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A NEW TELEVISION SERVICE FOR READERS

Popular Wireless

AND TELEVISION TIMES

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February 2nd, 1935.

MORE ABOUT THE ALL-ELECTRIC KELSEY ADAPTOR

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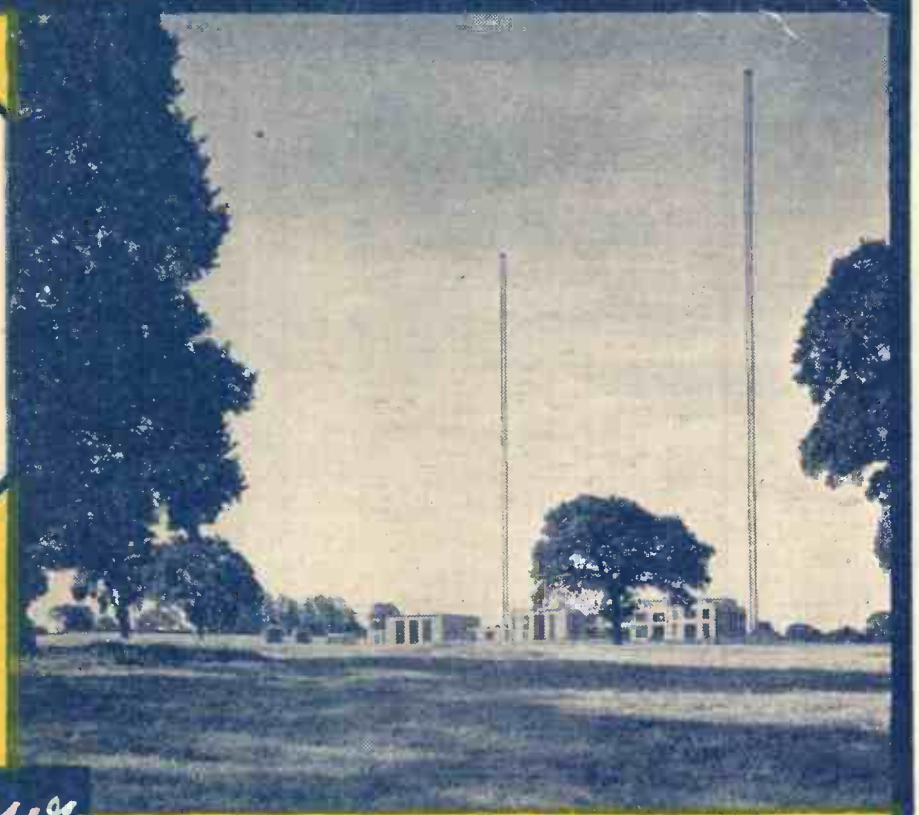
ALTERNATIVE COILS FOR THE "B.C.L." TWO

EVERY WEDNESDAY PRICE 3D

DROITWICH FADING

Special Interview with Noel Ashbridge by Alan Hunter

and



More about our

4 VALVE *all-wave* SUPERHET

MANAGING EDITOR: N.F.EDWARDS. TECHNICAL EDITOR: G.V.DOWDING ASSOC. I.E.E

ANOTHER PLAN ?
GUEST ANNOUNCERS
" VODEVIL "
" PAPA STEPHAN "

RADIO NOTES & NEWS

ONLY THIRTEEN
WELL DONE, G.P.O. !
TROPICAL RADIO
AIRPLANE RADIO

What's in a Name ?

WHEN the B.B.C.'s fine conception of alternative National and Regional programmes was first announced it looked like Listeners' Paradise. But it was gradually whittled down, and diagonalised and decentralised until it became a mere shred of a Regional scheme, so now they are renaming the programmes to suit.

London's particular station is still referred to as " Regional," but the other poor chaps are now trimmed down to " Midland," " Northern," " Scottish " and so forth—just a local habitation and a name.

We shall soon have to comfort ourselves with the philosophic reflection of the Yankee diner ruefully regarding his plateful—" No matter how thin you slice it it's still Boloney ! "

Half-Time.

HAD you realised that Europe's radio half-time interval has passed ? A little over twelve months ago the powers blew a midnight whistle and introduced to expectant listeners the great Lucerne Wavelength Plan. In a little less than a year a new scheme will have become necessary.

It's been a good game so far. At first Luxembourg and a few other long-wave fellows took very little notice of the referee ; but most supporters will agree that the standard of play has been first class, if a little more robust than was expected. (" Square 2.")

Anyhow, the home team has done well, though our new full-back, Droitwich, has not been kicking out as far and as steadily as was anticipated. Trainer Ashbridge is looking into this !

Exchanging Mikes.

THERE is much to be said for this idea of various countries interchanging announcers on holiday. It would give those hard-working individuals longer leave and enable them to polish up their French, German, Italian or whatever language might be concerned. They would also gain an insight into foreign radio methods and doubtless find warm welcome in other countries—I have always wanted to meet some of the European announcers whose voices are so familiar that they seem like friends. (No, I did *not* mean the lady announcers. Arieline has decided views on those Blessed Damosels !)

Cry from the Heart.

THAT the B.B.C.'s postbag is not always devoid of interest is proved by an amusing extract from a letter published recently. The writer, though not a literary stylist, surely has the art of getting to the heart of his subject. He wrote under the sobriquet " Disgosted Lissner." And this is what he wrote :

" We don't want them bluming conserts from the Queens Holl wot we git evry bluming evenin. Wot we want is vodevil, and if we can't get vodevil we want gramofon ricords of vodevil."

Athens Up to Date.

NO longer is Athens to be reproached as one of the few world-famed cities without an adequate broadcasting station. A contract between the Greek Government and the Marconi Company has been signed, providing for the construction of a 60-kilowatt station and a regular broadcasting service of at least thirty hours a week.

The site for the station has been approved by the Greek Government, various concessions have been granted to the Company and it is hoped that tests will be on the air by July or thereabouts.

Toll of the Coal.

THE possibility of radio aid to coal-miners, which has often been mooted, seems now to be assured of a thorough test. Sir Henry Walker, Chief Inspector of Mines, the B.B.C. and the meteorological experts have been getting together with the idea of broadcasting warnings to collieries when deadly gases are likely to be found in mines.

It seems that sudden changes in weather, sharp variations in barometric pressure and so forth have been observed to coincide with the release of dangerous gases underground, so timely warning of the predisposing causes should prove of aid in combating the menace. Good news, this !

The " Yard " Gets Busy.

THE wireless school for police officers, formerly conducted at Scotland Yard, is now transferred to the Metropolitan Police College at Hendon, London, N.W.

Some idea of the seriousness with which this branch of police work is regarded can be gleaned from the fact that there are about fifty students now commencing a course that will last for seven months or so.

When qualified they will be drafted to the Flying Squad, to patrols and police cars or to the police transmitting stations ; and other selected candidates will then struggle with dots and dashes till they, too, are qualified to pass out.

A Far-off Friend.

MANY listeners in this country will have learned with regret that " Papa Stephan," of Katowice, has had to relinquish his mike duties

(*Continued on next page.*)

WHERE RADIO RECEPTION IS ALMOST IMPOSSIBLE

owing to illness. He is the jocular soul who conducted the "Letter-Box" feature, answering his foreign mail, with many a chuckle over the air on 395·8 metres.

There were scores of British names on his lists, and he always had good wishes or wisecracks for them; and even if his listeners could not understand his French they caught some of his infectious good will.

In private life "Papa Stephan" is M. Tymieniecki. Here's wishing him a speedy recovery!

Interval Signals.

THIS business of finding *distinctive* sounds for interval signals, representative of the different regions, is proving difficult. Suggestions that look all right on paper seem quite different in terms of sound.

For example, the noise of Atlantic breakers has been put forward as the ideal signal for West Regional. But it applies equally well to any sea-girt area, since "Atlantic breakers" make exactly the same noises as breakers on the Yorkshire coast—or those at Valparaiso.

The Scots have a good line in the sound of bagpipes, though I understand that even that unique skirl has been claimed with vehemence for North Ireland. Which all goes to show that somebody deserves a compliment for hitting on the pleasant sound of Bow Bells for London.

Europe's Youngest?

THE statement was made recently in a Derby newspaper that a 14-year-old pupil at the Derby Central School was believed to be Europe's youngest licensed radio transmitter. Surely there is a younger claimant for the honour.

With prodigies who can give a song-and-dance entertainment—including their own announcing—before attaining seven years of age it seems strange that the budding key-thumpers should all wait until they are nearly double that age before wangling a licence. Our young Derby friend apparently secured his official permit whilst he was only 13. Can nobody undercut this figure?

Social Service.

WHILE I was writing recently about a B.B.C. Questions-and-Answers service the worthy Corporation was fixing one up; but the idea is to put on a talk every Monday at 11 a.m. and to confine the subject matter to Social Service—the elucidation of Acts on rent restriction, hire purchase, landlords' and tenants' rights and so forth. Matters of High Moment, I grant you, but—oh, so frightfully dull!

However, take heart, my hearties. Nobody need listen at 11 o'clock on a Monday morning except, perhaps, the housewives who are waiting while the washing blows dry with gay abandon. And nothing worries them apart from rain.

Hullo, Belfast!

EVER since a postman ran into me with a red bike I have had a strong anti-G.P.O. prejudice. Yet an innate sense of justice compels me to pen a word of praise to that much-begingered department for the way it handled the telephone rush to Belfast at Christmas. By means of a hastily erected ultra-short-wave service five "Hullo-Belfast" circuits were in operation at once, and converse with Ulster was a pleasure.

BROADCASTING BREVITIES

The winter "Proms" have been a great success, and the excellent attendances show that there is a demand for music of this type during the winter holiday season.

* * *

An eye-witness account of the second round of one of the Scottish Cup-ties will be given by A. Y. Wilson in the Scottish programme on February 9th.

* * *

So successful have been the Potpourris produced by Dr. Julius Burger, the Viennese Professor of Music, that the B.B.C. has commissioned three more to follow "The Life of Offenbach."

One of these will be a medley of music of all nations, and has been given the title of "Round the World in Sixty Minutes."

Compared with cables, the 5-metre service is economical, and it provides more channels of communication across the channel of H_2O. Congratulations, not merely to the heads who ordained it, but to the stout lads who did the long hours and the hard work.

The World's Worst.

AFTER raising the question as to which is the best place in the world for radio reception it occurred to me that it has never been definitely decided which is the very *worst* part of the world either.

There have been plenty of truly appalling isolated instances of "impossible" conditions; but I do not know which country bears the dubious distinction of having the wretchedest conditions for listeners. It would probably be somewhere in or near the tropics, like Guatemala, where the x's are all capital X's and are continuous, day and night.

The flora and fauna often don't help either—climbing plants that festoon an aerial as soon as you take your eyes off it, and monkeys that look upon a wire as an invitation to tight-rope displays. What do overseas readers say is the world's worst spot for radio?

Organ-isation.

FAMILY reunions by radio are not much of a novelty nowadays, but methinks there was something noteworthy in the recent instance from Manchester.

It was the occasion of a broadcast organ recital from the Manchester Town Hall by Dr. F. H. Wood, the organist of St. John's Parish Church, Blackpool.

Dr. Wood has two sons, Denis and Charles—one in Perth, Western Australia, and the other in Grahamstown, South Africa. At the appointed time each tuned in for his father's broadcast, and each knew that his brother was doing likewise—a bit of a thrill for all concerned.

High Finance.

WHEN the broadcasting companies of the U.S.A. determined to bring all the most famous personalities to the microphone one of the first names they thought of was George Arliss. They asked that consummate artist how much he would want to undertake a series of thirteen broadcasts.

His reply caused them to take off their horn-rimmed specs and polish the lenses, look again and finally blink at the figure—£20,000.

But even that figure was once beaten, for in the palmy days before the Big Depression hit the States the cheery Will Rogers asked for £2,000 per session.

Safety in the Air.

BEHIND a Notice to Airmen issued recently by the Air Ministry is the promise of considerable simplification of the wireless direction-finding processes on the main air routes, and of the provision of better radio-direction facilities on the inland air services.

It is intended ultimately to employ 862 metres as a "home-traffic" wavelength and to transfer all the Continental traffic calls to 826·4 metres—though this wavelength had for long been regarded by aircraft beacons as their especial preserve.

The notice adds that, pending the completion of additional D.F. services, positions by radio observation can be given only to aircraft on the London–Continent airway, and on the Hull–Amsterdam route, except in certain special circumstances.

Eiffel Tower's Transformation.

THE versatile French continue to astonish all onlookers by the dexterity of their juggling with radio. It soars—it slumps—it is passionately exalted skywards—it almost falls to the ground—it is saved again. *Voila!*

At the moment of writing all advertising has been banned from the programmes of Radio Paris, Eiffel Tower, Paris P.T.T. and Poste Colonial. The ether is no longer to be soiled by this commercialism.

Moreover, Eiffel Tower, it is affirmed, will be changed to a medium-wave station with such speed that its tests on that waveband should be heard by listeners in April next.

So 'tis said on the boulevards to-day. We shall see.

ARIEL.

The All-Electric KELSEY ADAPTOR

FULL OPERATING DETAILS ARE GIVEN THIS WEEK BY THE DESIGNER OF THIS INGENIOUS ADAPTOR, WHICH CONVERTS ANY A.C. MAINS RECEIVER INTO AN EFFICIENT SHORT-WAVER.

DURING the past week I have been amusing myself by taking the all-electric version of my adaptor to various localities around London, mainly for the purpose of gathering information. It has been great fun, but it has its serious side.

It is easy to predict what is likely to happen when the adaptor is used in conjunction with different types of sets, but it is far more reassuring, both from your point of view and from my own, actually to *know* what happens in the widely differing circumstances under which it is likely to be used.

As a matter of fact, I *did* test the adaptor with, as far as I can remember, ten different sets before I gave my final O.K. on it, and those included the G.E.C. "A.V.C.5," the Ferranti "Arcadia," the R.I. "Ritz Airflo," the Marconiphone Model Q286 and the Ekco Model AC/85. With all of these sets it worked perfectly.

But that was with the same mains and with the same aerial and earth system, and these factors are bound to vary in different circumstances. Particularly does this apply to mains.

The problem of "smoothing" a set, or, in this case, an adaptor, for reception on short waves is very different from that appertaining on medium and long waves, and more often than not it is necessary to take slightly more elaborate precautions on short waves to ensure hum-free reception.

No Mains Hum.

In the case of the all-electric version of my adaptor, and due mainly, I think, to the particular method of construction employed, I was able to obtain absolutely hum-free reception right down to 16 metres with normal smoothing and without any extra precautions.

But I was aware that the mains at my home are reasonably "clean," and consequently I particularly welcomed the opportunity of trying the adaptor in other districts where conditions are not so good.

With one solitary exception the adaptor worked perfectly in the various localities in which it was tried, and it was obvious that in the majority of cases, at any rate, the possibility of mains hum could be ruled out altogether.

But in the exceptional case to which I am referring the hum below approximately 25 metres was terrible, and yet to my amazement above that arbitrary setting it was absolutely non-existent! Fortunately, the cure was a very simple one, and although I do not anticipate that there will be many readers who will find it necessary to take the additional precaution, I propose to pass the tip on, because appreciable mains hum is fatal.

If, therefore, you should experience any "hum" tendency below about 25 metres (by the way, it only happens when the two circuits are "in step"), connect a ·1-mfd. tubular fixed condenser from one of the filament-heater terminals on the 7-pin valve holder to the metal chassis.

In the particular case to which I am referring it did not seem to make any difference to which heater terminal the fixed condenser was connected, but if you should have to resort to it it might be as well to try it on each in turn to see which is more effective in your particular circumstances. It is a very simple remedy, and quickly tried.

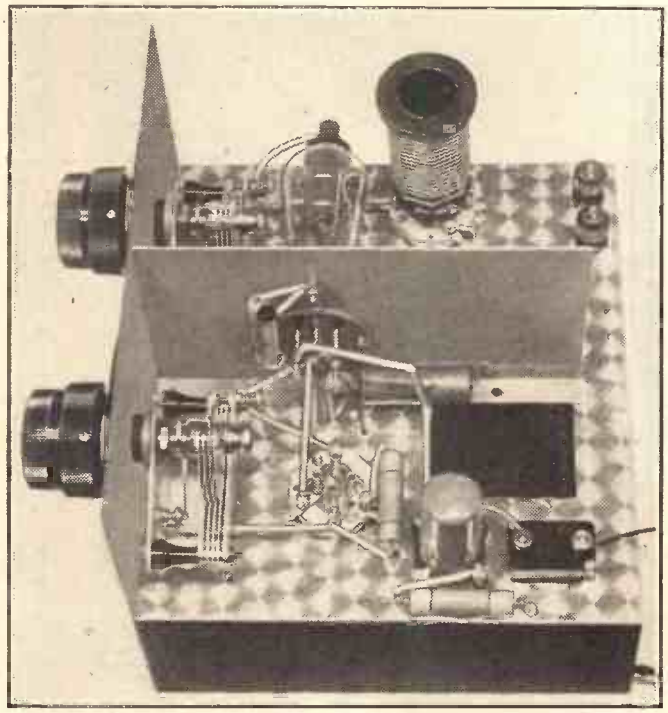
It is an almost certain cure in cases where this hum phenomenon is encountered, but, as I have previously indicated, I imagine from my own experiences that such cases will be few and far between. But I *do* want you all to obtain complete satisfaction, and with that object in view I want to cover every possible source of trouble, although, as a matter of fact, if you carefully follow my original arrangement, there is little to go wrong.

FROM 16 TO 60 METRES

Now a word about the coils and the ranges covered.

With the coils as supplied by B.T.S. from my original specification the complete range covered is from 16 to just over 60 metres. I do not think it desirable for the ordinary listener to attempt reception below 16 metres, for, apart from the fact that there are only very few stations to be heard below this wavelength, tuning is apt to be a little critical.

Above 60 metres there are certainly no stations worth worrying about, so that, with the adaptor as it stands, it is possible to receive every worth-while short-wave station.



Only two sizes of coils are employed in the adaptor, and they fit into four-pin "valve-type" holders, one of which is visible in the foreground to the right of the oscillator tuning condenser.

Wide Wavelength Range.

As for the individual coil ranges, the smaller ones cover from 16 to approximately 38 metres and the larger ones tune from 28 to a little over 60 metres. Don't be alarmed about that fairly wide overlap. When you have had a little experience with the adaptor you will see the purpose of that, and you will see how much better it is not to have to work right at the top and right at the bottom of the condensers when changing from one range to the other.

In previous articles I have stressed the importance of switching off the mains before making any adjustments whatsoever to the adaptor. That precaution applies also to changing the coils.

It is unlikely that you would get a shock through handling the coils in the adaptor with the mains switched on, because the

(*Continued on next page.*)

THE ALL-ELECTRIC 1935 KELSEY ADAPTOR

(Continued from previous page.)

only winding that is carrying H.T. is covered. But you never know, and, although there is no actual danger, a "tingle up the arm" is best avoided!

Last week I emphasised the importance of operating the dials—and particularly the oscillator or right-hand one—*very* slowly. In this connection tuning gets sharper as the wavelength decreases, and it may therefore be an advantage to use only the larger coils until you have acquired the knack of short-wave operating.

With these coils in use the tuning of the left-hand dial is very flat, and you will find it possible to do all your station selection with the right-hand dial alone, using the other dial simply as a vernier tuning control when you have actually found a station. But although the left-hand dial need not be touched when finding stations it is rather important to keep it roughly in step.

The Best Method of Tuning.

