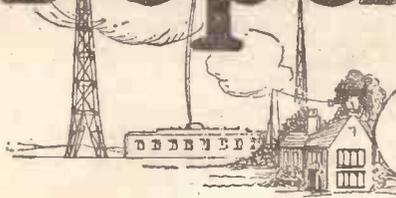
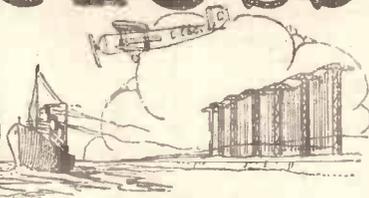


Popular Wireless



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 A. JOHNSON RANDALL.



WHAT ABOUT IT ?
 NEWS FOR YOU.
 TROUBLE IN EDEN.
 GARDEN HINT.

RADIO NOTES & NEWS

LEARNING MORSE.
 WHALES & WAY BACK!
 FREE TICKETS.
 RADIO ON CARS.

Random Thoughts.

STATED baldly, the greatest joke this year was the finding of the buried dinosaur at Tetuan. Wise men from Madrid hurried to examine the treasure and discovered it to be the rusted remains of a haymaking machine! Query: What will the archaeologist of A.D. 5000 make of our "earth" plates? Private deities or hidden loot? By the way, "carbarians" was the happiest misprint perpetrated for years, so much more refined and nace than "roadhogs." Any suggestions for an equally good name for oscillators?

Wide of the Mark.

ONE of my extra special "Sunday fellers," tiring of constantly paraphrasing "Hints on using sandpaper," etc., has stepped into the ring as a musical demigod. He says that, "we cannot be said as a whole to be a musical nation. Any noise that will make us dance seems to do." We certainly cannot correctly be described as a literary nation, for any half-truth, clumsily expressed, which will fill up space "seems to do." He adds that this tends to discourage the production of the perfect loud speaker. As though we were a nation of dancing bears! As though musicians develop loud speakers! Oh, dearie me!

What About It?

WOULD it not be a pleasing gesture if during the stay of the delegates to the Naval Conference the B.B.C. were to devote a programme to each nation represented by our visitors? And better still if these programmes were re-broadcast as widely as the King's speech? In America and France they are past-masters of the graceful touch in hospitality. Must our sole idea be simply to fill them up with food?

Now Line Up and Listen.

LADS, I've news for you! If ever Dame Opportunity came knocking at your door 'tis now. Last year we did our best to keep you in the forefront of radio receiver practice, and if letters are a true index of readers' thoughts it is beyond dispute that we gave results which not only pleased but amazed. Anyhow, we know our

designs were excellent because, you see, we "try them on the dog first."

News of the Month.

BUT "P.W." cannot rest on its old laurels; that is death to journalism but torture to our zippy technical squad. And then, of course, there's you! I spare your blushes, but—well, you are a bunch of live wires, and well "Ariel" knows it!



OXFORD STREET'S BIGGEST BARGAIN.

How often have you read that you should get the best possible aerial? Well, now's your chance to get the old 2 L O masts, which are still in position on the roof of an Oxford Street store, although "2 L O" has removed permanently to its country seat at Brookmans Park. The old masts, each 90 ft. high and weighing 20 tons, are now offered for sale.

So that all things considered you will not be surprised to hear that next week we shall fetch you bang up-to-date in one jump. If any man feels in his bones that he is going to miss next week's number and thereafter yowl in outer darkness, let him straightway rush from the house, emitting cries of alarm, nor cease from running till the order is placed.

The News at Last.

WITH our issue dated March 1st we shall give you four sixpenny blue prints: of This Year's "Magic" Three; This Year's "Titan" Three; The "Regional" Two; and The "Regional" Four. Do we charge two bob for these masterpieces and for "P.W."? No! We accept threepence (no French coins!) merely so as not to lay you under an obligation. The sets are designed to meet present-day conditions and readers who already own "Titans" or "Magics" will doubtless be charmed to know that they will be able to modify them to bring in the latest improvements. Stand back, boys, and don't push!

Trouble in Eden.

