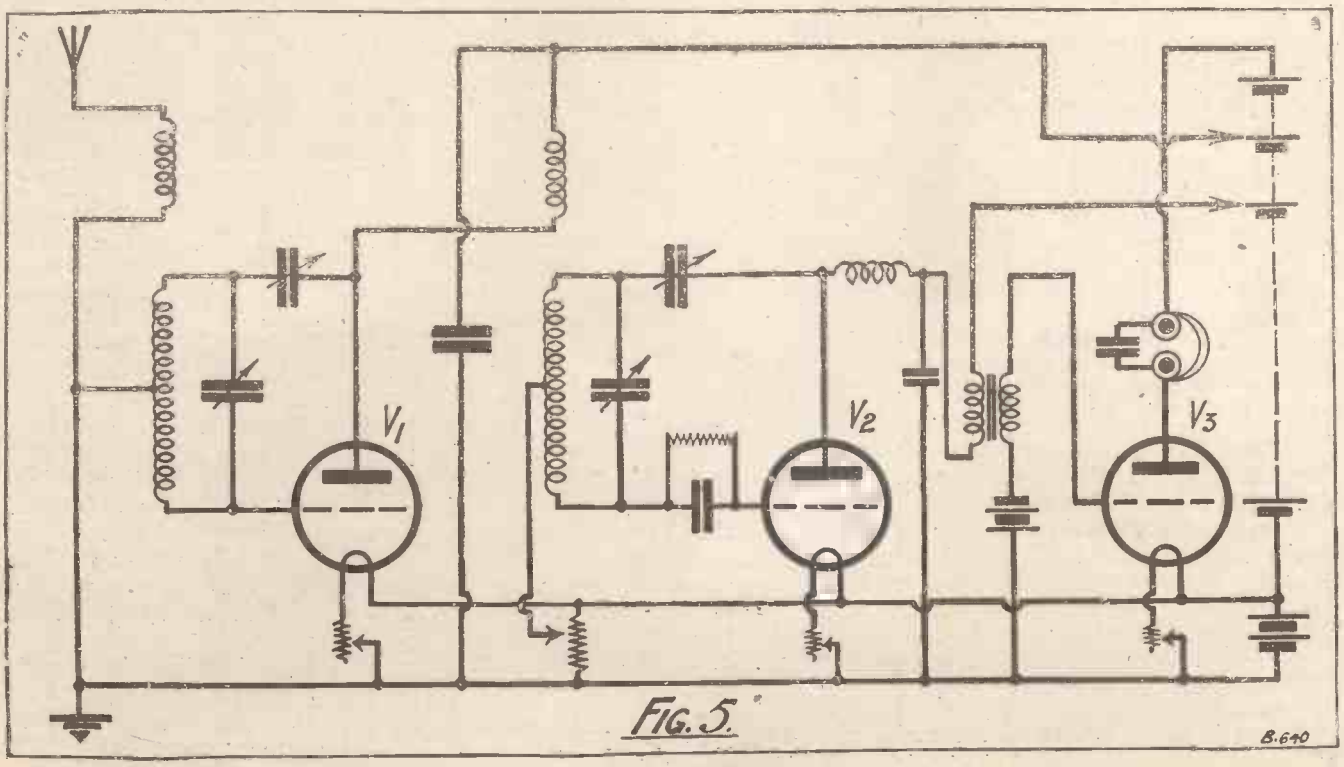


FIG. 5.

The B.B.C. Big Seven

In the opinion of many, British Broadcasting has deteriorated since the new B.B.C. took charge. Are the seven programme dictators to blame?

BY A SPECIAL CONTRIBUTOR to "The Wireless Constructor."

SINCE the old B.B.C. has been metamorphosed into the new B.B.C., and since the tentacles of the Civil Service have enwrapped themselves around the administration at 2, Savoy Hill, the results of the change have in many cases been unsatisfactory.

Programme Quality.

Probably the most conspicuous result of the advent to power of the British Broadcasting Corporation has been the rapid decline in the quality of the programmes. "Quality," in this particular instance, is used with reference to the type of entertainment. In one sense, the quality of the programmes has improved, inasmuch as the B.B.C. have included in their programmes in the first month of the New Year many classical items and many items of a more aesthetic nature than did the old B.B.C.

Mr. R. H. Eckersley (left), and Mr. Stobart, the B.B.C.'s educational adviser.

But the result has been, not unnaturally, an outburst of adverse criticism on the part of listeners throughout the country, for although there are many thousands of people who like what, for want of a better term, we might call a "cultural programme," there are undoubtedly many hundreds of thousands of listeners who prefer what, for want of a better term, we will call an "entertainment programme." The whole question is a relative one, and it again opens up that tremendous problem, "How to please everybody?" The answer is, of course, "It can't be done!" The question has now reached dimensions of such importance that the "Daily Mail" recently inaugurated a special prize competition to find out the needs of listeners.

Face the Facts.

But the B.B.C. can avoid the pitfall of trying to please the minority instead of the majority. Their endeavours to improve the programmes from the cultural point of view are undoubtedly sincere; but, on the other hand, they must face the facts, and the facts are pretty plain—viz., that the public want, first of all, entertainment. Aestheticism in small doses can be introduced into the programmes, but it must be introduced with far more discretion than has hitherto been exercised by the controllers of the programmes of the new B.B.C.

Readers of THE WIRELESS CONSTRUCTOR are, of course, primarily interested in the making, testing, and general operation of receiving sets; but we daresay that even the most fervid constructor, when he has built a set of which he is particularly proud, spends a certain amount of time tuning in broadcasting stations and, for the benefit of himself or the members of his family, listening to the broadcast programmes.

It may not worry him very much if the programme is poor six days out of the week, but on the seventh, perhaps, he grows a little weary of technicalities and wants to be thoroughly entertained. Then he will realise the acute controversy which rages concerning the programmes, and he will perhaps no longer stand aloof from the complaints of listeners, but will join with them in their criticisms of the B.B.C.'s efforts in the programme direction.

The Committee.

One of the first things the new B.B.C. has done has been to form what they call the "Big Seven." The Big Seven is nothing more or less than a Programme Committee,

Left: Mr. R. E. Jeffery. To the right is Sir Gordon Nairne, Bart., one of the new Governors of the B.B.C.

and it consists of six gentlemen and one lady. This committee has been subjected to a considerable amount of criticism, chiefly on the grounds that the individual members of the committee are, on the whole, quite unsuited to the important task of acting as arbiters of the broadcasting programmes.

The direct result has been, since this committee has been appointed, that the programmes have been rather stodgy, and criticism after criticism has appeared in the Press denouncing, in no uncertain terms, the B.B.C. programmes.

As we write these lines, however, it is interesting and pleasing to note that the B.B.C. have at last realised

(Continued on page 537.)

New Lamps for Old

Some further notes on the modernisation of some of the most popular sets of the past.

By PERCY W. HARRIS, *M.I.R.E.*
(Editor of "The Wireless Constructor.")

As mentioned in my editorial chat this month, the response to my request for details of the sets readers would like to see modernised has been so great that I am rather at a loss to know just where to start. I would like, however, first of all to deal with a few generalities, so as to clear up some misconceptions that have arisen.

Requests from Readers

First of all, quite a number of readers have written sending me details of their own individual sets, which they have designed themselves,

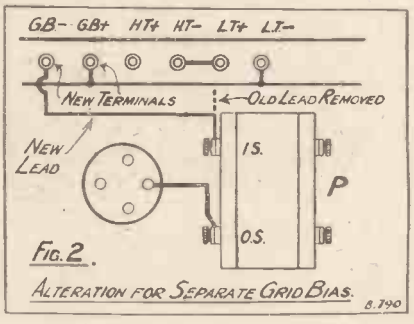


FIG. 2. ALTERATION FOR SEPARATE GRID BIAS. B.790

or made from particulars published in other journals, and have asked me to send, "by return," full working diagrams of how to make the necessary conversions. I recently received in one day sufficient letters of this kind to occupy all my time for a full week if I were to attempt to reply to them! I trust those readers who have written in this way will not be offended if I point out to them that I am bound to devote my attention first of all to matters of the widest appeal to readers, which means, in effect, that in "modernising" I can deal only with sets which have been built in large numbers. In any case, much as I would like to respond to such requests, individual replies are impossible, and those readers who have special queries that they desire to be answered should address them to THE WIRELESS CONSTRUCTOR, Query Department, where, with a skilled staff, under the able direction of Mr. G. P. Kendall, B.Sc., they can be dealt with promptly. Particulars of this service are given on another page.

Some Practical Tips

Several hundreds of readers have written asking that some particularly well-known set shall be "modernised in the next issue!" Here again it is manifestly impossible to deal with twenty or more sets in one issue, so that again there is bound to be a little disappointment. In the present article I am endeavouring to give practical information on a large number of sets so as to clear the air for further articles, and if your particular pet receiver is not described this month, please remember the limitations to which I have referred.

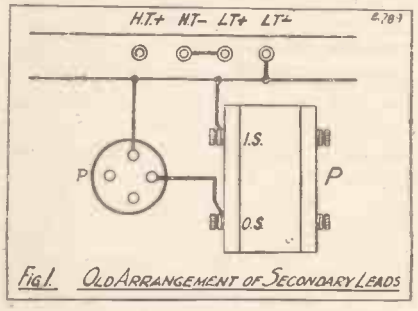
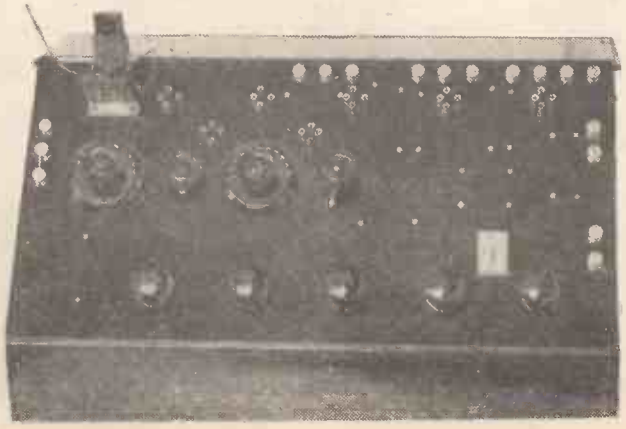


FIG. 1. OLD ARRANGEMENT OF SECONDARY LEADS

Wireless receivers in general can be classified under several heads, of which the principal are as given in the list below:—

1. Crystal sets.
2. L.F. amplifiers.
3. Single valve sets.
4. Sets with a detector, followed by one or more note-magnifying stages.
5. Sets in which the detector valve is preceded by one or more stages of H.F. amplification.
6. Reflex receivers.



The "Transatlantic Five," which used the barreter type of filament resistance.

New Lamps for Old—*continued*

In so far as crystal receivers are concerned there is comparatively little that can be done to modernise them, as no startling developments have taken place in this particular field. Crystal sets differ in sensitivity and selectivity.

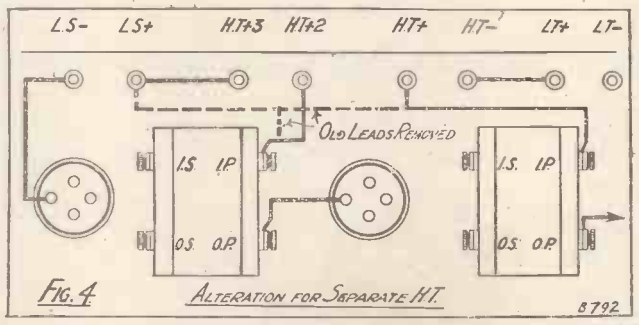
Changing the Cat's-whisker.

If your particular brand of crystal detector was purchased two or three years ago, and is of the cat's-whisker type, it is highly probable that one of the modern brands of crystals will give you much better results, as crystals on the whole are very good nowadays. A change of cat's-whisker is always an advantage after two or three year's use. In spite of absurd claims sometimes made, you can take it as definite that there is not a great deal of difference between the well-known brands of crystal, provided you get a good specimen of each. As reaction cannot be used with a crystal receiver and can with a valve, and as, furthermore, reaction with a valve increases its sensitivity very considerably, it is quite impossible to get the sensitivity with a crystal which is obtainable with a properly adjusted valve. If anyone claims that they can get as good results with a crystal as with a valve using reaction, then either they do not know how to use a valve properly, or else, to put it politely, they are careless in their handling of language.

Improving Crystal Sets.

The efficiency of a tuned circuit in a crystal receiver can often be improved considerably by substituting a new coil, particularly when the existing coil is of fine wire wound on a former which is moisture-absorbing, the whole coil being smothered in paraffin wax; but so much depends upon the aerial with which a crystal set is used that it is impossible to lay down hard and fast rules for crystal sets which will guarantee an increase in efficiency. Those who are experimentally inclined and desire to get better results with crystal sets, are recommended to try single-layer coils on thin insulating formers, preferably ribbed so as to keep the wire away from the solid material, and also preferably grooved so as to space turns by a distance about equal to the thickness of the wire. In such cases bare or enamelled wire can be used, the gauge being about 24 S.W.G. The tuning condenser should be connected across the whole of the coil, and the detector may be tried across the whole, or across portions, until best results are obtained.

Selectivity with crystal sets means, to all intents and purposes, cutting out ship or coast station Morse interference, as only in exceptional cases is it possible to hear more than one broadcasting station (excluding Daventry). A good practical way of making a crystal set more selective is to tap both aerial and crystal across only half of the coil. A centre tapped plug-in coil is very useful for this purpose, the variable condenser being connected to the two ends, the earth to one end and the crystal detector and aerial to the tap.

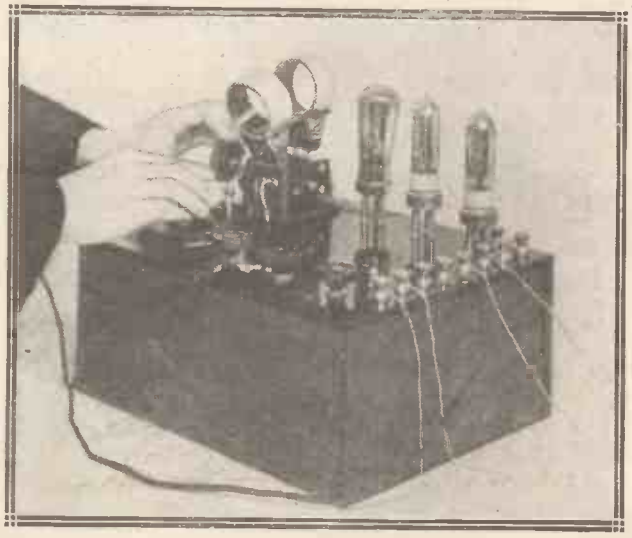


Very often a set which was designed several years ago can be improved enormously by adapting it for separate H.T. This diagram shows how to make the necessary alterations.

If you have a separate amplifier with one or two stages of note magnification and you are doubtful as to whether it is up to date, examine it for the following points.

Modernising Amplifiers

1. Has it provision for separate grid bias for each amplifier valve? If not, find which are the secondary leads of the transformer and you will see that one of these leads goes to the grid socket of the valve holder. The other secondary lead is generally taken to one of the L.T. leads if no grid bias is fitted. If this is the case, remove the wire which goes from this particular terminal of the transformer to the L.T. lead and take a new lead from the transformer to a new terminal fixed on the panel marked "grid bias negative." Place on the panel a second terminal for "grid bias positive," and connect this to any existing lead which goes direct to the "L.T. negative" terminal. If there is a second L.F. valve in the amplifier, you will require still another "grid bias negative" terminal which should be marked "grid bias negative 2." This should be joined up in exactly the same way as before, *i.e.*, a lead from it being taken to the correct secondary terminal of the other transformer. The same grid bias positive will serve for both valves.



The "Powerful Three" Receiver, which was first described in this journal two years ago. A simple method of improving its selectivity is described in this article.

New Lamps for Old—*continued*

The diagrams (Figs 1 and 2) will make the position clear.

If your amplifier is not fitted with separate H.T. to each valve, it is advisable that it should be so provided if you desire to try different types of valves in the same instrument. For example, you may care to use a super-power valve in the last socket and an ordinary power valve in the first. To get really good results with a super-power valve you want at least 120 volts H.T. on the plate and you may be able to do with less on the previous valve. Here again the provision of separate H.T. is a very simple matter, and should be proceeded with as follows :

Examine the wiring, and you will probably find that (exclusive of any switching arrangement which will always complicate wiring) a lead goes from the plate socket of your last valve holder to one loud speaker terminal marked " L.S. negative," the " loud speaker positive " terminal being taken directly to " H.T. positive " terminal. This same H.T. positive terminal will be found connected to one of the primary terminals of the L.F. transformer preceding the last valve, the other primary terminals of this transformer being taken to the plate of a valve.

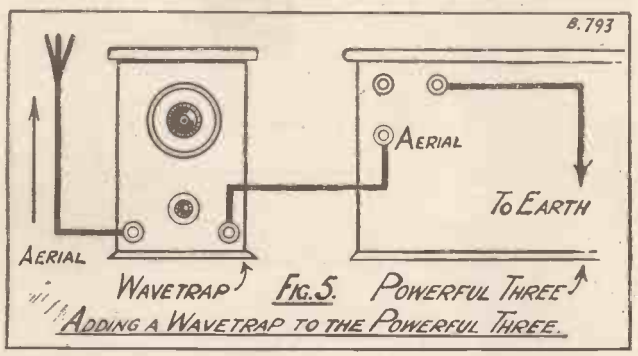
Simple Alterations.

Now in some convenient position fit an additional " H.T. positive " terminal and disconnect the lead which goes from " loud speaker positive " to the existing H.T. positive terminal. A lead should now be taken from " loud speaker positive " terminal to the new " H.T. positive " terminal.

Do not forget that each H.T. tapping requires its own shunting condenser of the Mansbridge type, and if you already have a Mansbridge condenser across your H.T. terminals, leave it in position and connect a new one between the new H.T. positive terminal and " H.T. negative," or, better still, between the new H.T. positive and L.T. negative.

Single Valve Sets

Single valve sets are so simple that there is no great point in giving details of how to modernise any existing one. It is far simpler and better to pull it to pieces and rebuild it in a more modern design along the lines already published. A really excellent single valve set right up to date in design is that described by Mr. L. H. Thomas in the present issue. Probably many of your existing parts can be used for this ; in any case the total cost of a single valve set is not high.



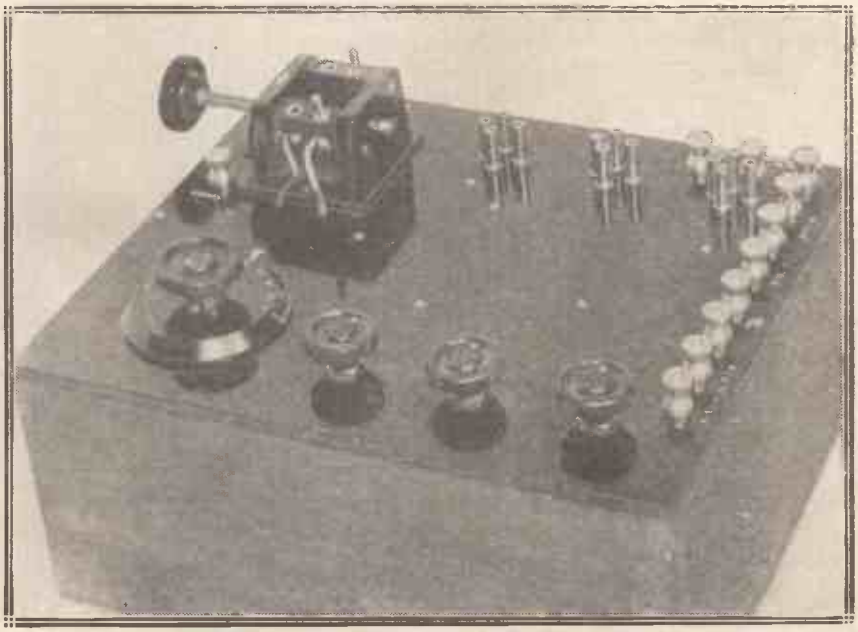
The " Radiano Silencer " Wavetrap, described in this issue, gives excellent results when used in conjunction with the " Powerful Three," as shown.

Sets without H.F.

A very large number of sets have been built along the lines of a detector valve followed by two note magnifiers. The modernising of the note magnifying stages can be undertaken along the lines suggested above for " amplifiers." The trouble with most sets of this kind—in fact, practically all—is that they are unselective, although when properly handled such a set can be very sensitive for long-distance work. A typical set of this kind and one which readers are asking to have modernised, is the " Powerful Three," published in this journal for April, 1925. A large number of readers have written to say that they are getting excellent results so far as quality and sensitiveness are concerned, but that the set lacks the selectivity necessary for modern conditions.

Selectivity Improved.

After carefully considering the problem, I have come to the conclusion that by far the best step to take with a set of this kind is to precede it by a good wavetrap. The Radiano wavetrap, described in the current issue, will fill the bill in practically all cases, and is not only simple to make, but inexpensive. With the " Radiano Silencer " in front of the " Powerful Three " the reader can get as good results as are possible with any simple modern set, using a detector and two L.F. valves. Really high selectivity of the knife-edge variety generally requires several tuned circuits and is



A close-up of the panel of the " Powerful Three."

New Lamps for Old—*concluded.*

not to be expected except in a receiver which incorporates stages of H.F., or the super-heterodyne principle.

Sets with One or More Stages of H.F.

The older sets using H.F. stages used either a tuned anode coupling or else the barrel type of H.F. transformer. In the case of a receiver with a single stage of H.F. the stability was to some extent dependent upon the kind of aerial with which it was used. For example, if the aerial was of the heavily damped variety, then this itself was more than sufficient to absorb the surplus energy fed back, which would otherwise cause the set to burst into oscillation. Similar sets with a really efficient aerial would require some positive bias on the grid to obtain stability.

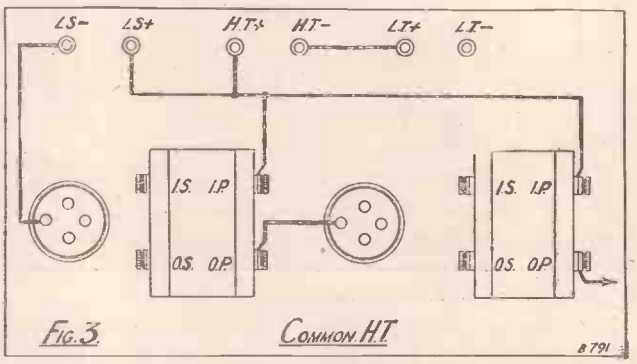
A Damping Action

With two stages of H.F., violent oscillation would take place unless some damping was introduced by means of positive grid bias. This bias was obtained in the older designs either by connecting the grid return of the H.F. valve or valves, to the slider of a potentiometer, by which a varying degree of positive bias could be applied; or more crudely, by connecting the grid return directly to the positive leg of the valve, thus giving a positive bias to the grid equal to the voltage drop across the filament resistance. This means, in effect, that with a 4-volt valve the connection of the grid return to the positive leg would give a positive bias on the grid, setting up appreciable grid currents and consequently much damping.

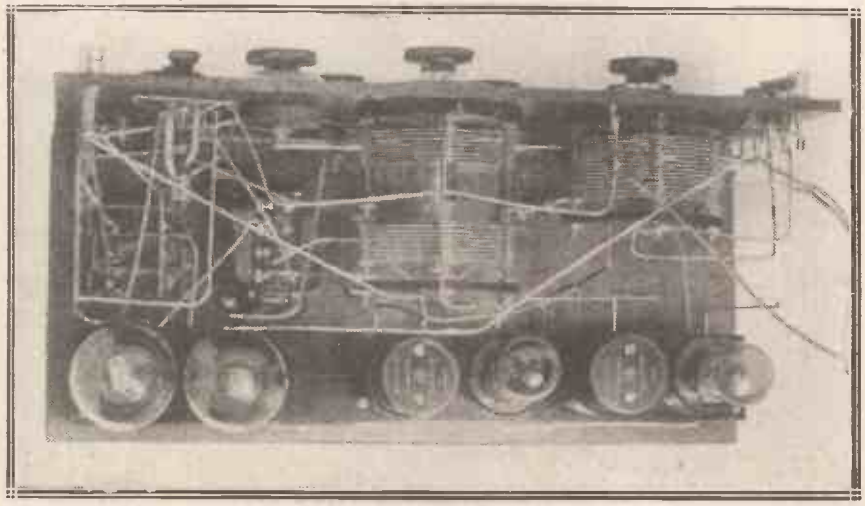
The main step in modernising a receiver of this type is to introduce a far higher efficiency into the method of coupling. This is generally best done by adopting one of several neutralising methods by which the H.F. valve or valves are prevented from oscillating, not by deliberately introducing damping, and therefore losses, but by balancing out the effect which normally would feed back energy from the plate to the grid circuit. The second step is to use low-loss coils in place of the older high-loss transformers. I have measured the H.F. resistance of the older barrel types of H.F. transformer and find that it is from eight to ten times as high as the H.F. resistance of the best types of modern coil. Unfortunately for our modernising endeavours the modern H.F. transformer of efficient design is far larger than the old barrel type. This brings with it two disadvantages, the first being that the space they occupy is more than we have available in most receivers; and secondly—a very important point—the stray field effect is far greater. The space problem can sometimes be overcome by a rearrangement of parts and the stray field problem can be overcome by one of two methods. One is to use the screened coil now so widely sold, and the other is to use a special small coil with restricted field.

Practical tests show that such small size coils are very efficient and can be used for many modernising purposes. Next month, in dealing with practical details of one or two of the more popular sets, I will give you particulars of how to use these coils.

SPECIAL NOTE.—Particulars of how to modernise the Four-Valve Family Receiver were given in "Popular Wireless," Nos. 235 and 236.



This sketch shows the old-fashioned method of giving a common H.T. plus connection to three valves.