Perhaps if I tell you the procedure that I adopt when tuning my adaptor it will give you a better idea of the way to set about it. I first set the left-hand dial at 5 degrees, and then very slowly tune with the right-hand one until I reach 10 degrees. I then advance the left-hand one to 15 degrees and tune (again very slowly) with the right-hand one until I reach 20 degrees. Then another 10-degree "jump" with the left-hand one, followed by a corresponding slow movement on the right-hand one, and so on throughout the range.

it is best to try to acquire the knack of tuning with both dials simultaneously. *But do move them slowly!* It really is most important if you want entirely satisfactory results.

The tuning procedure which I described above for the larger coils can be used when searching with the smaller coils; but if you do it this way you must move up the left-hand dial more frequently than every ten degrees of travel of the oscillator, or right-hand dial. But on these shorter waves I do really advise you to try to get the hang of moving both dials at once. It is quite a simple procedure, and it does definitely lessen the chances of missing anything.

Simply remember that your aim is to maintain the "lively" condition, i.e. the background noise, as you tune with the two dials, and you will find it quite straightforward.

But, as I have advised you before, start off with the larger coils, for tuning in an American station on, for instance, 48 metres is much more simple than tuning in one on 18 or even 28 metres. And there are plenty of stations between 48 and 50 metres.

It is unfortunately impossible for me to give you an accurate calibration, because there are almost bound to be slight but, on these wavelengths, quite appreciable variations in individual construction. But I can at least give you some idea of where you can expect to find the various "popular" bands, and that should be near enough.

I was writing a moment ago about the 48–50-metre American stations. These you will find at approximately 140 degrees on the oscillator, or right-hand dial, when using the larger coils. There is almost always something to be heard around the 140-degree mark, but it is little good listening for Americans much before about 10 p.m.—at least, not on this particular wavelength.

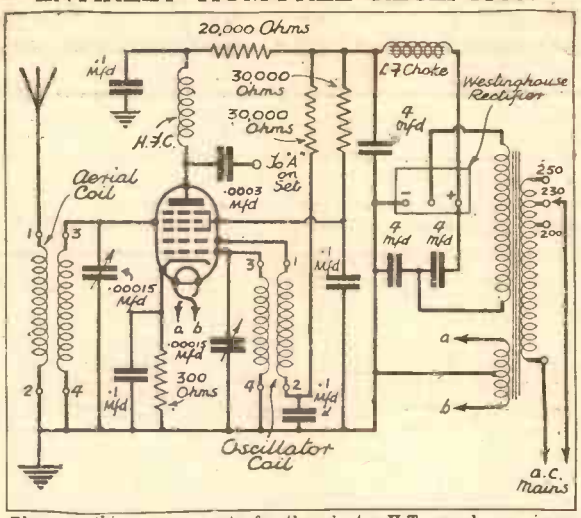
At 50 degrees on the oscillator dial (still with the larger coils in use) you will be able to tune in the 31-metre band—the wavelength on which the Australian stations are to be found. In this connection it is useful to try to identify the Daventry short-wave station G S C, which works on a wavelength of 31·32 metres, for it is on this identical setting that one of the best Australian stations comes in, but at a different time of day.

In the Morning.

From 8.30 onwards in the morning is usually the best time to hear Australia, although, of course, it can be heard at other times during the day.

On the shorter-wave coils the best guide as to "where you are" is to remember that 100 degrees of the oscillator dial corresponds to a wavelength of 25 metres. That is the place to find Americans on a Sunday afternoon, particularly between 5 and 7 p.m. W 8 X K is the "star" turn, and can usually be heard at loudspeaker strength sufficient to sit down and listen to. G. T. K.

ENTIRELY HUM-FREE RECEPTION



The smoothing components for the adaptor H.T. supply are incorporated in its design, and entire absence of hum is obtainable right down to 16 metres.

THESE ARE THE PARTS USED

2 UTILITY ·00015-mfd. standard variable condensers (type W187/15).
2 UTILITY micro-dials.
2 BULGIN 4/5-pin valve holders (type S.W.21); or Benjamin, Wearite.
1 CLIX 7-pin valve holder (chassis-mounting type).
1 WEARITE screened H.F. choke (type H.F.P.); or Graham Farish L.M.S.
1 T.C.C. ·0003-mfd. fixed condenser (flat type "S"); or Dubilier, Graham Farish.
3 T.C.C. ·1-mfd. tubular fixed condensers (type 250); or T.M.C.-Hydra, Dubilier.
1 T.M.C.-Hydra ·1-mfd. tubular fixed condenser (type T.24); or T.C.C. Dubilier.
2 T.M.C.-Hydra 4-mfd. fixed condensers (type 25); or Dubilier, T.C.C.
1 T.C.C. 4-mfd. fixed condenser (type 80); or T.M.C.-Hydra, Dubilier.
1 ERIE 300-ohm resistance; or Amplion, Graham Farish, Dubilier.
1 ERIE 20,000-ohm resistance; or Amplion, Graham Farish, Dubilier.
2 ERIE 30,000-ohm resistances; or Amplion, Graham Farish, Dubilier.
1 BULGIN L.F. choke (type L.F. 16).
1 HEAYBERD special mains transformer (type K1); or B.T.S.
1 WESTINGHOUSE metal rectifier (type H.T.12).
1 PETO-SCOTT Kelsey Structakit type "M." (This includes chassis, panel, fixing strip for resistances and mains flex and plug).
1 Set B.T.S. Kelsey adaptor coils.
2 BELLING-LEE terminals (walnut, type R, engraved "Aerial" and "Earth").
Tinned copper wire and sleeving.
Flex, screws, etc.
1 Ferranti heptode valve (type VHT4). Note.—Marconi, Osram and Cossor heptodes can be used, providing bias and voltage dropping resistances are changed in accordance with makers' recommendations.
Optional: 1 Bulgin station-log, panel-mounting type.

When using the smaller coils the procedure is perhaps not quite so straightforward, because the tuning, especially at the bottom end, is very much sharper, and it is in consequence necessary to keep the two circuits more in step.

But it is not difficult, because when the two dials are in step there is a fair amount of background noise (which dies down when a station is tuned in), and as soon as the background noise disappears you know immediately that the two dials are out.

So that, for best results on shorter waves,

BROADCASTING HOUSE TOO SMALL B.B.C. STILL EXPANDING

ANOTHER rearrangement of the office accommodation at Broadcasting House will be carried out during the next few weeks, and several sections of the various departments that have been housed in the "Big House" since its opening will be transferred to adjoining premises in Portland Place.

For some time the Corporation has been steadily acquiring property in the vicinity of its headquarters, and in some cases whole departments have been shifted. This has certainly eased the pressure to some extent, but with an ever-increasing staff it has now become necessary to move a good many more people to outside offices.

The disadvantages of splitting up departments is obvious, and some time ago it was decided to have a bridge from the third floor of Broadcasting House as a physical connection between it and other premises in Portland Place. The building and fixing of this bridge are now almost complete.

Meanwhile, it is increasingly apparent that the effective life of Broadcasting House will not be anything like so long as was originally thought. It may be that Broadcasting House will be added to by rebuilding on adjoining property, but a lot can happen before the time comes or the opportunity occurs to take such a decision. This applies to both studios and office accommodation.

So far as it can the B.B.C. is endeavouring to overcome the difficulties without undue disturbance to the staff and work, and with no effect that is detrimental to the maintenance of the high standard of the programmes. In connection with the latter aspect a start is now being made with the preparatory work of constructing four additional studios at Maida Vale, where the B.B.C.'s largest studio is already in regular use for orchestral programmes. O. H. M.

NOEL ASHBRIDGE tells "P.W." about THIS DROITWICH FADING

IF you had gazed up at Droitwich's two 700-ft. masts, as I did a few months ago, and had then toured the transmitter building underneath that towering T-type aerial, you would surely have been impressed.

For Droitwich is a wonderful station. No gainsaying that. Power in the aerial 150 kilowatts—five times that of Daventry. Frequency response level up to 9,000 cycles—better than any other long-wave station in Europe.

High power, good quality—yes. Then what's the trouble? Those of you living anywhere from 150 to 250 miles from Droitwich know all too well. Fading and distortion rampant during night-time reception. Much worse than ever was noticed with Daventry.

Some of those who regularly listen to the giant B.B.C. long-wave station at Droitwich have recently noticed a peculiar fading effect, accompanied by distortion. In this article the Chief Engineer of the B.B.C. discusses the problem, in an exclusive interview with

ALAN HUNTER

Already Hard at Work.

That sums up the trouble. But it does not pacify that fairly considerable percentage of listeners in the affected area. Which is why I went along to ask Mr. Noel Ashbridge what the engineers were going to do about it.

He very quickly made me understand that there was no question of what they were going to do about Droitwich fading. They were already mustered in full strength on that very perplexing problem—and had been ever since the first serious complaints began to trickle in.

As Chief Engineer of the B.B.C. Mr. Ashbridge *knows*. What is more, he is in a position to "debunk" a lot of the nonsense that has been written about the causes of this fading business.

Right away, with engaging candour, the Chief admitted that Droitwich was fading—and in a very peculiar way. Not in a unique way, for something of the effect had been noticed on certain foreigners, though not to the same extraordinary extent.

Apparently Droitwich is unique or peculiar in fading out for such long stretches at a time. Sometimes he will go right out for four or five minutes. Then a whole night will be free from the trouble.

All Sorts of Tests.

"During August, when Droitwich was undergoing its tests," explained Mr. Ashbridge, "there was no such trouble. But that might be because at that time of the year the hours of real darkness are limited—and the effect is only pronounced some hours after sunset."

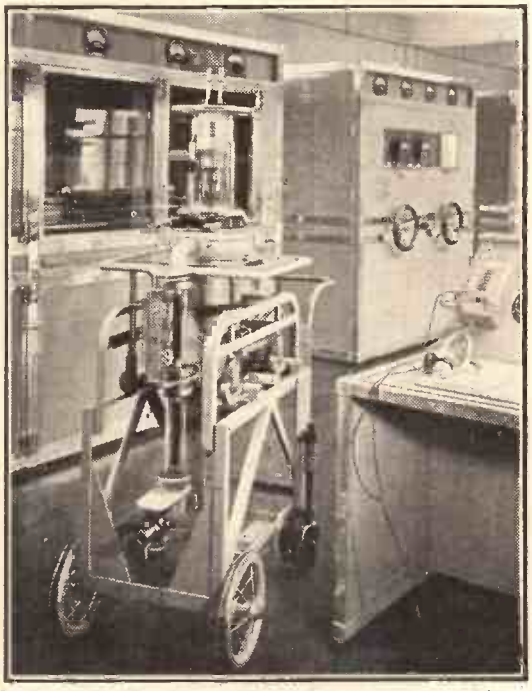
As I was reminded, Daventry had a nasty habit of fading right in the middle of the winter for about a month. Round about the equinoxes—periods of equal night and day—seasonal fading was common.

At first the engineers quite naturally put down Droitwich's spot of bother to the Autumn Equinox—but the fading, like the poor, is still with us.

Don't imagine that the engineers simply sat down and waited for Nature to put Droitwich right, though. They tried a vast number of dodges to see if they could stop the fading.

For example, Mr. Ashbridge tells me that they brought down that magnificent power of 150 kilowatts. They cut down those extensive sidebands until the low-frequency response was about equal to Daventry's. They reduced the modulation. In fact, they did everything humanly possible to find a root cause of the trouble. But none of these experiments proved anything. All the results were negative.

A 50-KW. OUTPUT VALVE!



One of the big output valves used at Droitwich ready for fitting into the transmitter. These valves are each capable of a maximum output of 50 kw. Owing to their weight and physical size a special trolley is provided for wheeling them into position, with a jack to lift them on to their seatings.

I particularly asked about the quality. Was it true that the wider sidebands were partly to blame for the distortion? No, thought Mr. Ashbridge, for the violent fading complained about was caused by the cancelling out of the carriers of ground ray and reflected ray. Sidebands did not seem to enter into that.

Then I came to the vexed question of the aerial design. Vexed only because there have been so many conflicting rumours about it. Was that the nigger in the woodpile?

"If the aerial has any effect on the performance of Droitwich compared with Daventry," emphasised the Chief, "it should certainly be for the better."

Some people had commented on the relatively simple nature of the T-type Droitwich aerial, implying that a more elaborate affair would have helped prevent this fading. It was not true that the engineers had put that aerial up without any thought of other types.

That "T" Aerial.

Indeed, before the final plans were agreed upon for the erection of the T aerial all kinds of novelties were considered—on paper. Careful scrutiny of these rival systems did not reveal anything conclusively better than the design adopted.

"The T-type aerial was chosen as being likely to give the best performance for the money expended," I was told.

So we arrived at the last possible cause—the Heaviside Layer. This temperamental canopy of the ether, hovering some sixty miles above the surface of the earth, has gone "all peculiar" just lately.

Authorities have been consulted by the B.B.C. It has been confirmed that the layer's totally unusual behaviour may be responsible for the Droitwich trouble.

"But I personally don't think that is the whole story," volunteered Mr. Ashbridge. Which shows you that the Chief Engineer is not going to take this thing lying down, by any means.

"Secret" Investigations.

He would not tell me exactly what he proposes to do. He did say that he has a whole list of tests—"secrets," he added, with a twinkle that defies cross-examination.

"What about the little Nationals?" I asked, for you will remember that when Droitwich was opened grim hints were thrown out that the three medium-wave Nationals would be closed down.

"The Droitwich fading really does not concern their fate," was the reply,

(*Continued on page* 738.)

THREE NEW RELAY STATIONS

LATEST NEWS AND VIEWS ABOUT BROADCASTING

I HEAR the balance sheet and statement of accounts rendered by the B.B.C. to the P.M.G. with the Annual Report the other day provide for the construction of three new relay stations. It is understood that these are to be in the Norwich district, in North Wales or Mid-Wales and in the south-west. The sites have not been determined in any case, but active work continues in the south-west, where the B.B.C. vans are now testing. None of these stations will be in operation this year, but the programme of building involved should be completed in 1936.

* * *

Newcastle Studios.

There will be a public occasion in Newcastle-on-Tyne next week, when, on February 5th and 6th, there will be ceremonials connected with the full commissioning of the new studios there. The north-east is claiming a good deal of attention from the B.B.C. these days. It is now practically certain that there will be a North-East Region as soon as the new transmitter is finished. Thereafter the programmes will consist of a mixture of local and London efforts rather than of local and Manchester products.

* * *

Political Broadcasting.

There is intense activity behind the scenes about the arrangements for party political broadcasting at the forthcoming General Election. The National Government organisation has made up its mind to attempt to secure about two-thirds of the facilities.

Labour and Liberal Parties are reported to have decided to demand a third each. Mr. Lloyd George expects to be ranked as a party and to receive at least the same consideration as the Liberals. Then there is Sir Oswald Mosley, and lastly the Communists, Welsh and Scottish Nationalists.

The curious thing about all the feverish activity that is going on is the complete ignoring of the B.B.C. I do not expect that the B.B.C. will be anxious to admit anything like the demands that are being formulated. Parties will be told to make some arrangement among themselves; if they fail, then the B.B.C. will lay down a plan, and if this is unacceptable, then the B.B.C. will eliminate political broadcasting during the Election period. It is most unlikely that the plan will completely break down; but I look for a lot of fun before there is a settlement, either agreed or imposed.

* * *

Bigger Symphony Season.

The 1935-36 season of B.B.C. Symphony concerts will consist of twelve concerts, six before Christmas and six afterwards. This means a reversion to the practice followed before the present season, which was reduced to eight concerts only. It is felt at Broadcasting House that the reduction has seriously impaired the artistic value of the season and has thrown out the balance.

Incidentally, this move may mean the end of the truce between concert producers in London a truce which began last year with an agreement about the number and programmes of public concerts. The B.B.C. feels that it did not gain much from the truce, and that the listening public were the losers on balance.

* * *

S O S Results.

Although the B.B.C. no longer broadcasts messages for missing persons, except in cases originated by the police, thirty-one more S O S messages were radiated in 1934 than in 1933, in which year the total (858) included 181 messages of the kind not now accepted.

Larry Adler, the young American mouth-organ player, who is now appearing in C. B. Cochran's revue, "Streamline." He recently broadcast from the B.B.C. in Henry Hall's programme.

The 889 messages sent out last year produced a higher percentage of "successes," a fact which is also attributed to there being no "missing-persons" appeals.

Broadcasts for witnesses of accidents showed a big increase over 1933 (218 as against 123), and here again the percentage of "successes" increased from 48·78 to 54·14. In broadcasts relating to cases of dangerous illness the percentage of "successes" in 1934 was greater than that of the previous year—58·97 against 51·70.

* * *

Cecil Lewis Returns.

Cecil Lewis, one time member of the B.B.C. staff and Chairman of the old Programme Board is collaborating with Lionel Fielden in the production of a new alternate Sunday-night feature, entitled "Retrospect." The first of which is being broadcast on February 3.

In some respects the programme will resemble the News Reel broadcasts which were heard on Saturday evenings about two years ago, and it will include "snippets" taken from the news of the previous fortnight, though differing from the ordinary news bulletins in production, shape, rhythm and balance. Where suitable a faint background of music will be added.

* * *

Jethart Ba'.

One would suppose that there is nothing very gentle about the old Border sport called Jethart Ba', which is played at Jedburgh on Candlemas and Fastern's E'en, since it is necessary to barricade the windows in the main streets to prevent them being smashed while the game is in progress.

Broadcasting in Scotland is taking the next hand-ba' festival, on Saturday, this week (February 2nd), as an opportunity to provide a programme in praise of the ancient burgh. Provost W. Wells Mahon is to give an eye-witness account of the game, and he will also have something to say about the history of the town in a programme that is to be relayed from the banqueting hall of Queen Mary's House, a building where she lay dangerously ill after her strenuous cross-country ride to visit Bothwell in Borthwick Castle after he had been badly wounded by Wee Jock Elliot.

Queen Mary's House was purchased on behalf of the town of Jedburgh in 1928.

* * *

Charles Brewer Comedy.

A story of the extraordinary conditions required to comply with an eccentric will is the basis of a musical comedy written by Charles Brewer, and called "Breakfast in Evening Dress," which is to be broadcast on Wednesday, February 6th. The music is by Alan Paul, and the cast will be headed by Wynne Ajello. Opposite her will be Michael Cole, while the humour will be left—quite safely, I have no doubt—to Dick Francis and Claude Hulbert. Gladys Marlowe, Cyril Nash and Ernest Sefton are also in the show, which will require the services of the Revue Chorus and the B.B.C. Orchestra, conducted in this instance by Mark Lubbock.

* * *

The Kailima Trio.

The Kailima Trio, who will be heard by listeners in the North on Thursday, February 14, claim to be the only true exponents in this country of the Hawaiian guitar and of Hawaiian music. The players also use ukeleles and Spanish guitars.

O.H.M.

Listen To These Next Week

Regional: Wednesday, February 6th. Running commentary by George F. Allison on second half of England v. Ireland Association Football match at Liverpool.

Midland Region: Tuesday, February 5th. Nine scenes from the Emile Littler pantomime "Aladdin," relayed from the Prince of Wales' Theatre, Birmingham. In the cast are Sir Henry Lytton, Cora Goffin, Stanley Holloway and Davy Burnaby.

West Region: Monday, February 4th. A Cornish concert relayed from the Foster Hall, Bodmin.

North Region: Thursday, February 7th. "Famine in Lancashire," a radio-dramatic feature by Michael Reynolds, produced by Jan Bussell. The "Famine" referred to is the Lancashire Cotton Famine of the 1860's.

Northern Ireland: Tuesday, February 5th. "The Mask," a Grand Guignol play by Alice Greaves. Also "Twisted Smile," a comedy by Thomas Kelly.