ONE would be inclined to think that in Guernsey radio reception would be serene and undefiled, but the answer is of a citrous nature, according to "Dido" of St. Peter Port. On the 5 X X and broadcast band, he says, listening-in is not radio but toothache's young brother, owing to a power station, a tramway and several other leakers of "juice"; hence he has been driven to short waves, and queries whether the P.M.G. ought to sting him for the fee. Of course, our jolly old "Dido" knows that the fee is charged for the operation of a wireless receiver, not for the supply of B.B.C. programmes, the P.M.G. not caring a tinker's whether "Dido" batters on Chamber Music or listens in for Mars.

Correspondents Wanted.

MY valued correspondent, Mr. Alf. W. Mann, 62, Costa Street, Middlesbrough-on-Tees, Yorks, would be pleased to exchange letters with people who are interested in short-wave work, particularly with those resident in Australia, Canada, Africa, Egypt, India and the Philippine Islands. Nationality is immaterial but letters must be written in English. He would like to know the conditions of S.W. reception in those countries, strength of reception of S.W. stations (telegraphy and telephony), type of receiver and type of transmitter used by the correspondent (if any). Many thanks for the

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

gramophone "tip." Short-wave remarks passed to W. L. S. of this paper.

"Ariel's" Gramophone Adventures.

RADIO is playing shuttlecock with me, its opponent being the gramophone. The monotony of the B.B.C. programmes flung me into the clutches of this potted music and now that I am tiring of having to cook the grammy before a slow fire every evening in order to make it work, I am being hurled back on to radio. I see myself on the steep and slippery slope leading to a radio-gramophone. But oh! that is an expensive and risky adventure, methinks. Can the little electric motors in those articles be relied upon to keep an invariable speed? Not so easy!

Garden Hint.

THANKS to this summer-like winter the great god Pan is calling us before his due time and the Dutch bulb merchants, the lawn fertilizer makers and the itinerant gardeners are already pestering me. The fellow next door, a keen listener, has begun to desert the loud speaker for the garden. I tackled him the other day and he amused me by propounding a scheme to conceal a loud speaker in his rockery during the summer. Fancy hearing the cricket scores coming out of the saxifrage! But it's a pretty idea all the same.

One Fallacy—and Another?

IN a contemporary monthly magazine Dr. G. W. O. Howe makes an amusing and good-natured attack on what he calls the fallacy of teaching that the electric and magnetic fields of an electro-magnetic wave are 90 degrees out of phase. He is pleasantly facetious at the expense of Sir A. Fleming, Capt. P. P. Eekersley and others, and I am therefore emboldened to enquire whether his explanation of the state of affairs "when a wave is passing any point on the surface of the earth" does not enshrine another fallacy—since we are so mighty particular! The question is, "Can an electro-magnetic wave pass a point?" That's all! The doctor can tell us.

Plans in Ireland.

THE Free State Government has okayed (effect of "talkies") the plans of the Irish Post Office for the erection of a high-power broadcasting station. Somewhere about the centre of the country, say near Athlone, is expected to be the site of this station, which will cost anything from £50,000 to £70,000. The rumour that G. B. Shaw is to be its chief announcer is patently absurd; if he made himself so cheap the stream of strange Americans to his door would drop to the veriest trickle.

The Advertising Question.

A REVIEW of the press shows that the idea of augmenting the B.B.C.'s revenue by the sale of transmission time to advertisers is not so abhorrent to the majority as its opponents would like. I do not see that a few programmes a week sponsored by some of our great business firms and newspapers would lessen the dignity, the utility, or the delectability of British broadcasting. I think that precisely the reverse would result. Even the holy Post Office condescends to accept adver-

tisements. Even a saint must eat—unless he would be a dead saint.

Learning Morse.

I HAVE frequently pointed out how greatly the fun derivable from a radio receiver is increased by the ability of the listener to read the signals transmitted by radio stations in the Morse Code. Such ability opens to the listener the sphere of the ether used by ships, shore stations, aircraft, lightships, and so forth, to say nothing of the hundreds of amateur transmitters all over the world. But how to gain the desired facility in aural Morse-reading? That is the question put by R. J. G. (Brockley).

Two Suggestions.

IF the cash be available, why not invest in the gramophone records which were made years ago, under the direction of the Marconi people, for the training of wireless operators? These give specimens

SHORT WAVES

OBVIOUSLY.

When the microphone broke down at a Continental broadcast, a temporary one was made from the speaker's bowler, I read. He talked through his hat for once.—"Sunday Pictorial."