Plan of the "Translantic Four," which employed the barrel type of H.F. Transformer.

"An Old Circuit in New Clothes."

By an oversight the "Table of Results" referred to on page 409 of our last issue was omitted. The following further particulars of the receiver should have been included.

Received in one hour, on outside aerial, at good telephone strength: All British main stations, with the exception of Cardiff, free from interference from London (about 8 miles off), Dublin, Belfast, a large number of German stations, mostly unidentified, three Spanish, three French, Rome, and several stations speaking languages not French, German, Italian or Spanish.

On indoor aerial, about fifty per cent. of above were heard, but of course much weaker. Birmingham and Bournemouth and a number of German stations came in at good telephone strength when proper adjustment of reaction control was made. Several of the German stations seemed to come in just as well on the indoor aerial as on the outside aerial, probably due to the fact that on the latter critical reaction adjustment was unnecessary.

Above tests were made with D.E. 8 H.F valve with 60 volts H.T.

THE ARGUMENT FOR THE TRICKLE CHARGER

This is the second of a series of articles which are being specially written for "The Wireless Constructor" by our Scientific Consultant:

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

IN this series of articles I am going to deal generally with the interesting and important subject of battery eliminators, which permit the high-tension and low-tension currents for the wireless receiver to be obtained directly from the electric lighting mains, and also with the allied subject of battery charging.

In the last article we discussed the relative advantages and disadvantages of valve and chemical (or electrolytic) rectifiers.

In the present article I would like to deal with the question of low-current battery charging.

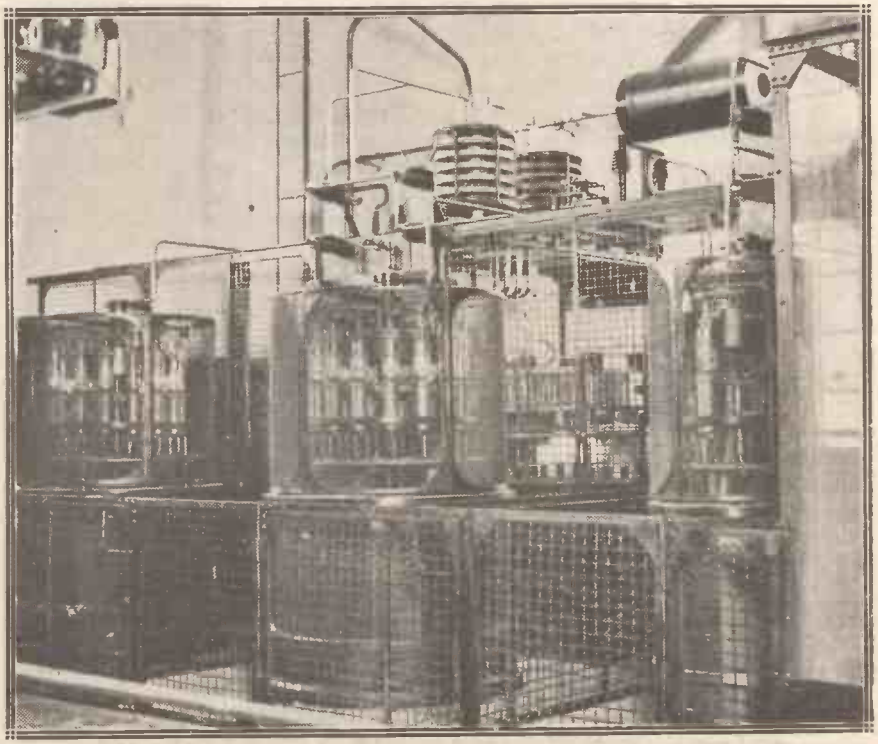
In the battery eliminator proper there is no battery whatever (as, of course, the name of the device implies). Instead, a system of choke coils and condensers is provided which merely serves the purpose of "ironing out the wrinkles" from the electric supply, so that no crackle or hum shall be heard from the wireless receiver when the current for the filaments or the anode circuits is being supplied in this way. In the case of the current for the filaments, it will usually be necessary to employ also a step-down transformer (if the electric supply be alternating current), or a suitable resistance (if the electric supply be direct current).

The Charging Switch.

Suppose, however, that we leave out of account for the moment the battery eliminator proper, and consider the very simple system represented by a battery (in this case, of course, I mean an accumulator), which has its terminals connected to the middle terminals of a double-pole double-throw switch, one end pair of terminals of the switch being connected to the electric supply, and the other end pair of terminals of the switch being connected to the filament terminals (or the H.T. terminals, as the case may be) of the set. It will be clear with this arrangeme t that, if the switch is thrown over into one position, the battery is connected to the set and disconnected from the mains, whilst if the switch is thrown over into the contrary position, the battery is disconnected from the set and connected to the mains.

Never Runs Down.

If the battery is never left standing idle—that is to say, if the double-pole double-switch throw referred to is always in the left-hand position or the right-hand position, and never in the neutral position—then the battery is always either charging or discharging. And, if we can so arrange matters that the battery takes up a charge, between one evening and the next evening, equal to the discharge which it has suffered during an evening's use, the charge and discharge will balance or compensate one another, and the battery may for practical purposes be forgotten; it serves the function of a very temporary reservoir, or a vehicle for transferring the electrical energy from the mains to the receiver. Thus, although an arrangement of this kind actually includes and depends upon a battery, and, therefore, cannot strictly be called a *battery eliminator*, it certainly can be called a battery *trouble eliminator*, inasmuch as the battery may almost be forgotten.



The main transmitting plant used at the Rugby station for the trans-Atlantic telephony service.

The Argument for the Trickle Charger—*continued*

There is a great deal to be said in favour of the simple arrangement mentioned above, even as compared with the best and most elaborate battery eliminators.

In the first place it is simple both in construction and maintenance.

In the second place it is inexpensive in first cost and maintenance, and its cheapness will still further be realised when I deal, as I shall do in a moment, with the actual size of battery which may be employed.

Some Surprising Calculations

In the third place it surpasses any battery eliminator which has ever been devised, or probably which ever will be devised, on the score of smoothness and steadiness in the current supplied to the set. This will be obvious, for when the set is actually drawing its current supply the battery is entirely disconnected from the mains, and we have, therefore, all the well-known advantages of accumulator supply, so that this "battery eliminator" might, perhaps, with more correctness, be called a mains supply "mains eliminator."

With this arrangement no choke coils or condensers are necessary. The only components which are required are, as I have mentioned, either a resistance, if the current is D.C., or a stepdown transformer with rectifier, if the current is A.C. In the case of high-tension supply, even the transformer will usually be unnecessary. It should also be borne in mind that with a battery eliminator proper these components are equally required—that is, transformer and rectifier for A.C., or resistance for D.C.—so that, comparing the battery eliminator proper with the little battery device in question, we see that the small battery itself takes the place of the smoothing system represented by the choke coils and condensers, and, as I have already remarked, it carries out the functions of smoothing the current infinitely more efficiently.

Now we turn to the question of balancing the charge and discharge of the battery from day to day, and here a few simple arithmetical calculations will perhaps prove rather surprising.

Supposing you are using a three-valve set, with dull-emitter valves consuming $\frac{1}{4}$ ampere each, which, I suppose, represents a fairly average case. The total current is $\frac{3}{4}$ ampere. Suppose, also, that the set is operated for an average of four hours a night; then the total ampere-hours consumed is 4 by $\frac{3}{4}$—that is, 3 ampere-hours. We now have 20 hours left, until the same time next evening, in which to put back into the battery the 3 ampere-hours which it has lost. If we divide 20 by 3, we find that a current of approximately 1/7th of an ampere will be required, so that if a battery is put on steady charge at 1/7th of an ampere for 20 hours it will turn up at the same hour the next evening in precisely the same condition as it was when we started: it will have taken up 1/7th of an ampere multiplied by 20 hours—that is, almost exactly 3 ampere-hours.

Consequently we have to arrange matters so that when the battery is left on charge it is receiving only a very small current, and a few additional calculations will soon satisfy you that this current may be, in the majority of cases, between 1/10th of an ampere and $\frac{1}{2}$ ampere. It is very unlikely to exceed $\frac{1}{2}$ ampere, because $\frac{1}{2}$ ampere in 20 hours gives you 10 ampere-hours, and there must be very few wireless sets indeed which will consume 10 ampere hours in a single evening.

An Important Point

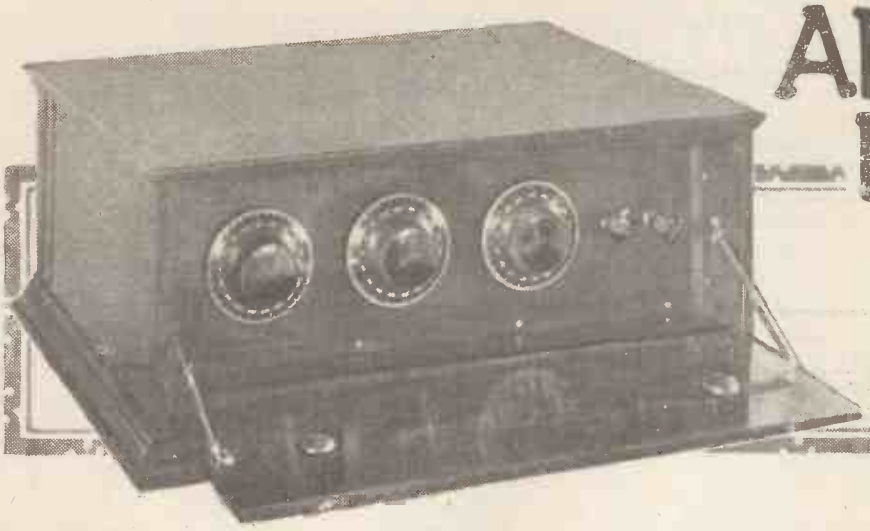
The very small current of, say, 1/10th or 1/5th of an ampere is obviously only a "trickle" of current, and it is for this reason that the battery charger delivering such a small current is known as a "trickle charger."

Now we come to what is an important practical question—namely, the question of size and cost. In the ordinary way the average wireless experimenter recharges his accumulator, say, every week or every fortnight, and, consequently, he has to use an accumulator of sufficient size and ampere-hour capacity to operate the set for that time without its voltage dropping below the standard value. This may mean quite a large accumulator; many listeners use accumulators of 50 ampere-hours, or even 100 ampere-hours capacity.

Again, when the average listener comes to charge his battery, he wants to complete the charge in a matter of a few hours—at any rate a day at most—and he has therefore to put back into the battery in the course of, say, 12 hours, the charge which it has lost during a fortnight or a month. Taking our original estimate of 3 ampere hours per night, seven nights a week, this works out at about 40 ampere hours in a fortnight. Forty ampere hours have thus to be put back into the battery in 12 hours, which means a charging current of about 4 amperes.

(*Continued on page* 540)

KDKA on one valve.



ANYVALVE FOUR

A four-valve receiver, specially designed, as its title indicates, to give good results when almost any combination of valves is employed.

By L. I. LESLIE

ONE of the difficulties with which the amateur is faced to-day arises from the number of different valves on the market. One valve manufacturer considers that a certain combination of internal-impedance and amplification-factor gives the best results under given conditions, while another manufacturer has similar but often definitely different views.

On the low-frequency side the problem has become fairly standard, although there are still discrepancies, but the differences resulting from the interchange of the various types of valves in the L.F. stages of a receiver are not usually very marked. On the H.F. side, however, the problem is somewhat different.

Strength and Selectivity

In a H.F. amplifier we have not only to consider the signal strength which we obtain from the arrangement, but we have also the question of selectivity. Most experimenters who have had much experience of H.F. amplification will realise that in order to obtain satisfactory results on both these scores some very careful design is necessary.

For example, in the case of transformer-coupled circuits the number of turns on the primary winding has to be designed to suit the valves in use. If the number of turns is reduced, the selectivity of the arrangement is correspondingly increased; but at the same time there is a tendency to drop signal strength. It will be clear that for any particular type of valve there must be some point at which the best conditions obtain. For example, at a given signal strength there would be a point at which the selectivity is the best, but this optimum arrangement only holds good for one particular type of valve.

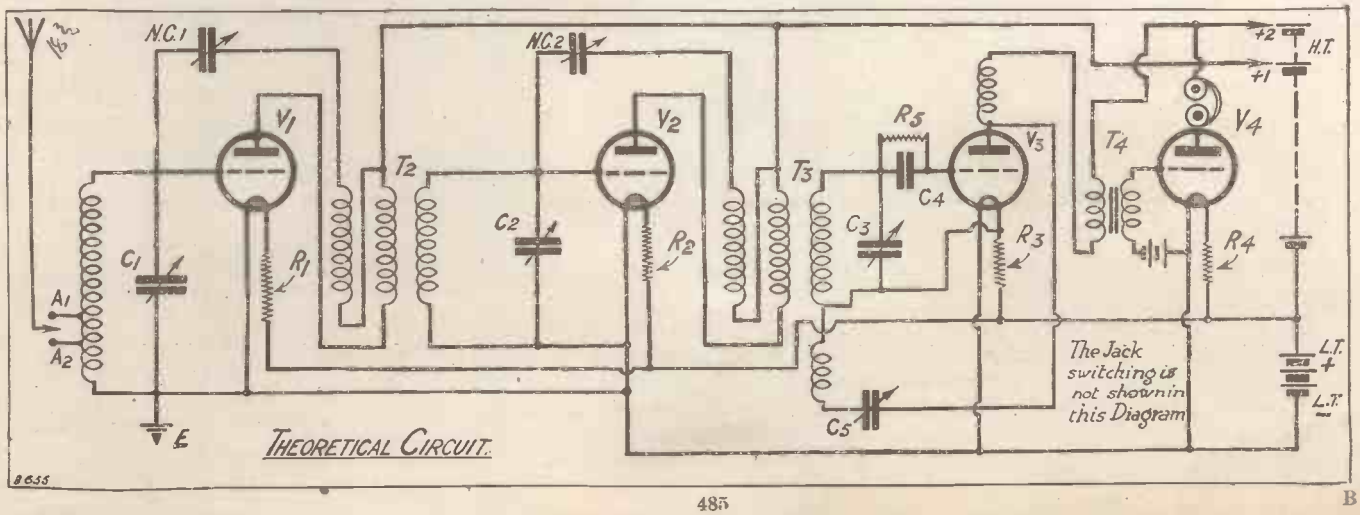
COMPONENTS REQUIRED.

1 panel, 21 in. by 7 in.
1 cabinet to suit, with baseboard, 10 in. deep.
3 ·0005 variable condensers (S.L.W. or S.L.F.)
3 Standard six-pin coil bases.
1 special aerial coil.
2 special transformers, with replaceable primaries (Collinson Precision Screw Co.).
4 vibratory valve holders.
1 L.F. transformer, 2·5 to 1 (Ethoplus).
1 ·0001 reaction condenser (Ormond).
2 neutralising condensers.
1 H.F. choke.
4 amperites to suit valves in use.
1 ·0003 condenser, with 2 megohm leaks
Aluminium Sheeting for Screen.
1 single circuit filament switching jack (Edison Bell).
1 terminal strip, 20 in. by 1½ in.
10 terminals.

An Ingenious Method

There are on the market now a number of types of H.F. transformers which have been devised by various writers, the most well known being the screened coil type. These transformers were intended for use with a valve of the D.E.5b type and were designed accordingly.

There are many readers, however, who possess other types of H.F.



Anyvalve Four—*continued*

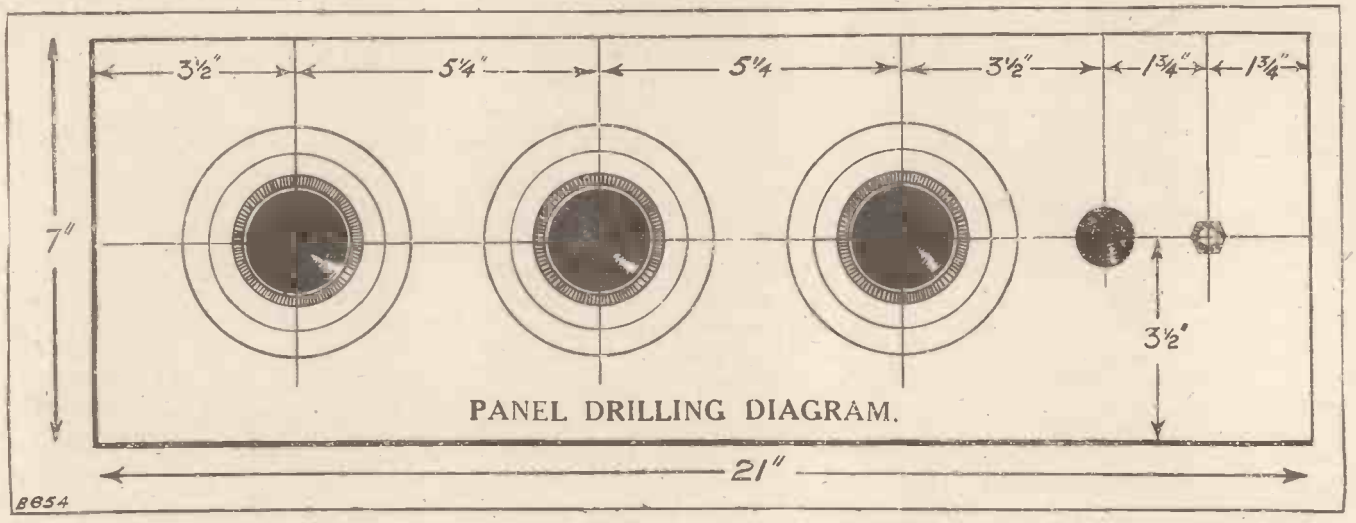
valves which they may prefer to use for various reasons. If these standard transformers are used with valves having appreciably different characteristics, the results are not going to be up to expectations. If a lower impedance valve is used, the selectivity will suffer, while conversely a higher impedance valve will result in instability.

A simple way out of the difficulty would be to be able to design one's transformer to suit the particular valves intended to be used. Whilst this is satisfactory in the case of the individual, it is an impracticable proposition commercially because it would mean carrying such an enormous stock of different types of transformers.

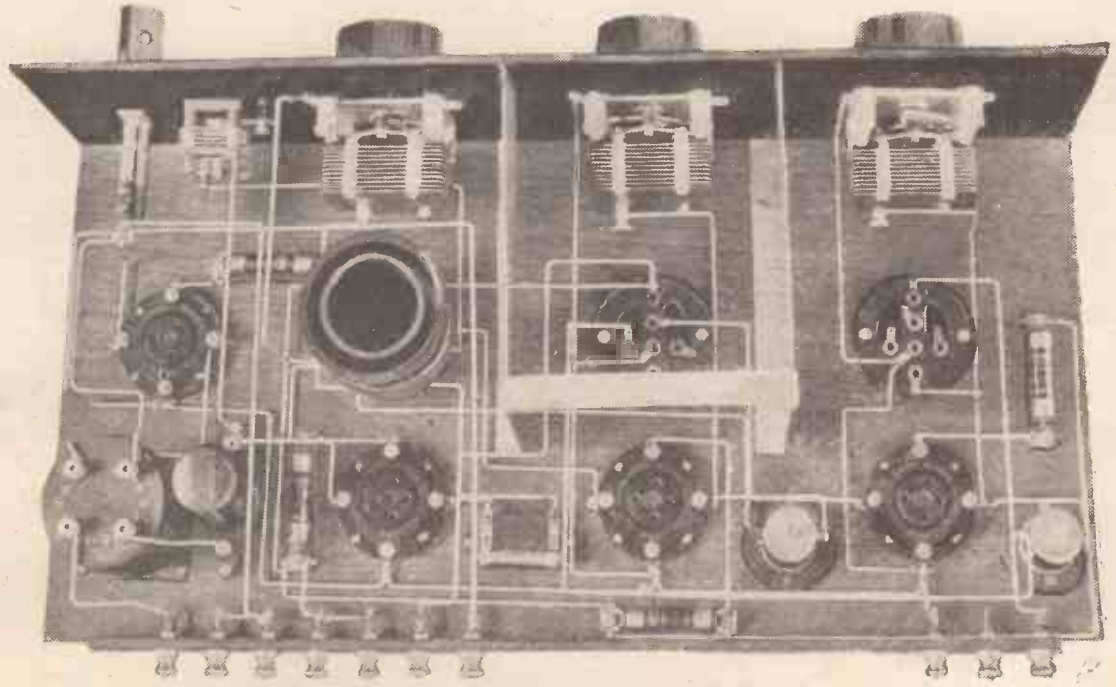
An ingenious way out of the difficulty, however, has been devised by the Collinson Precision Screw Co., who have produced a transformer having an interchangeable primary winding. The secondary winding is designed to tune over a fine range with the condensers in use, and is, of course, of low-loss construction, while the primary winding is fitted inside the secondary and can be removed and replaced by a different pattern.

The transformer is similar generally to the standard screen coil transformer marketed by the Collinson Precision Screw Co., but it is wound on a large former in order to increase the efficiency. It is designed to suit the standard six-pin base, which has already become popular. The primary winding can be obtained to suit the particular valves in use, or alternatively, the experimenter can, if he desires, obtain the blank primary former and wind on his own primary until he obtains satisfactory results.

These transformers enable the maximum efficiency to be obtained



PANEL DRILLING DIAGRAM.



Looking down on the "Anyvalve Four." The aerial coil and the first H.F. transformer have been removed to show the connections to the coil bases. Note how the aluminium screens are fixed, and also the spacing between these and the variable condensers.

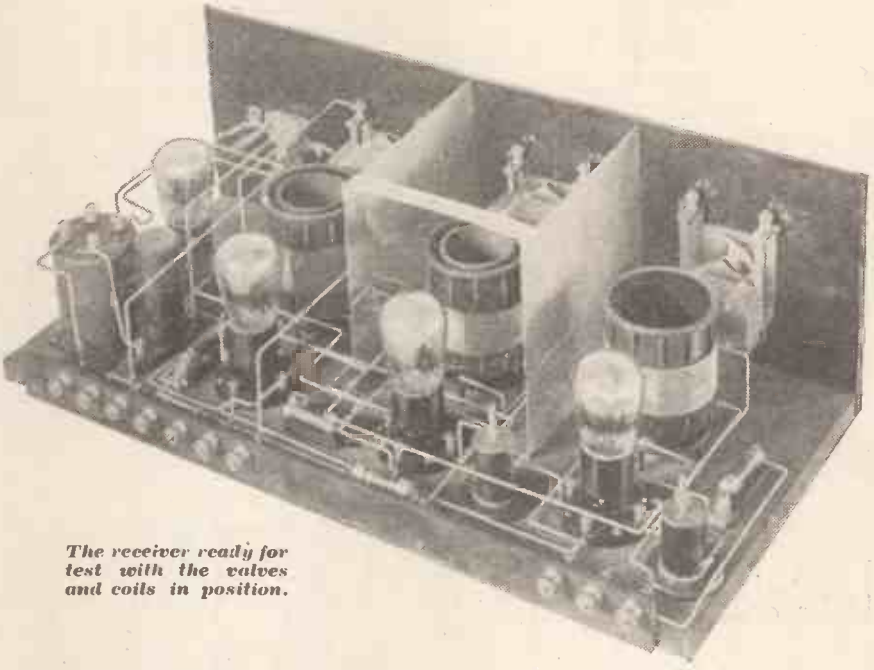
Anyvalve Four—*continued*

with any given set of valves, and the results are extremely interesting. The present receiver has been laid out as a real long-distance set, incorporating two H.F. valves, a detector, and one note magnifier, and over forty stations were obtained on the loud-speaker when testing out. These stations could not all be identified positively, however; but those included in the test report were definitely located. At the same time a variety of different valves was employed in the receiver, using the appropriate primary windings in each case, and there was little difference in the results obtained with of different types of valves. It was possible, for example, to replace a P.M.5a valve (50,000 ohms), with a P.M.6 valve (6,000 ohms), and still obtain almost equivalent results, which is a most remarkable state of affairs.

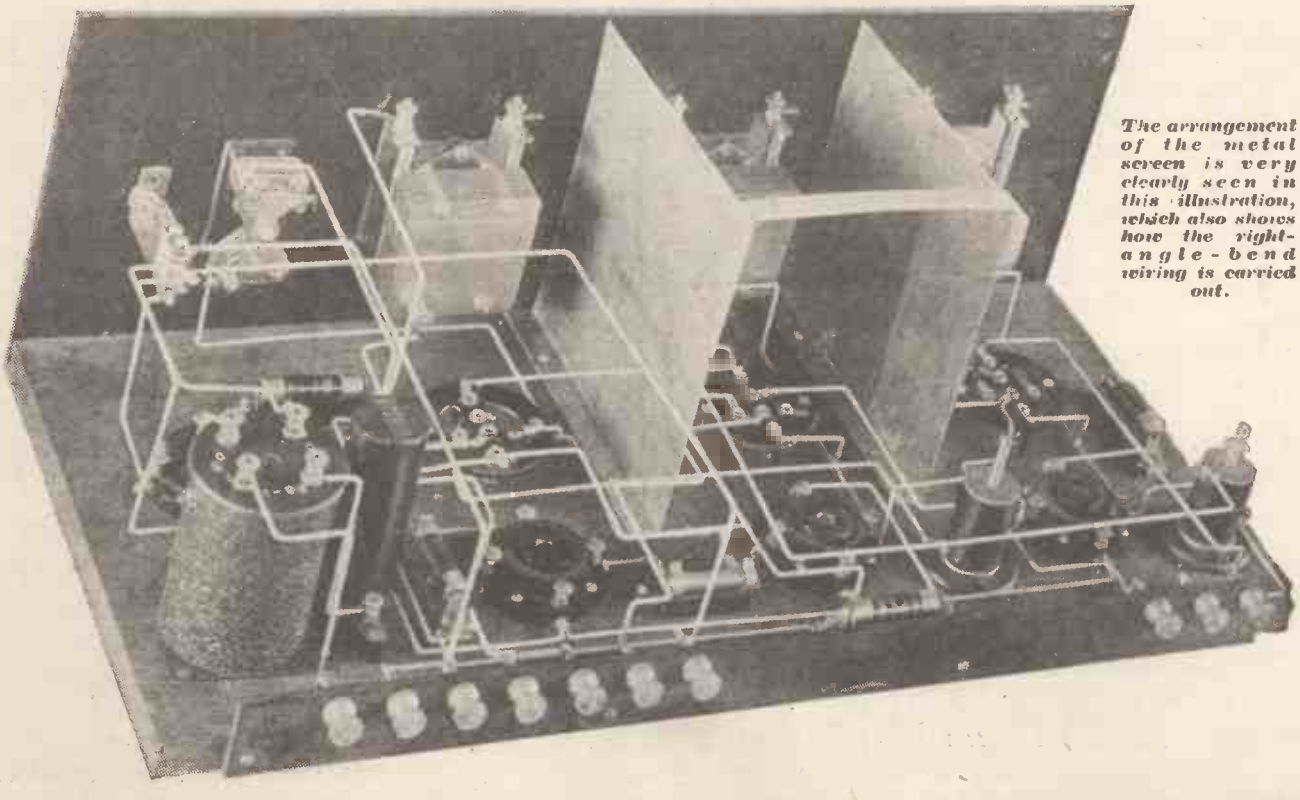
The constructional work is comparatively simple. The first operation is that of drilling the panel to take the three tuning condensers, the reaction condenser and the filament control jack. These are all mounted on the centre line of the panel, giving a very symmetrical and pleasing arrangement. When these operations have been completed, the panel may be laid on one side for the time being.