Scottish Region: Thursday, February 7th. A studio variety programme from Glasgow.

ON THE SHORT WAVES

Conducted by W.L.S.

THE poor old post-bag has been rather neglected lately, I fear, thanks to Christmas and the extra time involved in the preparation of the "B.C.L." Two. Its appearance at the moment suggests a surfeit of Christmas fare, and I must resort to "lucky-dip" tactics.

G. W. G. (Ipswich) is a convert to the screened-grid note-mag. idea, and likes it, but finds the gain inconveniently high at times. He wants identification of J H B calling Rugby (G B O). It's a Japanese station, but I have no fuller particulars. He also comments on good signals from W 1 X A Z, W 3 X A U, V K 3 L R and V U B, all on the 31-metre band.

An Interesting Question.

He also asks the rather interesting question of whether it is necessary to obtain a licence if you wish to transmit telephony along a beam of light! Personally, I should say not; it's a pretty short wavelength! I used to do it with a neighbour and had excellent results.

J. F. (Forest Hill) has been hearing American stations "calling all cars" on the various wavelengths allotted to the American police. They believe in power over there—fancy a call intended for a car a mile or so away being heard in England!

S. R. D. (Higham's Park) raises one or two queries about the standard-baseboard layouts that I have been publishing. I will deal with them separately. (1) Is it necessary to use a metal panel and baseboard or is "Metaplex" O.K.? Either will do perfectly. (2) Has the lead from the aerial series condenser, marked "to tap on coil," got to go to the exact centre? No; try all sorts of points.

Not Critical.

(3) Are components critical? No; I intended readers to use up anything that they happened to have on hand, provided that it's not junk. The tuning condenser may be ·0001 or ·00015, but shouldn't be bigger unless you are a real he-man at handling it.

Another long letter from R. D. E. (Ware). He includes a terrific list of American amateur 'phones, and replies to my query as to what kind of receiver he managed to cram 10 valves into! It turns out to be a converter plus a commercial superhet, including rectifier, which, of course, explains all.

R. D. E. is keen on loudspeaker reproduction of everything that he can get, and I should imagine that if his converter (which is, of course, the vital spot) is good his outfit should be ideal. Thanks for all the other "dope," R. D. E. Fellows like you who sit down and write 9-page letters are real enthusiasts!

R. W. (Ashby-de-la-Zouch) encloses a page from an old periodical and wants to know where he can get particulars of the three-valve S.W. set depicted thereon. Unfortunately, there are two more valves

Points from the POST-BAG

tucked away behind the coils—it is my old 5-valve "Empire Super." His other queries are mostly answered by the appearance of the "B.C.L." Two.

R. N., who hails from Bangalore, reminds me of my promise to design an A.C. short-wave superhet. He says that he and his friends are sick of the sight of all these fiddling little "twos" and "threes," and want something that is a real walloper.

There's one on the way, R. N., when the Powers That Be think fit; and how about the adaptor that my learned friend, G. T. Kelsey, describes this week? It's only the short-wave part that matters, after all, and the superhet section may just as well be in the form of a commercial receiver.

But I have noted all your remarks, and am completely sympathetic.

L. W. S. (Leytonstone), who had a biggish set that didn't seem to be delivering its full quota of goods, took my advice and cut off the L.F. end. He found that there was so little left that he had to rebuild the H.F. and detector stages completely.

Now, of course, with the L.F. back again, it's a proper rib-shaker. He even put wise a local engineer in this way, and *he* had to admit that he had been camouflaging a rotten detector with an efficient L.F. side.

L. W. S. also mentions excellent reception of the Colombian H J-5 A B D, coming in at R 8-9 at 11 p.m.

G. W. A. (Hull) suggests that the station heard by S. N. B. (Kensington) was W 9 X A A, Chicago's half-kilowatt station on 49·34 metres. Probably right.

A Windmill Charger.

J. H. C. (Bridge of Marnoch) sends a diagram of an ingenious "windmill charger" that he uses. (No, I don't mean that he charges windmills.) Among the components are an old aeroplane four-bladed prop., bought for 10s., the back axle of an ancient Overland car and a Dodge dynamotor.

It charges his radio batteries and also the storage batteries for the house lighting. I should imagine that he lives in a windy corner, which must be admirable for the job.

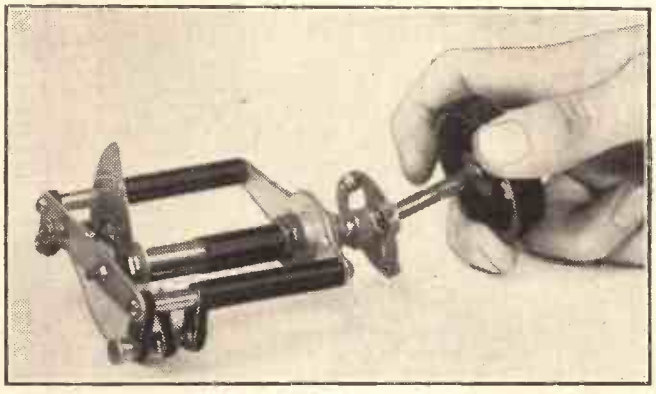
Do you remember the photograph of three types of short-wave coil that I published a few weeks back? I asked readers to call the three types of coil A, B and C, and to tell me which they preferred. The result has been astonishing, since I've had literally scores of letters saying "type B is the goods," and *not one single letter* voting for either of the other types.

Four-pin Types Preferred.

Just as a matter of interest I might mention that I had written down, on a piece of paper in my den, my forecast of the result—and I wasn't far wrong. So everyone prefers four-pin "valve-base" type coils! They certainly are easy to make, compact and efficient, and I predict that this type will be sweeping the market before the year is over.

Lest you should rub your eyes when you look at the photograph on this page, let me assure you that you *are* seeing straight. It illustrates a gadget of mine, using a flexible "gang coupler" and a little extension piece. It makes a set extraordinarily comfortable to handle, as one's hand can rest on the bench or wiggle about all over the place while actually tuning in. It also helps if you happen to have a "pongy" valve.

A FLEXIBLE DRIVE



This coupling, removed from an old gang condenser, makes for comfortable operation and the reduction of noises due to a "pongy" valve.

ON THE SHORT WAVES.—*Page 2.*

EVERYONE is remarking upon the extraordinary way in which the American amateurs are coming over nowadays on the 75–85-metre band. Many short-wave enthusiasts have receivers that don't go up as high as this ; it's time they added another coil to their range, because it really is worth while.

Mr. Leslie W. Orton, of the A.A.R. & T.S., sends a long list, and also sends particulars of tests arranged by the West Middlesex and East Bucks Branch of the society. Unfortunately, these will be all over by the time you read this, so I won't give full details.

A Good Scheme.

But I *do* like the idea of holding a midnight party, at which members will have the chance of tuning in Americans on other people's sets and will be able to pick up essentially practical hints on how it's done.

"Ariel" has commented on the interesting experiments conducted by Mr. J. Louis Orton, in which the A.A.R. & T.S. has been co-operating. I understand now that hypnotism by *television* is the next project in view.

A radio exhibition is being held in Bombay during this month, if all goes according to plan. I understand that short-wave developments are almost entirely responsible for the gratifying growth of the radio industry in India.

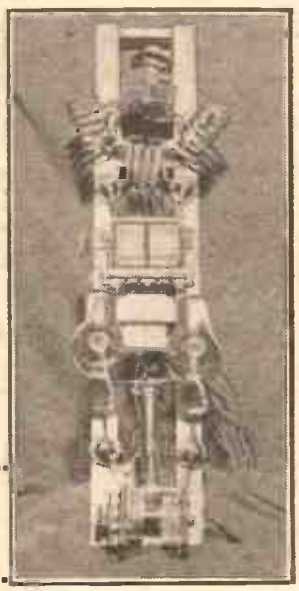
The success of the historic Christmas Day broadcast, of course, was obvious. But a bright spot about it that not everyone has noticed was the fact that the transmission was received in most parts of the world with very nearly the same reliability that it came to your own fireside.

A big broadcast like this is a fine advertisement for short-wave receivers in distant parts, especially as the Empire programmes are now almost as comprehensive as our own National and Regional programmes.

Aerial experiments at Daventry continue, and further improvements in signal strength are reported from many parts. In particular I am told that South-West Africa is being better served these days.

During 1934 883 hours of special programmes were radiated by the Empire station, in addition to 2,239 hours radiated simultaneously with the British programmes. Added to these were 820 hours of electrical recordings and 461 hours of gramophone records. Incidentally the total transmission hours amounted to over 10,000.

The special Empire Programme Orchestra is an important addition to the B.B.C.'s possessions, and it has been greatly appreciated.



A neat and compact high-power transmitter for use on 5 and 10 metres. The two valves are used in a push-pull circuit.

Readers who have reported reception of V K 3 X X may like to send a report to the station. The address is P.M.G. Research Laboratories, 59, Little Collins Street, Melbourne, Australia.

Station Information.

The new station in La Paz, Bolivia (C P 7), listed as transmitting on 19 metres approx., is only operating very irregularly. I have heard him once, and R. D. E. (Ware) also reports him. But he may be heard if you are lucky.

The Bol-Inca Radio Expedition, C P-1 G B, is on the air every Monday, Wednesday and Friday from 11 p.m. till after midnight. The wavelength used is at the lower end of the 20-metre amateur band — about 20.8 metres. Reports are welcomed by G. Barbour, Bol-Inca Mining Corporation, Sipiapo Placer, Bolivia, using plain envelopes and *not* mentioning station call-letters.

W C F Q is the call-sign of the sloop Igdrasil, on the way to New Zealand from Jamaica. Operators, W4AXJ and Mrs. W4AXJ! This station may be heard on 36 and 24 metres.

One or two readers also report a South American expedition in Colombia using the call-sign H J A W. I have no particulars of the location as yet. Readers can help me to keep these news paragraphs up to date by sending along any little titbits of information that they happen to come across.

A SPLENDID RADIO PLAY

The recent B.B.C. drama success, the "January Revue" experiment and other programme details are discussed by our Broadcasting Critic.

THE big thing in the offing in the sphere of radio drama to which I referred last week came sooner than I anticipated. In fact, if we include the Sunday Shakespeare there were two big things. But for once in a way Shakespeare takes second place. I am all for the Russian play "Azeff," which far exceeded my expectations. There can be no surprises over a Shakespeare broadcast now. We already know that Shakespeare is excellent broadcast material. We know Val Gielgud's love of it, too, and his determination to provide the best players to play it. So, as I say, there aren't any surprises for us in a Shakespeare broadcast.

* * *

But a play like "Azeff" is more of an unknown quantity. It has to be judged on the performance. "Azeff" stood the test well and emerged with flying colours. It was a great triumph, thanks largely to the wonderful acting of D. A. Clarke-Smith, who played the title part. This player got right inside his part: he was the character to the life. One could positively *see* him, and he didn't look made up either. Here was the real stuff. His tone and the dialogue generally recalled characters from Edgar Wallace, and one can't give it higher praise.

All Parts Perfectly Played.

Though almost a one-man play, "Azeff" did contain a number of important small parts. All were perfectly played, but a special word of praise is owing to Veronica Turleigh for her portrayal of Varya. There was, of course, the usual shot—no Russian play would be complete without this—and the bomb-throwing scene was not too pronounced.

* * *

Lance Sieveking must have been quite satisfied with his performers. Personally, I consider "Azeff" one of his best productions. Robert Speaight is quite right to do his narrating *sotto voce*, but not too *sotto*.

"January Revue" opened with a number whose standard one felt immediately couldn't be maintained. I roared with laughter at it. Unfortunately, my interest in the turns that followed gradually decreased as they increased in length. The idea behind the production as a whole was good. Satire in moderation can be amusing to listen to. There was more than a suggestion of going on and on in some of the later turns that even the satire began to pall. It was a pity that I couldn't appreciate to the full the relief offered by the singers, especially the "blues" singer. Hutch was different, although I don't go the bundle on the sort of stuff he sings. But I love his tone ! And his polish !

* * *

It would be unkind to be over-critical of what was admittedly an experiment. Experiments have to be tried, and the B.B.C.'s light-entertainment controllers are nothing if they aren't experimenters. That's one of their most refreshing qualities. I am certain, however, that something worthy will soon be evolved from this novel effort at sophistication. "January Revue" proved that Jack Strachey can write clever music suitable for broadcasting. His Viennese number was a gem. Arthur Marshall, too, as a really funny man left no small impression.

Is "For Farmers Only," the title of John Morgan's weekly talk, to be taken literally and listened to by farmers only ? If it is, then it is a mistake. All lovers of the countryside—and people haven't to be farmers to be this—will find Mr. Morgan a great source of pleasure. In fact, any person who can appreciate a good talk, no matter the subject, will find all he wants in this typically English farmer.

* * *

Regional listeners who on Saturday evenings take the twenty minutes' gramophone interlude sandwiched between the B.B.C. Dance Orchestra and the Guest-Night programme cannot fail to notice the lack of the personal touch of this twenty minutes' item. It is all by comparison, I know. I do not exaggerate when I say that to me the twenty minutes are no more than an interval, the music being of little more interest than the Bow Bells interval signal. I brace myself up again at 11 p.m. in readiness for the next hour.

A Hint to Announcers.

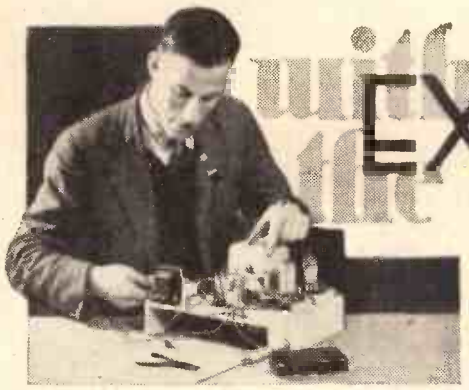
Have you noticed the points of similarity between "In Town To-night" and the Henry Hall Guest-Night programmes ? The principle of the two is identical ; but whereas Henry Hall presents people of note, the B.B.C. presents more often than not nonentities, as far as fame and reputation are concerned.

* * *

And here's a hint to announcers suggested to me by a correspondent who writes as follows : "We listened to Max Kroemer's German talk the other evening. No one told us it was a German lesson. The announcer simply said : 'And here is Max Kroemer.' As Max Kroemer himself never uttered the word German, so far as I can recall, to many people the whole affair may have been twenty minutes' mystery."

Well, it's a small point, but it *is* a point.

C. B



with the EXPERIMENTER

"GET THIS S.W. RACKET STRAIGHT!"

NOW that "P.W." has gone all short-wavish—it always did run a pretty good line that way—I think it behoves me to experiment "down under" too.

Mark you, I'm not entirely a short-wave tenderfoot. I've dallied with their charms since sunspots were first bruited abroad. But for various reasons that can't possibly interest any of you I have only dallied.

Which is why, perhaps, I'm less biased about the shorts than the red-hot experts. Granted they have a lot to shout about these days. The short waves have, as the newspapers would say, come into their own.

It's time we all came into the short-wave clan, I think. Or, if that seems too didactic, time we all gave the short waves a fair and square try-out.

At the moment I'm in the throes of a colossal refitting of what I shall be pleased to call a "lab"—though my housekeeper has already thought of plenty of lengthier and more luried things to call it.

Which, by the way, reminds me. The first person you'll have to square up is the lady of the house. Wives are perhaps the most difficult, though my fellow scribe, G. T. K., seems to have brought it off by the simple process of converting his wife to the short waves, too.

What You Must Expect.

Why the need for squaring? Well, you are going to make a lot of deuced queer noises. When you are first looking for Amos 'n' Andy you are going to find, unless inordinately lucky, the whole of the short-wave telegraphic world in full cry.

Then the hours you'll be keeping! Probably, if the bug gets you really badly, you'll move your humble pallet down near the set—or bring the set up to bed with you.

Frankly, I don't know which causes the more uproar. On the whole, from documentary evidence gathered through the medium of sworn affidavits, I am inclined to warn you off the second idea. Go to the set; don't take it to bed.

All this is but preliminary skirmishing. The real fun begins when you build a gadget to convert to short waves—I must borrow that Kelsey adaptor and—er—"experiment" with it. Or when, still more greatly daring, you build a complete short-wave set. Or when you commit the ultimate risk of actually buying a short-waver.

Again drawing upon a wealth of colourful experience, I suggest another way out—borrow something. Take no notice of Polonius' advice—borrow, if you can find anyone sap enough to lend.

A Ten-Valver To Try.

Of course, I don't have to borrow. Because I'm an Experimenter they send me everything "just to try." The other day, for example, a giant of a set arrived—a ten-valver covering all the short-wave bands and also the medium. Would I try it?

I should say so. Manna, indeed. The makers of this giant failed to send any calibrations. Everything was beautifully simplified in kilocycle ciphers. So, naturally, I tuned in London and left it at that for a time.

Underneath my studied indifference, though, was a gnawing excitement to tune in to the ends of the earth. I tried first about 10 o'clock at night. Morse—teeming Morse. All over the place. Most distressingly fast stuff. Even if it had been slow it would still have been mystifying Morse.

Then—presto!—a voice. English, at that. Daventry calling the Empire, rather patronisingly. A very "blah-blah" announcer indeed. But charming, all the same.

Next, a German. Calling the Empire—same Empire as before. English news bulletins designed for ears of South Africans. Plenty of Barons Von This and so on. I wish I could speak German as well as that True Aryan was speaking English.

All very amusing. For the Empire programmes alone a short-wave set seems worth having. You pick up titbits quite beyond the reach of the most powerful of broadcast sets.

There's a danger of overdoing this End-of-the-Earth business. Short waves come nearer home, sometimes. Nearly every country of note has its short-wave outlets now. Italy, Spain, Germany, Scandinavia, Russia—just a few of the nearer ones.

Not a sausage, so to speak, of America. I explored every band from about 13 metres up to 200 without a break. But no sign of America. Or Japan. Or Australia.

Don't think that I was disappointed. It is all in the run of the game. Conditions must have been very bad that night. I tuned faithfully to 31·48 metres in search of my old friend W 2 X A F. Then, finding him not, up to W 8 X K, the sturdy Pittsburg station on 48·86 metres. Nearly midnight it was by then. But nothing doing.

Now I can quite imagine this being enough for the complete tenderfoot. With a final sneer he might hurl the gadget to glory and revert to ordinary broadcasting bands for ever. Which would be foolish — because the very next night an entirely different story might be told.

Eleven Different Wavelengths.

Then, again, the beginner might not listen on the 30 to 50-metre band at that hour. He might, ignorant like, try to make something of the 20-metre band.

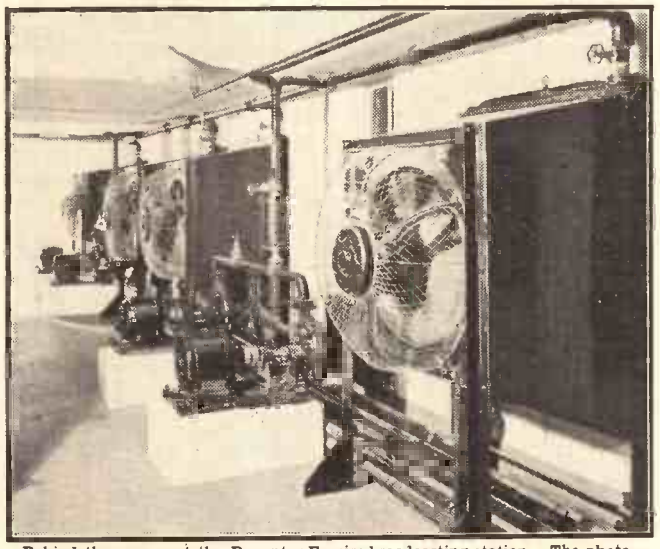
Others more *au fait* than I will tell you that each waveband has its own period of activity for the twenty-four hours of the clock. That is why, incidentally, the B.B.C. needs its eleven different short wavelengths—from G S J on 13·93 metres up to G S A on 49·59 metres—to cope with its Empire transmissions from two stations at Daventry.