Complaint is made that the B.B.C. recently gave millions of listeners "a half-hour's reading from Thucydides, without any alternative."

Magistrates sometimes find it necessary to give seven days without the option; but this does seem a bit harsh.—"Birmingham Gazette and Express."

"The Bath Surveying Committee yesterday reported an application from a company to install a new system of wireless for all," we read in the "Western Daily Press."

The old-time habit of singing in the bath will thus, we presume, be completely replaced by music from portable sets.

Ex-Convict's Broadcast.—He should enjoy giving a few sentences.—"Daily Mirror."

"It may be that many people receive wireless sets as Christmas or birthday presents," we read.

We thought there must be some explanation.

WHAT! NO NOISE?

A lady living in Portland Place writes to complain that she is unable to sleep owing to the noise the B.B.C. make in constructing their new building. This seems unreasonable, for it is surely the B.B.C.'s function to make as much noise as possible on every occasion.—"Vox."

POSTSCRIPT.

"No, thank you," said the little boy, asked whether he would have a second helping of pudding. "Closing down now until four-thirty."—"Daily Herald."

of Morse sending which can be run off at varying speeds and include realistic records of "jamming" by other stations. A cheaper, and possibly better, method is to set up a simple circuit containing a high-note buzzer, dry cell and Morse-sending key and to collaborate with a friend who can transmit Morse. The whole business can then be done on a small table, one man sending, the other panting after him with pencil and paper. Great and useful fun!

An Indian Tragedy.

SO the Indian Broadcasting Company is to close its shutters! This will be more than a pity, it will be a tragic event, though that may not be understood by people who do not understand India. The commercial interests behind the scene have tried to carry on, despite tremendous

difficulties and heavy losses, and nothing but praise is due to them, unless it be sympathy. No Government subsidy is forthcoming, and so the service must stop. I believe that if Germany wore our Indian shoes she would cheerfully—and wisely—run the stations at State expense, and use them for propaganda. Don't we need something of the sort in India just now?

Whales—and the Way Back.

I HAVE just read an account of the technique of whale-catching, which goes to show how superlatively useful are the wireless telephone and direction-finding sets which are fitted on many of the whalers. It seems that when the "blow" of a whale is sighted the whaler steers for it. The whale then playfully dives and comes up again in another place, the ship having to alter its course again. This goes on for as many as 20 or 30 rounds, so that by the time the whale is secured the ship has very little idea where she is or where her base lies. Radio puts her right in a very few minutes.

Free Concert Tickets.

COUPLES, young, old or medium, who like music may be pleased to know that free tickets (admitting two) for the last few B.B.C. concerts of contemporary music held at the Central Hall, Westminster, can be obtained by applying to the Music Department, B.B.C., Savoy Hill, enclosing a stamped and addressed envelope. The concerts are to take place on March 3rd, April 7th, and May 5th.

Gleanings.

ON January 1st the number of licences issued in Germany amounted to 3,066,682.

The Spanish Government is to put up for auction the monopoly for broadcasting in Spain.

Dr. Alexander, the well-known American radio engineer, has succeeded in communicating over a distance of 3,000 miles on a wave-length of 3 metres.

It is rumoured that the 100 kilowatts station at Moscow (938 metres) is to be promoted to 300 kilowatts.

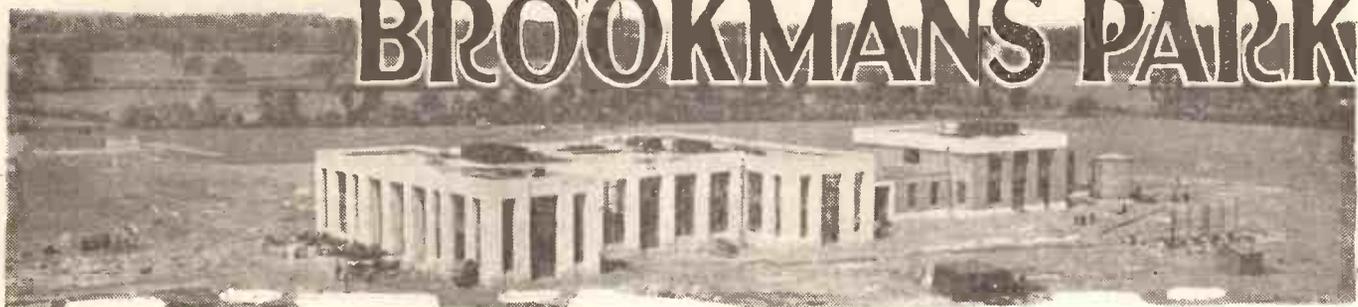
More Free Licences?