The Baseboard Components

Attention may then be turned to the baseboard components, which, again, will present no difficulty. The three six-pin bases are mounted immediately behind the three tuning condensers, and the valve holders in turn are then mounted behind them. The L.F. transformer and the L.F. valve are mounted on the right-hand end of the set, the other



The receiver ready for test with the valves and coils in position.



The arrangement of the metal screen is very clearly seen in this illustration, which also shows how the right-angle-bend wiring is carried out.

Anyvalve Four—*continued*

components being mounted in the positions shown.

In this particular receiver earthed shielding has been adopted between the H.F. stages. The new transformers are too large to be used effectively in the standard screen coils, so that it was decided to try the effect of a simple earthed shield in between various stages.

Two sheets of aluminium have been placed in between the first and second H.F. stages, and the second H.F. and detector stages. With the layout shown, each screen is nearly one inch away from the coil at the nearest point, and consequently the loss introduced in the coils is very small.

The screens are shown in the photographs, and they may very easily be cut and bent into shape.

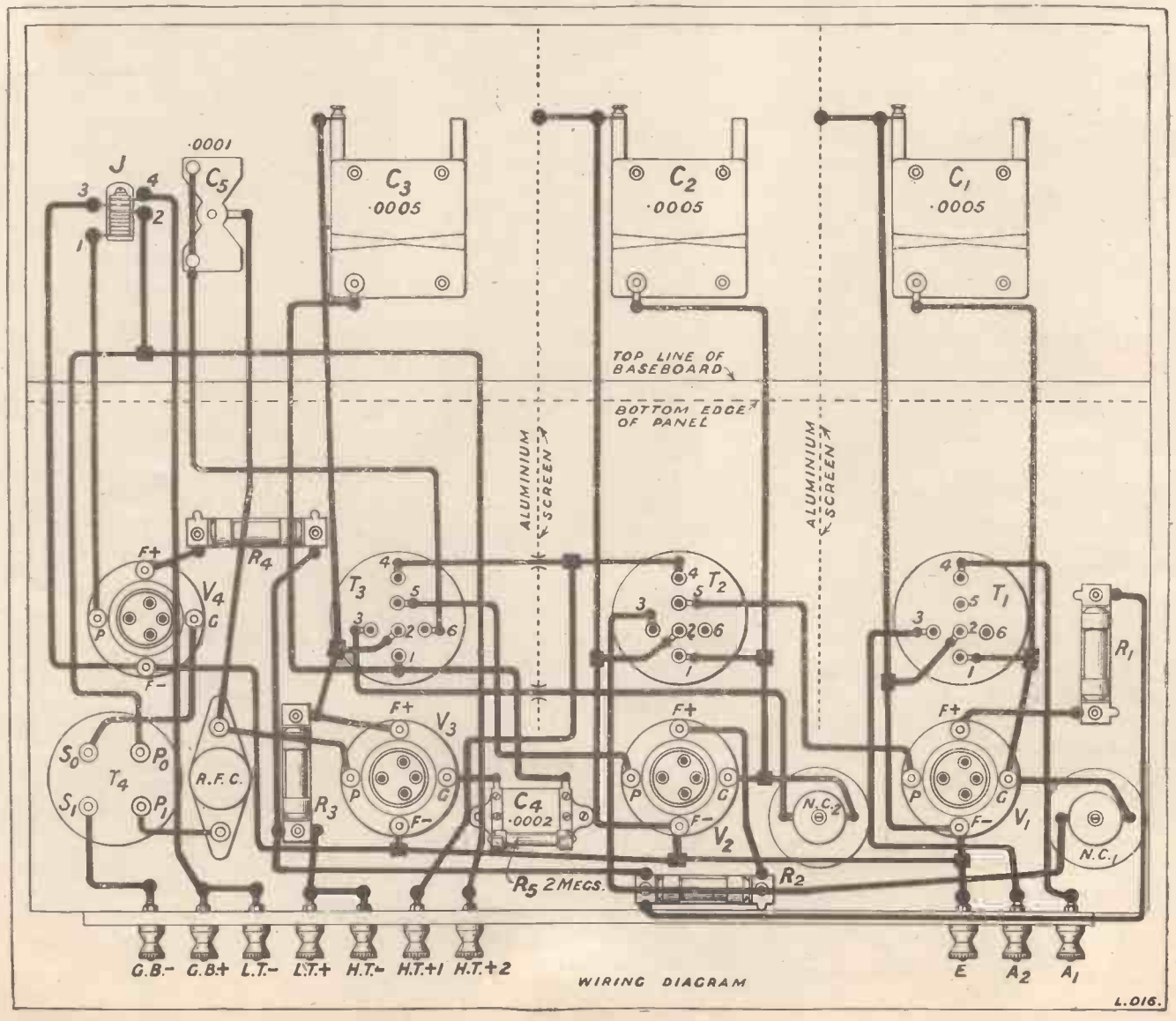
The assembly of the components completed, the receiver is ready for wiring up. The filament circuits should be wired up first, the remaining wiring being done later on. Amperites or fixed resistors have been used to control the filament current supply, while the switching on or off of the whole set is accomplished by the filament control contacts on the jack at the right-hand end of the receiver.

The H.F. Wiring

Having completed the filament wiring, the H.F. wiring can then be carried out. The wires have been kept well spaced and the rectangular system of wiring has been adopted. This method avoids capacity coupling between the leads as far as possible and should be adopted where practicable.

It will be seen that two holes had to be made in the screen between the second H.F. and the detector valve, but apart from these two leads all the other connections are brought round the ends of the screen.

The reaction condenser requires certain further reference. (This condenser is a small unit which can be used either as a small vernier condenser or as a reaction condenser. In this respect it is very convenient for use in different parts of a receiver.) There are two sets of fixed plates and



Anyvalve Four—*continued*

one set of specially shaped moving plates. To obtain a small capacity the connections are taken one to each pair of fixed plates, while no connection at all is taken to the moving plates. This connects the capacities of the two halves of the condenser in series, in which case its maximum capacity is of the order of ·000025.

In the particular case in point it was desired to use it for a reaction condenser, in which case somewhat higher maximum capacity is required. One connection is therefore taken to the moving plates, while the two pairs of fixed plates are both joined together and the second connection is taken to both. By this means the two halves are placed in parallel and a maximum capacity of the order of ·0001 is produced. This is perfectly satisfactory for the provision of reaction and is distinctly cheaper than the purchase of a condenser of the usual pattern, which is quite unnecessary for a reaction adjustment pure and simple.

Coil-base Connections

A word may perhaps be added concerning the connections to the six-pin bases. If the Collinson type of base is employed, the connections should be taken direct to the soldering tags on the various pins; but, of course, these connections must be kept flat along the top of the base, otherwise the coil cannot be inserted.

Another point which is important is that the screens between the H.F. stages must be connected to earth, and this point should not be forgotten, as otherwise peculiar effects may be introduced in the receiver. Beyond this there are no special points to note, and the wiring may be completed in accordance with the wiring diagram and photographs provided.

The receiver is then ready for testing out. First of all, carefully check over the wiring to ensure that no mistakes have been made. It is a particularly desirable plan in the case of a multi-valve receiver to incorporate a small H.T. fuse or flashlamp bulb in the negative H.T. lead. Should there be any mistake in the connections, this flashlamp bulb or fuse will then burn out before any damage is done to the valves or H.T. battery.

(*Continued on page 532.*)

TEST REPORT.

The following stations were received on a 20-foot aerial after dark at full loud-speaker strength (many others were received as well).

Station.	*Wave-length.* Metres.	*Dial Settings (approximate)* C_2	C_1	C_3
Stockholm	229	0	26	13
Toulouse	245	24	43	23
Eskilstuna (Sweden)	250	27	45	29
Bradford	254·2	34	49	26
Malmö (Sweden)	260·9	42	59	38
Dortmund (Germany)	283·6	68	73	54
Liverp'l and Hanover	297	78	82	65
Königsberg	303	88	86	70
Belfast	306·1	93	95	83
Marseilles	309·3	93	96	84
Newcastle	312·5	104	104	94
Dublin	319·1	104	104	96
Bournemouth		110	109	99
Copenhagen	337	118	116	110
London	361·4	140	138	130
Manchester	384·6	150	150	146
Toulouse	394·7	160	155	151
Berne (Switzerland)	411	180	170	170
Frankfurt	428·6	193	180	185
Paris (Ecole Superieure)	447·8	213	200	206
Barcelona	460	218	206	212
Lyons	476·2	234	224	226
Birmingham	491·8	246	233	237
Brussels	508·5	257	245	252
Rosenhugel (Austria)	517·2	268	254	260

WIRING IN WORDS.

Join the L.T. negative and the G.B. positive terminals together and to contact 4 on the jack.

Join No. 3 contact to one filament socket of each of the valve holders, to the earth terminal, to No. 2 terminal on T1 and T2, to the moving vanes of C1 and C2, and to each of the aluminium screens.

Join the L.T. positive and H.T. negative terminals together and to one side of each of the fixed resistors.

Join the other side of each of the fixed resistors to the remaining filament socket of the appropriate valve holder.

Join the A1 terminal to No. 4 terminal on T1.

Join the A2 terminal to No. 3 terminal of same.

Join No. 1 terminal to fixed plates of C1, to grid socket of first valve holder, and to one side of NC1.

Join the other side of NC1 to No. 3 terminal on T3.

Join the plate socket of the 1st valve holder to No. 5 terminal on T2.

Join No. 4 terminal on T2 and T3 to H.T.+1.

Join No. 1 terminal on 2nd base to fixed plates of C2, to grid socket of 2nd valve holder, and to one side of NC2.

Join other side of NC2 to No. 3 terminal on T 3.

Join the plate socket of the 2nd valve holder to No. 5 terminal on T3.

Join No. 2 terminal on T3 to moving plates of C3 and to the positive filament socket of the 3rd valve holder.

Join No. 1 terminal to fixed plates of C3 and to one side of grid leak and condenser (C4 and R5).

Join the other side of grid leak and condenser to grid socket of 3rd valve holder.

Join plate socket of 3rd valve holder to one side of RF choke and to moving plates of C5.

Join the fixed plates of C5 to No. 6 terminal on T 3.

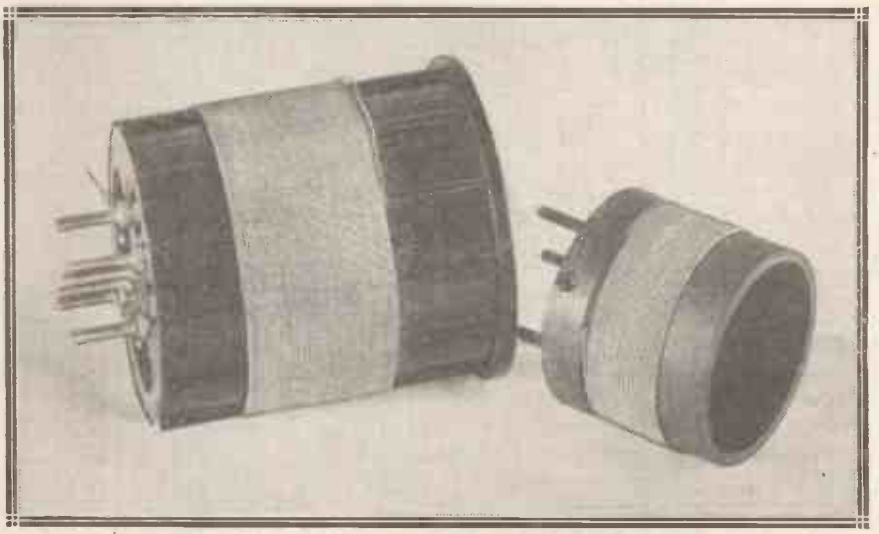
Join the other side of R.F. choke to IP terminal of L.F. transformer.

Join the OP terminal to contact 2 of jack and to H.T.+2.

Join the OS terminal of transformer to grid socket of the 4th valve holder.

Join IS to GB− terminal.

Join the plate socket of the 4th valve holder to contact 1 of jack.



A close-up of one of the transformers, showing the interchangeable primary coil.

Another Cossor

—new series of 6-volt Valves giving remarkable volume and exquisite tone

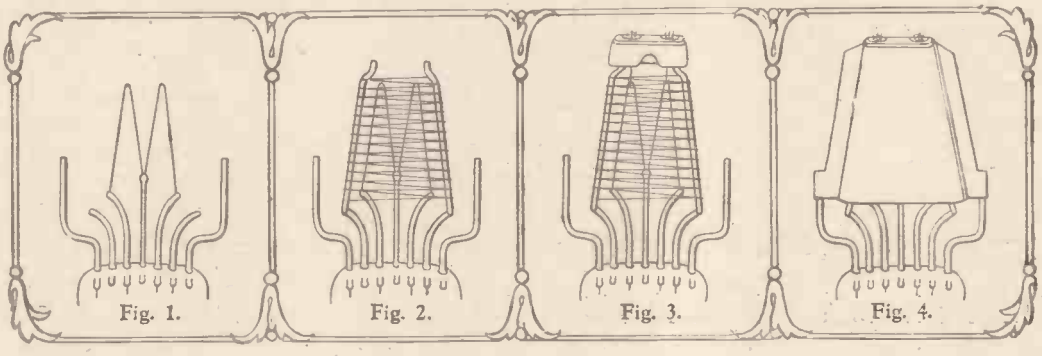
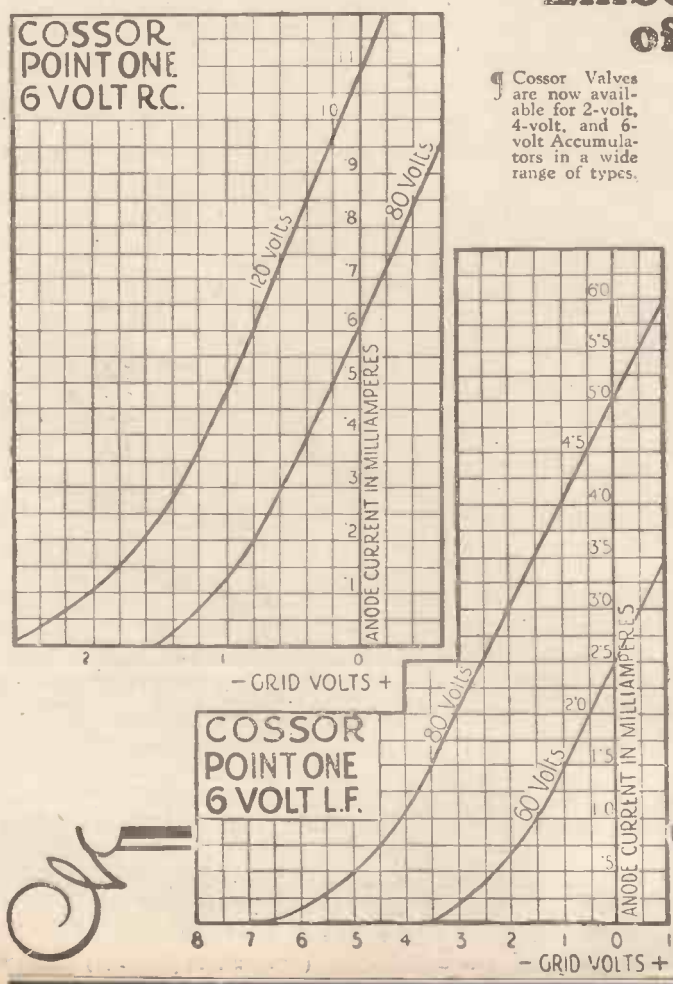


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Embodying the principles of Co-axial Mounting



¶ Cossor Valves are now available for 2-volt, 4-volt, and 6-volt Accumulators in a wide range of types.

WHEN Cossor introduced Co-axial Mounting at the commencement of the present season it was acknowledged to be one of the greatest improvements in Radio. At one blow it abolished the main cause of lack of uniformity in valve manufacture. These same successful principles have been retained for the new Cossor Six-volt Valves. Look at the illustration above which shows how Co-Axial Mounting is successfully achieved.

In Fig. 1 see the twin filament of exceptional length. And the grid, its wire securely welded in 28 different places—which is so rigid that microphonic noises are utterly impossible. Note the seonite insulator in Fig. 3. holding immoveably in position the ends of the grid and also providing a bridge for the two shock-proof filament supports, And finally, see how the anode is locked in position in accurate and life-long alignment with the grid and the filament. All three units are secured to each other and individual movement is impossible.

Throughout its whole life the characteristics of the valve can never change through filament sag or accidental blow. How important this is, will be appreciated by every serious experimenter. All Cossor Six-volt Valves in the same class must be identical in every respect—there can be no variation.

Cossor 6-

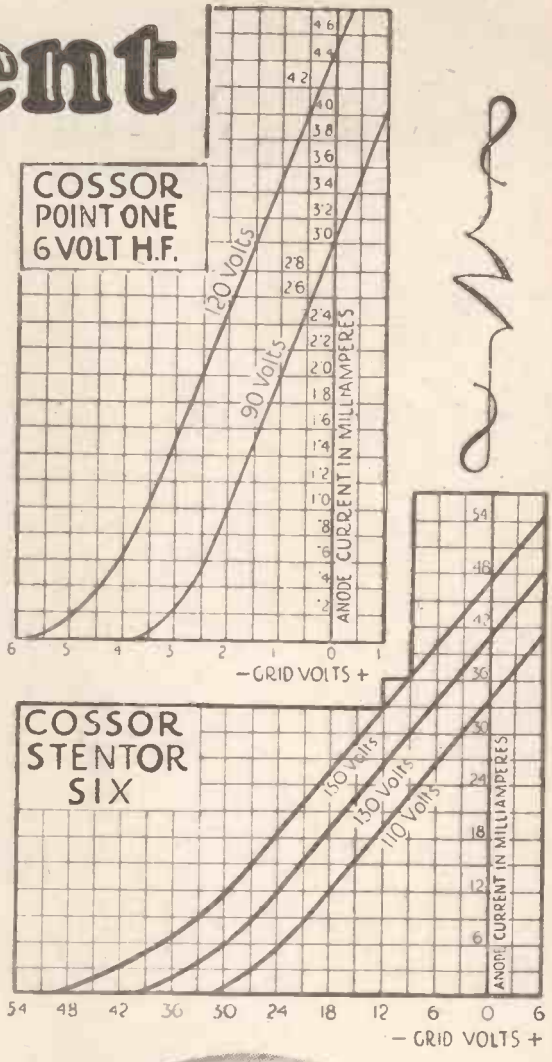
Issued by A. C. Cossor Ltd., Highbury Grove, London, N.5.

Achievement

UNFETTERED by any electrical or mechanical limitations this wonderful new series of Cossor 6-volt valves give a volume and a richness of tone never before achieved in Radio. Experts have been amazed at the rare beauty andpower — the vitality and mellowness of broadcast music which these valves can create.

And small wonder — for Cossor, after the three years spent in bringing the Cossor Point One 2-volt Valve to an extraordinary degree of perfection, comparable only with valves of higher voltage, now brings to the six-volt field a wealth of experience and technical skill.

Cossor 6-volt Valves are unique in every way—and as such they set new standards of performance. All records for volume, purity of tone, and sensitivity have been broken. Hearing is believing! Let your Dealer demonstrate them to you to-day. For you must hear to realise to what heights of realism Radio music has now attained.



Every valve has a Kalenised filament

A LARGE share in the success of these amazing valves must be placed to the credit of the Kalenised Filament. Operating without visible glow—yet giving off a perfect torrent of electrons—the Kalenised filament is revolutionising Radio. It has cut to shreds the previous high costs of Receiving Sets maintenance. Half a dozen of these new Cossor Six-volt Valves cost less to run than one bright emitter. And because it operates practically without heat, its life is immeasurably longer.

Finally, do not forget the famous Cossor aeroplane test, when a dozen Cossor valves were hurled 500 feet from an aeroplane without harm to their Kalenised filaments.

Only a high emission—coupled, of course, with perfect control—can give volume and natural reproduction. The Kalenised filament gives off an emission unequalled in its intensity—that is why these new Cossor Six-volt valves attain such a remarkably high standard of efficiency.

Compare these curves:

IF you cannot try out a Valve, the next best thing is to study its curve. The curves shown here speak for themselves. Note, for example, the steep slope of the H.F. valve—clear proof of its ability to handle weak signals from distant stations. Compare also, the curve of the wonderful new Stentor Six—observe how well it can cope with the large changes of grid voltage without distortion. As a super-power valve the Stentor Six is without equal. And finally, remember the prestige enjoyed by Cossor valves. Every experimenter speaks well of them. Their long service and low current consumption—their superb tone and high standard of efficiency—have won a great reputation, which these new valves will considerably enhance.

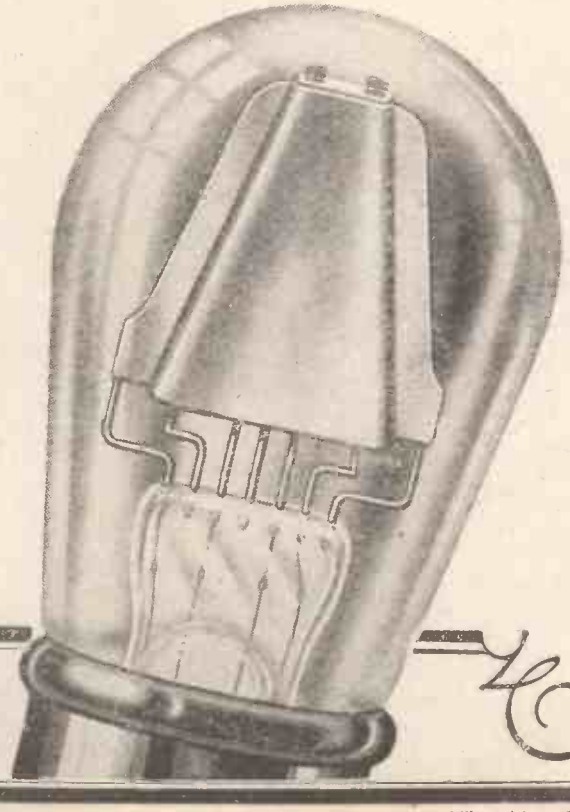
Four types for all requirements:

610 R.C. For Resistance or Choke coupling - - - **14/-**
Impedence 80,000 ohms. Amp. factor 50. Consumption 1 amp.

610 L.F. For 1st stage Low-frequency amplification **14/-**
Impedence 8,000 ohms. Amp. factor 8. Consumption 1 amp.

610 H.F. and Det. For H.F. amplification or Detector use **14/-**
Impedence 20,000 ohms. Amp. factor 20. Consumption 1 amp.

610 P. Stentor Six Super Power Valve - - - **22/6**
Impedence 3,000 ohms. Amp. factor 3·5. Consumption 1 amp.



volt Valves

The Marconi D.E.A Power Valve.

WITHIN THE VACUUM

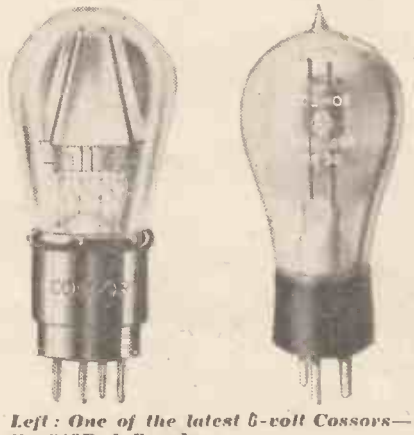
Some interesting notes on the most important valve developments that have taken place during the past few weeks.

By KEITH D. ROGERS

(Assistant Technical Editor of "Popular Wireless")

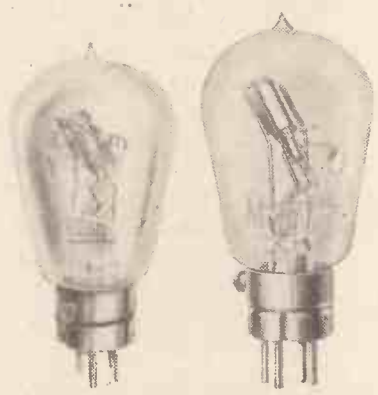
A famous 2-volt power valve—the "Stentor Two."