The very next afternoon I had an excited call from an absolute greenhorn staying down at the cottage, telling me he had tuned straight into a terrifically strong American programme. He was being asked to 'phone Atlantic so-and-so for a delivery of coal or coke!

He had quite fortuitously groped his way to the "active" band for that

(*Continued on page* 733.)

LINKING BRITAIN WITH THE EMPIRE



Behind the scenes at the Daventry Empire broadcasting station. The photograph shows some of the valve water-cooling fans and the circulating pumps.

ALTERNATIVE COILS FOR

THE "B.C.L." TWO

As promised last week, details are here given of the connections necessary for using other makes of coils than the one specified in the "B.C.L." Two.

By W. L. S.

THE coils used in the original model of the "B.C.L." Two were of the six-pin type, carrying three independent windings, and were chosen for the set because my own personal preference is for inductive aerial coupling.

Bearing in mind the fact, however, that thousands of readers are probably using a capacity-coupled aerial arrangement and obtaining excellent results from it (I mean in other sets), there is no reason why many of the popular makes of two-winding coils should not be used.

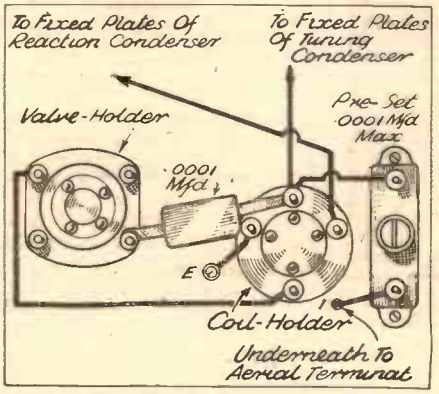
Alterations are Simple.

The alterations that have to be made to the wiring of the "coil" corner of the receiver are perfectly simple, and the two diagrams on this page show the arrangements necessary for accommodating other popular types of coil.

Fig. 1 shows an ordinary valve holder installed for use with the Eddystone four-pin type short-wave coils. The only additional component required is a preset condenser with a maximum capacity of ·0001, through which the aerial is connected to the top end of the grid coil.

The valve holder is best mounted in the position shown, as one can retain the short grid lead (or rather the absence of any grid lead at all!) and the anode lead is not too long.

EDDYSTONE CONNECTIONS



This is the wiring for the four-pin Eddystone coils. Note that the grid condenser is still connected directly from the coil to the valve holder.

One word of caution may be necessary—don't try the little experiment of plugging the valve in the coil holder, and *vice versa*. It might be expensive!

Fig. 2 shows the arrangement used with the Wearite "Mycalex" short-wave coils. This holder is of completely different shape, and a longish anode lead is almost unavoidable, but it has no ill effects upon the performance of the receiver.

As a matter of fact, any type of two-winding coil can be accommodated in the set, the holder being suitably connected to the four points concerned. What I want to deal with mostly is the matter of operating the capacity coupling.

First, of course, you must bear in mind the fact that it is going to alter the wave-ranges covered by the coils. If you are using the Eddystone four-pin type, for instance, the coil that covered 13–23 metres with no aerial tapped directly on could hardly be expected to "stay put."

With a reasonable amount of damping introduced the range will probably be something like 14·5–25 metres. Also the setting of the coupling condenser depends so much upon the type of aerial you are using that I can't possibly give you any idea of dial settings for the various stations, as I could in the case of the six-pin coils.

The golden rule, in every case, is this: Use as *little capacity* as is consistent with reasonable signal strength. You will find that you can bring up certain signals to a beautiful strength by being a little heavy handed with the "preset" condenser; but then you will tune up the band and find that the set stops oscillating just before it reaches the setting on which you hope to hear some other station. Also, probably, you will find it becoming terribly inselective.

The Question of Calibration.

Mind you, I don't object to all this, providing you don't write to me and complain about the rotten set I have turned out!

When I use capacity coupling, if that is any help to you, I may say that I invariably use the condenser at its minimum setting; but then I have a 70-foot outside aerial. When I transfer to a small indoor affair I can work with it about half in.

My chief objection to the system is that if one wants to get the maximum efficiency out of the set one has to reset the aerial coupling for each coil that one plugs in, and that, of course, makes calibration an almost impossible matter. As I am very keen on calibrating short-wave sets I need say no more.

Look up the published wave-ranges of the coils—whatever type you decide to use. Then fix the amount of coupling you propose to employ and leave the preset condenser severely alone. Mentally add a few metres to the top and bottom of each wave-range, search round carefully and try to find a well-known station.

Sooner or later you will be able to draw up a rough curve for each coil, and you will then begin to find your way about.

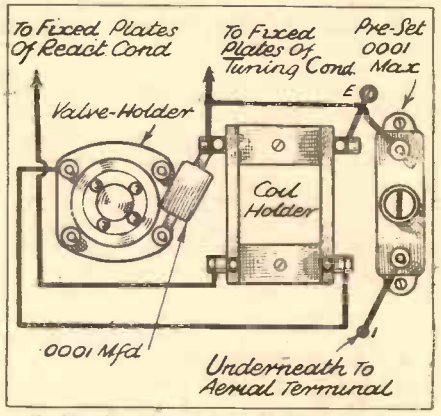
An Interesting Suggestion.

One real refinement that some readers may care to make was mentioned in some of my short-wave notes a few weeks ago. If you mount the preset condenser *on its side* and carry an ebonite rod from the threaded adjusting spindle to the front panel, fitting it with an "arrow" knob, you will then be able to make small adjustments without diving inside the set. You will also be certain of returning to the position that you started with (provided you don't miscount the number of turns).

It is quite useless as a vernier control, because of its relatively great effect upon the reaction setting. One of the good points about the "B.C.L." Two is the fact that the reaction control is hardly affected at all by the tuning, and any attempt at cleverness by using the aerial series condenser as a tuning control will properly upset this feature of the set.

There are one or two other types of coils that one may use, and I hope to discuss

FOR WEARITE COILS



The Wearite coil is of completely different shape from the originally used coil, but this does not affect the efficient operation of the set in any way.

further the question of alternative coils next week.

The short-wave component market is not exactly in a state of stability at the moment, and I, personally, am hoping to see a number of interesting schemes appearing shortly.

If only one of these could be a really efficient wavechange coil unit for the short waves, how happy we all should be! If such a thing does crop up, needless to say I will try it out in the "B.C.L." Two and describe the necessary alterations in the wiring.

The All-Mains Model.

I intend to keep the set running as a kind of "stand-by" for quite a long time, and I will let you know periodically how it is going on. If my own set develops any "growing pains" it will probably help me to put readers back on the right track if theirs go wrong.

I don't anticipate, however, that anything *will* go wrong. The only trouble I can think of off-hand is that L.T. accumulators and H.T. batteries *will* run down, so that I shall have to make a mains version of the set sooner or later.

The reports that I have had from readers up to date have been distinctly favourable, and I am looking forward to the arrival of some voluminous "logs" one of these days.

TELEVISION

A SPECIAL PRACTICAL SERIES FOR ALL READERS

By L. H. Thomas

What circuit do you use for television reception? Mr. Thomas deals with circuit considerations this week and gives some tips on their adjustment for obtaining the best results.

ALTHOUGH I have been making general remarks on the subject of receivers for some time, quite a number of readers have written and asked for detailed information about a suitable circuit for television reception.

For their benefit I intend this week to describe my own receiver fairly fully, with the help of the circuit diagram shown in the centre of the page.

It must be quite a typical television receiver; and, after all, by a "television receiver" we only mean an ordinary broadcast receiver that is well up to its job. As I have said once before, the beauty of a good receiver for television is that it is also so good for other things that it isn't "tied up" to the present two transmissions a week, but can be in constant use.

Aerial Volume Control.

Starting at the aerial lead-in, let us analyse the circuit diagram. The aerial goes to the slider of a 250,000-ohm potentiometer which is connected across the input circuit. The coil and condenser LC1 are simply part of the tuning arrangements in a three-gang "Colpak" or similar device.

This aerial volume control is invaluable when one lives anywhere near a powerful station, unless one uses a multi-mu valve in the first stage. Some arrangement to prevent detector overloading is certainly necessary.

In my case the first valve is an ordinary S.G. type with the usual biasing arrangement in the cathode circuit and the usual fixed screen voltage. In this instance it is fixed at four-sevenths of the anode voltage, which I know is rather a high figure, but it "comes off" satisfactorily.

Push-Pull Output Stage.

The S.G. valve is parallel-fed, and a ·0001 condenser couples the anode to the detector grid circuit. The detector is arranged on the leaky-grid system, and its reaction arrangements are perfectly straightforward. Reaction, by the way, is seldom used at all for television reception, but there are occasions when a little extra selectivity is required, and it often comes in useful then.

Following the detector is a resistance-coupled stage of L.F., its grid leak being of the potentiometer type, giving an L.F. volume control when one is required. Actually this is not mounted on the front panel, but in its normal position in the circuit—that is to say, on the baseboard just in front of the grid terminal of that particular valve holder.

It is not actually used as a control when "looking," but more as a kind of pre-adjustable setting for the general amount of gain that one wants to employ. The aerial volume control is on the panel.

This valve is transformer-coupled to a pair of biggish directly-heated valves in push-pull. A push-pull stage, using really good transformers, gives an overall response that shows up quite well in comparison with a resistance-coupled stage, and push-pull is being more and more frequently employed in television receivers.

A centre-tapped 1 : 1 output transformer is used for the last stage, and the neon tube and synchronising coils fed from its secondary, with the whole H.T. voltage applied in series with a 25,000-ohm variable resistance. This latter, incidentally, is of the type which has an on-off switch incorporated, and the switch is wired in series with the resistance itself, so that the current flowing through the neon tube can be cut off completely when the set is being used for normal every-day reception.

The use of directly-heated valves in the output stage necessitates the use, in the power-pack, of a transformer with two separate 4-volt windings. One of these (designated "a" in the diagram) feeds the three indirectly-heated valves, and the other, "b," which must be centre-tapped or equipped with a "humdinger," feeds the last two valves only.

The bias for the latter is supplied by a 700-ohm resistance, by-passed by a 50-mfd. electrolytic condenser, inserted in the lead from the centre tap of the "b" winding to H.T. negative. The centre tap on the secondary of the L.F. transformer coupling to the push-pull stage is connected direct to the H.T. — and earth line.

There is very little else to say about the circuit arrangement, except that each valve is decoupled, only the last stage having the full H.T. The two PX4's, running at an anode voltage of about 250, pass about 45 ma. each with the recommended bias of 34 volts.

Must Be Carefully Trimmed.

Under these conditions an undistorted output of 4 or 5 watts can easily be obtained. This is considerably in excess of the output required to give good results with the average disc scanner and neon tube, but is useful when one wishes to test out other types of tube or other methods of reception.

Five watts output is also a nice round figure to play with on ordinary broadcast reception; but one should preferably install sound-proof walls if one lives in a semi-detached house.

The only thing about the whole set that has ever caused a moment's bother is the trimming of the three-gang unit. One *must* play with this until a setting is obtained at which one receives neither the "screechy" effect of too much top or the opposite "woomph" characteristic of an excess of bass.

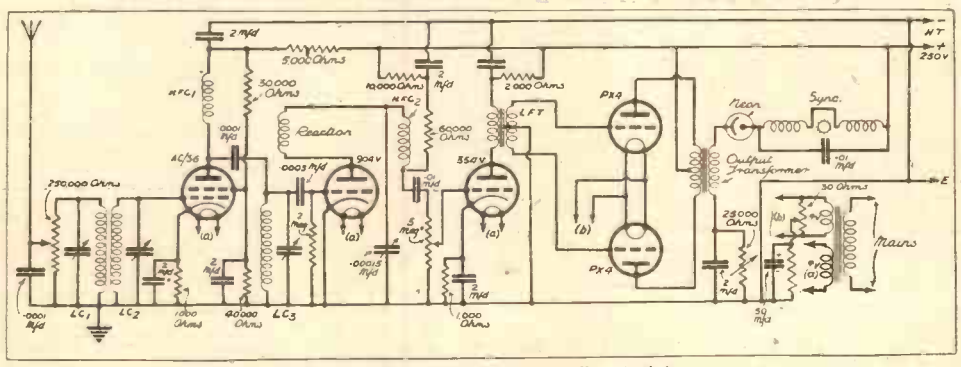
In some cases it may even be an advantage to damp down the tuned circuits slightly by connecting a 250,000-ohm resistance across the grid coil of the first valve, the LC2 circuit.

Using a Superhet.

Anode-bend detection is worth trying, but so far I can't say that I have been able to obtain results at all superior to those produced with the leaky-grid detector. If I were making a change at all I should prefer to use a low-impedance valve as a power-grid detector.

I wish readers would write and tell me what *they* are using, and what sort of results they get from it. Has anyone been successful with a superhet? And by "successful" I mean a lot more than the capability of receiving pictures. I mean really good, distortionless results.

A GOOD CIRCUIT FOR VISION RECEPTION



This five-valve circuit with push-pull output is the one employed by Mr. Thomas in his experiments, and is described in detail on this page.

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Although this book is absolutely self-contained, no one who already has the "Manual of Modern Radio" will want to miss this new book. It is beautifully bound in green cloth and printed in clear type, and gives practical information and advice which every person interested in radio requires.

Incidentally, there is a special section dealing with S.T. sets, so that, if you possess one or intend to do so, this book will be invaluable.

There is a wealth of "how-to-do" sketches and photographs, and the whole atmosphere of the book is intensely practical.

There are 384 pages including 63 art plates; sketches and diagrams accompany the text.

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For Office Use

TELEVISION—*Page 2.*

TELEVISION JOTTINGS

Points of interest to all readers.

MOST of us seem to be accustomed to thinking of television as a slow-moving science. Perhaps it has been for the last few years, as far as that part of it that is in the public eye is concerned. Just how much is going on behind the scenes very few of us know.

But if you have a file of wireless periodicals going back to 1927 or 1928, just dig it out and read up some of the allusions to television in those days. You will be surprised at the rapid growth of even the low-definition side of it.

These thoughts were inspired by a final run-over the previous page, and the reflection that what I have described is really nothing more than an ordinary broadcast receiver.

Some of the suggestions for television receivers in 1928 savoured of the Heath-Robinson school, and some of the suggestions for experimental methods of scanning were even funnier.

Still Going Strong.

Incidentally, one of the most amazing features of television has surely been the scanning disc. Invented about fifty years ago, it still stands the test of time, and I, for one, am far from convinced that it will die out when high-definition work really commences.

True, I find it hard to believe that we shall have any whirring machinery and mechanical bits and pieces in our televisors of 1950; but just at present the alternatives to the humble scanning disc are complicated enough to frighten the average home-construction enthusiast right away.

A complete ultra-short-wave receiver for high-def. transmission is not going to be a morning's work—not by a long way. I wouldn't tackle the job unless I had a clear fortnight with nothing else to do; and these clear fortnights only come once a year and are generally spent in an atmosphere of ozone.

Wanted—A Scanning Unit.

What I should like to see above anything else—certainly more than a complete commercial receiver—would be a "scanning unit" sold separately. Never mind the system; it might be cathode ray, mirror screw or what you like. If one could buy a complete scanning unit at a fairly reasonable price the rest of the work would be pure radio, and the ultra-short-wave receiver on its own is not a frightfully difficult proposition.

Marconi has announced his intentions of carrying out television experiments between Italy and the U.S.A. There is, of course, nothing new in transatlantic television, as it was achieved on short waves in 1928 between the Baird station G 2 K Z at Coulsdon and the U.S.A. amateur W 2 C V J at Hartsdale, N.J. But what the Marchese hopes for is two-way television, which would certainly be quite a new sensation!

Long-distance television on short waves is not an easy proposition, owing to such bugbears as variable conditions, rapid fading, night distortion and the rest of them. Also, unfortunately, the short waves nowadays seem much more prone to interference from man-made static than do the ordinary broadcast bands.

Some day someone will raise the important question of static suppressors. Why, for instance, are certain trolly buses fitted with chokes that (more or less) ensure absence of interference on the London Regional wavelength only?

Television is progressing in Japan, according to the latest reports. An experimental laboratory is being run by the Ministry of Communications, and a permanent service of some kind will probably be introduced this year.

The American Position.

Reports of advances in the U.S.A. are very varied. Some say that they are years ahead of us; others are certain that they are on the wrong lines, and that they will have to "go back to A" and start all over again. Probably they have just about reached the same age that we have over here. But when the question of a regular service for the States does arise their problem will be a hundred times more difficult than ours. How many stations will they want, for instance? How many channels will be available? If they use high-def. ultra-short stuff they will need about one transmitter for every thousand of the population! But things are going to move this year, without doubt. L.H.T.

SOME MORE B.T.S. COMPONENTS

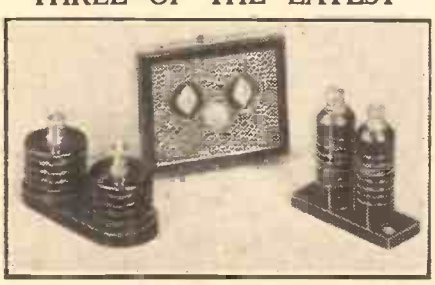
ONE of the most pleasant events of the radio world is the continuance of the progress of Messrs. British Television Supplies, Ltd., of Bush House, London, W.C.2. They have already produced a fine range of attractive and inexpensive components for home constructors, and there are no signs of a retarding of their development in this field of activity.

The name of this enterprising company does not do full credit to the wideness of their horizon. Anyone could be forgiven for imagining that they only supplied television apparatus. This is, as we have already indicated, very far from being the case.

For instance, we recently reviewed a number of ordinary radio components due to B.T.S. ("ordinary" only in the sense that they are not essentially television gear), and we have since received samples of some further articles of this nature.

There is, for example, the very nice terminal strip, price 1s. This is for mounting at the back of a baseboard. It accommodates two terminals and a switch.

THREE OF THE LATEST



A group of parts made by B.T.S. The component described in the accompanying text.

The two terminals could be for the L.T. and the switch an on-off switch, or they could be for aerial and earth and the switch for wave-changing.

The strip (that, by the way, seems hardly the right term to use) is a clean moulding very attractively embossed on one of its surfaces.

An unusual-looking short-wave choke that has many features to recommend it. It can be wired direct into circuit, as the wires from it are particularly rigid.

There are several excellent B.T.S. H.F. chokes. These include two of the binocular type. The one is the "Minor," which retails at 2s. 6d., and the other is the "Major," which sells at 4s. 6d. The latter is the taller of the two in the accompanying photo.

The "Minor" and "Major."

While the "Minor" is adequate for many purposes—for example, it gives excellent results in the normal detector reaction circuit—the "Major" is a first-class choke of low self-capacity, able to perform well in those positions which demand the very best chokes.

And it will be agreed that for a component able to do that its price is most reasonable.

There is also a B.T.S. short-wave choke which will command the attention of all short-wave enthusiasts.

It comprises a special winding on a former of a material having low dielectric losses.

A point of particular practical interest is that it has been made sufficiently light for wire-end connections to be possible. It can, therefore, be wired into circuit with a minimum of lead length, in view of its self-supporting character.

It is a good choke, and we have used it with complete success in a variety of short-wave hook-ups.