THE suggestion by Mr. P. Oliver, M.P., that free licences should be issued to persons who are permanently bed-ridden does not appeal to me as it stands. On what conception is it based? Should an invalid who is not financially embarrassed be exempt from paying his way? If so, why? And if a poor person is to listen tax free, why should he not also have free postage stamps and free telephone service? Let us be humanitarian, but not sloppy in thought. The blind, as I have said before, stand in a class apart.

Radio Sets on Cars.

IT is important that you should know that if you wish to take your Rolls-Royce to France you may fit it with a radio receiver, but must pay the Customs duties on the set; these, for British sets, are 22 per cent *ad valorem*. You must pay also the luxury tax if your set is valued at more than 700 francs, and if the loud speaker is valued at more than 200 there is a similar tax on that. Moreover, when you take the apparatus out of France the taxes will not be refunded.

FOUR MILES FROM BROOKMANS PARK



THERE was naturally quite a little local excitement among the residents of South Hertfordshire when it was known that the first Regional station of the B.B.C. was to be erected just inside the boundary between Hertfordshire and Middlesex.

Widespread Consternation.

On both sides of that border large numbers of listeners were wondering what would happen to their reception when the new giant station started on the air. St. Albans, Hatfield, Enfield, Finchley, Barnet, Watford, and Harrow, were distinctly worried. Personally, I welcomed the station, because I knew that at about four to four and a half miles from Brookmans Park we should be far enough away to avoid complete and hopeless swamping and wipe out, and at the same time near enough to enable us to get perfect quality with even the smallest of aerials and without elaborate receivers.

Such indeed has proved to be the case, and far from making us regret its appearance Brookmans Park has proved a very welcome station. Of course, with a high-power station, especially one working with two waves, as near as four and a half miles away, one cannot play any sort of tricks with one's receiver.

One has to decide very definitely whether the local alternative programmes, or distant programmes such as Oslo, Langenberg, Toulouse, etc., are most required, and for the average set the best compromise has been the use of two aerials. This sounds rather dreadful, I know, but unless one is prepared to go in for a couple of H.F. stages, one cannot expect any great degree of selectivity, and certainly no hope of cutting out Brookmans Park at four and a half miles, unless some little "wangle" is indulged in in order to increase the selectivity of the set.

Many Methods Available.

There are many ways of doing this; one is to use a rejector and to "trap" the unwanted programme, but in the case of Brookmans Park one has to use two "traps" such as the Twin Rejector, recently published in this journal. Or one can have several tuned circuits to achieve the operation, together with added complications in the tuning-in of foreigners.

But best of all, one can use a large aerial and a small aerial and a double-wave rejector. With the Brookmans Rejector designed by the "P.W." Research Department, one is enabled completely to cut out the Brook-

Here are some personal experiences of reception from the new London Regional Station. This double programme transmitter has excited a great deal of comment, and much feverish set redesigning has taken place in endeavours to "cut out the local." But even if you live almost "on the doorstep" of the new Regional station there is no need to despair, as is shown by the experiences given in this article.

By K. D. ROGERS.

mans Park transmissions, or alternatively by means of a switch, to cut out the wave-trap and receive the local station.

Now with a big aerial, at the distance which I am from Brookmans Park, the cutting out with the wave-trap is perfectly simple, but the switching in by means of switching out the rejector is a far too drastic reversion, because on a small set which is of only reasonable selectivity Brookmans Park immediately swamps everything.

One has to detune and volume control and all the rest of it in order to cut down the strength to a reasonable degree, while

right strength on which ever transmission you want to listen to, but this is troublesome and tricky.

The rejector completely "out" makes the signal too strong, and completely "in" washes it out altogether. If one tries to go between the two, it means readjusting the wave-trap every time one wants either one of the transmissions or a distant station.

A Simple Arrangement.

That is the state of affairs near St. Albans. A little further away, of course, one can switch the rejector right out, or that section of the rejector cutting out the signal you require, and get perfectly good reception. Here we are a little too close for that, so I have made use of the following scheme, which I advise anybody who is really close to Brookmans Park to try.