I WONDER how many people realise the tremendous advancement that has quite recently been made in the construction and efficiency of receiving valves. From the few bright emitters with which we used to struggle in 1923 have sprung up on the British market alone no less than 400 valves of all sorts, shapes, and characteristics. The constant changing of types and nomenclature of the valves often made it difficult to realise the advances that were being made, but now the trend of development is definitely pointing in one direction—towards less filament wattage consumption and more specialised and suitable characteristics. Personally, I do not think it will be long before the term "general purpose" is discarded altogether, and we shall have a special valve for every type of circuit we care to evolve.



Left: One of the latest 6-volt Cossors—the 610D, L.F. valve.
Right: This valve, the D.E.50, has been replaced by the popular D.E.55 made by the same firm.

This is, of course, as it should be; for the successful operation of any wireless receiver, however simple, must necessarily depend upon its components and their suitability for the tasks they have to perform, and of these components we must assuredly admit that the valve holds premier importance.



Two new A.C. Mains Valves—the Osram and Marconi K.L.1's.

In a very short time we have advanced from the bright to the dull emitter general purpose valves, to valves with an exceedingly low filament current consumption, as denoted by the 06 type, until at last we have reached a stage where filament consumption is reasonably low without making the valve unstable, while more attention is being paid to the characteristics of the valves, and to that very important point, standardisation. True standardisation has, I am afraid, not quite been reached, for it is a difficult matter to turn out large batches of valves so that every valve shall be exactly like every other, but we are nearing that goal, and can reasonably expect that when we discard a valve we can substitute another that will operate just as efficiently as its predecessor.

Recently, valve designers have been paying special attention to the production of valves having high magnification factors with reasonably low impedances. Such are typified by the Cossor R.C. range, the P.M.5 B, S.T.61 A, Ediswan R.C.2, and similar valves, and the success achieved in this direction has enabled H.F. and L.F. circuit design to move forward with far greater rapidity than has been the case during the last two or three years. An instance of this is very clearly shown in the fact that, although it has been *known* for a great many years, it has only just been possible to make resistance capacity coupling really efficient, and thereby suitable for use by the average constructor and listener.

New Valves.

Among these new valves, I am glad to see that, while amplification factors are gradually being raised, the impedances are being kept at a reasonable figure so that full advantage may be made of the valves as amplifiers, and a far greater proportion of amplification per stage can be obtained. As a matter of fact, the latest valve that has been brought to my notice, and which will, I understand, be placed upon the market before very long, has an amplification factor of 50, while its

Modern 2-volt Res-Capacity Coupling Valves—the S.P.18B and Ediswan R.C.2.

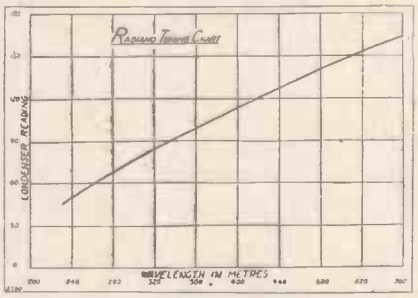
(Continued on page 538).

MORE ABOUT THE RADIANO THREE

by Percy W. HARRIS M.I.R.E.

Owing to the great success of the "Radiano Three"—described in last month's issue of THE WIRELESS CONSTRUCTOR—further details of the Editor's experience with the original set are given below, for the benefit of other constructors.

WIRELESS conditions during the last month or two have, on the average, been very good and the list of stations I have received on the loud speaker with the "Radiano Three" is steadily growing. Most remarkable of all have been the reliability of, and strength of reception from, the German stations, particularly the new high-power station at Langenberg. On each occasion



The Tuning Curve of the original "Radiano Three."

when I have listened to this station after dark, the strength has been more than sufficient to fill a large living-room.

Many Foreign Stations Received

By the addition of the "Radiano Silencer," described in this issue, the number of stations receivable without interference has been greatly increased. Indeed, I have now received so many that it is difficult to identify them all. To give readers some idea where the stations will be found, I am publishing this month a chart, giving a tuning curve of my own receiver. You will notice along the bottom line are marked wave-lengths, and on the vertical line condenser degrees. Provided you use the same make of variable condenser as that described in last month's issue, and that the coils you use are the same, you can expect that your own receiver will tune very much according to this curve.

To ascertain what wave-length you are receiving on a given condenser reading (the chart refers to the left-hand or "tuning" condenser, not to the "reaction" condenser) place a ruler horizontally on the chart with its edge against the condenser degree required. The edge of the ruler will now, at some point, intercept the curved line on the chart. Carefully note this point and then, placing the ruler vertically, find the point on the line below which comes immediately below the point on this curve. You will now be able to read the approximate wave-length to which the set is tuned when the tuning condenser is set at the degree referred to.

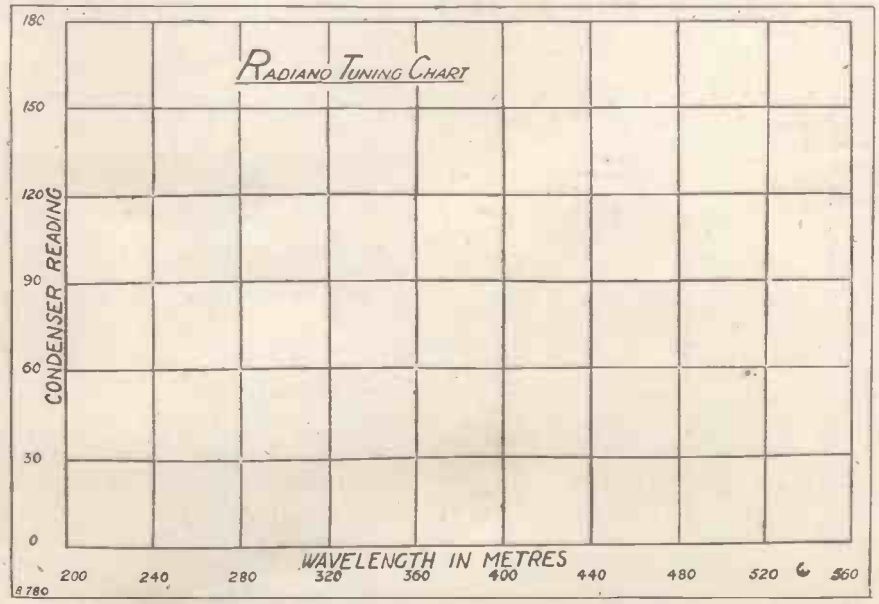
The Wavelength Setting

Similarly, to find the condenser setting necessary for a given wave-length, place your ruler vertically on the wave-length required and find where it intercepts the curved line on the chart. Then at this point place the ruler horizontally and its edge will pass through the particular degree corresponding with the wave-length required.

Make Your Own Tuning Chart

Slight differences in aerials will cause readings to be different, but with the make of condenser indicated and an average aerial your set will tune very closely to the chart. Similar readings will be given by any other make of variable condenser, provided (1) it is of the straight line wave-length variety and (2) that it has the same maximum capacity as that indicated, i.e., ·0005 mfd. If a straight line *frequency* condenser is used, the shape of the tuning curve will be different. A blank form is also printed on this page so that you can prepare your own tuning chart

(*Continued on page* 496.)



By filling in this diagram you can make a tuning chart for your own receiver. The method is explained in the article above.

PEOPLE PREVIOUSLY PAID TOO MUCH FOR THEIR TRANSFORMERS

8/6

Guaranteed for 12 months.

TURNS RATIO ... 3 to 1
RESISTANCE RATIO 4 to 1

Use it for 1, 2 or 3 stages L.F. It is suitable for all circuits and all valves you will want to use.

YOU know it is much more difficult to make a transformer good and at the same time low in price than it is to make it good and high in price. When the new LISSEN Transformer was first put on the market the people said:

"It is too low in price—it can't be as good as they say it is."

BUT THERE MUST BE MANY PEOPLE NOW WHO PAID A HIGH PRICE FOR THEIR TRANSFORMERS AND WHO HAVE SINCE REGRETTED IT.

REGRET AT PAYING 30/-

Here is a user of the new LISSEN Transformer who writes :—

Ref. 4150. 5/10/26.
Bognor.

"Last week my . . . (naming a well-known transformer) broke down after 3 months. I happened to see your announcement of the new LISSEN so I decided to get one, and luckily, a trader in Bognor had some in stock. The results are really astonishing; volume and purity are perfect, and, furthermore, it seems to pick out each instrument in an orchestra so distinctly. In addition I am now able to get numerous foreign stations more clearly than before. In conclusion I can only say how sorry I am that I spent 30 - when I now have something better for 8/6."

LISSEN knew they had produced a remarkable transformer in the new one—and they immediately withdrew all the previous expensive LISSEN Transformers in favour of the new LISSEN. By putting into operation a new direct-to-dealer policy of distribution, too, which eliminated big wholesale profits LISSEN were able to offer the new transformer at a price which brought it within the reach of everybody. SINCE THEN IT HAS SWEPT THE MARKET.

7 DAYS' TEST.

Test this new LISSEN as a transformer against the most expensive transformer, or as a Choke against the most expensive Choke you can find. If you do not definitely prefer the new LISSEN for tone, purity and power to any other transformer and choke you test it against, irrespective of price, return it within seven days of purchase and your money will be willingly refunded.

NOT ONLY A GREAT TRANSFORMER BUT A GREAT CHOKE ALSO—USED EITHER WAY IT FULLY AMPLIFIES EVERY NOTE, EVERY HARMONIC, EVERY OVERTONE.

This is the complete

LISSENOLA LOUD-SPEAKER

Price 34/-

The LISSENOLA Loud Speaking Unit (13/6 separate) is inside the LISSENOLA Stand.

Or you can buy the component parts for it as and when you wish. For instance, you can buy separately the

LISSENOLA UPRIGHT HORN

Big and powerful, with 14 in. flare. Exactly as embodied in the Lissenola Loud-Speaker. **17/6**

Or you can buy separately the

LISSENOLA STAND 3/-

For those who have already made an upright horn themselves from the full-size patterns and clear instructions enclosed with each LISSENOLA Unit, or who, having the LISSENOLA Unit, desire to buy the LISSENOLA Upright Horn. Price 3/-.

¶ *There are many advertising manufacturers and all expect a share of the use and mention of their products in the sets published by the papers they advertise in. The best parts are not, therefore, necessarily always used.*

NO MATTER WHAT PARTS MAY BE SPECIFIED IN ANY CIRCUIT, THEY CAN BE REPLACED BY LISSEN WITH AN ALL-ROUND IMPROVEMENT.

LISSEN, LIMITED
26-30 FRIARS LANE
RICHMOND, SURREY
Managing Director: Thos. N. Cole.

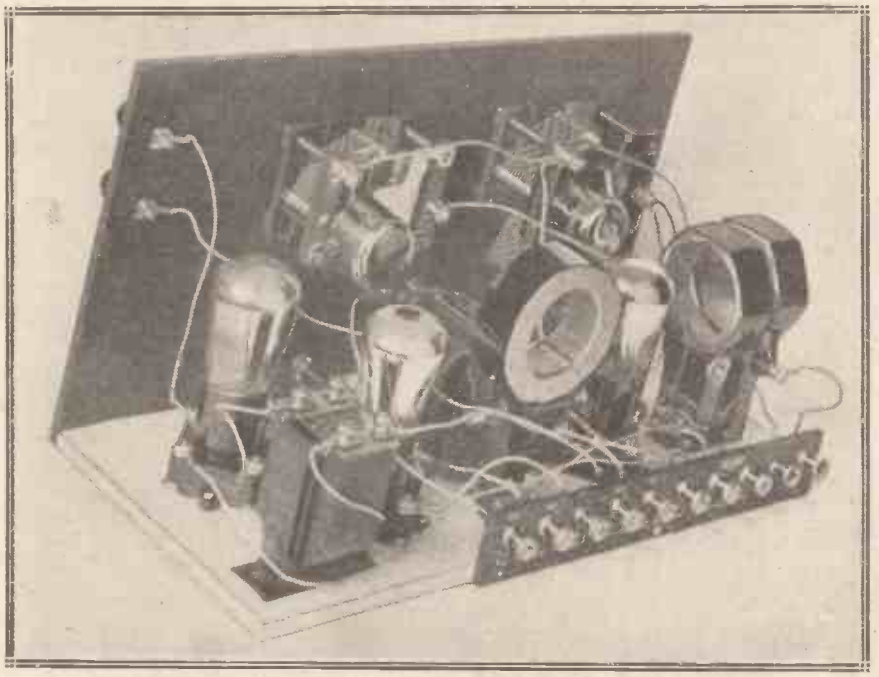
L.270.

MORE ABOUT THE "RADIANO THREE"

(concluded).

if required. To do this, all that is necessary is to take the readings of a number of stations which you have tuned in, the wave-lengths of which you know, and mark corresponding points on the plain chart. These points can then be joined by a line which will take a shape somewhat similar to that given in the specimen chart.

The use of the "Radiano Silencer" will slightly change the reading of the tuning condenser for a given wave-length, and the readings will also vary a degree or two according to whether your lead A2 is connected to one or the other tapping on the X coil. When using the "Radiano Silencer," I would suggest that the lead A2 be taken to the "ten" tapping on the X coil, as you will usually get greater signal-strength in this way, and although without the Silencer the selectivity will be slightly less than with the tapping taken to the "six" you will find that with the Silencer gives all the selectivity required. Don't imagine, either, that it complicates reception for it is as easy to work as it is to make.



A back-of-panel view of the Radiano Three, showing how flexible connections are used, to simplify construction.

THOSE ODD LENGTHS OF WIRE

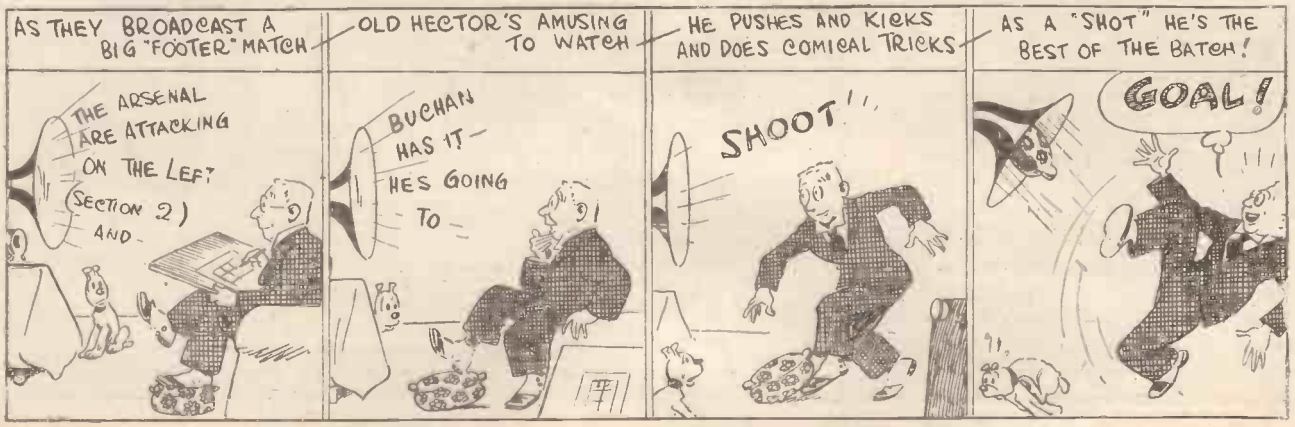
EXPERIMENTS involving the construction of special coils often lead to an accumulation of insulated wire of various gauges. Very short lengths are best thrown away, as they are only a nuisance to store and they lead to endless tangles in the wireless cupboard. The longer pieces, however, over three or four feet long, for example, are quite worth preserving, so long as the insulation is sound.

Hanks of wire have a habit of getting tangled together, so that the sorting out of the wire required for a particular job becomes not worth while, and new wire is preferred for even the smallest coils. If the wire is wound on a reel in odd lengths, the long, unbroken piece which is wanted will probably turn out to be underneath two or three shorter pieces.

Storing Short Coils

A good way of storing lengths of wire of this kind is to wind them on a wooden pole. Something about an inch in diameter will do very well, such as a broomstick. Two or three feet of the stick are needed, and holes are drilled through at intervals of an inch or so down its whole length. The spare lengths of wire are then wound on the stick separately; that is to say, the lengths are never wound one over another. The ends of the lengths are passed through the holes in the stick, so that they cannot unwind and get tangled. The stick may conveniently be supported on two brackets on the wall, being left free to turn, so that the particular length of wire wanted may be easily pulled off.

A. V. D. H.



BROADCASTING POLICY: THE LARGER VISION

By Our Special Commissioner

Is the Broadcasting Corporation taking a wrong view of its obligations? In this special article our Commissioner, who is in the closest touch with affairs, suggests the lines upon which the Corporation will develop its activities

Now that the new Governors of the Broadcasting Service have been initiated into their work, they will be called upon to consider many important questions of future policy before the end of this year. They will have the considerable advantage of carefully prepared proposals and recommendations shaped with a view to extensive and continuous development over a number of years. The executive staff at Savoy Hill are understood to have sketched out an extremely ambitious programme of development. A survey of some of the points probably covered may be considered appropriate at this juncture.

As broadcasting advanced under the ægis of the old Company, considerations of expediency and compromise necessarily intervened to modify policy. Nevertheless, the Company managed to keep public service steadily in the foreground. It was freely recognised that broadcasting had certain definite obligations to other branches of the entertainment industry, to the newspapers, and to the concert industry. Thus, for instance, the series of National Concerts at the Albert Hall was conceived partly, it is true, for Broadcasting, but chiefly as a contribution to music generally. Now, however, broadcasting is strong enough to reconsider this policy of general amiability.

Two Schools of Thought.

One school of thought holds strongly that a correct interpretation of the duty of the B.B.C. to its subscribers does not cover these so-called "social obligations." Those who adhere to this school point out that all available resources should be concentrated on the one main purpose, the improvement of studio work and transmission. They believe that when broadcasting becomes a distinctive art it will consist entirely of studio work on the entertainment side. Music, drama, talk—all will be specially adapted to the medium. To these people it appears wasteful and a breach of trust for the B.B.C. to develop outside shows, or relay from theatres or concert halls.

A Word of Warning.

Opposed to the narrow school of "straight studio work" is the school that believes the policy of the Broadcasting Company was right, and

Sir John Reith, Director General of the Broadcasting Corporation.

should be continued. Those who belong to this group advocate proposals which would involve the B.B.C. in joint stewardship of the essential interests of music, opera, and perhaps of other arts as well. They envisage a time not far distant when the whole musical enterprise of the country will be controlled by and centred in broadcasting. When this state of affairs is reached they believe it would be anti-social for the B.B.C. to exploit it for purely selfish ends.

The conflict between these two views will be interesting to watch. It is, of course, safe to prophesy that the result will be a reasonable compromise. The "straight" school will be left with priority, but the "social" outlook will be retained. Far-reaching consequences will flow from this result. Broadcasting will become a fairy godmother to many deserving artistic enterprises.

But one word of warning is in season. The Savoy Hill people will have to exercise great care to avoid subsidising inefficiency. It is all very well for them to keep art alive; but they must make sure that the organisations concerned are efficient and reliable. If this condition is not fulfilled, *then* there would be a breach of faith with the subscriber to the broadcasting service. But well handled on the lines so conspicuously successful with most B.B.C. enterprises to date, these projects should result in great benefit to the community. In five years' time, Opera should be permanently established in Britain without a state subsidy; and centres like the Queen's Hall should be safe for the best music.

Radio the Reformer.

Then, too, as time goes on, a development of the larger policy will make the work of the B.B.C. impinge on the progress of schemes of Empire trade expansion. Gradually but steadily Britain should regain in the ether the ascendancy lost on the screen. Ultimately the broadcast word will be a much more potent power, and the supreme broadcasting service will outbalance the supreme film service.

Discord, domestic and international, should be largely softened, and ultimately removed, through the statesmanlike handling of the broadcast service. Where class jealousy and suspicion are fostered by ignorance,

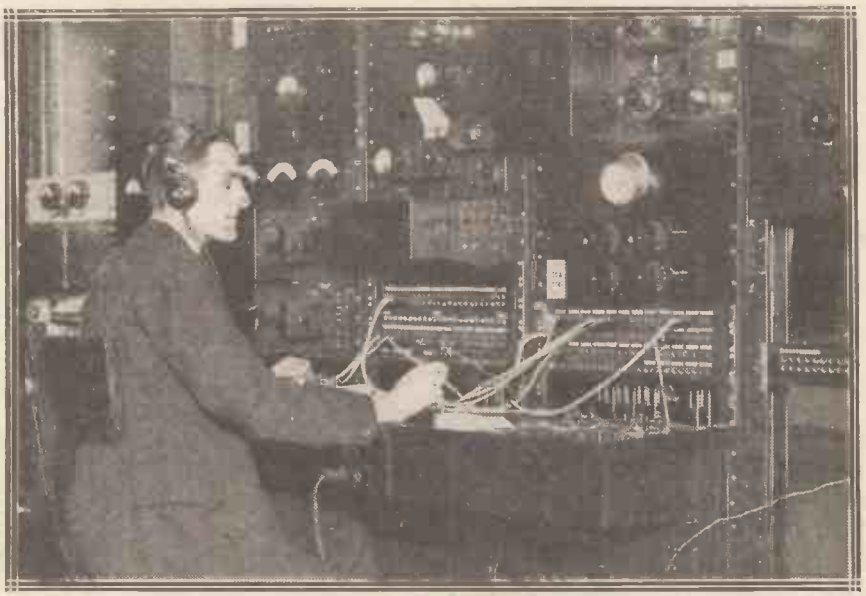
Broadcasting Policy: The Larger Vision—*concluded*

the broadcast word should illumine many dark places and obviate many unpleasant disagreements. Similarly in international affairs the discreet use of broadcasting may be an effective antidote to war-fever.

Broadcasting the Budget

Those who realise something of the implications of the reaction of broadcasting are agreed that once Parliament is put on the air, a new vitality will be breathed into our democratic system. Naturally Parliamentary broadcasts would be on a special wave-length, but they would be extending tremendously the value and significance of Parliamentary institutions. To broadcast Parliament is to ensure the permanence of the Constitution, and effectively to counter the agencies alike of extreme reaction and of extreme "action."

During the spring it is probable that the Government will set up a new select committee to investigate the problem of broadcasting their proceedings. This arises out of the renewed proposal to broadcast the Budget speech. But the probability that the select committee so appointed will report adversely need not discourage those who are advocates of the broadcasting of Parliamentary debates. The innate conservatism of Parliamentary committees will last out a little longer, but will not be on top in 1929. I would say that the broadcasting of Parliament will begin in 1930.



The Voice Controller. At this switchboard in the London Trunk Exchange the volume of the trans-ocean telephony via Rugby is controlled.

Better News Bulletins

As for the future of B.B.C. school transmissions and avowedly educational work, this will not have passed through its experimental stage for another two years. It is possible now, however, to indicate that in the rural areas its permanence is assured.

In the matter of its news services the B.B.C. is carrying on for a year with a working arrangement that allows for limited expansion, but probably for as much as can be exploited in the time. Before long listeners will expect to have more frequent and more complete news bulletins.

An Extension of Frontiers

Will this lead to war between the printed and the spoken word? Let us hope not. Such a war might have disastrous consequences. On the one hand the Broadcasting Corporation would not be able to spare the money required for the organisation of a world system of news collection. It may indeed be inevitable, but great efforts will be made at Savoy Hill to prevent a rupture. Perhaps the chief factor in the outcome will be the statesmanship and moderation of the spokesmen of the Press. If they allow broadcasting gradually to extend its frontiers, meanwhile adjusting themselves to the changing conditions, then all will be well in the end.

RESULTS WITH THE "SAMSON."

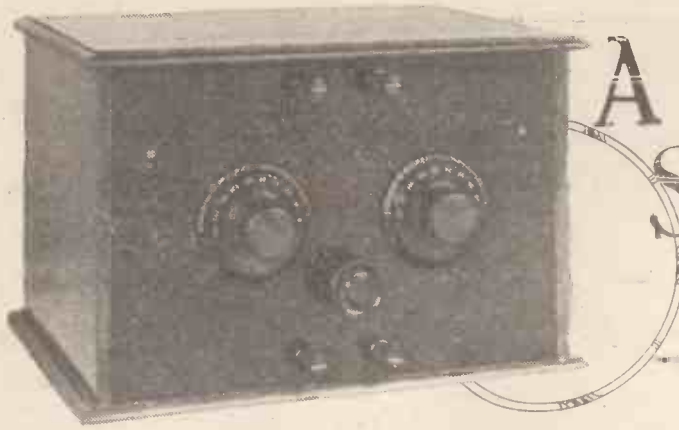
To the Editor, "Wireless Constructor."

Sir,—Having built the "Samson," perhaps you might be interested to know the results obtained, but first I should like to definitely say that both for quality and quantity it is the finest two-valve set I have ever heard. The volume is indeed remarkable. I receive London at fair loud-speaker strength, Bournemouth very good, and Manchester fairly well. Madrid excellent volume loud-speaker, also Barcelona, Radio Toulouse, and Langenberg very good. Berlin fair, and Madrid on indoor aerial at very good loud-speaker strength. Offering my congratulations on this very fine set, I am, Sir,

Yours, W. E. CHAPMAN.

83, Albany Road,
Roath, Cardiff.

More Talks!



A High Efficiency Single Valver

by L. H. Thomas

An easily constructed Reinartz receiver for reception on high or low wave-lengths.

SOME time ago it was the fashion for newcomers to the ranks of the radio enthusiasts to start either with a simple crystal set or with a fairly straightforward single-valver. The constructors would derive the greatest possible amount of pleasure from these early attempts, and would later on add amplifiers to them, leaving the "old originals" practically untouched. Times have changed, however, and it now seems to be the rule to scrap one set completely and to proceed to something bigger, better, and quite different.