An Inexpensive L.F. Choke.

The remaining B.T.S. component to which we desire on this occasion to draw our readers' attention is the B.T.S. 30-henry L.F. choke. This is a substantially constructed component, able to take a current of 60 milliamperes without depreciation of its value as a choke of excellent characteristics.

A 30-henry L.F. choke which will take up to 60 milliamps of current without losing its effectiveness.

The retail price is 10s. 6d., and that, too, we think it must be unanimously agreed, is a most reasonable price, even in these value-for-money days.

THE TELEVISION REPORT

What the Radio Prophets Forecast

BY THE EDITOR

THE Post Office Committee on Television has already presented its report to the Postmaster-General. Unless different arrangements have been made by the time this issue of POPULAR WIRELESS is on sale, the Postmaster-General will make the report public one day during the week.

Old readers of POPULAR WIRELESS will remember that for a good many years past we have kept a particularly watchful eye on Television development. So watchful, in fact, that at one time we issued a £1,000 challenge in connection with Television. The challenge was not accepted. But a good deal of water has flowed under the bridges since those days, and undeniably a good deal of progress has been made in the technique of Television. But, as we write this article, practically every newspaper in the country is exhibiting symptoms of Television prophecy. Some of the prophets may be right; some may be wrong.

Nevertheless, a good many of the newspapers' stories which we have read have contained some intelligent forecasts of the Postmaster-General's report and the possibilities of Television development.

Under B.B.C. Control?

The "Sunday Express" recently stated: "It is true that the radio trade anxiously awaits the report, holding a good deal of money ready to spend in the boom which will follow the change-over." According to this newspaper, the Post Office Committee proposes that the control of transmissions and entertainments shall be in the hands of the B.B.C., but that this recommendation has met with the determined opposition of some members of the Committee. Film and entertainment chiefs are reported to be strongly opposed to B.B.C. control, on the grounds that the B.B.C. has not sufficient room at its headquarters, nor has it the knowledge and experience of up-to-date technique. Film experts say that with Television we shall need the highly developed technique of the sound-film studios—a technique the B.B.C. has yet to learn.

Using Ultra-Short Waves.

The "Sunday Express" wireless correspondent forecasts that the Committee will recommend a service on the following lines:

1. Pooling the resources of the Television systems individually developed by Baird, Scophony, E.M.I., Cossor and others. 2. That the B.B.C.'s existing 30-line experimental transmission on medium-wavelengths will be superseded by one operating on ultra-short waves with a 180- or 200-lines system. 3. That the B.B.C. will control transmissions and entertainments. 4. It shall receive a special grant from the Treasury (now being discussed) for this purpose. 5. No increase in the cost of radio licences to be made. 6. No monopoly in manufacturing Television receivers. All radio industry to benefit. 7. Programmes at first to be confined to transmissions of studio performances and sound films. The first British station will be established in London.

The "Daily Telegraph" wireless correspondent forecasts that a pool of patents among Television manufacturers is likely to be proposed in order to procure co-operation in the interests of a young industry; that the B.B.C. would be authorised to start a high-definition service; that a joint licence could be made available to any manufacturer who wished to make Television receiving sets; that the system advocated by the Committee will scan in not less than 180 lines compared with the 30 lines at present used; that to meet the cost of a Television service in the initial stages the most likely proposal is that the B.B.C. will be given a larger proportion of the present 10s. licence fee; that owing to the short range of the ultra-short waves which must be used, a large number of stations will be necessary to cover the country; that it is improbable that more than one or two stations will be built at first, or that the transmissions of more than two or three hours daily will be given; that one estimate of the first year's cost of a high-definition service is £600,000.

EXAMINING THE GERMAN METHODS

Members and representatives of the Television Committee who went to Germany to inspect the latest Television progress in that country. Left to right: Mr. Varley Roberts, the Secretary; Mr. H. L. Kirke (representing the B.B.C.); Mr. O. F. Brown, of the Department of Industrial and Scientific Research; Mr. A. J. Gill, of the G.P.O.; and Dr. Banneitz, head of the German Post Office Television Laboratories.

Captain Ernest H. Robinson, writing in a recent issue of the "Observer," forecast that the Committee will find that high-definition Television is a commercial possibility, and will recommend the broadcasting of picture programmes in association with sound; that ultra-short wavelengths (those below 10 metres) must be used in the present state of the art; that studio performances will be transmitted direct; that the major problems are financial and not technical; that the Committee has worded its report in such a way as to prevent any monopoly and to suggest a transition period of two or three years in which some degree of stability can be reached; that nation-wide Television will be impossible for some time, and that the first transmitter will be in London; that receivers will be available in quantities in time for the first transmission; that there will undoubtedly be a large number of home-constructed sets, and that these will probably make use of the so-called mechanical systems.

The "Daily Express," in a recent issue, stated that Television development in Britain is not so behind that in the U.S.A. and Germany as the Post Office had believed; that the mass-production of Television sets, giving an 18-inch square image of plays or boxing matches, can be begun as soon as the Postmaster-General takes action on the report; that three new Television stations, each costing £100,000, are required immediately in London, Manchester and Glasgow; and that early in 1937 the film people hope to obtain control of world Television.

Establishment of a Regular Service.

We could go on reproducing the gist of newspaper forecasts for many more pages, but we will conclude by quoting from an article written recently in the "Evening Standard" by Mr. A. P. Luscombe Whyte—who, in our opinion, has written one of the most intelligent and one of the most thoughtful of the many articles dealing with the possibilities of Television. These are some of the main points, as the author sees them, after investigating his subject:

The Post Office Committee report on Television is likely to contain a recommendation in favour of the establishment of a regular service in England. If it does the manufacturers are ready for it. Television has technically arrived. Unfortunately, the technical aspect is one of the last problems to be overcome before listeners will be able to "look-in" to first-class programmes on a moderate-priced set in any part of the country.

Land-Line Difficulties.

One expert, when questioned, reckoned that at least 200 stations would be necessary to supply thickly populated areas with Television programmes. Their construction would run up a bill of about £5,000,000.

Technical barriers prevent engineers from putting Television programmes on a land-line from London and sending them to each relay station; land-lines will not "transmit the stuff." The only way out, according to most experts, is "the marriage of radio and the film." A national Television service will be very expensive—not only in technical outlay, but in the provision of first-rate actors. Who is to pay for this?

Suppose that the Television public numbers 500,000, and each is asked to pay about £2 per year for a licence—£1,000,000 a year. Hardly enough. A set is likely to cost £20 or £30, even with a "seeing-in" public of half a million.

* * *

And, finally, let us quote from an article

(*Continued on page* 738.)

Television Progress in Germany

Details of the Kinne High-Definition System.

By Dr. ALFRED GRADENWITZ

WHILE enabling low-priced receivers to be provided in the case of 30-line pictures or so, present systems of television will entail the use of expensive apparatus if they are adopted for pictures of greater detail. This apparatus, moreover, would be by no means easy to operate. In fact, there are both technical and economic difficulties in the way of a universal adoption of high-definition television.

It has been the writer's good fortune to inspect a novel system of television apparatus devised and constructed by a young Berlin physicist, Herr Erich Kinne, which seems to do away with present-day limitations and difficulties. It will reproduce television pictures transmitted by wireless using 180 lines and 25 frames per second with remarkable detail.

The new Berlin ultra-short-wave transmitter, working on 6·8 metres, is used in this connection. The new apparatus is remarkably cheap and simple, and gives incomparably brighter pictures than any of its predecessors.

The apparatus comprises the following items, all of which have been developed to a fully commercial stage: short-wave wireless sets for pictures and sound, a double cathode-ray deflector or time base, the cathode-ray oscillograph and the circuit connecting its anode to the mains.

Superhet Receivers.

While high-frequency amplifiers proved unsuitable for the 7-metre wave, sets using L.F. amplification and superheterodyne receivers gave satisfactory results. The former were satisfactory in close proximity to the transmitter (where the incoming energy, even in the absence of reaction was sufficient), while the superhets were found most suitable in the case of low field strengths.

The intermediate frequency is preferably in the neighbourhood of a frequency corresponding to 200 metres, and can be modulated directly to control the cathode ray.

The very fact that both short-wave receivers—for the picture and sound respectively—were given a common high-frequency side, whereas their low-frequency circuits were separate, made for increased simplicity.

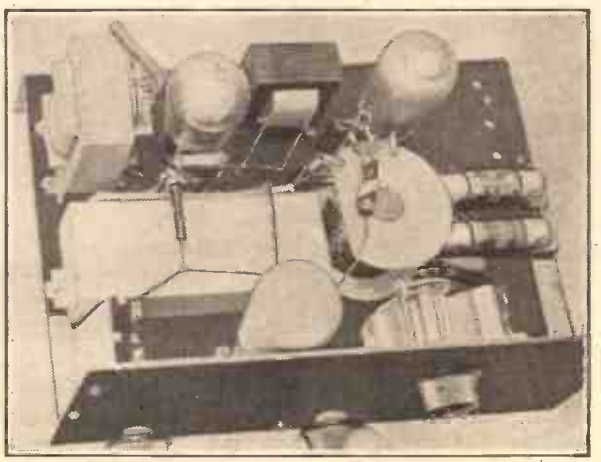
The two deflecting circuits or time bases are combined in one compact unit, only one three-electrode valve is used for each base, and, in a special circuit devised by the inventor, produces pure "saw-tooth" oscillations of any frequency. (Previously used time bases for frequencies over 4,000 cycles needed four three-electrode valves.)

A Special Cathode-Ray Tube.

One of the bases generates "saw-tooth" oscillations for line deflecting—at about 4,500 cycles per second, corresponding to as many lines. The other time base (picture time base) produces saw-tooth oscillations at the rate of 25 cycles per second, serving to effect the desired number of frames.

The circuit connecting the anode of the mains to the cathode-ray oscillograph is of remarkably cheap and compact design.

The cathode-ray tube is the outcome of two years' experimental work, a special feature being its very low gas pressure. It contains a special mixture of gases, viz. an extremely low amount of argon and several other gases. This, in conjunction with the use of a special mixture of calcium tungstate and several other chemical substances, provides extraordinary brightness with a low voltage.



The receiver used in connection with the Kinne television system. Sound and vision transmissions are sent out on ultra-short waves of approximately 7 metres.

Calcium tungstate gives out a blue light, cadmium tungstate a yellowish light (with a green component) and zinc sulphate an intense green light.

The brightness of the tube will throughout its life (700 burning hours) remain at its maximum, the amount of gas formed by emission being quite trifling.

Resonance in the course of the rays is made up for by the choice of a properly chosen mixture of gases—as well as by convenient deflecting plates—while any disturbing fields due to alternating-current heating are compensated by a counter-electrode, which sets up a disturbing field, though of opposite direction to that of the filament.

The heating filament comprises at its point a minute funnel which is filled with light-emitting oxide. This will provide a considerable reserve of oxide, thus securing long life. Moreover, by using special tools it has become possible to choose the section of the funnel at will, so that luminous points of, say, 1/100 square millimetre, 1/10,000 square millimetre or, on the other hand, 10 square millimetres can be produced without inserting any stop or diaphragm in the path of the cathode ray, which would be bound to reduce its life.

Another important feature is the fact that the brightness of the oscillograph can be increased almost beyond any limit by using several systems and combining the beams of each. Band-shaped cathodes are used in this connection, which are supplemented by an additional spiral, working as cylinder and as lens.

Special glass material is used in making the screen, which will not crack, even under full brightness.

MORE PRAISE FOR "THE BOOK OF PRACTICAL RADIO"

DELIGHTED WITH IT.

Dear Sir,—I have received my copy of "The Book of Practical Radio." I am delighted with it. It certainly is the "goods." I wish to thank Mr. Scott-Taggart for putting his experiences into book form for the benefit of radio enthusiasts. Also thanks to "P.W." for placing the offer of the book before its readers.

H. GROVES, 76, Ealing Road, Brentford, Middlesex.

A MINE OF INFORMATION.

Dear Sir,—I beg to acknowledge receipt of "The Book of Practical Radio."

It makes a delightful companion to the "Manual" and seems packed full of information. Thanking you for such a mine of information.

J. W. BAMENT, 57, Olive Road, Cricklewood N.W.2.

An All-Wave Four-Valve SUPERHET

Here are the necessary constructional details and operating data of the specially designed battery superhet which was introduced to readers last week. In a further article describing an easily built mains unit and an L.T. charger it will be shown how the superhet can be used virtually as an A.C. receiver.

By K. D. ROGERS.

LAST week I told you something of the theoretical aspect and the aims of the "All-Wave" four-valve super which will enable you to range the whole world in search of radio fare—and get it.

Now we come to the constructional details and the method of operating the set, though both the building and the handling of the receiver are extremely straightforward.

A wooden chassis has been chosen as the most convenient means for mounting the components in an efficient manner, and "Metaplex" has been chosen as the ideal substance for the baseboard part of the assembly. The two runners on which the baseboard is supported need not be metallised, but the baseboard should be coated on both sides.

The whole set is designed to fit into a cabinet of modern type, with the speaker and batteries included so as to make a compact and completely contained receiver. Later, I am going to tell you how to use a specially made power pack to supply the H.T. current and a suitable charger for keeping the L.T. battery up to scratch, so that virtually the set will be an all-mains receiver.

Power Pack Optional.

But the power pack and the charger are optional, and there is no need to forsake the H.T. battery and your present means of charging the L.T. battery unless you wish; while, on the other hand, readers who do not build the super may like to use the power pack or the charger with their receivers.

The baseboard and the runners are obtainable cut to size from the kit suppliers, and the cabinet can be bought ready drilled if desired. To those who may want to use the set with an ordinary external speaker and to construct some other type of cabinet I say go ahead, for there is nothing critical in the design of the superhet, and it is most docile in operation.

As a matter of fact, the actual construction is such that it needs but a few words—just a little explanation of one or two minor details, that is all.

One of these concerns the cutting away of the metallised surface of the baseboard under the metal brackets. It is clearly shown in the wiring diagram where such cutting away has to be done. The bracket holding the radiogram switch does not have to be clear of any metallising, for the switch has an insulated centre, and so there is no risk of any short circuit to earth through the bracket and the "Metaplex."

The valve holder V_1 is mounted on a wooden bracket so that it can be fixed on its side. This bracket is made of an ordinary piece of plywood such as is employed for the runners of the set, and is about three-eighths of an inch thick. Screws through the baseboard from the top on to the bracket hold it in place.

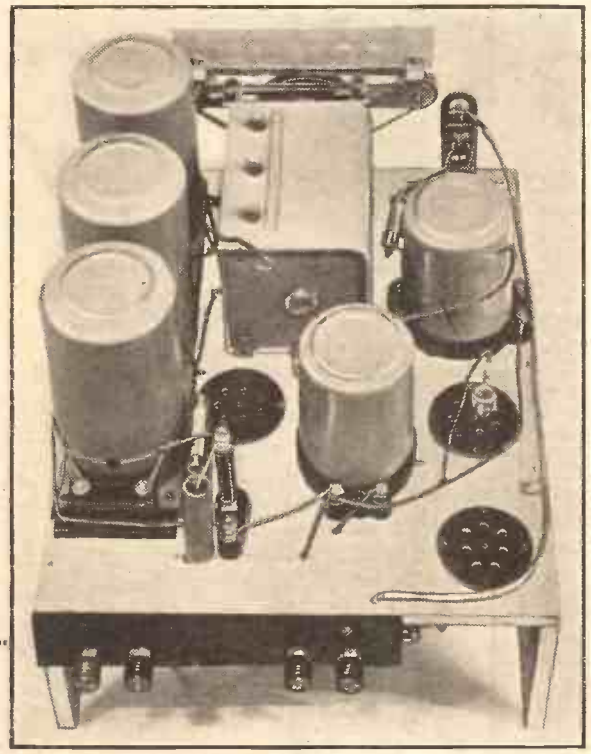
Note that in many cases an earthing point is carried out by tucking the wire concerned under the screw holding a component, or else under the component itself before it is tightened down. Care must be taken that such connections are securely made, and so I am drawing special attention to the matter.

The Loudspeaker Condensers.

And here I may also draw attention to the two ·002-mfd. condensers that are connected externally to the set across the loudspeaker terminals (see last week's issue). If a different loudspeaker is used, as well might be if the set is to be built for use with an external speaker, it must not be forgotten to connect these condensers across the input transformer.

Make every lead as short and direct as possible, and be sure that every connection is tight before passing on to the next lead. Wire of the insulated push-back type, such as "Quikon," is recommended for

(*Continued on next page.*)



A very clean upper deck, as well as attractive cabinet front, is obtained by the chassis design. The front of the set can be clearly seen by reference to our cover last week. A sloping scale enables the condenser readings to be seen with unusual ease.

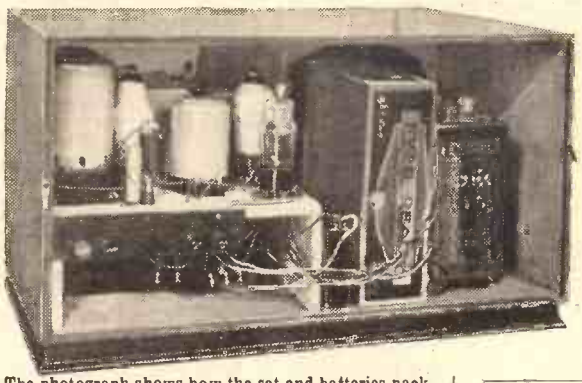
BUILD IT WITH

1 Utility 3-gang superhet tuning condenser, type W 349/3.
1 Utility drive for above, type W350. (This can be obtained without micro drive if desired, type W346.)
1 Colvern 3-gang superhet coil unit, types K61, K62, K63.
2 Colvern intermediate transformers, type 110.
4 Clix 7-pin valve holders, chassis-mounting type, with screw terminals.
1 W.B. four-pin universal valve holder.
2 Graham Farish screened H.F. chokes, type L.M.S.
2 T.M.C.-Hydra ·1-mfd. fixed condensers, type 25.
4 T.C.C. ·1-mfd. tubular condensers, type 250.
2 Dubilier ·1-mfd. tubular condensers, type 4404.
2 Dubilier ·1-mfd. tubular condensers, type 4403.
1 Dubilier ·01-mfd. condenser, type 610.
3 Dubilier ·002-mfd. condensers, type 670.
1 Dubilier ·001-mfd. condenser, type 620.
1 Dubilier ·0002-mfd. condenser, type 620.
1 T.C.C. ·0001-mfd. condenser, type 34.
1 T.M.C.-Hydra ·0002-mfd. tubular condenser.
2 Graham Farish ·25-meg. "Ohmite" resistances in vertical holders.
1 Graham Farish ·25-meg. "Ohmite" resistance in horizontal holder.
1 Graham Farish 100,000-ohm "Ohmite" resistance.
1 Graham Farish 5,000-ohm "Ohmite" resistance in vertical holder.
1 Graham Farish 2,500-ohm "Ohmite" resistance in vertical holder.
3 Graham Farish 1,000-ohm "Ohmite" resistances in vertical holders.
2 Dubilier 250,000-ohm. resistances, 1-watt type.
1 Bulgin 50,000-ohm potentiometer with three-point shorting switch, type VM36.