The ordinary aerial comes into the room close to the set. That aerial, in conjunction with the double rejector, is used solely for the reception of stations *other than Brookmans Park*. The wave-trap is set to wash out both transmissions of Brookmans Park and is left set.

By means of a crocodile clip and a couple of terminals either this aerial and its wave-trap, or another smaller aerial and no wave-trap is connected to the aerial terminal of the set.

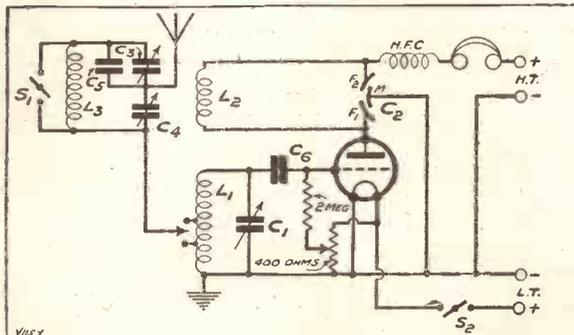
The Small Aerial.

The second aerial is a piece of wire, 3 ft. long (the length of course will have to vary from about 3 to 6 ft. or so, according to your proximity to the local station and the strength at which you want to receive from it), running alongside and touching, but insulated from, the main aerial.

This is quite sufficient to pick up at really loud strength the local station, and imparts quite adequate selectivity to the set, which enables you to go from the high- to the low-wave transmission of Brookmans Park with no bother of any rejector adjustment, detuning, or other messing about with the set.

When you want distant stations, you plug in the big aerial with the wave-trap in series with it, and you can then tune in Toulouse, Langenberg, Milan, Oslo, etc., quite regardless of the presence of Brookmans Park just over the other side of the hill.

SOLVING THE REGIONAL PROBLEM.



In this set—"Reg the Nat"—the Brookmans Park Rejector is included in the circuit and is tunable from the panel, enabling any degree of elimination to be obtained. This enables the listener living within a few miles of Brookmans Park to get either one or other of the transmissions perfectly free from interference, and the high degree of selectivity of the set enables searching for foreign stations to be carried out over a wide wave-length band.

on the switching out of a single rejector, of course, both transmissions come in.

With a double rejector one can tune one transmission or another quite well by manipulating the switches and slightly detuning the rejector in order to get the

LATEST BROADCASTING NEWS.

BIRMINGHAM INVADES LONDON.**CAPTAIN KETTLE ON THE AIR—LIFE ON A LIGHTHOUSE—WALES v. IRELAND, etc., etc.**

NOW that 5 G B programmes are also being radiated by one of the twin transmitters at Brookmans Park the officials at Savoy Hill have turned their attention to making improvements in the type of material hitherto broadcast to Midland listeners so as to make it of much wider general as well as of local interest.

With this end in view the Birmingham station has been made responsible for a weekly feature programme of the lighter type, and Mr. Charles Brewer, to whose credit there are several radio revues, will undertake the duties of arranging it.

His next production will be an entertainment called "Brighter Broadcasting," which will be heard on Wednesday, March 5th, with Anona Winn, Edith James, Alfred Butler, Charles Herbert, Clapham and Dwyer, and Jack Venables and George Barker, who will be in the cast.

Captain Kettle on the Air.

"The Frying Pan," a Captain Kettle adventure by Mr. Cutcliffe Hyne, which has been dramatised for broadcasting under the title of "Salving a Derelict," is included in the London Regional programme for Thursday, March 6th. It depicts the renowned "Captain" in the public room of a "Fonda" in a small seaport with his shipwrecked crew, "a collection of the sweepings of South American seaports, as fine a lot of gaolbirds as one can imagine." The play will be produced by Mr. Howard Rose.

Life on a Lighthouse.

One of the most interesting in the series of talks on "My Day's Work" promises to be that one arranged for Saturday, March 8th, when Mr. A. Pearn, keeper of the Eddystone Lighthouse, will describe some of the experiences which befall men who, like himself, are almost forgotten in the lonely towers round and about our coasts.

Tribute to Mrs. Pankhurst.