Modernizing the Detector

This may be all very well in its way, but the writer has noticed a friend pulling to pieces an excellent set, (in this case the popular arrangement consisting of a "Reinartz" detector followed by two stages of L.F. amplification) and constructing another set with, it is true, quite a different detector circuit, but two "note-mags." that were practically identical with the others just dismantled.

There may be something to be said for this complete destruction of old sets, but it certainly savours rather of wasting time. Once a low-frequency amplifier has been rigged up and made to give complete satisfaction, there is not much that can be done to it! Why not, then, when thirsting for improvements, occasionally be content to alter the detector only, and leave the note-magnifiers alone?

There is plenty of room for improvement in this direction, and a little time and trouble spent on the construction of the "nucleus" will certainly be worth while; it will be all the more appreciated when one or two note-magnifiers, known to work well (since they have not been dismantled and wired up again), are brought into service.

The single-valve receiver described in this article is the outcome of considerable time spent on improving an old receiver. The writer, instead of "going about things" in the usual way, removed the detector portion of the wiring from his old set, leaving the two note-magnifiers untouched. Various circuits were tried, and when the one giving the very best results was decided upon, it was assembled separately in another cabinet.

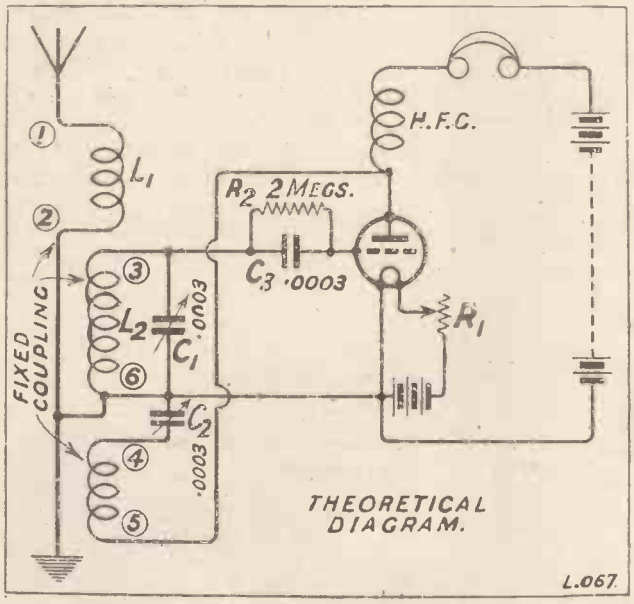


Fig. 1.—The circuit employed is one that has given consistently good results, especially on the higher frequencies.

LIST OF COMPONENTS.

1 panel, 12 in. by 8 in. by ¼ in.
1 oak cabinet and baseboard, 9 in. deep, for the above, and two panel brackets.
2 ·0003 low-loss condensers, with slow-motion drive.
1 valve holder.
1 ·0003 fixed condenser, with clips, and one 2 megohm leak.
1 H.F. choke.
1 six-pin base, and a suitable number of standard plug-in formers.
Terminals engraved "Aerial," "Earth," "'Phones" (2), "H.T. +," "H.T. −," "L.T. +," and "L.T. −."
1 filament rheostat, of resistance to suit type of valve used.
1 ebonite strip 5 in. by 2 in. by ¼ in., to take four terminals.
Quantity of brass bolts and wood screws, "Glazite" or tinned wire for wiring, etc.

Swinging coils, in the writer's opinion, are nearly always inferior to a good arrangement of coils with *fixed* coupling, reaction being controlled by some capacitative arrangement. The

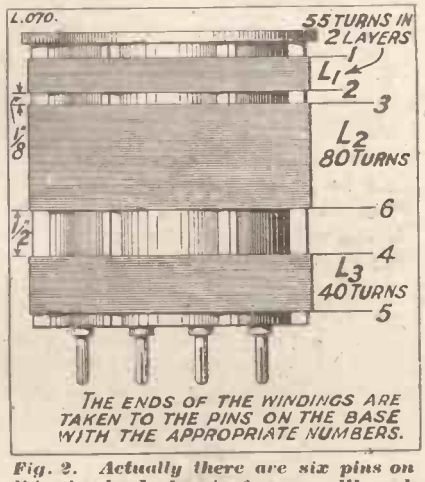


Fig. 2. Actually there are six pins on this standard plug-in former, although only four are shown in this sketch.

A High Efficiency Single Valver—*continued*

method adopted in this set was therefore one employing the conventional circuit, but with "parallel feed" for the H.T. supply. This means that the H.T. is supplied *across* the anode and filament, the reaction coil being also connected (in series with a variable condenser) across these two points, instead of in series with the H.T. (the original arrangement). Then, to prevent any H.F. energy from straying through the alternative path provided by the 'phones and high-tension battery, a high-frequency choke is inserted between the anode of the valve and the 'phones. The whole theoretical circuit should be quite clear from Fig. 1. Reaction control is, of course, effected by varying the capacity of the condenser C2, and, provided that the coils are arranged with the correct number of turns and also with the correct coupling, they may be permanently fixed in relation to one another, or may even be built in one unit. The latter arrangement has been adopted in this case.

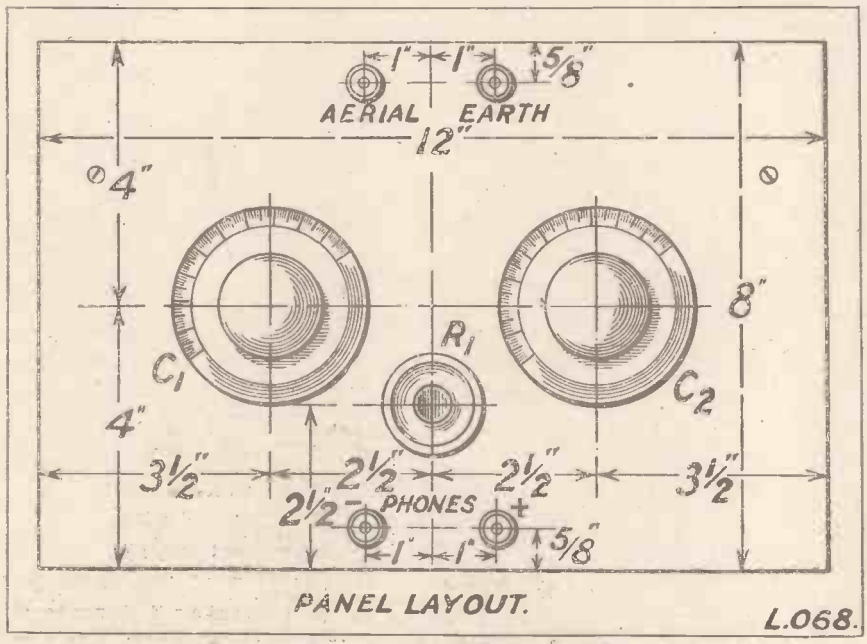


Fig. 3. The panel dimensions and drilling positions are given above.

The Coil Windings

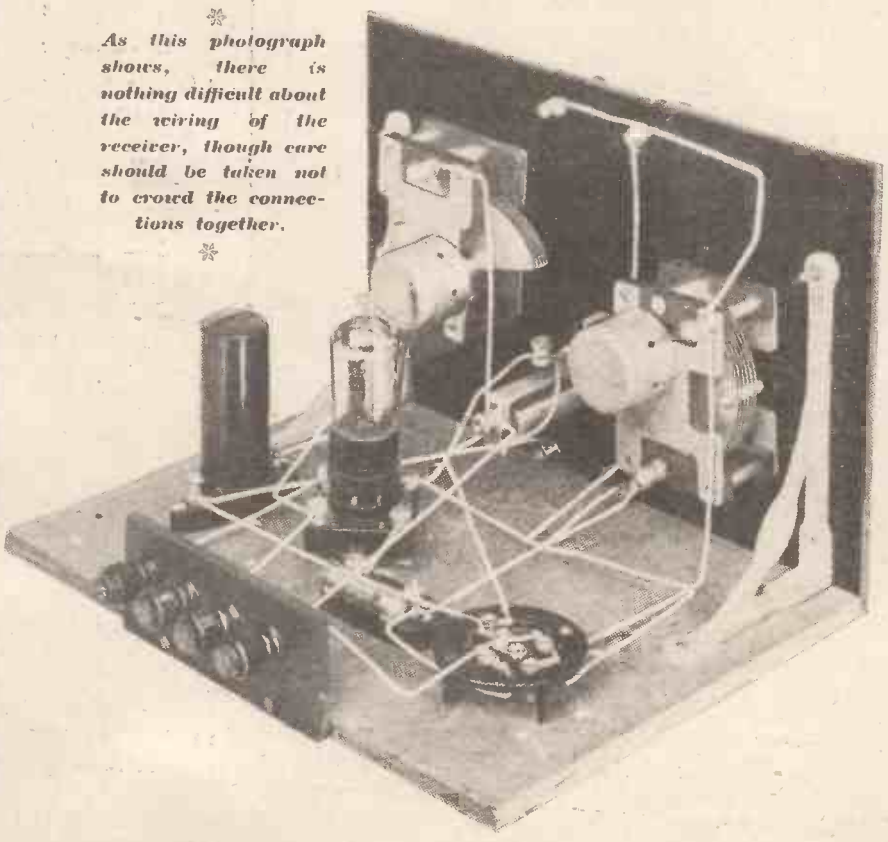
Coils are wound on ebonite formers provided with six-pin bases, each former accommodating three separate windings—L1, the primary or aerial coil; L2, the secondary winding; and L3, the reaction coil. The aerial coil is fairly tightly coupled to the secondary, and is untuned; an excellent degree of selectivity is obtained by means of this arrangement, and it has the additional advantage of eliminating one control which would be necessary if any attempt were made to tune L1. The whole of the secondary coil is tuned by a condenser (the left-hand one on the front panel), and the reaction coil is wound so that it commences at a distance of about half an inch from the end of the secondary winding.

Economy and Efficiency

This arrangement is extremely convenient from the point of view of those who may wish to change rapidly from one wave-band to another, since it is only necessary to pull out one "coil unit" and to insert another. (Quite a favourable comparison with the amount of fumbling and alterations of coupling necessary with some sets of the "three-coil tuner" type). Again, with sets employing separate plug-in coils, it is sometimes impossible to make quite sure that the right size of reaction coil is used. Even if certain sizes of coils are duplicated, it is quite possible that the correct size is one between, say, No. 50 and No. 75. With home-made coils of this type one can always arrange the turn numbers to suit oneself.

It may, perhaps, be argued that to

(*Continued on page 505*).



As this photograph shows, there is nothing difficult about the wiring of the receiver, though care should be taken not to crowd the connections together.

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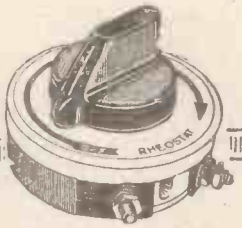
Triple Honeycomb
INDUCTANCE COILS

are made in 17 sizes and cover all wavelengths from 100 to 25,000 metres.

The prices are very low, the smallest sizes are only 2/9 each.

Igranic "NONMIC"
(Anti-microphonic)
Valve Holders
3/- each.



Igranic-Pacent Porcelain Rheostats
6, 10, 20, 30 & 50 ohms. 2/6 each.

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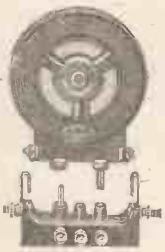
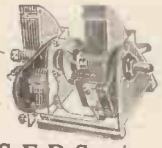
Specially suitable for Neutrodyne circuits. Five sizes for wavelengths of 110 to 3,350 metres.

Prices from 7/- each.



IGRANIC
GANG CONDENSERS



Fitted with special balancing devices for equalising the tuned circuits.

Twin Gang	... ...	£2 10 0
Triple Gang	... ...	£3 15 0

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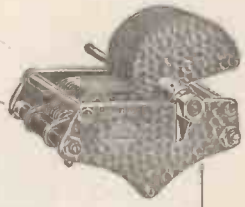
A GOOD
RECEIVING SET
you must use
GOOD COMPONENTS

RADIO IGRANIC DEVICES

IGRANIC
PRESET RESISTOR
(Fixed-variable)

Maximum resistances of 6, 10, 20, 30 and 50 ohms. Variable over whole range.

Price 1/8 each.



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Variable Condensers
Low Loss Sq. Law.

.00015 mfd.	... ...	... 17/-
.0003 "	... ...	... 18/6
.0005 "	... ...	... 21/6
.001 "	... ...	... 25/-

IGRANIC
"Indigraph"
Vernier Knob
and Dial.

Price 7/6

IGRANIC
"E" Type
Low Frequency Transformers
for full volume and outstanding purity of tone.

Ratio 1:5	...	... 16/-
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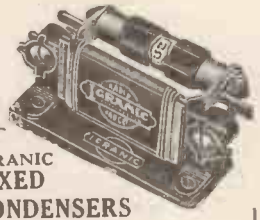

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A High Efficiency Single Valver—*continued*

wind separate sets of coils in this way involves unnecessary "waste of wire," but the expense is even then much less than that of a set of ready-made coils.

The front-of-panel drilling diagram reveals the fact that there is nothing mounted on the front of the set but the two variable condensers, a filament rheostat, and four terminals, two for the aerial and earth, and two for 'phones.

Slow-motion condensers have been used, and the size has been kept small (·0003). Here again the home-made coils score, since there can be no question of the condensers failing to cover the range properly. The coils are wound to suit the condensers.

As will be seen from the back-of-panel diagram, Fig. 4, the wiring is of the simplest order. It should, however, be borne in mind that unless the connections to the "'phones" terminals are made first of all, they may be found a little awkward to get at. After these connections have been made, there is no particular order of preference for the others.

Avoiding Overlap

It will be seen that a cabinet of ample size has been used to house the set, all the components thus being well spaced out. In the writer's opinion, much of the success of the receiver depends upon this.

The grid leak is normally connected across the grid condenser, although it may, of course, be taken direct to the positive end of the filament, if the reader has any special preference for that arrangement. To obtain freedom from "overlap," several different values of grid leak may be tried, since it is, of course, quite impossible to name one value to suit all the different types of valves which may be used with the receiver. If a valve of the high-impedance type designed for resistance-capacity coupling is used, it will, as a general rule, be found advantageous to use a grid leak of higher value than usual—4 or even 5 megohms seems to suit these valves very well.

Now, as regards the actual construction and turn numbers of the coil units. The formers are of Bakelite, which is quite easy to drill with an ordinary twist drill, if the former is held in a clamp or vice (though not under too great a pressure). Both the bases and the bottoms of the formers are numbered, and this makes it quite simple to ascertain that the connections are all correct. The numbers appear both upon the back-of-panel diagram and upon the theoretical circuit diagram. The best guide for constructing the coils themselves, however, will be the small sketch, Fig. 2.

Construction of the Coils

For the broadcast band of wavelengths the turn numbers and positions are as follow: Aerial coil (at top of former), 55 turns; secondary coil, separated from end of aerial coi by ⅛ inch, 80 turns; reaction coil, separated from bottom end of secondary coil by ½ inch, 40 turns. It is this coil that appears in the small sketch, and it should be noted that the 55-turn aerial coil has been wound in two layers: 28 turns are wound straight on, beginning, of course, from the top, and the wire is then taken back to the first turn again, and the remaining 27 turns wound over the first layer, and, of course, in the same direction. The 80-turn

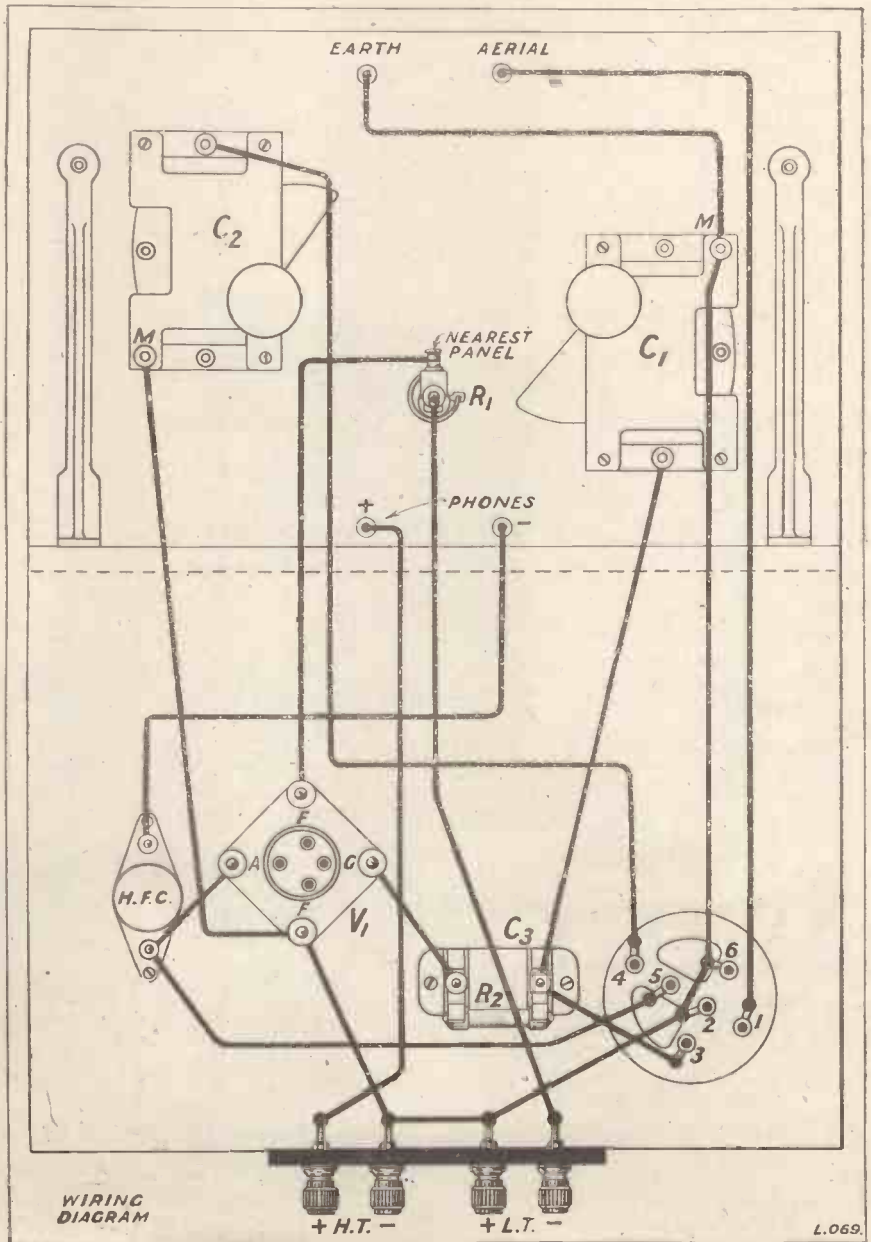


Fig. 4. With the aid of the above diagram no difficulty in wiring will be experienced.

A High Efficiency Single Valver—*concluded*

secondary is wound in a single layer, and so is the reaction coil. With the wire used by the writer (No. 30 D.S.C.), the coil former will just accommodate these three coils as described, but, of course, for higher wave-lengths it will be found necessary to wind the secondary also in two layers.

For the Short Waves

The coil unit shown in position in one of the photographs was wound for the purpose of carrying out some tests on the 150-200 metres amateur wave-length band, and has the following windings: aerial coil, 27 turns; secondary coil ($\frac{3}{8}$ in. spacing), 40 turns; reaction coil ($\frac{1}{4}$ in. spacing), 13 turns. As will be seen, the aerial coil is not coupled so tightly to the secondary for the reception of these shorter waves, as the damping effect of a tight-coupled aerial sometimes makes it difficult to persuade the set to oscillate.

For the very short wave-lengths (between 30 and 50 metres) the following turn numbers are suitable: Aerial coil, 5 turns; secondary coil ($\frac{1}{2}$ in. spacing), 12 turns; reaction coil ($\frac{1}{4}$ in. spacing), 6 turns. The set is extremely easy to handle on these short waves, and K D K A and W G Y have often been heard at good strength, in addition to amateur transmissions from all parts of the world, including the Antipodes. The writer's short-wave coils were wound "close up," but probably a slight spacing between turns would be found beneficial.

As regards the operation of the receiver, this is so simple that there is very little need be said. It should not be omitted, however, to connect the earth end of the aerial coil to the positive side of the L.T. battery (socket 6 to socket 2 on the base).

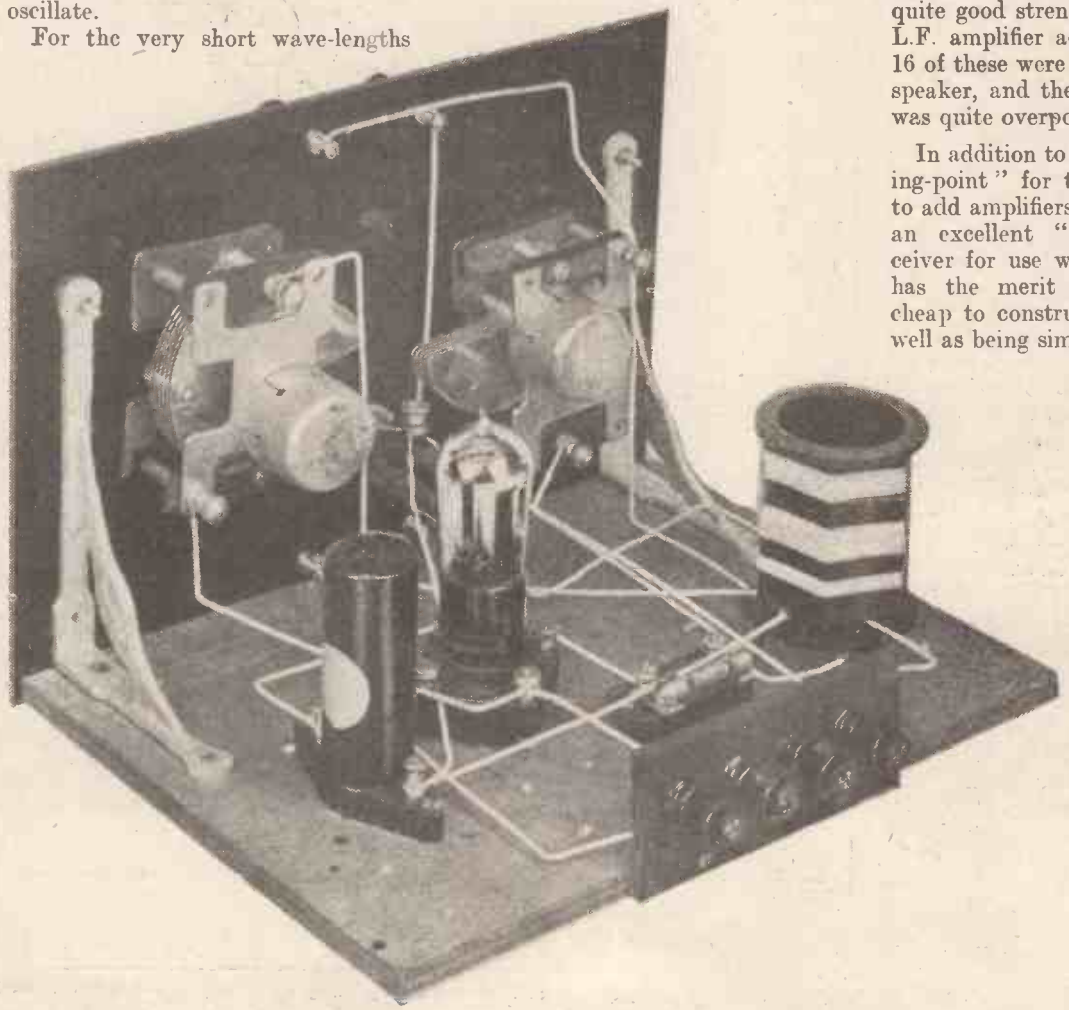
The valve used by the writer was one of the $\frac{1}{4}$ ampere "resistance-capacity" type, and about 60 volts H.T. was found desirable to give the very best results. The particular valve employed worked perfectly well with 4 volts across the filament, although rated at 5·5. A 30-ohm rheostat was used, in conjunction with a 6-volt accumulator. With the turn numbers and spacing mentioned, the set should in all cases stop oscillating when the reading of the reaction condenser is about 30°. A slight increase in the capacity of the latter will bring it smoothly over the oscillation point.

The Results Obtained

Results on the broadcast band were very gratifying, the local station, although extremely strong, only occupying 10 or 15 degrees of the dial (this at a distance of 6 miles).

About 24 Continental stations were logged, nearly all of these being at quite good strength. With a 2-valve L.F. amplifier added, no fewer than 16 of these were tuned in on the loud speaker, and the volume from 2 L O was quite overpowering.

In addition to being a good "starting-point" for those who may wish to add amplifiers later, it seems to be an excellent "self-contained" receiver for use with headphones, and has the merit of being extremely cheap to construct and maintain, as well as being simple to operate.



The completed receiver ready for test with the valve and coils in position. Note the relative spacing between sections of the coil—a very important matter.

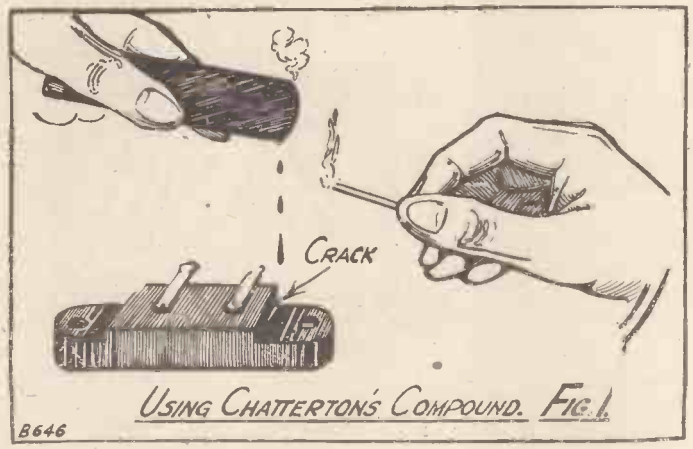
SOME PRACTICAL WORKSHOP HINTS

By R. W. HALLOWS

A great deal of time can be wasted if the constructor happens to go about a job in the wrong way, while the use of a few "wrinkles" may make all the difference between a well-done task, and one which is only just passable. The ideas incorporated in this article will be of value to all set builders.