THESE COMPONENTS

1 Bulgin short-wave H.F. choke, type HF3.
1 Bulgin double-pole double-throw switch, type S98, with radiogram indicating plate.
1 Bulgin push-pull four-spring switch type S29.
1 Polar ·00015-mfd. variable condenser, type C.
1 Westector type W6.
1 Varley Class B input transformer, type DP40.
1 Peto-Scott "Metaplex" (both sides) baseboard, 10 in. by 12 in., with wood runners 12 in. by 3⅛ in.
1 Peto-Scott terminal strip, 7 in. by 1½ in.
2 Peto-Scott brackets, type 22/1.
1 Peto-Scott bracket, type 23.
3-feet Goltone spiral screened sleeving.
3 Coils B.R.G. "Quikon" connecting wire.
1 B.T.S. Kelsey adaptor coil No. 1.
1 B.T.S. Kelsey adaptor coil No. 2.
4 Clix terminals, type A.
2 Clix L.T. spade terminals.
1 Belling-Lee wander fuse.
5 Belling-Lee wander plugs. Screws, flex, etc.

(Continued from previous page.)



The photograph shows how the set and batteries pack into the cabinet. The loudspeaker is hidden behind the H.T. battery in this view of the set, while the 16.5-volts G.B. battery fits alongside the receiver. The wiring diagram is of the under side of the chassis. It shows clearly where the metallising is cut away under the metal brackets.

the wiring, with the exception of the short lengths of screened wiring that have to be run where shown on the diagram.

One more point should perhaps be explained. The side view of V_1 on the wiring diagram of the under portion of the set is labelled with letters. This, of course, does not mean that the actual valve holder supplied by the makers will be so lettered. It is merely to enable you to see how the terminals run, and a separate "key" is provided on the right-hand top corner of the diagram. The two filament terminals are labelled D and E, and these, of course, correspond to the valve-base numbering of the heptode valve, 4 and 5.

Disposition of Controls.

The relative disposition of the components that protrude through the cabinet are shown in a separate diagram which should be carefully followed if the set is to slide into place in the ready-drilled cabinet. The diagram takes the place of the usual panel-drilling chart that is supplied with designs having panels separate from the cabinet front.

There is one point in the mounting of the various controls on the brackets which is important if you are going to use the cabinet. I say "if" because I know that, however much I recommend the use of the cabinet in order to make the set a really "posh-looking" job, many of my readers will take no notice and will use the receiver in its naked chassis form.

The volume control is mounted on its bracket in the usual way, but the radiogram switch, the short-wave switch and the short-wave condenser are mounted as follows:

Points to Note.

The brackets are set back on the baseboard by an amount equal to the thickness of the inner nut on the components. It will be noticed that each component has two nuts. *Both* these are removed, and the component is mounted on the bracket by the inner nut only. Afterwards, when the set is in position in the cabinet, the outer nut is added to keep the set tightly in place.

The radiogram switch spindle is half an inch in diameter, so that its bracket has to be filed out slightly in order to let it fit in position.

If the brackets are not set back a little it will not be possible to get the chassis flush with the rear surface of the front of the cabinet, a desirable feature if the whole assembly is to be rigid; and for successful operation on short waves it is essential that rigidity is obtained.

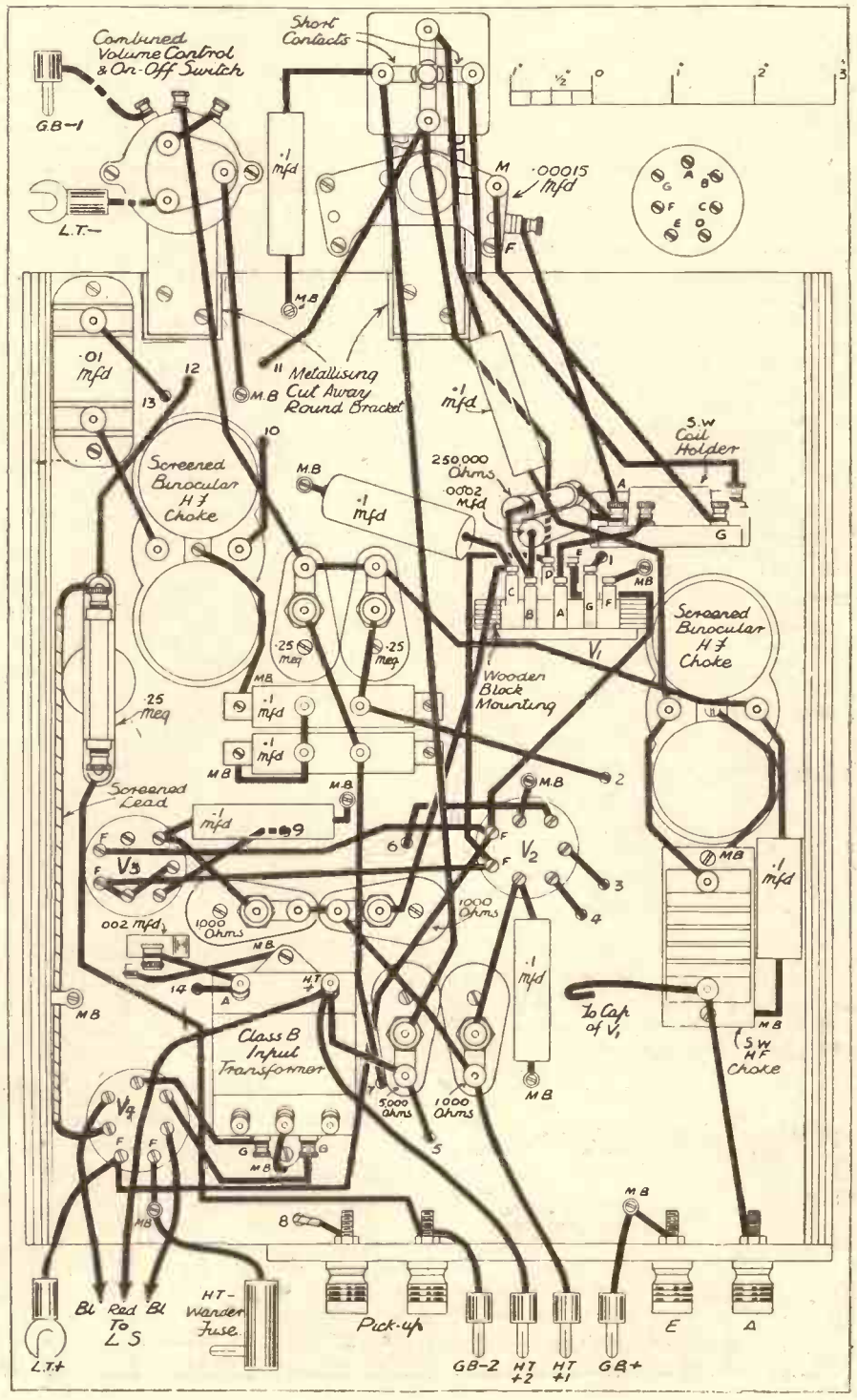
The holes in the cabinet—or the panel, if you use one—are clearance, of course, but not so large that they will not allow the nuts to clamp up against the wood; while the short-wave coil holders must protrude so that they cover the hole in the cabinet, but do not quite touch the surface. This ensures that each coil is pushed well and truly home in its valve holder every time.

Two coil units are required for short waves, the No. 1 covering a wavelength range of about 16 to 32 metres, and the other going up to about 60 metres with a good overlap at the lower end on No. 1's waveband.

How the Fixed Condensers Are Placed.

I may as well say here one more thing about the actual construction. It will be seen in the list of components that there are a number of ·1-mfd. condensers. Their positions are as follows: the T.M.C.-Hydra's are the metal rectangular ones near V_2

(Continued on page 728.)



IMPORTANT Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire purchase terms are NOT available to Irish and Overseas Customers.

PILOT AUTHOR KIT
EXACT TO SPECIFICATION

ALL-WAVE 4-VALVE SUPER-HET

KIT "A" CASH or C.O.D. Carr. Paid **£10:8:6**

Author's Kit of First Specified parts, including Ready-drilled Metaplex Chassis, 2 B.T.S. Short-Wave Coils, and Micro drive for Condenser, less Valves, Cabinet and Speaker.

YOURS FOR **19/-** and 11 monthly payments of 19/-.

KIT "B" As for Kit "A," but including set of 4 specified Valves, less Cabinet and Speaker. Cash or C.O.D. Carriage Paid, £13/14/6, or 12 monthly payments of 25/3.

KIT "C" As for Kit "A," but including Valves and Peto-Scott Walnut Classic Consolette Cabinet, less Speaker. Cash or C.O.D. Carriage Paid £14/14/0, or 12 monthly payments of 27/-.

KIT-BITS *You pay the Postman. We pay Post Charges on all orders over 10/- GREAT BRITAIN ONLY.*

	£	s.	d.
1 Peto-Scott ready-drilled Metaplex Chassis, 10 in. x 12 in. x 3⅜ in.		3	6
1 Utility 3-gang Superhet Condenser with Micro drive	1	12	0
1 Colvern 3-gang Superhet Coil Unit	1	10	0
2 Colvern I.F. transformers	1	5	0
2 B.T.S. Short-Wave Coils, type "K"		8	0
1 Varley Class B Input transformer		13	0
1 Westinghouse Westector W.6		7	6
1 Set of 4 specified valves	3	6	0
1 W.B. Standard Stentorian Speaker (*See below for terms.*)	1	12	6
Peto-Scott Classic Walnut Consolette Cabinet		19	6

B.T.S. SHORT-WAVE COILS

SPECIFIED for the

ALL-WAVE 4-VALVE SUPERHET

TYPE "K" *Exactly as specified* **8/-** THE PAIR *Post 6d. extra*

B.T.S. KELSEY S.W. COILS *Specified for Mains and Battery Versions of the* 1935 KELSEY S.W. ADAPTOR

SET OF 4 *Exactly as Specified* Post Free **16/-**

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2/6 DOWN

W.B. Stentorian Senior. Cash or C.O.D. Carriage Paid, £2/2/0, or 2/6 deposit and 11 monthly payments of 4/-.

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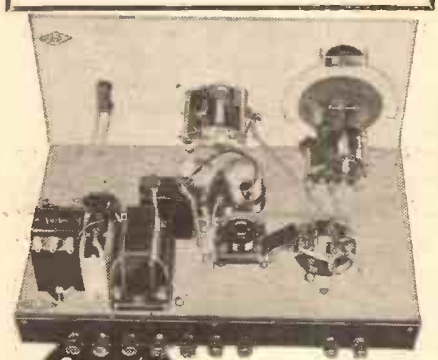
"B.C.L." TWO SHORT-WAVER



Yours for 7/6 DOWN

KIT "A" CASH or C.O.D. **£4-14-0** Carriage Paid.

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KIT "A" Author's Kit of First Specified Parts, less Valves and Cabinet.

KIT "B" As for Kit "A," but with set of 2 specified Valves, less Cabinet. Cash or C.O.D. Carr. Paid, £5/18/0, or 12 monthly payments of 10/9.

KIT "C" As for Kit "A," but with set of 2 specified Valves and Peto-Scott Table Cabinet. Cash or C.O.D. Carr. Paid, £6/15/6, or 12 monthly payments of 12/6.

1935 KELSEY S.W. ADAPTOR

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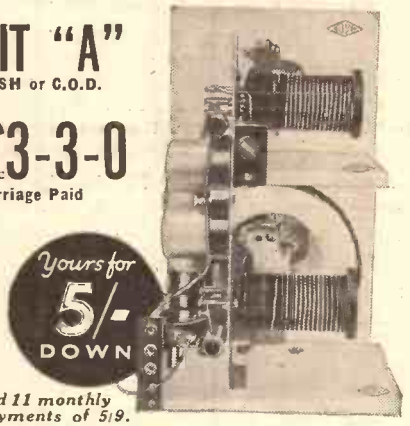
KIT "A" CASH or C.O.D. **£3-3-0** Carriage Paid



Yours for 5/- DOWN

and 11 monthly payments of 5/9.

KIT "A" Author's Kit of First Specified Parts, less Valve and Cabinet.

KIT "B" As for Kit "A," but with specified Valve, less Cabinet. Cash or C.O.D. Carriage Paid, £4/1/6, or 12 monthly payments of 7/6.

KIT "C" As for Kit "A," but with Valve and Peto-Scott Cabinet. Cash or C.O.D. Carriage Paid, £4/12/0, or 12 monthly payments of 8/6.

1 FERRANTI VHT2 Specified Valve .. 18/6.

PETO-SCOTT Walnut CABINET Specified and used by Mr. G. T. Kelsey. Cash or C.O.D. (Carriage and Packing, 2/6 extra.) **10/6**

For full detailed list of parts, see our advertisement in Jan. 19th issue.

STRUCTAKITS

'B.C.L.' TWO SHORT-WAVER

Complete "B.C.L." Two Short-Waver Structakit, comprising Peto-Scott Walnut faced ply panel with Metaplexed back; Plymax Chassis; Terminal Strip. **8/-** *Post 6d. extra.*

1935 KELSEY S.W. ADAPTOR *Battery Version*

Complete Kelsey Type "B" Structakit, comprising Burr Walnut Finish Paxolin Insulating Panel, ready drilled for escutcheon, 2/6; aluminium Screening Panel, ready drilled, 2/6; METAPLEX Baseboard, and Sub-baseboard Screen, 1/3; Ebonite strip, "A" terminal, Paxolin strip, 2 valve supports, 1/3; 12 fixing screws. *Post 6d. extra.* **8/6**

FINISHED INSTRUMENTS

"B.C.L." TWO SHORT-WAVER

Exact to First Specification. Aerial tested on actual broadcast. In Peto-Scott Cabinet, as specified and used. Complete with valves. Cash or C.O.D. Carriage Paid £7/7/0 or 15/- deposit and 11 monthly payments of 13/3. YOURS FOR **15/-**

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Exact to Mr. G. T. Kelsey's First Specification. Aerial tested on actual broadcast. In Peto-Scott Cabinet, Complete with Ferranti VHT 2 valve. Cash or C.O.D. Carriage Paid, £5/0/0, or 10/- deposit and 11 monthly payments of 9/3. YOURS FOR **10/-**

1935 KELSEY (MAINS) S.W. ADAPTOR

KIT "A" CASH or C.O.D. **£6:11:6** OR YOURS FOR **12/-** and 11 monthly payments of 12/-

Carriage Paid.

Author's Kit of First Specified Parts including Peto-Scott Type "M" Kelsey Structakit and set of 4 B.T.S. Coils less Valve and Cabinet.

KIT "B" As for Kit "A," but with specified Valve, less Cabinet. Cash or C.O.D. Carr. Paid, £7/11/6, or 12 monthly payments of 14/-.

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FINISHED INSTRUMENT. Cash or C.O.D. Carriage Paid, complete with specified Valve and Cabinet, £9/0/0, or 17/6 deposit and 11 monthly payments of 16/6.

For fuller details of Structakit and Cabinet, see our last week's advertisement.

PETO-SCOTT CO. LTD.

77, P.W.7, CITY ROAD, LONDON, E.C.1. *'Phone: Clerkenwell 9406/7*

West End Showrooms— 62, P.W.7, HIGH HOLBORN, W.C.1. *'Phone: Holborn 3248.*

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

AN ALL-WAVE FOUR-VALVE SUPERHET

(Continued from page 726.)

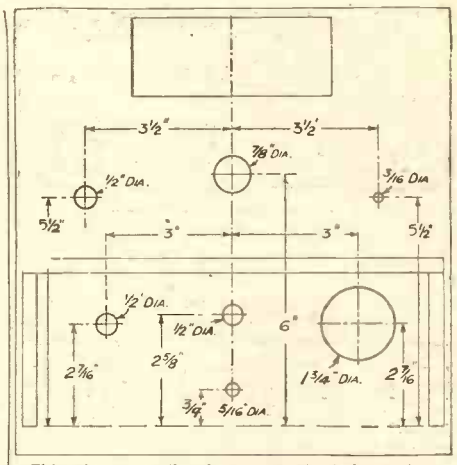
and V_3. Two of the four T.C.C. ·1-mfd. condensers go to the short-wave switch, one to V_2 and one to V_3. Of the Dubilier type 4404 one goes to V_1 and the other "upstairs" on the baseboard to the 2,500-ohm resistance. Type 4403 Dubilier condensers go to No. 3 of the K.61 coil and to one of the screened H.F. chokes. The rest of the fixed condensers, I think, are easily placed from the wiring diagram without any further explanation.

After checking all the connections the set is ready for test, and I recommend that the first test and trimming be done with the receiver out of the cabinet. Place one or other of the short-wave coils in position—No. 1 if the time is before 8 p.m. and No. 2 if it is at a later hour—place a heptode in V_1 and another in V_2. Then insert the screen pentode in V_3 and the Hivac driver B valve in V_4. G.B. — 1 should be between 9 and 16·5 volts—you will find by the operation which is best later (choose a voltage that enables you to cut the volume down sufficiently on the local station)—and G.B. — 2 in 3 to 4·5 volts.

The H.T. Voltages.

H.T.1 should have 80 volts and H.T.2 the full maximum of the H.T. battery. Then, with L.T., aerial and earth and loud-speaker connected up, the set is ready for test. Switch on by turning the volume control clockwise.

Screw all the trimmers fully up, and then unscrew them about three turns. Set the intermediate transformer trimmers central. Now leave the back trimmer completely alone, and carry out the trimming on the other two in the usual way, using a weak and the lowest-reading medium-wave station (wavechange switch turned clockwise) you can, changing to a weaker station each time as the trimming brings up the volume to good strength. When you have trimmed them in as accurately as you can you have to set about trimming the intermediates, but don't go on to these until you are sure you have the others absolutely sharp.



This diagram will help you to place the various controls in their proper positions.

Adjusting the Intermediates.

Then switch over (turn anti-clockwise) to long waves (the short-wave switch is "in" all this time) and, picking a fairly strong station, though not one that will overload things, trim the intermediate trimmers by means of a flat piece of wood until you are in the "hollow" of the received signal. On either side of the "hollow" you will find that the signal hisses, so that it is essential to get this trimming right.

It will depend on your location whether or not you prefer to adjust the couplings of the transformers, which are described in the maker's leaflets; but if you do, remember that as the coupling is tightened selectivity will be reduced somewhat, and, of course, you will have to retrim each time on the intermediates after altering the coupling.

With trimming accomplished—and it is quite easy—you can go ahead and use the receiver. Ordinary medium and long-wave reception is carried out, as before stated, with the short-wave switch in the "in" position, and tuning is done with the main tuning knob only.