Victoria Tower Gardens, adjoining the Houses of Parliament, will be the scene of an interesting ceremony on Thursday, March 6th, when a memorial is to be unveiled to Mrs. Pankhurst, of Suffragette fame. The ceremony, which will include speeches by Mr. Stanley Baldwin and Mrs. Drummond, will be broadcast from 2 L O and other stations.

"A Canadian in Bristol."

The first Canadian Shopping Week in England has been arranged to take place in Bristol, beginning on Monday, March 3rd, and broadcasting is contributing its share in calling attention to a well-merited effort to popularise the produce of our Dominion by including a special talk in the Cardiff programmes on the opening day of the week.

This talk will be given by Mr. Douglas S.

Cole, a graduate of the McGill University, Montreal, who has had extensive business experience not only in his own country and in the United States of America, but also on this side of the Atlantic.

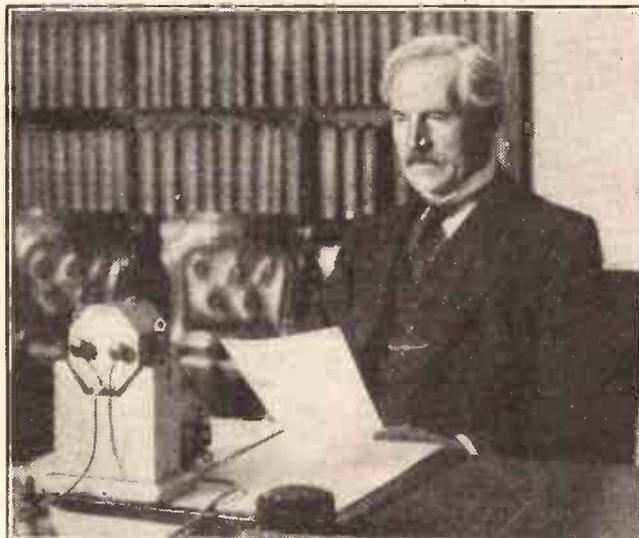
Mr. Cole has titled his talk "A Canadian in Bristol," but no doubt he will refer to several competitions which have been arranged in connection with the Shopping Week, one of which is a free trip to any part of Canada or its equivalent in cash.

Wales v. Ireland.

London and Daventry (5 X X), as well as other stations, including, of course, Cardiff and Swansea, are to broadcast a

running commentary on the International Rugby football match between Wales and Ireland which is to take place on St. Helen's Ground, Swansea, on Saturday afternoon, March 8th. This will be the thirty-ninth struggle between teams representing Ireland and Wales.

Although the Principality has come off best on twenty-three occasions, one game, that played in Belfast last year, having been drawn, a keen game is anticipated, and the task of describing the contest could not be given to a better commentator than Capt. H. B. T. Wakelam, whose voice is now as well known to listeners as any regular broadcaster.

THE MICROPHONE AS DIPLOMAT.

More and more the statesmen of the world are realising that the microphone affords incomparable assistance in establishing friendly relations between the nations. Here is the British Prime Minister with the microphone that linked him by radio to millions of listeners in the U.S.A., to whom he gave an account of the London Naval Conference.

Sutton-Coldfield Broadcasts.

The 5 G B microphone on Tuesday, March 4th, is to take a trip to the Town Hall at Sutton-Coldfield in order that listeners may hear part of the second of the three concerts which the local music committee has arranged for the populace of that ancient borough.

A thoroughly popular orchestral programme has been arranged, in which the Birmingham Studio Orchestra, conducted by Harold Gray and Joseph Lewis, will contribute a number of items, Keith Falkner, the well-known baritone, being the vocalist.

FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events.
By PHILEMON.

(Who is deputising for Mr. Cecil Lewis while the latter is in America.)

Sherlock Holmes.

MISS GLADYS MANN gave a talk on "Eat More Fish," and the official programme contained a full-column advertisement anonymously advertising "Eat More Fried Fish." Our local sleuthhound said to me, "The fishmongers have got hold of the B.B.C. It is the tail end of the cod," meaning, I suppose, the thin end of the wedge. "Mark my words," he said, "next week we shall have a lecture on Milton telling us that Paradise would be lost without it!" A humorous fellow!

Compliments Flying!