CHATTERTON'S COMPOUND

I AM often surprised to find how few constructors know of Chatterton's Compound, or at any rate make practical use of it. Yet this material is of the greatest utility in the wireless man's workshop, and can be employed as a trouble-saver in a variety of different ways. It is sold in sticks of dead black hue, and looks not unlike sealing wax; it is, however, considerably lighter in weight than wax.



USING CHATTERTON'S COMPOUND. FIG. 1.

A cracked fixed condenser may be repaired in a few moments by the method shown here.

Its great virtues from the wireless point of view are two: It is a good insulator, and it is one of the very few substances that will adhere firmly to ebonite, and the black moulded compounds used in wireless components. Fig. 1 shows how Chatterton's compound may be used for repairing a crack in the case of a small condenser. A lighted match is held a little way from the end of the stick. The heat soon causes the compound to flow, and drops of it are allowed to fall into the crack. This done, the case may be placed between the jaws of a vice and slight pressure applied in order to close the crack. Any surplus amount of Chatterton's compound can then be removed with the blade of an old pocket knife. When the material has hardened it will be found that a very satisfactory repair has been made.

Holes in ebonite panels can be stopped most handily with Chatterton's compound. In this case it is not necessary to make the material run. It should be softened by heat and then a piece should be taken on the blade of a knife. This should be rolled between the fingers into a little "sausage," and worked into the hole. A little more of the compound may afterwards be applied to the upper surface to fill up any slight hollow that there may be, after which the surplus should be trimmed off with the blade of a knife as before. When the plugs have set hard the whole panel can be rubbed down with fine emery cloth and re-surfaced. If botching of this kind is carefully done the holes so filled up will hardly show.

Other Uses for Chatterton's

Many other uses for Chatterton's compound will suggest themselves. If, for example, when a receiving set has been finished you find it necessary to mount an extra fixed condenser at the back of the panel, you can do so without bothering to make any holes for the fixing screws. Run a little Chatterton's compound on to the underside of an ebonite cased condenser, and it can be stuck to the back of the panel quite firmly. Copper foil screens or even those of rather heavier metal can be fixed to the back of panels in the same way.

If you have a screw that has stripped in its hole you can make it grip by smearing its threads over with a very little of the softened compound. Small pieces of ivorine or celluloid used as terminal indicators can be stuck to panels or to pieces of apparatus by means of Chatterton's compound. If you have to take an insulated lead through a piece of metal, as happens when each high-frequency stage is mounted in its own screened compartment, it is very important to take precautions against the occurrence of a short-circuit through the abrasion of the insulated covering by the edges of the hole in the metal. Since such screens are earthed a contact between one of them and a high-tension positive lead would probably have expensive consequences. Here is a way of making all secure. Drill the holes in the screens a little larger than is necessary to allow the insulated wires to pass through them. When the wiring is finished take a small piece of softened compound, rub it into a ball between the fingers and work it in round the lead at the point at which it passes through the metal screen. Not only is an extra insulating layer obtained in this way, but the lead is also held firmly in position once the compound has set, and since it cannot move there is no fear of the covering's being worn away by contact with

One easy way of making a good connection to a tinsel telephone lead is to bind it as illustrated.

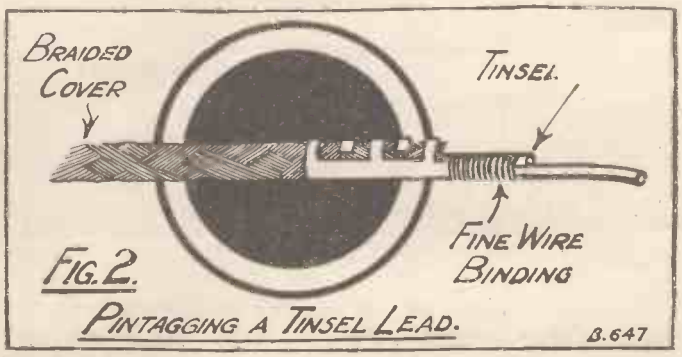


FIG. 2. PINTAGGING A TINSEL LEAD.

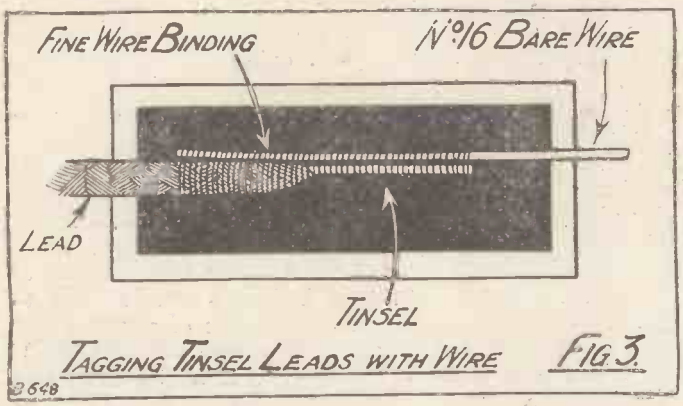
Some Practical Workshop Hints—*continued*

the metal edges. The tip given above about fixing a screw into a hole whose thread has stripped has also another very useful application : if you want terminals to " stay put," smear a little Chatterton's compound, when you are mounting them, not only on the shank of each but also on the surface of the boss, which comes into contact with the panel.

TAGGING TINSEL LEADS

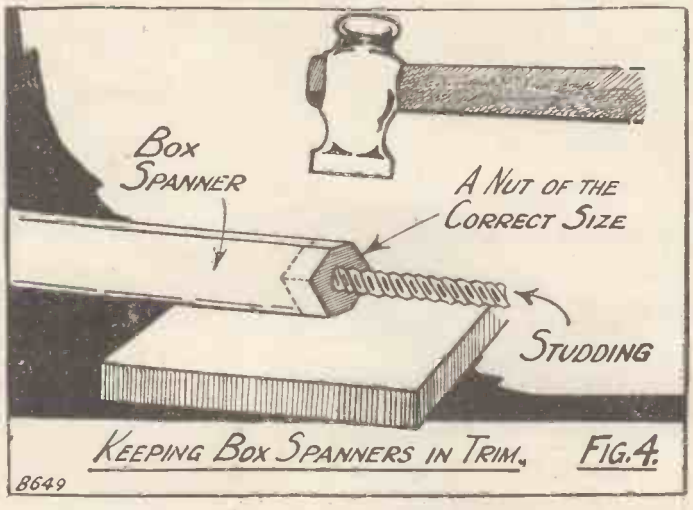
When, as not infrequently happens, the tags at the end of telephone leads come adrift, some little difficulty may be experienced in replacing them unless the right way of doing it is known. Such leads are usually made of tinsel with inner and outer coverings of cotton or silk, and a braided sheath. The tinsel itself is so flimsy that it is pretty certain to break if it is used for direct connection to any kind of terminal, and ordinary spade or pin tags cannot be attached to it without some kind of support for the same reason. Fig. 2 shows how a pin tag may be fixed securely to a tinsel lead. Remove the outer and inner coverings very carefully so as to lay bare about half an inch of the tinsel. Now place the serrated portion of the tag over the end of the braided covering of the lead and lay the tinsel along the pin. Clamp the tag on firmly by squeezing its points down with a pair of pliers and bind the tinsel to the pin with a seizing of fine wire. This done, wind silk over the serrated part of the tag and the seizing, and finish off with a layer of insulating tape.

If no pin tag of the kind referred to is available, tagging may be done effectively in the way shown in Fig. 3. Cut off a piece of stout bare copper wire about 1½ inch in length. Bare the tinsel as before and lay the wire so that about half an inch of it overlaps the braided covering. Bind then the stout piece of wire to both the covering and the tinsel ends with fine wire, put on as tightly as possible, as shown in the drawing. Finish off as before with a winding of silk covered by a layer of insulating tape. When either method is used a little solder may be run into the junction between the tinsel ends and the pin, but I am not very much in favour of this procedure owing to the corrosive action of fluxes upon both tinsel and fine wire.



TAGGING TINSEL LEADS WITH WIRE FIG. 3.

When no tag is available, bare wire may be secured to a tinsel lead by binding the connection with fine wire.



KEEPING BOX SPANNERS IN TRIM. FIG. 4.

Tightening up a loose box spanner is best done by gently tapping with as hammer, as illustrated here.

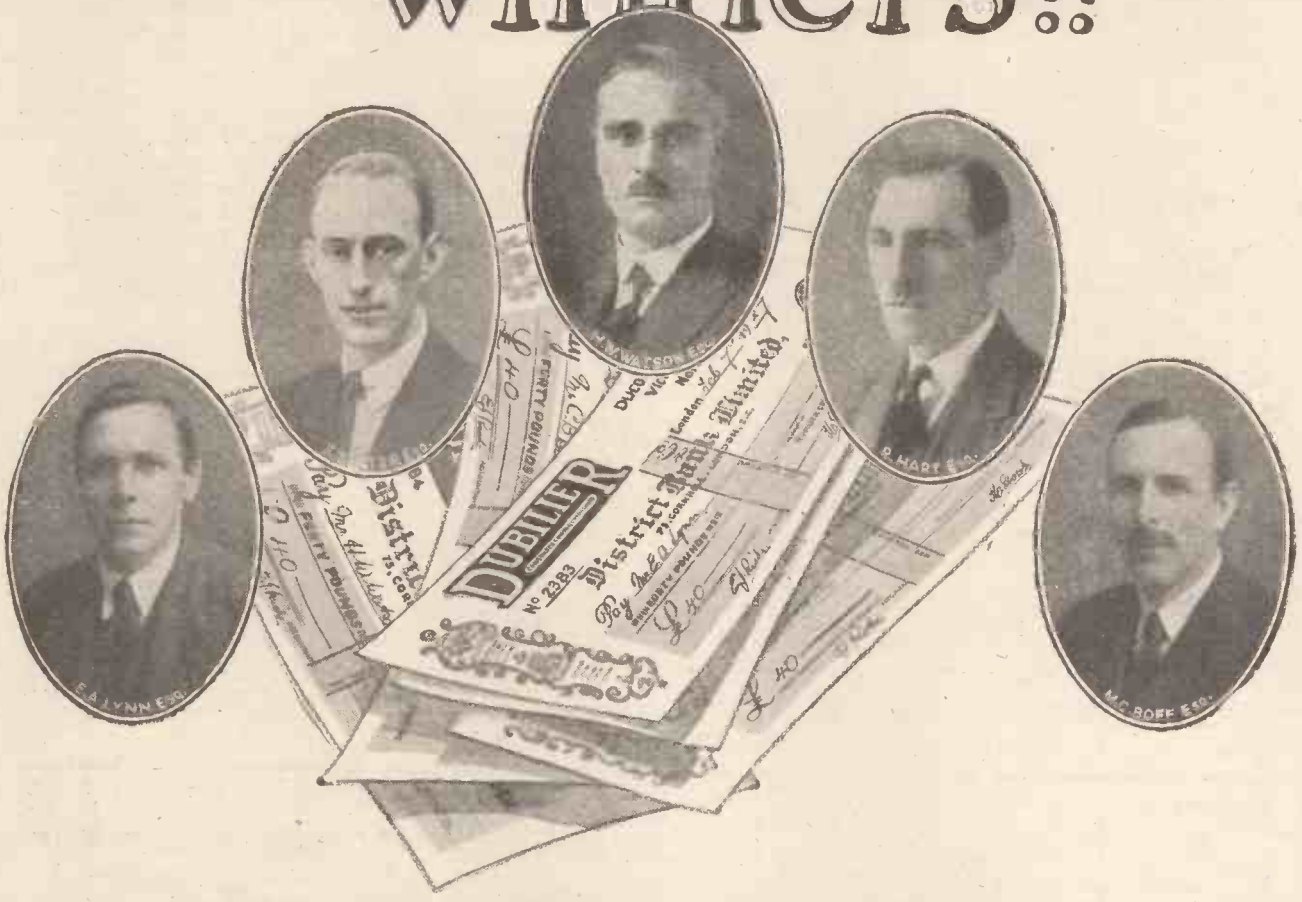
KEEPING BOX SPANNERS IN TRIM

Many of the B.A. box spanners sold for use in wireless constructional work are made of brass or some other rather soft metal. So long as no great amount of force is applied with them they will retain their shape for a long time, but where heavy work comes their way—particularly when they are used for dismantling old sets whose nuts may have become firmly jammed—they are liable to spread a little. A box spanner that has suffered in this way is a perfect nuisance, owing to the way in which it slips, especially if one happens to have a stock of nuts that are slightly under standard size (how often does one find that one has such a stock after laying in a new supply!). Fig. 4 shows how a spanner that has spread may be brought back again to its proper size so that it is a good tight fit. Obtain a big nut of the size which the spanner is intended to fit.

(*Continued on page* 513.)

FIG. 5.

Winners!!



The Dubilicon Competition

The result of the highly successful Dubilicon Competition can now be announced.

Each of the five gentlemen whose portraits appear above correctly worked out the number of different capacities obtainable from various arrangements of the first five capacities of the Dubilicon Condenser.

The correct number was—475.

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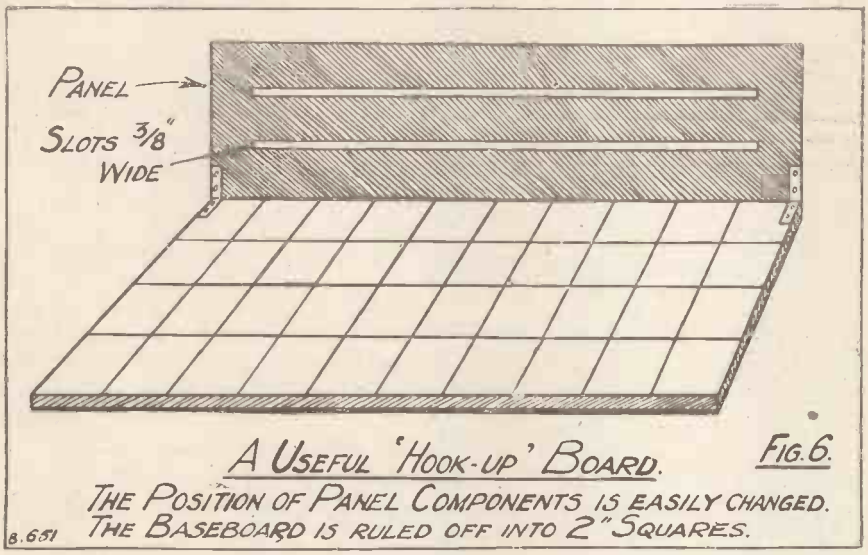
E.C. 268

Some Practical Workshop Hints—*continued*

Into this insert a screw or a piece of studding and push it into the end of the box spanner. Now lay the spanner with one of its flats downwards upon the closed jaws of the vice or some other flat piece of metal and hammer gently, as shown in the drawing. Keep on turning the spanner and hammering the flat surface that is at the top until it has been drawn in sufficiently to grip the nut firmly.

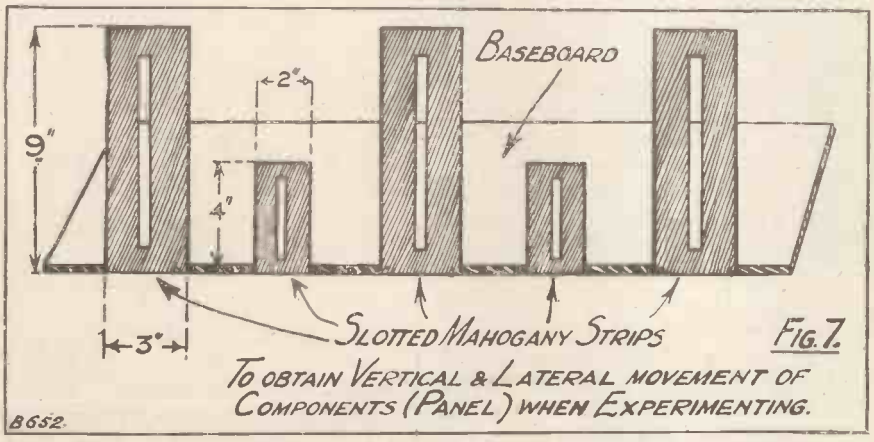


A USEFUL 'HOOK-UP' BOARD. FIG. 6.

THE POSITION OF PANEL COMPONENTS IS EASILY CHANGED. THE BASEBOARD IS RULED OFF INTO 2" SQUARES.

CENTRE-PUNCHES

When visiting friends' workshops I am often amazed to observe the condition of centre-punches, which are frequently left without any attention from the date of their purchase onwards. When a punch of the small size needed for wireless constructional work is new it has quite a sharp point, which makes the work easy tor two reasons; you can feel the point slip into the small groove cut by the scriber in marking out, and this prevents inaccurate punching; secondly, only a very slight tap is needed to make a sufficient starting-place for the drill. Examine a punch of your own that has been in use for some time without being trimmed. You will probably find that the "point" has assumed somewhat the shape shown in Fig. 5; or it may have become merely rounded without any "mushrooming"; or again it may have become turned over to one side. In any case it is no longer a fit and proper tool for the work in hand. A little time spent with a keen fine file will soon put matters right. Place the punch horizontally in the vice and trim it up with diagonal strokes, turning it a little after every two or three. A little work on these lines will bring your punch back to its old form; it is well worth while to examine punches before a job of work is undertaken and to treat in this way any that are not up to the mark.



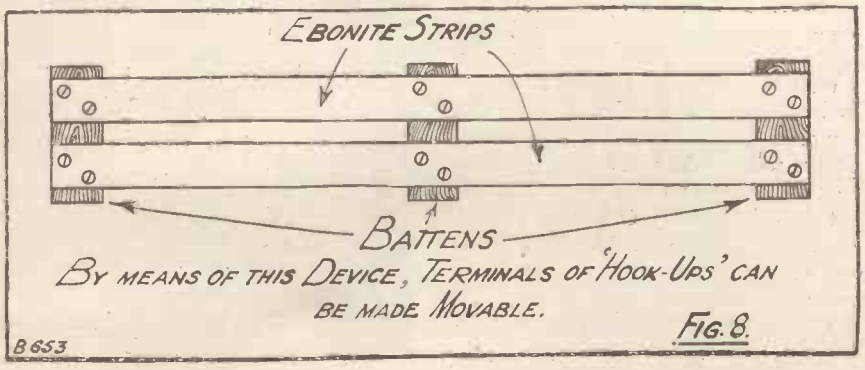
TO OBTAIN VERTICAL & LATERAL MOVEMENT OF COMPONENTS (PANEL) WHEN EXPERIMENTING. FIG. 7.

A USEFUL HOOK-UP BOARD

Those who like to try out new circuits (and what wireless enthusiast does not?) will find a hook-up board made on the lines shown in Fig. 6 a very present help. The baseboard is made of $\frac{3}{4}$-inch *soft* white wood; it is very important that the wood should be soft so that the screws used may be driven in without difficulty.

My own panel consists of a piece of $\frac{1}{4}$-inch material. In it are cut two slots each $\frac{3}{8}$-inch wide and extending for almost its whole length. The upper one of these is intended mainly for mounting variable condensers of the "one-hole" fixing type, but if the slot is widened slightly towards the right-hand end (as seen from the front) it can be used for jacks. The lower slot is meant for smaller components, such as rheostats, potentiometers and so on, which are most conveniently mounted on a lower level. The great virtue of the slot system is that one-hole fixing components can be moved about on the panel as desired. Suppose, for example, that you wonder whether you can mount two coils on the base

(*Continued on page* 528.)



BY MEANS OF THIS DEVICE, TERMINALS OF 'HOOK-UPS' CAN BE MADE MOVABLE. FIG. 8.

Notes and Jottings

By A. V. D. HORT

Under this heading our contributor discusses those little practical difficulties that confront every constructor. This month's subjects include the mounting of variable condensers, and an easy method of reducing the minimum capacity of neutralising condensers.

THE removal of the insulation from the ends of lengths of wire with a spirally wound insulating covering, such as "Glazite," can be quite a troublesome business if it is not tackled properly. If a knife is used to remove the wrapping, there is a risk of cutting into the wire and so weakening it near its end, and also it is not easy to get rid of ragged ends of the insulation, which does not improve the appearance of the finished set.

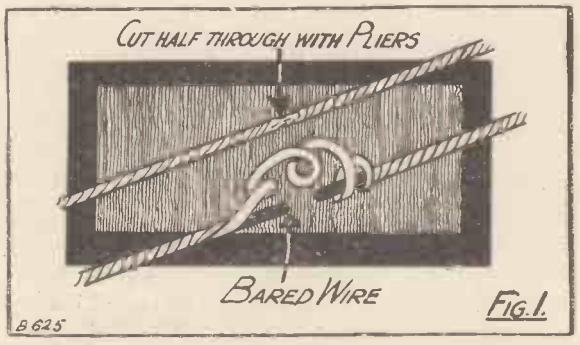


FIG. 1.

The method which the writer employs is to cut half through the wire at the required point with a pair of wire-cutting pliers. In this way the wire is cut enough to enable it to be broken easily with the fingers, while the strip of insulation is not severed. On breaking the wire, the insulation remains attached to both sides of the break, when it can readily be unwound for a quarter-inch or so from the end of the length to be used. Scissors are then used to cut it off close to the wire at the required point (Fig. 1). The loose end of insulation is left on the other piece of wire, so that it can be unwound when that piece comes to be used.

When starting on a new length of wire, a piece about one-sixteenth of an inch long is cut off the end, to enable the above operation to be carried out. This method avoids all possibility of damage to the wire and leaves the "standing" insulation still closely adhering to the wire.

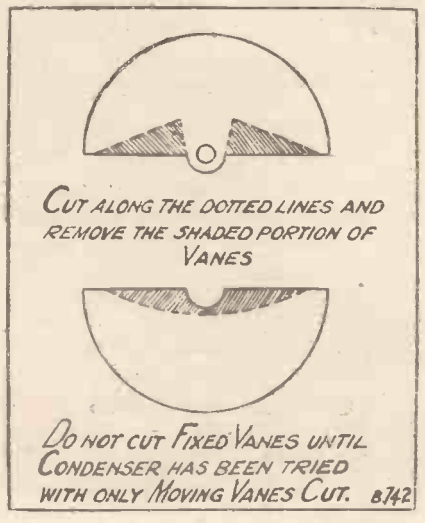
* * *

WHEN a variable condenser of modern type with one-hole fixing is mounted on the panel, the top end plate is usually pressed flat against the back of the panel. The condenser is then held rigidly in position, the friction between the end plate and the panel assisting the fixing nut. It sometimes happens that the ends of the rods on which the vanes are mounted project slightly beyond the top end plate. When this is the case, care must be taken in tightening up the fixing nut, or the centre of this plate will be pulled in towards the panel, distorting the whole component and probably causing the fixed and moving vanes to make contact.

If it is preferred to have the end plate flat against the panel, the ends of the rods should be filed down flush with the plate, or alternatively, shallow depressions may be made in the back of the panel where the ends of the rods are to rest.

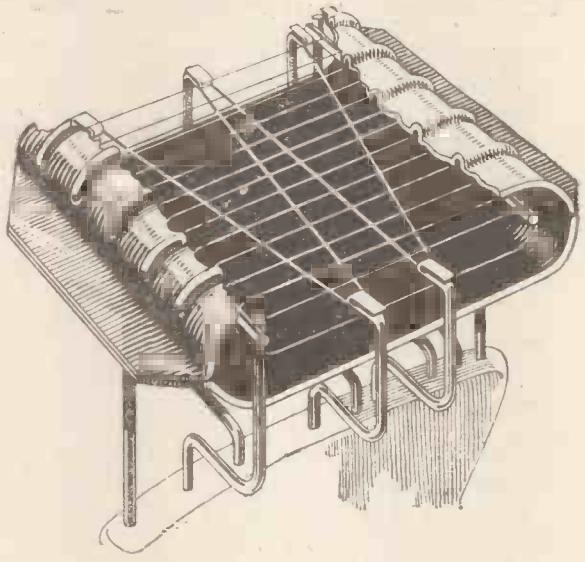
When wires are covered with spirally-wound insulation it is often difficult to make the ends neat, but a good method is illustrated here.

IN making the preliminary adjustments of a modern neutralised receiver, it should be possible to find a setting of each neutralising condenser which gives a definite silent point, the filament of the appropriate valve being turned out in the usual way. It sometimes happens, especially close to the local station, that no actual point of silence can be found, signals being faintly audible at all settings of the condenser. It should, however, be possible even under these circumstances to find a minimum point, where signal strength falls nearly to zero. If the correct point has been found, it will be noticed that the signal strength increases on either side of the critical point. If, however, the neutralising condenser is unsuitable for the valve in use, it may be found that signal strength falls off as the minimum setting is reached, without any definite point of minimum signals. In this case the trouble is usually that the minimum capacity of the neutralising condenser is too high. There are neutralising condensers available which have a specially low



(*Continued on page* 517.)

The P.M. FILAMENT



Note the great length and thickness of the wonderful P.M. Filament shown in this sectional view of a Mullard 6-volt P.M. Master Valve.