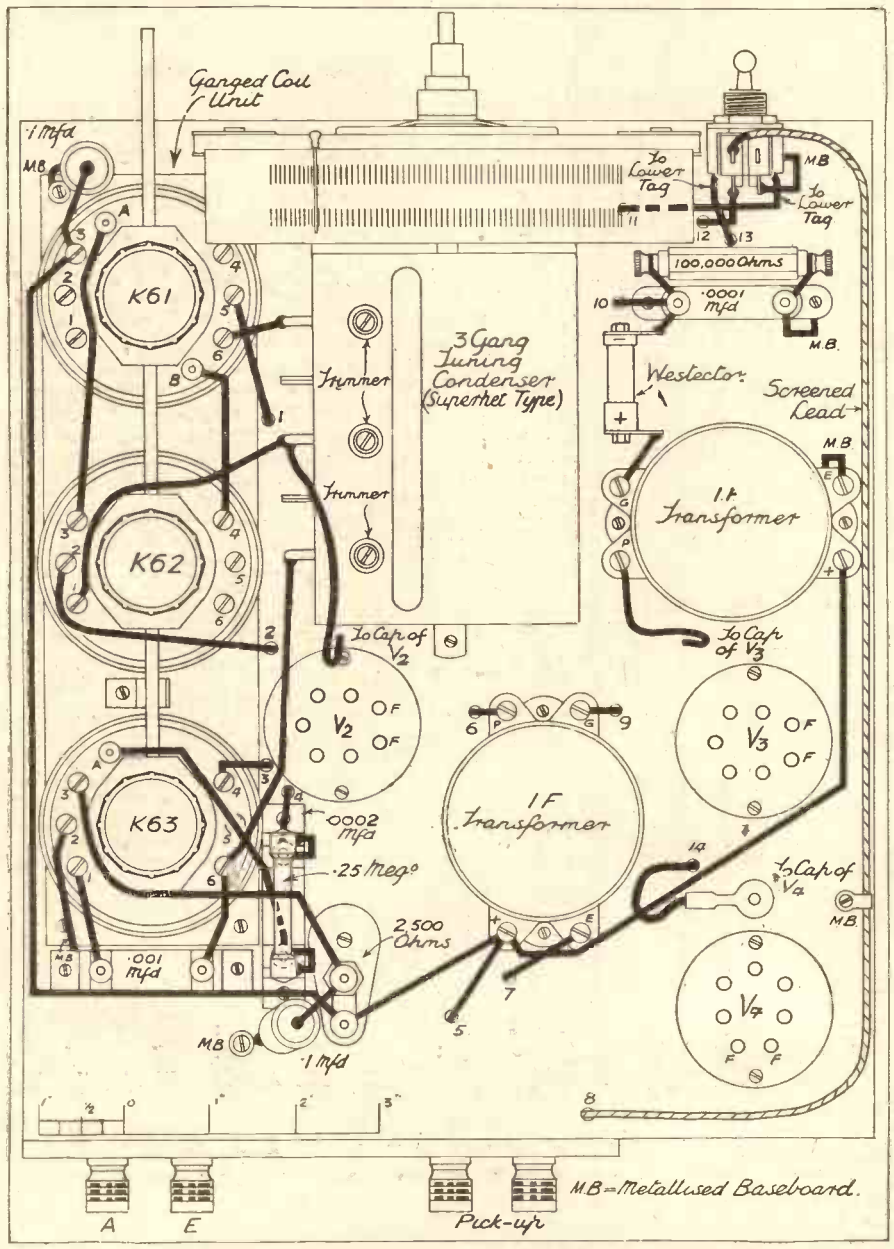
For short waves switch the main portion of the set to long, turn the main tuning dial to about 95 degrees and pull out the short-wave switch. Then turn the short-wave condenser *very* slowly.

(Continued on page 732.)

VALVES AND ACCESSORIES

Valves: V1 Cossor 210P.G., V2 Cossor 210P.G., V3 Osram V.P.21, V4 Hivac D.B.240.
Batteries: H.T. 120 volts: Ever Ready Standard.
L.T. 2 volts: Exide IFG-C.
G.B. 16½ volts: Lissen, Drydex, Ever Ready.
Loudspeaker: W.B. Stentorian Standard.
Cabinet: Peto-Scott type Classic Consolette.

THE "TOP DECK" OF THE RECEIVER



The above-baseboard layout of the "All-Wave Super," showing the positions of the coil unit, the gang condenser and the two intermediate transformers. The three valve holders seen here are of the chassis-mounting type, and care must be taken that the holes for them are of sufficient size to clear the sockets.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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

QUESTIONS AND ANSWERS

WHAT IS THE CIRCUIT?

P. T. S. S. (Berwick-on-Tweed).—"Can you advise me as to whether a set employing the following S.G. circuit is likely to give good reception in this part of the world?

"The circumstances are that I have been offered the set cheap, but as I have not used one of the kind before I should like to make sure that it is not one of the hopelessly out-of-date kind. I have listened to it working (but not on my own serial), and it seemed to me to be very good indeed. As I have been told that even an old set can give plenty of programmes when it uses an S.G. valve, I thought I would like to make sure that it is not of a kind likely to go out of date directly I get it.

"I copied out the connections to the S.G. valve holder, thinking I would get your opinion on it and that you could tell me what kind of circuit it is. These are the connections:

"Usual flex wiring (screened) to filament terminals. Cathode terminal to fixed resistance and to two large condensers.

"One of these condensers was marked 1 mfd., and its other terminal went to H.T.+ lead and to the "Plate" terminal on the valve holder.

"The other side of the resistance joined the other terminal of the other large condenser, and was also connected to the metal baseboard.

"The grid terminal of the valve holder was joined to one of the sets of fixed vanes on the ganged condenser and to the first coil.

"The flex lead to the S.G. valve top came from an H.F. coil unit, which had three other terminals, as follows:

"One was joined to another H.T. + lead, another to the metal base and the third to another set of fixed vanes on the ganged condenser and to the grid condenser of detector valve.

"I think that was all, and hope it is enough for you to tell me what kind of circuit this is."

The arrangement you describe is apparently quite up to date and should be satisfactory in every way, for your description tallies with that of a tuned transformer. This is definitely a very good method of S.G. coupling, and if the components are correct we should certainly expect it to give very good results indeed.

BOTHER WITH THE BATTERY.

M. W. (Swanage).—"I particularly wanted to hear the programme one night, but the battery (L.T.), which had only been recharged four days, seemed to be running down again.

"My other one is always at the shop when this one is at home, but in addition I have an old one, not in use now. I got this out and tried it in place of the unsatisfactory one, but no luck.

"Then I thought I would try them both, but was not quite sure of the way to connect or if I was doing right.

"However, I worked it out that if I undid the set's L.T.+ lead and put it to + of second battery, and then joined the two batteries with a lead between the + of one and the — of the other, it would be 'in series,' as shown in 'P.W.' And I thought it would not hurt to try it just for a moment and see how it went, undoing if there was no improvement.

"Rather to my surprise, it went fine. And I kept it like that for the rest of the week. Then I changed over to the new battery, only to discover that this did not now work as strong as before.

"It goes very well if I put the old battery on as well, but this seems wrong to need two batteries all the time, so I thought I would ask what is the fault."

(*Continued on next page.*)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

We are afraid that *you* were at fault in connecting up two batteries to the one set; and it seems certain that you have ruined your valves, which are now unable to work without excessive filament voltage.

By wiring as described you undoubtedly placed the batteries in series; but we have never, never told you in "P.W." that this arrangement should be applied to a set's filament-supply leads.

It doubles the voltage applied, and as your valves should have only 2 volts applied instead of the 4 you have "over-run" them, *and they will need replacement.*

L.F. CHOKE COUPLING INSTEAD OF TRANSFORMER.

A. C. R. (Hove, Sussex).—"I have been told that a coupling from detector to output pentode by L.F. choke instead of transformer is a good way to secure a quieter background on short waves. I should like to try this if you can give me the anode and grid connections concerned.

"At present I am using S.G. as detector, and pentode output, with common H.T. +. In the S.G.'s lead there is H.F. choke and transformer primary. (Also a voltage-drop resistance, as I find this pays.)

"Going off from other side of primary is the H.T. to pentode's screen and plate, the latter through a tapped output choke.

"How could this arrangement be changed over to choke coupling, and would it be worth while changing over to separate H.T.'s for the two valves? (I do not want to if it can be avoided.)"

It may not be found essential to change to separate H.T.+ supply leads, so we should try the choke coupling first. It is easily fitted.

Take out the transformer, and have a ·01-mfd. condenser ready for coupling, together with a 1-meg. resistance (for grid resistance).

Do not disturb the H.T.+ supply to the output valve, but connect the + lead which goes to the output choke and to the screen of the pentode to one end of the new coupling L.F. choke. Its other end is then joined to the H.F. choke terminal which formerly went to the L.F. transformer primary.

This point is also connected to one side of the coupling condenser (·01 mfd.). The other side of this condenser is joined to the grid terminal of the output valve holder, and also to one side of the grid resistance. Its other side goes to the pentode G.B.— bias lead—the one which formerly was attached to the L.F. transformer secondary.

This description should enable you to get the arrangement going satisfactorily, but we would warn you that we do not give unqualified assent to your theory that the background will be much quieter. It *may* be, we admit, but a very great deal will depend upon the quality of the components.

Should this arrangement prove disappointing, undo the detector H.T. supply lead (at the junction of new L.F. choke and pentode screen wiring) and give the detector separate H.T.

Incidentally, if you want to decrease the detector's H.T. by a voltage-dropping resistance, this is the place to insert that—at the point where the new L.F. choke is wired to the pentode screen and output choke.

COMPARING THE EFFICIENCY OF ONE EARTH WITH THAT OF ANOTHER.

M. S. S. (Nr. Diss).—"By means of a dry cell, milliammeter and good water-pipe earth connection I have been trying out the comparative merits of two outside earths, and find one takes nearly twice as much current as the other with the same apparatus in circuit. Does this mean that it is of *half* the resistance, and therefore *twice* as good an earth?"

It is not quite as simple as that, since you are measuring the D.C. resistance, whereas in reception it will be the H.F. resistance of the lead and connection to earth that will be of importance.

But the lower the D.C. resistance the better is the earth connection likely to be.

WINDMILLS TO RUN BATTERY-CHARGING PLANTS.

"AGRICULTURALIST" (Nr. Newmarket).—"I was very interested to see from a letter in an old number of your periodical that successful battery charging from windmills can be carried out in the right conditions.

"I know it is a bit outside the usual run of wireless, but can you put me on to any book or article on this subject?"

We believe that the work on this subject undertaken by the Institute for Research in Agricultural Engineering, Oxford University, was described in a pamphlet costing a shilling or so. It would be worth your while to send an inquiry as to whether this and similar information is still obtainable from that source.

LOST ALL ITS VOLUME AND QUALITY.

A. G. (Rotherham).—"As manager of a small factory my time for recreation of any kind is very limited, so I have never given wireless the attention it deserves. Particularly the 'how-does-it-work' angle, which I know I should find full of interest if only I could find time to follow it up.

"Being so keen on the hobby, I feel that I ought to try to put the simpler faults right for myself, since that is one way of learning. And with the aid of 'P.W.' I have had several successes in this direction.

"The latest trouble beats me completely, however. It came on quickly, the set being O.K. one week-end and only with the words barely distinguishable the next week-end. And all I have found out so far is that the total H.T. current is now about nine milliamps instead of twenty-one.

"Can you tell me where to look for the fault which would account for this?"

As you have discovered the big drop in anode current it should not be very difficult to find what is causing it; but, like so many other fault symptoms, this fall in current may arise from different causes, so you must decide which applies in your case when you have considered all the likely ones.

The most obvious thing to account for the fall is that the H.T. or L.T. supply is failing.

If the H.T. is a battery, check the voltage when the set is working; if it is a mains set, get the rectifier valve checked for failing emission, etc.; and, in either case, make sure that the supply leads are faultless.

Equally likely as a source of trouble is the output valve; it may be losing emission, especially if it is old or has been mistreated at any time by being subjected to excessive voltage.

(Continued on next page.)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

(You will probably have to call in the aid of a dealer or expert amateur with testing equipment to decide the questions of faulty valve emission, since it requires proper conditions of test.)

You will perhaps find that the fault is in H.T. or L.T. supply or in a failing valve, so give these Special attention. Far less likely is the failure of the supply leads, though, since these are often associated with condensers which may break down, the tests should be carried out carefully.

Finally, there is a possibility of grid bias being wrong; it is not likely, but if through some unsuspected cause your grid bias to the output valve were very greatly increased the anode current would fall as you describe, even though the valves and H.T. were in good order.

FINELY ADJUSTED BIAS TO AN S.G. VALVE.

R. N. (West Wickham, Kent).—"Being on batteries, I want to keep H.T. down as much as possible. As 1½-volts bias variations are too much for my S.G., how can I get fractions of a volt from a potentiometer and G.B. cell?"

Connect a potentiometer (25,000 ohms will do) across the battery's + and —, arranging to break one lead with a switch when the set is off. Then use the potentiometer slider terminal instead of the negative connection to the set.

(A by-pass condenser may be necessary between + and slider.)

Apropos this question of S.G. bias, the following letter to the Editor from Mr. Ivor Haigh (of 1, Balmoral Road, South Harrow, Middlesex) may interest many readers besides the one to whom it refers. Mr. Haigh says:

"In your edition dated January 5th, 1935, under the heading 'Radiotorial,' I noticed a letter from W. E. D. (Hunslet), in which I was particularly interested, especially in view of your reply, with which (pardon me) I do not agree entirely. The valve in question may be a dud—but try this:

"I am using a Cossor 220 S.G. myself.

"If W. E. D. applies a negative bias of 3 to 4½ volts on the control grid I think he will find a remarkable improvement in the state of affairs prevailing.

"It is a fact that a reduction of H.T. current by this means greatly improves the performance of my particular valve, both as regards sensitivity and output volume from set.

"On test my valve takes 8 milliamps without bias, and gives as poor a performance as I presume W. E. D. is gnashing his teeth about; but with bias as above the H.T. consumption falls to 3 milliamps (plate and screen together) and the improvement in H.F. stage gain is terrific.

"The bias is, of course, applied via the grid coil.

"I should be pleased to hear the result of W. E. D.'s experience on these lines should he have the opportunity of reading these remarks through the medium of your excellent paper."

EUROPE'S MOST POWERFUL STATION.

"SCHOOL" (Chelmsford).—"Which station in Europe uses the biggest power, and what is its wavelength?

"Ordinary broadcasting station, I mean, not Morse or Government."

The most powerful station in the European group is Moscow I.

It has an authorised power of 500 kilowatts—more than three times the power used by Droitwich or Luxembourg, which come next in power rating with 150 kilowatts each.

Moscow I's wavelength is 1,724 metres, which brings it just above the wavelength of Radio Paris. But owing to the latter's more favourable situation for British listeners the Paris station is usually much stronger than the Russian in this country.

AN ALL-WAVE FOUR-VALVE SUPERHET

(Continued from page 728.)

Plenty of stations will be heard if you are listening at the right time and on the right coils. I advise you to turn back to the articles by Mr. Kelsey and by W. L. S. in our last two issues to see when the best times for listening are, and then, with the correct coils, you will be able to go ahead.

Especially on the big coil (No. 2) will you find plenty doing after 10 p.m. round about 60 degrees on the short-wave dial. On the original set G S A (Daventry) came in at 66, Rome at 65, Bound Brook at 64·5, Pittsburg at 64. At the bottom of the dial Madrid was heard at 19 and G S C at 22. These readings may help you as a start, but you will soon find your way about.

Do not forget that the easiest method to get perfect tuning on the short waves after picking up a station is to move the main tuning dial, which operation will correct any slight inaccuracy in the tuning of the short-wave section by adjusting the frequency of the second heptode. This, it will be remembered, is "supering" the incoming signals after they have been heterodyned by the first heptode.

Easy To Operate.

The "All-Wave Four-Valve Superhet" is very easy to operate, as you will find, and a very few hours on the short waves will show you that there are tremendous possibilities if you take a little care in the handling of the short-wave condenser. Next week I shall tell you how to use the set on a mains unit and how to use an L.T. charger to obviate taking the accumulator to the charging station if you are on A.C. mains. But now I will end on one most important injunction to all who take up the fascinating hobby of short-wave reception.

Tune slowly *always*, or you will miss many a really powerful transmission. A degree on the short-wave condenser dial may easily mean a couple of stations, and if you pass over the waveband in anything but a slow and methodical manner you will simply sweep by the stations without as much as hearing a swish, let alone any modulation.

Tune slowly and you will find plenty to interest and entertain you; a whole world is at your disposal.

THIS DROITWICH FADING

(*Continued from page 713.*)

"for the simple reason that they are all within the non-fading area of the Droitwich transmission."

Which is perfectly true, when you come to think of it. London, West and North Nationals have somewhat limited service areas, in any case. Droitwich does not begin to fade, as a general rule, at any point within these areas.

Worst off at the moment seem to be the listeners in the Newcastle area and in North Wales. Not forgetting, of course, the South-west—for the "toe" of England has always produced odd radio effects, due possibly to the nature of the sub-soil.

Anyway, sufferers will be glad to hear that Mr. Kirke, the B.B.C.'s wizard research engineer, is at the moment stationed up at Newcastle, where he is taking endless measurements. At the same time engineers at Droitwich perform their frightfully secret tests.

The Chief Engineer does not preclude entirely the idea of a new aerial for Droitwich. If necessary a new aerial will be erected. That much-quoted figure of £30,000 is rather wide of the mark, though. I am told that something like £100,000 would have to be spent.

You cannot put up a ring of fairly high masts to make an anti-fading aerial without incurring big money.

"GET THIS S.W. RACKET STRAIGHT!"

(*Continued from page 717.*)

particular hour—when he told me the dial reading I knew that he must be on about 19 metres. Actually he had tuned in W 8 X K on 19·72 metres—always strong on a Saturday afternoon.

Admittedly, it is a good set. Ten valves, automatic volume control, shadow tuning and all the rest of it. But even so the strength, clarity and reliability of Pittsburg on that Saturday afternoon about a fortnight ago was something to marvel at.

Take another case—going to the not so ridiculous from the decidedly sublime. Called on a "B.C.L." type of listener and noted a disconsolate-looking one-valve headphone short-waver in the corner.

"Useless," snarled its owner, "and they told me I could get America on the blankety thing."

I looked around. About twelve feet of indoor aerial wire. No earth worthy of the name. One valve. H'm! Asking a lot, wasn't it?

But, believe me—cross my heart and all that—I did get America on that little set. So plainly that the two of us were able to follow the grim news of the killing of a gangster. And then we heard Amos 'n' Andy—even more clearly. Their drolleries soon had my "B.C.L." chuckling—and converted for evermore to the short waves.

"The Experimenter"

IF VALVES WERE MADE OF RADIUM

Much has been said in the past about the possibilities of using radium or a radium salt in the construction of valve cathodes. At first sight such an emissive substance seems to have everything in its favour—until one remembers one or two seldom considered aspects of the case. The main reasons why the radium valve is not likely to materialise are clearly explained below

By J. F. STIRLING.

ANOTHER American worker, I see, has succeeded in operating a radio valve by means of radium.

These American radio workers! How indefatigable they are! One wonders, sometimes, whence they get their radium.

But, speaking about radium valves and the possibility of making them, there is no reason on earth why anyone with a little technical knowledge shouldn't devise a valve worked by radium.

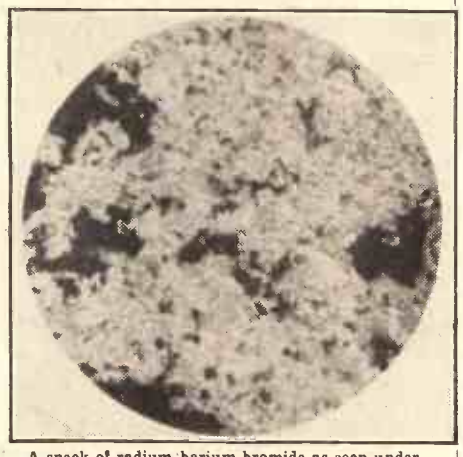
Except one reason, perhaps, and that is a rather formidable one—the shortage of radium.

I feel sure that if you were to forward an order for one or two radium valves to any of the valve manufacturers who advertise in this paper, accompanied, of course, by a decent specification of the sort of thing you wanted, together with (and this would be most necessary) a small fragment of radium, you would receive the valve of your devising within a few weeks' time.

A radium valve, you see, is even now quite a possibility, but its appearance is decidedly not a probability.

I don't think anyone has ever produced

UNDER THE MICROSCOPE



A speck of radium-barium bromide as seen under powerful magnification. Its size is about that of a pin's head, and it will emit electrons for over 2,000 years.

a filament of metallic radium, although I feel sure that such an article could be made.

Suppose, however, that you took any ordinary type of present-day valve and replaced its filament with one made of metallic radium. Well, working on the present price of radium, it would cost you about £125,000 to do so. Nevertheless, having acquired your radium-filament valve, that article should last for 2,500 years in good condition, and for many additional thousands of years as well.

Radium metal and its salts, as you know, are continually shooting off electrons. That is why, if you incorporated a filament of this precious metal or a fragment of one of its salts into a valve, you would have provided an extremely long-lived electron stream.

Rather than devise a valve possessing a radium filament it is much more within the bounds of practical probability to construct a valve which, in place of the usual filament, would have a tiny speck of some radium salt. This would give off electrons in much the same way as radium metal does, and it could be surrounded by a specially devised grid and plate system.

An Uncontrollable Electron Stream.

A valve of this nature would be very much cheaper than a radium-filament valve. In fact, there are many private individuals who would be able to afford a valve of this description in their equipment.

But, apart from this question of price, would a valve operating in virtue of a supply of radium be a practical success?

It would not be a success, and this in no more striking way than for the reason that its electron stream would be quite uncontrollable.

We can at all times control very finely the electron stream of our present-day heat-operated valves simply by varying the filament current; but with any type of valve working on a supply of radium this would be quite impossible.

Radium and its salts emit an electron stream which never varies and which no influence known to mankind is able to control in the least. The radium in a valve would go on emitting almost exactly the same number of electrons second by second, minute by minute, day by day, year by year, century by century. Unless, therefore, you can devise some superior force to control the electron output of radium and its salts you cannot hope for a successful radium valve.

Possibility of Harmful Effects.

Then, again, radium and its preparations are particularly dangerous things to handle. They are much more disastrous to have continually round one than are T.N.T. or dynamite. Continual exposure to even traces of radium rays brings on all kinds of skin diseases, tumours and cancers. There would, indeed, be a lot of trouble in this respect if radium valves became articles of practical importance amongst the home radio user. Fortunately, however, they are not likely to attain that rôle.

The only advantage which a radium valve would hold over any of our present types of valves would consist in its extremely long life—so long that the family valve would become an heirloom to be passed down throughout successive generations for upwards of 2,000 years—and its capability of being operated without any external source of energy such as, for instance, the filament-

(Continued on next page.)

IF VALVES WERE MADE OF RADIUM

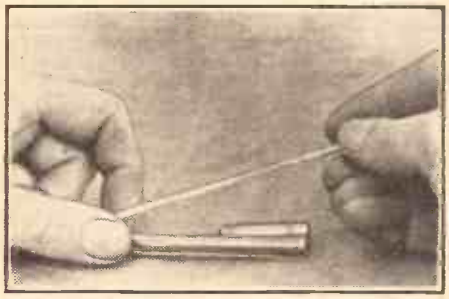
(Continued from previous page.)

heating battery or circuit, which is, of course, quite inseparable from all present-day types of valves.

Whether or not a radium valve, in consequence of its uncontrollable electron stream, would exert any interference effects upon the other parts of the receiver is hard to say. Probably, however, any possible interference of this nature could be dealt with, but it would mean very heavy and careful screening, for radium emits rays which can go through several millimetres thickness of lead with perfect ease, and which are only completely stopped by heavy screens of that metal.

Affect On Other Components.

If your radium valve were not very thoroughly screened from all immediately adjacent objects it would mean that the



This thin quartz tube contains "radium emanation." It has to be kept in the lead-lined nickel case to prevent its rays from causing bodily harm.

latter themselves would become temporarily radio active, which would not be a very welcome state of affairs in a well-ordered receiver. A radio-active choke, a condenser which emitted rays or a resistor which slowly decreased in value until it became a pretty good conductor would spell havoc in any set! There would, without doubt, be the very dickens to pay in the internals of any receiver of known design which went over to radium.

And so, I think, reports of radium valves, however interesting they may appear, are to be regarded with a great sense of proportion. Let modern practical research concentrate itself on the problem of producing reliable present-day valves for sixpence apiece. That, I imagine, would appeal to the heart of the average amateur much more than would the introduction of cheap radium rectifiers at twenty thousand pounds each!

LISTENING IN BED

A reader's report on the "Midget Portable."

To the Editor, POPULAR WIRELESS.

Dear Sir,—In answer to a query of mine re poor reception on medium waves, you were kind enough not only to return the fee, but to write me fully in a most courteous manner.

I am pleased to report that the little set (the "Midget Portable") has given me an immense amount of pleasure, particularly when laid up in bed. Droitwich has, of course, added greatly to its value.

Medium waves I can hardly expect to do much with here, but anyone who wants a little inexpensive set for a sick room could scarcely do better.

My grateful thanks to you.

Yours faithfully, I. T. KEMPE.

Harewood Forest,
Longparish, Hants.

AMPLION FIXED CONDENSERS

AS we have observed on previous occasions, the name "Amplion" is at once identified with a particularly good range of loudspeakers having tradition and a reputation behind them.

But Messrs. Amplion are responsible for other high-class radio components and accessories as well, and this is a fact which constructors in their own interests will do well to remember.

For example, there is a fine range of Amplion fixed condensers of the high-capacity, non-inductive type. That condensers should ever possess inductance still seems to be a source of surprise to readers.

But they do, appreciable inductance, and for this reason: In order to build up a capacity of the order of 1 or 2 microfarads it is necessary in normal constructions (by this we except the electrolytic types) to employ considerable "plate" surfaces.

These plates can be of thin material without affecting the efficiency of an ordinary condenser, so that it is quite possible to pack them into comparatively small spaces.

THE QUESTION OF INDUCTANCE.

Long ribbons of foil constitute a convenient material to use, and an obvious way to facilitate manufacture is to make a sandwich of two strips and a paper insulating strip, cover this sandwich with further insulation and wrap the whole up into a compact bundle.

But clearly, continuous strips of metal foil folded up can be likened to a coil of wire, and can possess what is, in certain circumstances, a quite considerable inductance.

Such circumstances are encountered when high-frequency currents are being dealt with. It can be appreciated that to use a condenser which possesses some appreciable inductance for by passing H.F. currents is like pushing railway lines through a hill

Constructors will notice that the terminals on these Amplion condensers are placed on the mounting lugs—a very practical point.

and not moving the earth away for the passage of the train!

Therefore you can see that there are real needs for condensers of the "non-inductive" type, and that this is far from being a glib phrase used for extolling merely an empty virtue.

In the Amplion range of non-inductive condensers there are 1-mfd., 2-mfd., and 4-mfd. values which retail at 2s. 6d., 3s. 6d. and 5s. 6d. respectively. They are all for 350-volt D.C. working, and so there is a comfortable margin when they are employed in the average mains outfit.

Their use is not necessarily restricted to H.F. circuits. They are, of course, equally suitable for use in L.F. stages, in the smoothing circuits of mains units and sets and so on. The fact that they are of "non-inductive" construction renders them suitable for employment in H.F. circuits as well.

They are very well made condensers, and are built into neat and strong bakelite casings. Constructors will be pleased with the positions of their terminals. These are placed well down towards the bottom for tidy wiring, but are nicely raised above baseboard level to make them easily accessible.

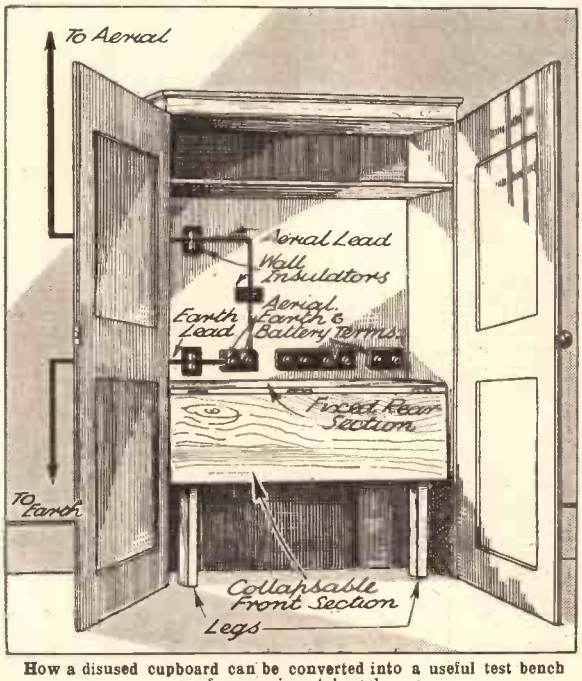
We have both tested and used these Amplion condensers with success. Their actual capacities follow their ratings with inappreciable or no deviation. And we can safely say that they should stand up to their tasks with all the reliability that is attained by other Amplion products.

CONSTRUCTING A TEST BENCH

By A. W. YOUNGMAN.

PRACTICALLY every enthusiastic constructor, irrespective of the type of receiver to be tested, appreciates the necessity for some form of test bench for constructional work and the testing out of a completed set. Those who are fortunate in possessing a fully equipped workshop experience no difficulty in this respect, yet there are undoubtedly vast numbers who have neither space nor facilities for a permanent test bench.

Actually, a receiver of moderate proportions does not require a considerable amount of space for its assembly and initial try-out, and, providing that some form of bench capable of accommodating the receiver is available, the constructor can well afford to be less ambitious so far as anything more elaborate is concerned.



How a disused cupboard can be converted into a useful test bench for experimental work.

A Collapsible Table.

As long as the aerial earth and battery leads are easily accessible, there is no reason why a bench adequately suitable for test purposes should be a fixture, and a very effective and satisfactory arrangement of the collapsible type can be simply devised in almost any odd corner, or, better still, perhaps the interior of a disused cupboard can be adapted. The latter suggestion is illustrated above, where it will be seen that the actual bench top is in two separate parts. The rear section is a permanent fixture, to which the front portion is attached by means of three hinges. To ensure stability whilst construction or testing is in progress, two supports or legs are hinged on the underside of the front portion. The hinges affixed to both the legs and top enable the bench to be neatly and conveniently folded when not required.

It will be noted that the aerial and earth leads are taken to two terminals mounted on an ebonite or wooden block and firmly secured to the rear portion of the bench by small wall insulators. If preferred, these insulators can be efficiently improvised from odd pieces of ebonite and aluminium. See second sketch. The aluminium should be cut and shaped into "L" pieces according to the size required; then bolted to suitably shaped pieces of ebonite with either 4 B.A. or 6 B.A. screws. To prevent the metal from coming into direct contact with the wall, it is advisable to countersink the screws and fix the ebonite by means of separate holes, as shown.

Although the above details suggest a practical means of obtaining an efficient and serviceable test bench, many improvements to assist the convenience of the constructor can be simply effected. In fact, if desired, the rear portion of the bench can be of such a width as to allow sufficient space for the addition of shelves underneath to accommodate the various spare components. In this way the bench top will serve the purpose of a door in keeping the parts dustless.

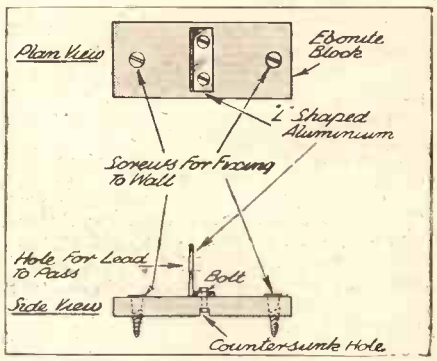
The Power Supply.

In the event of the receiver in question having been designed for battery operation, both the low- and high-tension supply can be kept on one of the shelves with the respective leads connected to a terminal strip permanently fixed to the rear bench top.

Alternatively, this strip can be combined in common with the aerial and earth block previously mentioned.

The constructor will very likely have many personal ideas regarding improvements, but perhaps it would be as well to point out that as the bench is for test purposes, the inclusion of a switch in the negative lead of the H.T. supply will prove exceedingly useful as a means of reducing the possibility of a disagreeable shock whilst various modifications and adjustments are being made in the set. This, together with any other additional fixtures, such as a small lamp or tool rack could be mounted on the rear section of the bench.

A test cupboard of this type is very easily arranged, and it will not matter if your carpentry is not above reproach, for the whole affair is enclosed when not in use.



Details of the insulating blocks for the aerial and earth leads.

MEASURING A.C. VOLTAGE

Technical Jottings of Interest to All.

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

WE are all very familiar with the copper-oxide rectifiers in connection with high-tension and low-tension mains units, and also as incorporated in all electric sets for a similar purpose. In this capacity they are not only simple in operation, but have shown themselves also to be extremely reliable and efficient. It is not generally realised, however, that the copper-oxide rectifier is finding increasing uses in almost all branches of electrical science.

A.C. Instruments.

One of the latest and most interesting of its applications is in connection with alternating-current measuring and indicating instruments. The introduction of these small rectifiers has greatly increased the use of moving-coil instruments for the measurement of alternating currents and voltages.

No doubt most of you are aware of the difference between A.C. and D.C. instruments, or, at any rate, you know that an accurate D.C. instrument is a simpler matter than with A.C. Furthermore, it is always an advantage if an instrument (or any other electrical device, for that matter) can be made universal for A.C. and D.C. You will appreciate that a small rectifier makes any instrument a D.C. one, or rather a D.C. instrument fills all requirements when so equipped with a rectifier.

An Interesting Investigation.

It is not, however, quite so simple as it sounds, for an instrument used with a rectifier in this way is liable to give incorrect readings unless proper precautions are taken. Those of you who are interested in this subject should consult an excellent paper in the October issue of the Journal of the Institution of Electrical Engineers by Dr. E. Hughes on "Copper Oxide Rectifiers in Ammeters and Voltmeters."

L.F. Amplifier Distortion.

Distortion in a low-frequency amplifier may be produced by a variety of causes, although the distortion itself is one of two kinds. In the majority of cases where distortion occurs it is due to too much amplitude at some part or other of the circuit.

Whenever this occurs it means that too great a load is being thrown upon the succeeding valve, and it is unable to handle properly the input that is being offered to it. A rough-and-ready rule on this point is to arrange matters so that the input voltage to any valve is not more than half the grid-bias voltage.

Excessive Amplitude.

Apart from the distortion brought about by excessive amplitude and overloading of valves, there is the distortion which is due to resonance in different parts of the circuit, whereby some frequencies are singled out for greater magnification than others. As a rule, this effect is not very pronounced below about 5,000 cycles, but above this region it may become very noticeable. Resistance-capacity coupling is a favourite dodge for getting over frequency distortion, and certainly works well for the range of frequencies generally used.

Values of Coupling Components.

Talking of resistance-capacity-coupled amplifiers, I should mention that it is important that the proper values be used for the coupling components, otherwise the advantages of the R.C. coupling system, as regards freedom from frequency distortion, will be lost. The anode of the valve in an R.C. coupled stage should receive the maximum voltage which it is rated to stand, and this means arranging the total resistance in the anode circuit accordingly.

Condenser Impedance.

It is important also that the impedance of the coupling condenser should not be too high at the lower end of the frequency range. The impedance should not be greater than about ten per cent of the resistance value of the grid leak. Another point about the coupling condenser is that the insulation should be very good and this means that a mica condenser is preferable, although some of the best types of paper condenser on the market would be suitable.

Energised Speakers.

I am often asked by readers whether there is any great advantage in using a mains-energised loudspeaker or whether the permanent-magnet type is just as good. This is a very difficult question to answer, as it depends so much on what type of mains speaker and what type of permanent-magnet speaker you have in mind.

A few years ago it would have been easy to say that the energised speaker would have the advantage every time, because in those days the permanent-magnet speaker had not been greatly developed. But such great improvements have been made in this during the past two or three years that it is really very hard to say that a good permanent-magnet speaker does not do all that an energised speaker will do—at any rate, in all ordinary circumstances of home use.

Of course, when it comes to power speakers for large halls, cinemas, public-address and open-air work there is no question that an energised speaker is called for. But for ordinary broadcast reception in the home the permanent-magnet speaker has undoubtedly been brought to a pitch of extraordinary perfection.

The Permanent-Magnet Speaker.

Development work has been concentrated on the permanent-magnet speaker because, in the first place, it has the great advantage that it does not require any field current and, secondly, it can now be made very small and compact, both of which features

(*Continued on next page.*)

MEASURING A.C. VOLTAGE

(*Continued from previous page.*)

render it particularly suitable for portable or transportable sets. Since portable or semi-portable sets are becoming so popular, this is a point of great importance.

Power Consumption.

The power consumed in the field of a speaker of the energised type is generally from 3 watts upwards. It may be in the form of ½ amp. or more at 6 volts or 15 m.a. or more at 200 volts, and so on. With A.C. supply, obviously it will be necessary to use a rectifier system, and remember that the voltage output must be sufficient to give the requisite current through the resistance of the speaker field.

This resistance is fixed for any particular instrument, and so you must make certain that your mains unit—or whatever source you use—can develop the required voltage and deliver the required current at that voltage.

Incidentally, there is nothing very critical about the wattage consumed in the speaker field, and it is often better to exceed slightly the rated figure rather than to be on the under side.

High-Frequency Pentode.

The high-frequency pentode is of comparatively recent origin, and many people do not fully appreciate its special advantages. You probably know, however, that it takes precedence now over the screened-grid valve. It seems no time ago since the screened-grid valve was hailed as the greatest thing ever; hardly has the shouting died down before the H.F. pentode comes along and supersedes it.

If we consider the questions of selectivity and stability we shall soon see wherein the advantage of the H.F. pentode lies.

In the first place, the screened-grid valve enables us to a large extent to dispense with reaction, because the "stage gain" of the screened grid is so much greater than that of previous valves. Reaction, although enhancing both sensitivity and selectivity, is very apt to introduce distortion.

The screened grid gets over that particular part, but is itself apt to produce certain kinds of distortion, and, moreover, if the circuit is to be kept free from oscillation and instability generally it is necessary to adjust it very carefully.

Coil Efficiency.

Another important point is this: Latterly great improvements have been made in the design and efficiency of *coils*, but the screened-grid valve has not risen to the occasion, as it were, and enabled the full advantage of this greater coil efficiency to be obtained.

The H.F. pentode has come to the rescue, and with this valve not only is greater amplification obtainable than from the best S.G. valve, but also the circuit does not require that critical adjustment that is often so troublesome with the S.G. valve.

THE TELEVISION REPORT

(*Continued from page* 723.)

written by the Postmaster-General himself, Sir Kingsley Wood, in a recent issue of the "Sunday Chronicle."

"Chief among the features which will make 1935 important will be the introduction of Television. It is not surprising that people accustomed to listening, at the turn of a switch, to music and speech from all parts of the world should now be looking forward to the day as not too far distant when it will be possible to see as well as to hear events taking place far from their firesides. The Television Committee, presided over by Lord Selsdon, has been busily engaged on its labours for some time, and I realise that the public is awaiting its report with the keenest interest. I hope soon to be able to present a report to Parliament.

"This new science is still, of course, in its infancy, and it is true that a vast amount of preparatory work must remain to be done before a public Television service can be inaugurated, but everyone will desire to see this new miracle of man's ingenuity make rapid advance."

The above extracts, which we have garnered from the newspapers during the last few days, will show readers that a good many of the wireless correspondents coincide in their views about the report.

It seems very likely that before you have a chance of reading this article there will be available details of the Committee's Television report, and very soon after that it is more than likely that the Postmaster-General, and Parliament, will make up their minds whether to accept the recommendations in part or in whole.

Whether they do, or do not, it can, we think, be taken for granted that before the end of 1935 Television transmissions will be greatly improved: will be given, perhaps, two or three hours every day; and that—although this is speculative—before the beginning of 1936 London will have its own experimental Television transmitting station.

But at the moment of writing that is all that can be said with any degree of safety. What we have to do now is to "wait and see"!

NEXT WEEK

ALL THE LATEST TELEVISION NEWS

A SPECIAL ARTICLE BY ALAN HUNTER on EMPIRE BROADCASTING

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(Continued from previous page.)

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