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The great advantages of the wonderful P.M. Filament are secured to their fullest extent in the range of Mullard 6-volt P.M. Valves. The enormous length and copious emission of the Mullard P.M. Filament, when combined with the special design of P.M. anode and grid, produce 6-volt valves for special purposes that ***will improve any radio receiver.***

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THE P.M. 6 (Power) 0·1 amp. 18/6
Super power valve for last L.F. stage
THE P.M. 256 0·25 amp 22/6

Notes & Jottings—*concluded*

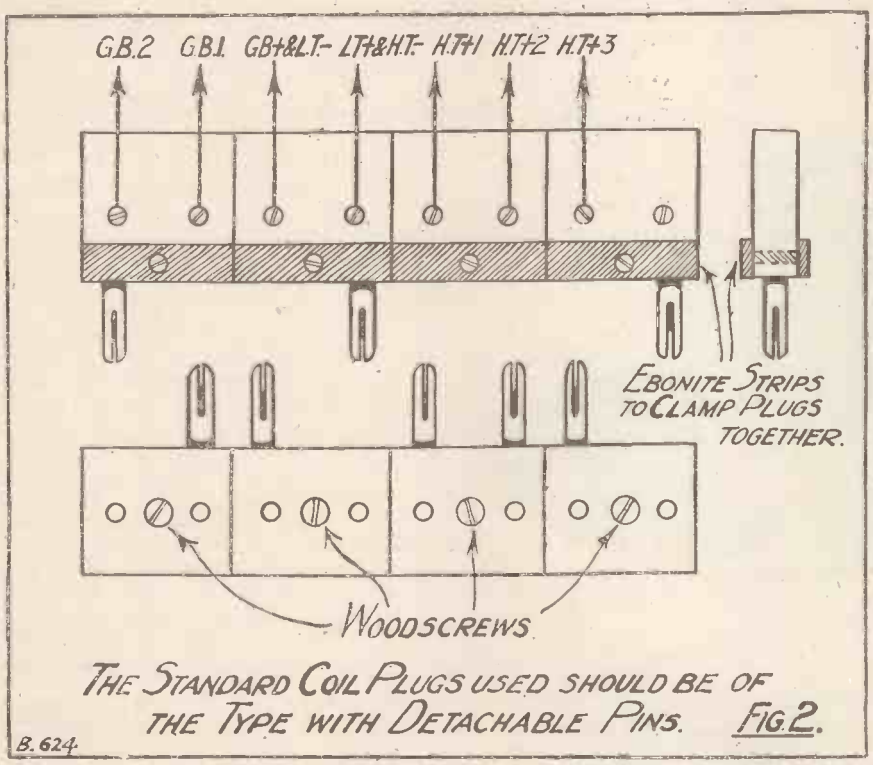
minimum, but with some of the older patterns the trouble mentioned may be experienced.

The remedy is to reduce the size of the vanes, either the fixed or the moving, or both. This procedure is more to be recommended than the expedient of removing one or more of the vanes altogether, owing to the difficulty of keeping the correct spacing of the vanes when some of them have been removed. The vanes can be quite easily cut with an old pair of scissors, pieces being taken out of them as shown in the sketch. The vanes may then be straightened with flat-nosed pliers, or in a vice, and the condenser reassembled. It will be best to cut the moving vanes first, and then reassemble and test the condenser in circuit, rather than to cut both sets of vanes at first. Otherwise the maximum capacity of the condenser may be reduced too far, necessitating the purchase of new vanes.

* * *

THE use of "Multi-plug" connectors for the battery connections of a receiver, such as have been recommended in the design of sets recently published in these pages, has a certain attractiveness when it is desired to make the set foolproof. When such devices are incorporated, the batteries may be left connected to the ends of the leads, the plug being disconnected from the set. There is little danger of short-circuits, since the pins of the plug can only be connected together if an odd piece of metal is accidentally laid across them.

Foolproof battery plugs which will be immune from even this risk can be made up by the constructor in his own workshop. These are most conveniently made with standard coil plugs. Similar standard plugs must be mounted on the set, with the ends of the ebonite blocks flush with the cabinet surface and the pins projecting. Separate plugs will, of course, be required for each set of battery leads, but these plugs can be made up into a unit, as indicated in Fig. 2. The arrangement of the pins and sockets ensures that the leads are connected to the set the right way round.



THE STANDARD COIL PLUGS USED SHOULD BE OF THE TYPE WITH DETACHABLE PINS. FIG. 2.

* * *

A WARNING against careless handling of the screens in screened-coil receivers has already appeared in these pages. It is certainly inadvisable to move the screens in a receiver without first switching off the batteries, since accidental contacts of a disastrous kind can so easily be made with the metal of the screens. A further point which needs attention in screened-coil receivers is the wiring up of the connections to the coil bases. The terminals on the base are quite close to the screen when the latter is in position, so that it is best to use soldering tags for the connections rather than loops at the ends of the wires. Even with tags, care should be taken to see that the ends to which the wires are soldered point out radially from the base, as if they are turned sideways there may be some risk of their coming into contact with the screen. Since the screen is earthed, such a contact might mean a short-circuit across the H.T. battery.

A LETTER FROM Mr. HALE

SIR,—Since the publication in your journal of the Hale Receiver circuit, communications have reached me which prompt me to make it known that the patent in this circuit (No. 234965) was obtained by Radio Engineering Company, Ltd., jointly with myself as the inventor and in the capacity of research engineer to that company. The position applies also in the case of the following patents:

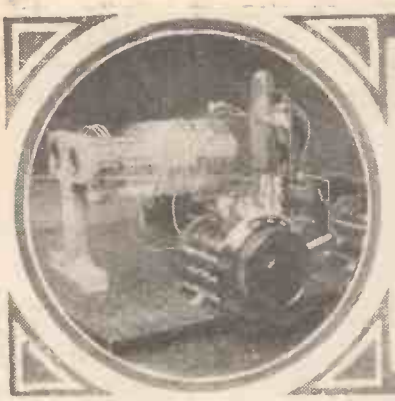
237025.—Telephony control (neutralised retroaction) system. 237683.—Variable electrical resistances. 239309.—Telephony control (series-valve) systems. 239310.—Hale circuit modifications (plug-in detector being used for varying function of receiver or amplifier valves). 241653.—Transformers (low frequency). 243794.—Variable condensers. 252764.—Variable amplification systems (coupling between valves varied by differential inductance).

From the foregoing it will be appreciated that the Hale circuit was devised with a specific object in view and as part of a radio research programme, which also included the development of the Hale-Lyle broadcasting reception system employing cordless radiophones.

The fact that I am interested in radio research in a professional capacity is, of course, quite contrary to what has been assumed by those who have been kind enough to congratulate me on "discovering" a circuit which "only the trained engineer might have devised."

Yours faithfully,

Raynes Park, S.W. G. W. HALE.

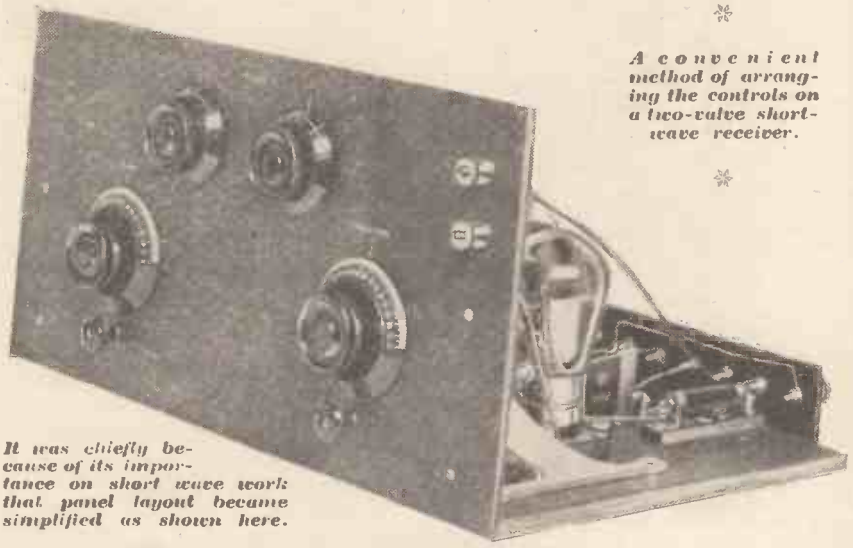


SOME SHORT-WAVE ADVENTURES

There is a romance and "unexpectedness" about listening on the very short waves that make it always worth while to construct a set that will "take you down."

By W. L. S.

THERE is no doubt that the broadcast band of wave-lengths (that is, from 300 to 500 metres) has more attraction for the average enthusiast than any other band. There is always the intriguing uncertainty as to what one may pick up, the local station is always available for loud-speaker work, and, for those keen on experimenting, what is more interesting than the task of "cutting out" the said local station?



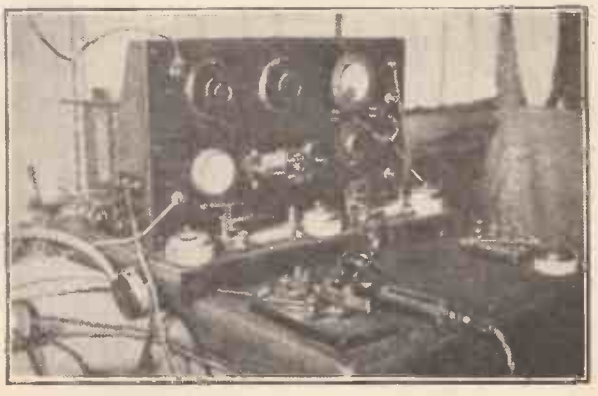
A convenient method of arranging the controls on a two-valve short-wave receiver.

It was chiefly because of its importance on short wave work that panel layout became simplified as shown here.

This wave-length band, however, has by no means a monopoly of the events of interest, and for sheer romance and "unexpectedness" the shorter wave-lengths excel. In this short article it is my intention to give a few of my own experiences, so that the reader may judge for himself whether or not short-wave reception is worth the trouble.

First across the Atlantic

The really short wave-lengths first came into their own, as far as reliable and consistent work was concerned, in the late autumn of 1923, when a well-known French station (8AB, operated by M. Leon Deloy, of Nice) succeeded for the first time in establishing communication "both ways" across the Atlantic. Naturally, an achievement like this set everyone on the track to see what could be done to beat it. My first receiver to go down as low as 90 metres (which did seem really low in those days!) was chiefly composed of extension handles, vernier condensers, and glass "stand-off" insulators! Nevertheless, it succeeded in doing the work that was required of it, and very efficiently it performed until a better one took its place. On the first night this receiver was working I searched round very carefully indeed, scrutinising every degree on the condenser scale as if for inspiration, for I felt like an explorer in an unknown land; suddenly a faint signal with a peculiar note was heard sending "1MO 1MO 1MO . . " fading out at intervals. Knowing that 1MO was the American station with whom French 8AB had communicated a week before, I hung on to this signal like grim death. I was not rewarded, however, for it faded right out and did not appear again.



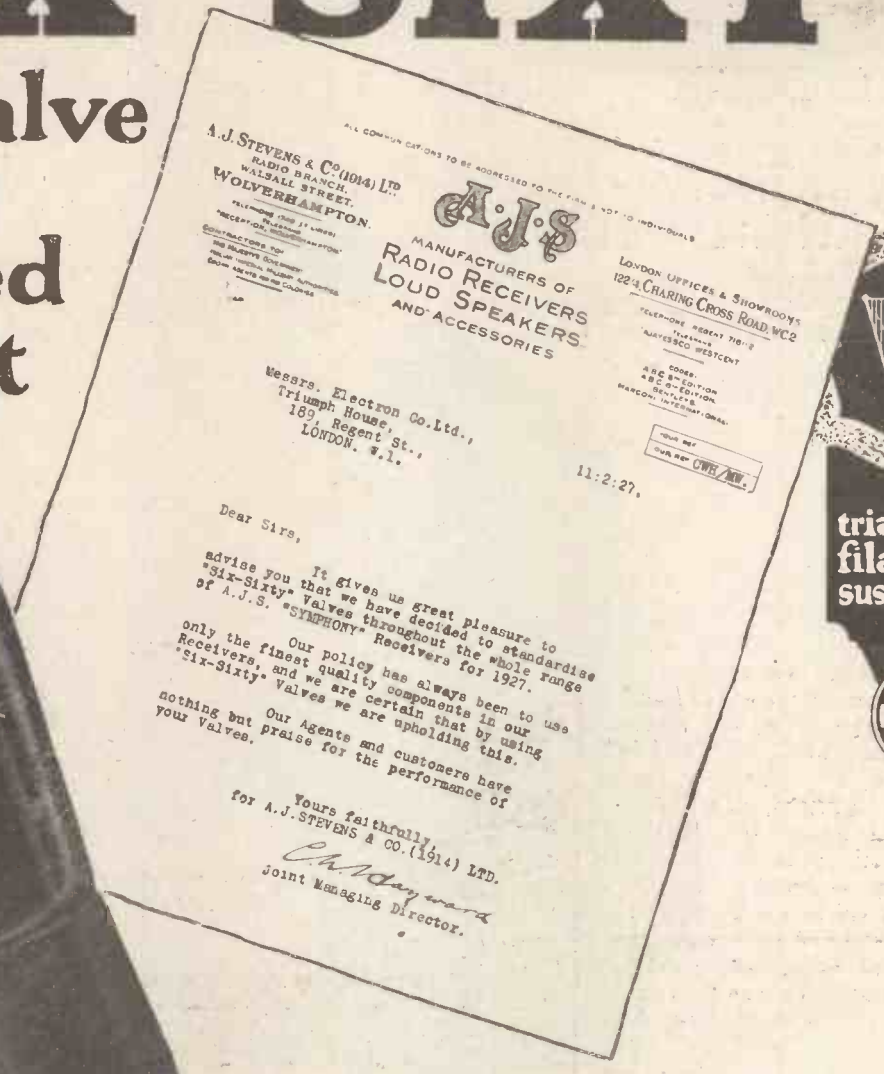
A carefully-thought-out layout for a short-wave transmitter. In this class of set the spacing is of the utmost importance.

Receiving Reinartz.

A few moments later, however, I received loud and clear signals from French 8AB calling 1MO, and telling him that his signals were weak and fading. This, naturally, made me sit up and take notice once more, for the time was about 10.30 p.m., and until that time it had been an unheard-of thing to hear an American amateur before 2 or 3 o'clock in the morning. This was truly a promising start for the new receiver. Going lower down the scale, grasping the extension handles in a vice-like (but necessary!) grip, I ran into three more weak stations. Two of them were unreadable, but the third gave the call-sign of U-1 XAM, which I recognised at once as that of Mr. John L. Reinartz,

SIX-SIXTY

The Valve of Proved Merit



Duo-triangular filament-suspension

SIX SIXTY

NEW VALVES JUST ADDED TO THE SIX-SIXTY RANGE.

S.S. 7A.—D.E., 4 volts, .1 amp., Super Power Valve .. 22/6

S.S. 11A.—D.E., 6 volts, .1 amp., Super Power Valve .. 22/6

S.S. 12.—D.E., 6 volts, .1 amp., General Purpose Valve .. 14/-

S.S. 13—D.E., 6 volts, .1 amp., High Impedance Resistance Capacity Coupling Valve .. 14/-

Descriptive leaflet S.S. 9/26, giving full particulars of the complete Six-Sixty range of 2, 4 and 6-volt Valves, free on application.

EVERY month marks an increase in the number of Wireless Set Manufacturers who have come to the conclusion, after exhaustive and exacting tests, that Six-Sixty Valves yield by far the best results in their Receivers.

We reproduce a letter of appreciation from Messrs. A. J. Stevens and Co., (1914), Ltd., which shows that they are of the same opinion as to the excellence of our valves as the General Radio Company and many others, from whom similar testimonials have been received. All these manufacturers have standardised Six-Sixty Valves in their Receivers as they realise that for real purity of tone nothing can approach them.

The unique Six-Sixty filament with its special Duo-Triangular Suspension ensures increased electronic emission, consistently perfect reception, longer life and lower running costs.

SIX-SIXTY GLOWLESS VALVES

The Electron Co., Ltd., Triumph House, 189, Regent Street, London, W.1.

Some Short-Wave Adventures—*continued*

of Hartford, Connecticut. There was no doubt this time about the identity of the signals.

Promising Pioneer Work

Shortly after this everyone was receiving the American signals, and after a few days' work on the receiver I myself had them coming in on two valves at about the same strength as the average French signals used to be on the longer 200-metre wave-length band.

There was no doubt now that the pioneers had opened up what promised to be an extraordinarily interesting band of wave-lengths, and, naturally, I concentrated on the new receiver for many weeks. Many were the adventures and surprises that befell me during this time! One evening I had been listening fairly late to the harmonic of 2LO on 120 metres (the third harmonic of his 360-metre transmission); he was coming through with dance music at about R5 or R6 on two valves. Idly turning the dials, I searched round to see if anything else worth listening to was about. Finding nothing, however, I went back to listen to 2LO again.

KDKA's Telephony

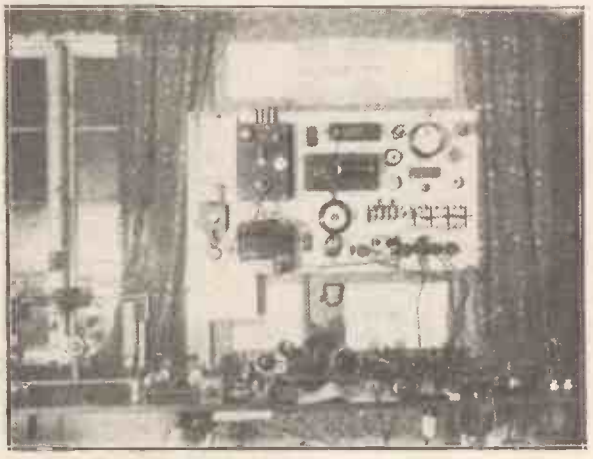
The dance music was still there, certainly, but seemed to suffer from curious fits of fading from time to time. Then, at the end of an item, came the announcer's voice: "This is KDKA, the Westinghouse Station at East Pittsburgh, broadcasting tests on 103 metres." To say that I received a shock was to put it mildly! I looked at the setting of the tuning condenser, and found that I was about 20 deg. below the spot at which 2LO's harmonic had been coming in. Tuning back to that place, I found him as he was before; I did not stop long to listen to him, however! This must have been about the first time KDKA transmitted on the short waves; it was certainly the first broadcast worthy of the name that I had heard from America.

Australia and New Zealand

The next excitement was caused by the reception of amateur signals from Australia and New Zealand, and also the establishment of actual "contact" with them by British amateurs. This was towards the end of 1924. I shall always remember my first successful attempt to receive these signals. I was listening round the 100-metre band among the "U" (United States) stations, and was "hanging on" to one, waiting for him to give his call-sign when it came. Not with the familiar "U" before it, however, but with "Z" (New Zealand). The station was operated by Mr. Frank Bell with the call-sign Z-4AA, and was heard all over this country within about a week.

Sunset Fading

Unfortunately, since the reception of Australian and New Zealand signals, the search for new countries has lost much of its glamour. The record distance has apparently been reached until the time when our Martian friends start a short-wave station!



A well-known Danish short wave station that is often heard in this country.

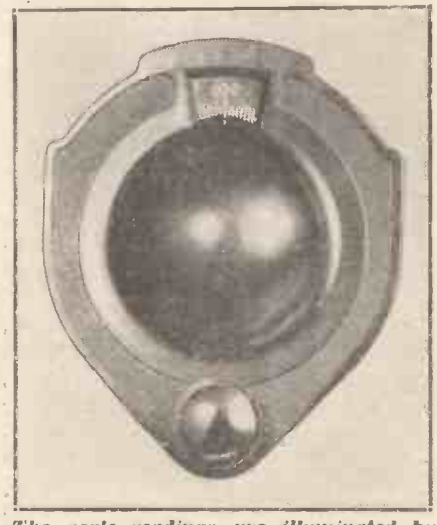
The short waves, however, still manage to preserve their extraordinary interest in other ways, since it is often impossible to tell whether a station picked up is in the next street or at the other end of the earth until his call-sign is received. At 6 a.m., for instance, New Zealand signals are often considerably stronger than those received from a station five or six miles away. This peculiarity of the short waves—namely, the fading out of signals from fairly short distances at certain times—takes a great amount of getting used to.

(*Continued on page* 530.)

A MONTHLY REVIEW OF TESTED APPARATUS.
(NOTE: All apparatus reviewed in this section each month has been tested in the Editor's private laboratory, under his own personal supervision.)

An Interesting Illuminated Dial

FROM The Rothermel Radio Corporation. Ltd., we have received an example of the new National Velvet-Vernier dial, the appearance



The scale readings are illuminated by means of a small lamp.

of which can be judged from the photograph accompanying this article. The National Company were one of the first firms—if not actually the first—to produce the modern friction type of vernier dials, giving smooth motion without backlash, and the present model has all the advantages of their previously produced non-illuminated type including the variable speed ratio attachment, by means of which the user can choose any ratio of gearing between 6 to 1 and 22 to 1. In the present model, provision is made for illumination of the dial through the small window, by means of a tiny lamp provided with the dial. An ingenious method of attachment has been adopted, so that the work of fitting is made very simple. A paper template is provided and after the drilling holes have been located by means of a scriber or centre punch, only five holes need to be drilled. The lamp itself can be run, as we would recommend, as a pilot light in conjunction with the on-and-off switch, so as to show whether the valves are on or off. It should be pointed out, however, that vernier dials of many makes, including the National Velvet-Vernier, require that the front of the panel shall be free from projections, such as the large nut used with some one-hole-fixing condensers.

Binocular Coils

The increasing popularity of binocular coils has led Messrs. Wright and Weare, Ltd., makers of the well-known "Wearite" components, to produce some well-made binoculars of the standard type, utilising the popular six-pin base. The windings are those suitable for the "Night Hawk" and other receivers of the kind, and thus are immediately applicable to any set already using the standard binocular coils. Practical tests in the laboratory show that these coils are well up to the standard required, while the finish is very high grade.

A New Radio-Frequency Choke

The growing popularity of circuits calling for radio-frequency chokes has brought a number of these devices on the market. One of the latest being the McMichael "M.H." radio-frequency choke. On practical tests the choke was found to function efficiently over all the wave-lengths with which the listener is likely to require such a choke, and its construction is sound mechanically, although we would like to see longer soldering lugs, particularly that nearest the base, as, unless the soldering iron is handled skilfully and is of a suitable size, the average constructor may find a little difficulty in making a good joint. The makers now supply this choke, if required, for horizontal mounting, with a suitable base, connections to the choke when fitted in this way being particularly easy and simple.

S.T. Valves

In the last issue of "The Wireless Constructor" a description of the S.T. 42 power valve was published and since then this valve has been given a thor-

A photograph of the "Wearite" binocular coils referred to on this page.

ough test in all kinds of receivers and has always proved exceedingly satisfactory. By the way, the remarks about distortion were unfortunately

(Continued on page 524.)

WHAT'S NEW

—*continued from page 522*

accompanied by a misprint, for they should have read "able to handle considerably more energy *without* distortion" and not as they appeared, giving an altogether wrong impression.

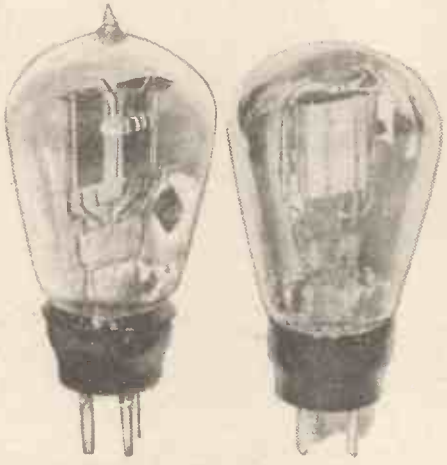
Osram Rectifying Valves

From the G.E.C. we have received their rectifying valve known as the U.5, with a filament voltage of 5 and a filament current of 1·6 amps, designed to work with an anode voltage of 250, giving a maximum rectified current of 50 milliamperes. The U.5. is a double rectifier, that is to say by the use of two plates full-wave rectification is obtainable with one bulb.

The U.4., which we have also tested, is a single wave rectifier, designed for a smaller output. Both of these valves have been found to work satisfactorily for the purposes for which they are designed.

H.F. Vario-Transformers

Messrs. The Metrovick Supplies have sent us a "Cosmos" H.F. vario-transformer for test and report. This instrument consists of a double variometer, of which one winding acts as the primary and the other as the secondary of an H.F. transformer. Thus, as the rotor is rotated, the inductance of both



The U.5 and U.4 rectifying valves.

primary and secondary is varied simultaneously. What appears to be a small balancing condenser is mounted on the side of this instrument. For connecting the instrument in circuit four insulated leads are provided.

The component is marked as having a range of 350 to 500 metres, and when placed on test this range was exceeded, it being found to be actually in the neighbourhood of 280 to 600 metres. A very satisfactory degree of stability was obtained, while the degree of H.F. amplification obtainable was in every way up to standard. The selectivity obtained with this component was up to standard, and the overall efficiency was of a satisfactory order.

A knob and pointer are provided, which, together with a scale graduated in ten divisions, enabled the setting of any station to be logged. The component is mounted by means of three holes, two for fixing screws, and one for the spindle, while three small screws and nuts fasten the dial to the panel. Both the construction and finish of this component are satisfactory, and it can be recommended for use.

An Interesting Crystal Unit

One of the very earliest, if not the first, crystal to be used as a detector in wireless circuits was the artificially made compound known as carborundum, an American Army investigator, General Dunwoody, having discovered its excellent recti-

(*Continued on page 526.*)

WHAT'S NEW

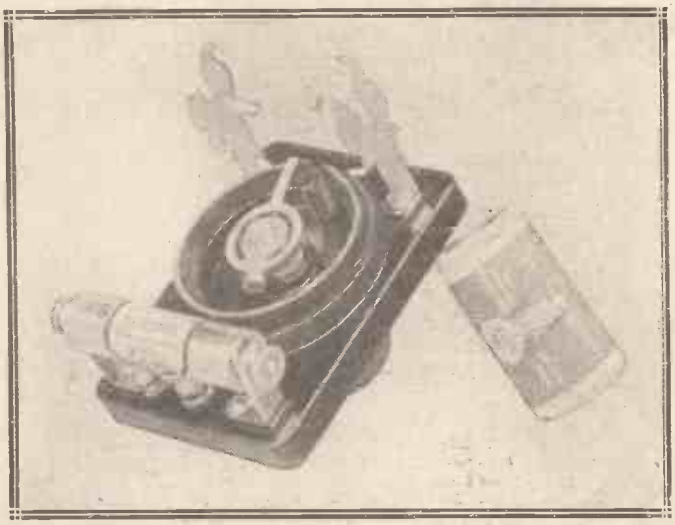
—*continued on page* 524.

fying properties as long ago as 1906. The newcomer to wireless may well have gathered the impression that "permanent" crystal, or, to describe them more accurately, crystal detectors which maintain their adjustment even under considerable vibration, are a modern invention, but actually the carborundum detector (a crystal of carborundum in contact with a steel plate) is considerably more "permanent" than many detectors now sold under that name.

In such circumstances the question will be asked, why the carborundum detector has received so little attention in broadcast receivers, particularly in those built by home constructors. The reason is that the detector is not particularly sensitive unless it is arranged to operate in conjunction with a small local battery, this latter applying a constant voltage of about 1·2, and this, of course, means complication in the provision of a battery and some voltage regulating device such as a potentiometer. Properly handled, a good carborundum crystal—and they want picking carefully—is a particularly stable, sensitive and reliable detector.

Carborundum is a material produced in the electric furnace by the interaction of sand, and coke, the final produce crystallising out in the familiar form. Out of a great mass of crystallised material so formed, only a tiny portion is of value for wireless purposes, and the Carborundum Company, having created a Wireless Department, is now able to sell selected crystals of a quality hitherto only obtainable with difficulty. Furthermore, they have been enterprising enough to fit selected crystals in cartridge detectors, and to supply them in a special and particularly neat fitting for back-of-panel mounting. This fitting comprises clips for the cartridge detector, a pair of clips to hold a single Ever-Ready dry cell of miniature size, and a well-made

(*Continued on page* 540.)



A sensitive and extremely stable carborundum detector unit recently put on the market by the Carborundum Co.

EDITOR'S CHAT

—continued from page 469.

which would exist in motoring circles, if every brand of petrol required a special carburettor jet! Think of the muddle which would result if every different make of electric light bulb required a special holder! The position in wireless is almost as bad!

Speaking of experiments in the laboratory, here is a practical tip for you. Examine your set and if you have any valve holders of unknown or dubious make, take them out and replace them by a make with a reputation. I have recently been experimenting to determine the H.F. losses in some of the moulded materials, and have found that many of the unbranded valve holders cut down the efficiency of a receiver in a most remarkable fashion. The worst holders of all are those made with the four individual sockets moulded into a solid block of material which looks like ebonite and is not. The moulded bakelite anti-vibratory sockets are all good, although some are slightly better than others. Some of the coil sockets sold reduce the efficiency of the coil by 50 per cent.!

Some Practical Workshop Hints

—continued from page 513.

board 6 inches apart and the variable condensers which tune them the same distance from centre to centre on the panel without interaction effects occurring, you can try them first of all in these positions. Then by shifting the coil holders on the baseboard and moving the condensers in their slot you can ascertain whether greater spacing is advisable or whether even less can be used without evil results. The baseboard is ruled off into 2-in. squares. This immensely simplifies the business of laying out, for once the best positions for components have been found it is a simple matter to read the measurements from the markings on the baseboard and often there will be no need at all to use a ruler for the purpose.

Another Method

There is only one drawback to the use of the slotted panel described in the previous paragraph. It allows variable condensers and other panel-mounted components to be moved in one direction only—laterally. For this reason the method shown in Fig. 7 is in some ways to be preferred. A number of strips of ¼-in. mahogany some 9 in. in height by 3 in. in width are cut out. In each of these a vertical slot about 7in. in height and ⅜ in. wide is cut. Other strips 4 in. in height and 2 in. in width with slots about 2½ in. long may be cut for smaller components. Two holes for the fixing screws are drilled towards the bottom of each strip. Components mounted on the strips can be raised or lowered at will, and it is the easiest thing in the world to move the strips laterally since the screws holding them are easily removed from and driven into the edge of the soft wood baseboard. Terminal strips for either type of baseboard may be made on the same lines in a very simple way. Fig. 8 explains how this is done. Two strips of ¼-in. ebonite of any required length and about ½ in. in width are cut out. By means of screws these are fixed to battens, the strips being so arranged that a slot is left between them just wide enough to take comfortably the shank of a 4 B.A. terminal. Terminals can thus be moved about until the most convenient position for each is discovered.

(Concluded on page 530.)

Some Practical Workshop Hints

—concluded from page 528.

THE ART OF HAMMERING

The heading of this paragraph may seem absurd to some readers, for after all a hammer is simply a "thing to hit with," and what art can there be in delivering blows with it? As a matter of fact there is enough to be said about hammering to fill not merely one short paragraph but an entire article! Take, for example, the job just described (trimming box spanners); if a medium or heavy hammer were used and a good deal of force applied with the blows, the box spanner could never be drawn in to grip the nut; the upper and lower faces would be brought closer together, but the others would be thrust considerably outwards, and at the end of some little time it would probably be found that the spanner was a worse fit than ever. The whole secret of doing such a job is to use a small light hammer and to remember that a large number of gentle taps are in the end far more effective than a few heavy blows. This tip applies to nearly all hammering jobs that come the way of the wireless constructor.

Some Short Wave Adventures

—continued from page 521.

Not long ago I had a schedule with a Danish transmitting station at 6 p.m. every evening. On the first day his signals were about R8 at the start, *increasing* slightly in strength every time he came back. At 6.33 p.m. exactly, however, his signals suddenly dropped to R2 in the middle of a word—one might almost say in the middle of a dot or dash!—and then slowly disappeared. This had been expected, as signals from a distance of 600 miles eastwards nearly always fade out about two hours after sunset. Next evening a careful watch was kept towards 6.30 p.m., and he disappeared at 6.30 exactly. Each evening, quite independently of weather conditions, he faded out three minutes earlier, until, before a fortnight was over, the schedule had to be arranged for 5.30 instead of 6 p.m.

Picking Up the Beam

On December 22 (the shortest day) the fade-out occurred at 5.27 p.m., and it now seems to be getting about 2½ minutes *later* each day. In the summer his signals would be audible until 11.30 p.m. or after.

All this work was carried out on 46 metres. On the shorter wave-lengths still, however, there appears to be no such regularity, signals coming and going at all sorts of unexpected times. This is almost certainly due to the fact that weather conditions (i.e. clouds, etc.) would have a greater effect upon signals.

An interesting little experiment that anyone may carry out now is as follows. Tune the receiver to 26 metres at about 6 p.m. Just below this the Marconi Beam station at Bodmin will be heard at fairly good strength, sending either fast Morse or a continuous string of dots. Now listen very carefully just above him, when the corresponding station in Canada will be heard very faintly, sounding like an echo of Bodmin.

Later in the evening, say at about 8 o'clock, listen again. It will probably sound as if the two stations have changed places—the *upper* one will be far the stronger of the two. All that has happened, of course, is that Bodmin has faded out and the Canadian has "faded in." It is practically impossible for these stations to shift their wave-lengths, since to do so would involve pulling down the whole of the Beam reflector! Yet

(Concluded on page 532.)

Some Short-Wave Adventures

—concluded from page 530

it seems exactly as if they do so daily, If anyone is enthusiastic enough to listen for the whole evening, and note the time when Bodmin starts "going down" and the Canadian starts "coming up," he is welcome to do so.

It is an adventure in itself to tune in WGY nowadays on 32.79 metres. So strong is he that it is almost impossible to believe that the signals are coming from the other side of the Atlantic. Most of the programmes consist of dance music, and they are almost entirely free from "night distortion."

It is certainly well worth while either to build a special receiver for short-wave work or to convert the broadcast set so that it will "get down." Any trouble spent will be amply rewarded in the space of a few weeks.

ANYVALVE FOUR

—concluded from page 489.

Assuming that everything is in order, the necessary valves may be inserted and the receiver tuned in. A little difficulty will be experienced at first owing to the very sharp tuning obtained with this receiver, but the log given in the accompanying test report will serve to indicate the approximate positions of the various stations.

The simplest method is to tune in to the nearest station, or the local station, as the case may be, and adjust the dials to give the same reading in each case. Then, by moving the dial 2 degrees at a time, the receiver may then be calibrated in the usual manner.

Neutralising the Set

The best method of neutralising is to remove the first amperite, keeping the receiver tuned to the local station, and adjust the neutralising condenser until no signals are heard. The first amperite should then be replaced, the second one removed, and the process repeated with the second neutralising condenser. The set is then completely neutralised, the second amperite may then be re-inserted, and the distant stations may satisfactorily be received.

The best method of receiving distant stations is to tune in first of all to the local station and then to move the dials together a little at a time. The reaction adjustment may be increased until the receiver oscillates gently in order to facilitate the searching during the preliminary period.

The valves in use may be chosen to suit the requirements of the user. In general it is better to use fairly high-impedance valves for the H.F. and detector stages, while the L.F. valve should be a suitable power valve, capable of handling a fair volume of signals. Apart from this, however, the choice of the valves is not very important, because the correct primary winding for any particular valves can readily be obtained. The makers have developed a number of primary windings as a standard, so that for any particular valve there is a definite primary winding which gives the best results. It is only necessary when ordering the transformer to specify the type of valves to be used.

It is really quite a fascinating business changing the valves in the H.F. stages and then changing the transformer primaries to suit. While the transformer remains unaltered, the valves make a considerable difference either to the signal strength or the selectivity, or both; but when the appropriate transformer primary has been used, the difference between the various types of valves is really surprisingly little, and this development certainly appears to be one of the most striking for some time.

A Reader's Appreciation

2, Grimstone Villas,
Plymouth.

SIR,—I am writing you this letter to tell you how delighted I am with "The Night Hawk," which I have made up. The number of stations I get at full loud-speaker strength is simply amazing, without using any reaction at all! Birmingham, a station badly received in this district, comes in with wonderful strength and purity. The only departure I have made from the specified parts is in the transformer and variable condensers. I use a Marconiphone "Ideal," and Jackson S.L.F. I use 6-volt valves, B.T.H. B.4 H.'s. This set cannot be too highly spoken of, and it does *more* than you claim for it!

I can thoroughly recommend this set to anyone wanting a set easy to tune, and also a set which can be relied upon to give a programme from any particular station at a moment's notice. I am very much indebted to you and your wonderful paper.

Yours faithfully,

FRED W. NICHOLLS.

Grid or Plate Rectification?

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though delicate devices such as the oscillograph will detect its presence. Nor can it be said that an anode-bend rectifier is always entirely blameless in this respect. There may, for example, be—there probably are in the majority of cases—tiny "kinks" in the characteristic curve which cause small deformations of the wave forms. In order to give faithful reproduction an anode-bend rectifier requires exceedingly careful adjustment, particularly if it is preceded by several stages of high-frequency amplification so that grid-voltage swings are fairly large.

Cause of Distortion

An examination of the curves in Fig. 3 will show how such distortion may occur. If the working-point of the valve is that shown at A with an anode potential of 20 volts, a grid swing of 2 volts, that is 1 volt in either direction, would cause the working-point to be taken well to the right of the zero line by a positive half-cycle, and almost to the bottom of the bend by a negative half-cycle. There would thus be the desired reduction in the plate current for negative half-cycles; but what would happen in the case of positive half-cycles? A flow of grid current would occur, causing the crest of each half-cycle to be flattened, an event which gives rise to a particularly unpleasant form of distortion. It is necessary always to see that the plate voltage is sufficient to ensure an adequate straight portion of the characteristic to the left of the zero line, a fact which is not always realised.

Fig. 4 shows the circuit diagram of a three-valve set, with one high-frequency stage and an anode-bend rectifier followed by a note magnifier. In Fig. 5 the same general circuit is seen, but grid-leak-and-condenser rectification has been substituted. It will be noticed that in the latter drawing a potentiometer is shown. By means of this the grid potential of the rectifying valve can be adjusted with the utmost nicety, so as to minimise damping and to keep selectivity good. The potentiometer used in this way often makes an appreciable amount of difference to the results obtainable with the set. Most British valves are designed to rectify with the grid set at a positive potential, but a few of

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Grid or Plate Rectification?

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them are at their best when the grid return is made directly to L.T.—. I have tried the circuits shown in Figs. 4 and 5, and by far the best results are obtainable when leaky-grid rectification is used. There is little to choose when the local station is tuned in, but when one is trying for distant stations, the Fig. 5 arrangement will bring in many that are quite inaudible with the other.

Grid Leak More Sensitive

We may sum up the merits and drawbacks of the two systems as follows: The leaky-grid method does introduce a certain amount of damping, and it makes the tuning of the rectifying valve differ from that needed for preceding high-frequency amplifiers.

On the other hand, it is a great deal more sensitive with a weak signal than is anode-bend rectification, and if proper components are used it need not introduce audible distortion. The anode-bend rectifier can give exceedingly pure reproduction, but it is inefficient unless the grid voltage swing is fairly large. Like the crystal detector the efficiency of the anode-bend rectifier varies directly as the square of the incoming voltages.

The conclusion to which we come is that the anode-bend rectifier is of real use only when applied to the detection of strong signals. In the multi-valve set with two or more high-frequency stages, which enable weak signals to be built up to considerable amplitude before rectification, the anode-bend method can be used with advantage, the full benefit of the good quality which it gives being obtainable, and it being possible to reduce the number of control knobs for the reasons that we have already discussed.

For D.X. Work

In the single-valve set, or that which has but one stage of high-frequency amplification and is used for long distance work, the grid-leak-and-condenser system is the better, since it may enable signals, which might be quite inaudible if an anode-bend rectifier were used, to be dealt with, and to be brought up to good strength by means of low-frequency amplification.

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these points before actually buying the components. Though space does not here permit an explanation as to how the correct values for resistors may be calculated, it may be understood that the firm from whom the resistors are being bought will willingly advise readers as to the best values to use so long as the information as to valves and accumulator voltage is given.

Suitable Valves

For the best results a special valve designed for H.F. amplification should be used for V1, while for the detector and L.F. stages, valves of the small power class should be chosen.

For the benefit of readers whose preference for filament voltage extends towards 2 and 4 volt valves as against 6 volt specimens, it may be stated that valves of all three voltages have been tried, and with each class of valve the same stations were received without difficulty.

To test the receiver connect aerial and earth and the requisite batteries and proceed as follows:—

First set the reaction condenser so that the moving vanes are completely disengaged from the fixed, turn both the C1 and C2 dials to zero, adjust the moving vanes of the neutralising condenser so that they are also completely out of mesh with the fixed, and pull out the switch. If the set shows any tendency towards self-oscillation turn the moving vanes of N.C. slightly, when the set will become stable over at least some of the possible tuning range.

Neutralising

With the valves alight, slowly turn the dials of C1 and C2 from zero towards their maximum readings, when, if the local station is working you will pick up the transmission. Tune in these signals to their very loudest, whereupon extinguish the filament of the first valve by removing the resistor R1, and turn the neutralising condenser one way or the other until signals from the local station become inaudible, even upon retuning the variable condensers, when the set may be said to be stabilised.

Upon replacing the resistor R1 signals will again be heard from the local station, and after tuning these in again to their loudest, increase the reaction condenser, when there will

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THE BIG SEVEN

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that their programmes are not what the public wants; and they have promised to include more "pep and punch" in them.

It appears that the B.B.C. endeavour to ascertain what the public really does want by a systematic analysis of the letters they receive from listeners. We have it on the authority of an official of the B.B.C. that communications are received from people of all walks in life, and that some of these letters are critical in a common-sense way, others in a stupid way, while others are frankly eulogistic.

These letters are carefully sorted and considered by the Programme Board. But we doubt whether the B.B.C., even with its enormous post-bag, can receive enough letters in order to obtain a reliable clue as to what the majority of their clients require in the way of programmes. They had much better try to strike a happy medium and forget a little of their own superiority, constantly bearing in mind the fact that broadcasting is primarily a medium for entertainment. If they go on forcing what can only be termed highbrow programmes upon the public, the immediate result will be a falling-off in the licence revenue.

A Broadcasting Cochran

We feel sure that all connected with the B.B.C. are actuated by high ideals, but those ideals must be held within bounds. If they are given unrestrained sway, it is inevitable that a very large majority of listeners in this country will be disappointed and, to put it colloquially, "fed up" with the programmes. What is wanted is a broadcasting Cochran, a man who has the psychology of public entertainment at his finger tips. That is what the B.B.C. lack, undoubtedly, for they have not a single man on the staff at the moment who is really *au fait* with the wants of the public. Mr. George Grossmith, perhaps, is the most suitable member of the Programme Board, but even Mr. George Grossmith is only *au fait* with light entertainment in relation to the needs of the public.

The whole problem is a difficult one, but we feel sure that if the B.B.C. will not stand on their dignity too much, they will succeed in pleasing the majority of their public.

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be noticed an increase in signal strength; this condenser *must not be increased* too far, however, otherwise undesirable oscillations will be produced.

If suitable coils are chosen for L1 and L2, these may be used for tuning over the whole wave-length band used for broadcasting, excluding, of course, the long-wave stations. For L1 a No. 35 coil is suggested, bearing in mind the earlier remarks concerning the two aerial terminals, while for L2 a No. 60 coil will be found suitable. If this latter size is used, it will be found that when the circuits L2 C1 and L4 C2 are in tune the condenser dials will read approximately the same; Hamburg, for instance, comes in on the original set when C1 reads 131° and C2 129°, while London is found when C1 is set to within two degrees more than C2, the readings being roughly 124° and 122°; these readings will not, of course, hold good in copies of the original set, on account of slight alterations in the disposition of the wiring; they will, nevertheless, indicate to readers *where about* they may expect to receive these two stations.

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impedance is kept at a low figure of somewhat around 80,000 ohms. I have one of these valves on test at the present moment, and up to the time of writing, though it has not had by any means an exhaustive test, I must say I am exceedingly pleased with the results.

Other valves of the same make, but of different classes, have equally good characteristics, though I am not at liberty to say anything about them at present, except that in my mind they represent one of the greatest advances in receiving valve design that has occurred for some time.

The K.L.1 Valves

In a class all by themselves must be mentioned the new Osram and Marconi K.L.1 valves, representing another very definite advance, although on a somewhat different line. As readers will probably know, these valves have been developed for the purpose of enabling listeners to run their sets direct from the A.C. electric light mains, so that no accumulators or H.T. batteries are required. In the case of the latter, an eliminator is of course employed, while the special construction of the valves and the use of a transformer supplied with them enables the former to be done away with.

So far valves of moderately low impedance and amplification factor, which may really be classed under the "general purpose" type, have been the only ones placed on the market in this new series, but others will undoubtedly follow, and I have had three of them under observation for some time.

I must own I was unlucky with one of the three, for the filament which acts simply as a heating element (the coated cathode being raised to its correct temperature by radiation from the filament) burnt out before the valve could be thoroughly tested, but the other two are still going strong. Several circuits have been tried, and in all cases requiring valves with the characteristics of the K.L.1 (5,500 ohms and 7·5), excellent results have been obtained, while up to now the valves have been going continuously for over 400 hours, and have cost under 3s. in power. This, I think, speaks for itself, and no further comments on the economical working of these valves need be made.

I understand also that yet another series of valves is to be placed upon the market this month, or may very possibly be available before this reaches the eyes of the reader, and these concern the new 4-volters of the same make. As a matter of fact, I have some in use now, and here again the H.F. valve, which has a very low filament consumption, has an amplification factor as high as 40, while at the same time the internal impedance is kept down to

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THE BIG SEVEN

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A significant point in connection with the coming into power of the new B.B.C. was the "killing" of the Uncles though now they have been "resurrected." This move was signified, for it indicated a lack of humanity—a lack of what Kipling calls "the common touch." Probably the psychological effect of this move did the new B.B.C. more damage as regards popularity than a dozen faults made by the old B.B.C.

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moderate limits. The L.F. valve accompanying this also has the moderately low impedance of 13,000 or so, with an amplification factor of about 13. As a matter of fact, from what I can gather, it is likely that this valve, although it comes under the L.F. category, will operate equally efficiently as an H.F. amplifier in some neutralised circuits as it will in the first stages of L.F. amplification, though I have not yet tested it under H.F. conditions.

Finally, this little series is completed by a new power valve, which has not only an exceedingly low filament current consumption, but also an impedance of somewhere about 6,000, with an amplification factor of between 6 and 7.

With such valves as those that have been mentioned in these jottings, and the others that will probably make their appearance before very long, this year should be a very rosy one for the constructor. At any rate, he will have plenty of valves to choose from, and some exceedingly good ones at that.

The Argument for the Trickle Charger

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Now we come to the next important point—the size and cost of the battery charger which must be employed. A battery charger capable of delivering a current of 4 or 5 amperes is a much bigger and more expensive device than one capable of delivering a current of 1/10th or 1/15th of an ampere.

So, although the trickle charger, with its tiny charge always "trickling on," accomplishes precisely the same work by the end of the fortnight as the big charger does in a sudden 12-hours' spurt, its first cost is very considerably less. Again, the battery, when used on the trickle-charging system, need only be a very small one, for it is only required to stand a charge and discharge of perhaps a maximum of 5 ampere hours. Thus a battery of a capacity of 10 ampere hours will be quite sufficient for most purposes, and a battery of 20 ampere hours should be far more than adequate. The need for 50-ampere-hour or large 100-ampere-hour accumulators with a wireless receiving set

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PLEASE MAKE OUT YOUR LIST FOR ORDERS OVER 20/- IF REQUIRING COMPONENT PARTS FOR ANY SET AND WE WILL GIVE YOU A FIXED INCLUSIVE PRICE.

The Argument for the Trickle Charger

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is entirely abolished if the trickle-charging system is adopted. Similarly, the need for large and expensive heavy-current charges is also abolished.

It may be interesting to use an illustration which serves to bring out the comparison rather well. Suppose a man wanted to go from London to Manchester, say 200 miles, by motor-car in 24 hours. He could either spend the first 19 hours on other business or idle them away and then set out to accomplish the whole journey in the remaining five hours, which would require an average speed of 40 miles an hour; or he could set out at once and spend the whole 24 hours in getting there, which would only require an average speed of about eight miles an hour. He would get there just the same in either case, but in the first case he would need to employ a large and high-powered, and therefore expensive, car, whereas in the second case a small and inexpensive motor-cycle, or even an ordinary cycle, would be sufficient for the purpose. (I am, of course, leaving out of account personal questions, such as the man's endurance, for simplicity of illustration.)

The Ideal Method

Trickle charging is, in my opinion, the ideal system of charging a wireless battery, for the battery is subjected to comparatively small charges and discharges, which are much less likely to injure the plates and so to shorten the life of the battery than are the considerable depletions and subsequent over-chargings which fall to the lot of the average battery used in the ordinary way. Nothing could be simpler or more satisfactory than the arrangement of a small 20-ampere-hour-capacity accumulator coupled to a tiny trickle charger capable of delivering $\frac{1}{16}$ to $\frac{1}{4}$ ampere, the latter permanently connected to the electric light mains, with a throw-over switch so that the battery is either on to the set or on to the mains.

In view of the general interest in such a method, the different forms of trickle charger will be dealt with in next month's "Wireless Constructor."

(To be concluded.)

WHAT'S NEW

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potentiometer, together with a fixed condenser of suitable value. The whole device is of the one-hole-fixing variety, and is sold complete for 12s. 6d. On test the device proved very sensitive, comparing favourably with the good specimens of the cat's-whisker type of crystal.

This detector is particularly useful in such circuits as the Hale and the more conventional reflex types, the adjustment of the potentiometer giving a particularly good adjustment of reaction. We would make only one criticism of the design. Fortunately, the potentiometer is of considerably higher resistance than usual, but if left in circuit, the cell will discharge continuously at the rate of about three-quarters of a milliampere and cannot be expected to last long in such a position. It would be a fairly simple matter to fix a small switch, and we hope that this improvement will be introduced in later models.

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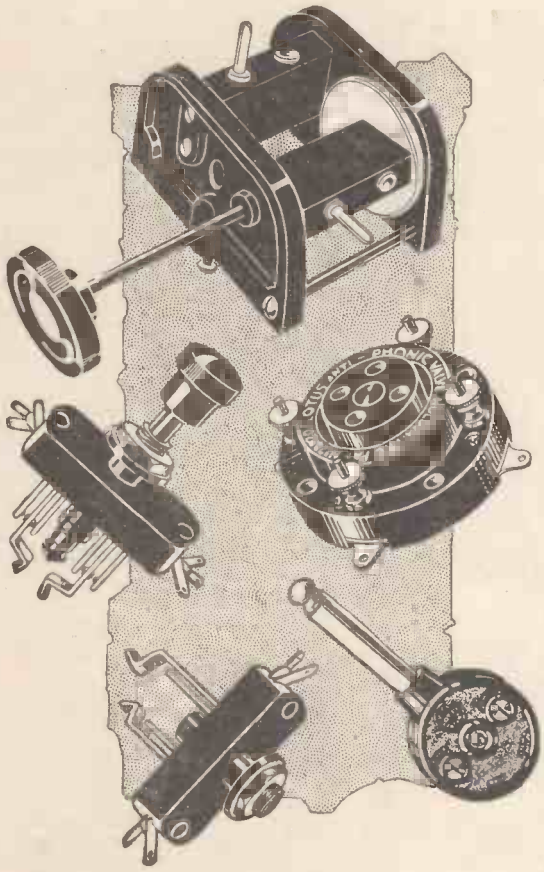

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