Suggia, of course, was superb. But why did the announcer publicly express the thanks of the world to her when she had finished? That is a very awkward precedent. Why not a "vote of thanks" to Miss Mann for her talk on "Fish"? Or to the players who gave such a fine rendering of "Pompey the Great"? Why only to Suggia? Well, I suppose, because she is

Suggia. But that smacks horribly of snobbery.

I Give It Up.

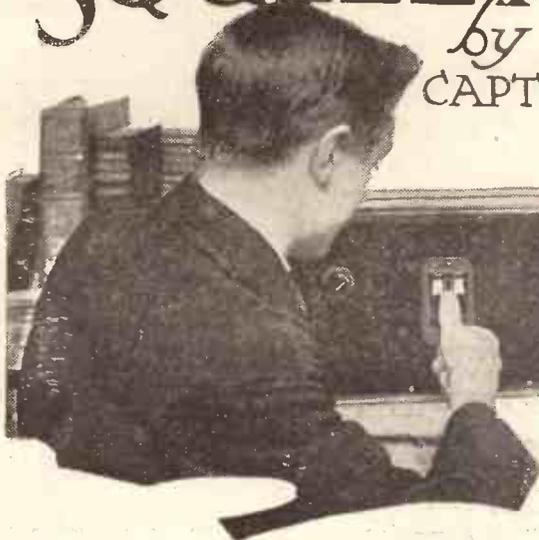
The conundrum of this modern music, I mean. I cannot make head or tail of it. Honegger's "Rugby," being a musical impression of a Rugby match, knocked me out as completely as if I'd been standing up to Carnera. From the title of Stravinsky's "Nuptials" I expected moments at least of something melodious and tender; but it sounded like a Zeppelin raid outside a tinsmith's shop, with the Wireless Chorus screaming at the tops of their voices for help!

It is all too subtle for me. I can only hope that our young English composers will make something more like music out of these modern experiments. William Walton, for example, whose Sinfonia at the last Symphony Concert was understandable enough and quite jolly.

(Continued on page 1222.)

SQUEEZING IN STATIONS

by
CAPT. P.P. ECKERSLEY M.I.E.E.



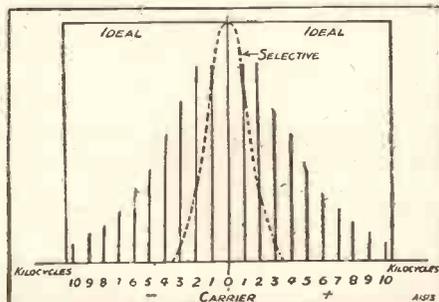
PART II.

In this second article our popular Radio Consultant-in-Chief, dealing with the problem of the overcrowded ether, looks at it from the station-designer's point of view. His clear, authoritative and interesting exposition lays bare the fundamental facts of an otherwise rather obscure situation.

IN my previous article I showed that every station transmits side-bands when the currents in the aerial are modulated in intensity. Thus, if we have a frequency of steady transmitting aerial current of frequency (n) and alter the intensity of these currents at a lower frequency, n1, then the aerial radiates three frequencies simultaneously, namely one of n periods per second, another of n+n1, and a third of frequency n-n1. In effect, we radiate three

wave-lengths, $\lambda_1 = \frac{c}{n}$, $\lambda_2 = \frac{c}{n+n_1}$, $\lambda_3 = \frac{c}{n-n_1}$.

A picture which I reproduce in Fig. 1 shows the intensity of the total disturbances



The ideal response would be flat-topped, as shown, and the dotted line, representing a selective receiver, shows how far from ideal such a set can be.

of various frequencies of a broadcasting station at some instant of full modulation. The full line in Fig. 1 shows the ideal response curve of a receiver designed to include all the side-bands and so get a true sound picture of the original.

A Special Receiver.

If, as is shown by another dotted line, the receiver response curve is such that it does not include the full spectrum, that receiver may be very selective, but it does not do justice to the relative intensities of the transmitted spectrum.

But it has been bruited abroad that possibly a special receiver might be able to dispense with the necessity of receiving the spectrum and it might receive only the pure varying amplitude of the carrier-wave if it was designed to do so, and yet give good quality.

The argument is that up to now selec-

tivity has only been obtained by making a circuit of very low damping. If such a circuit is asked to change its amplitude of response very quickly it has so much electrical inertia that it refuses. It can only change amplitude relatively slowly.

This would be another way of saying that it would only reproduce bass, or as our theory has it, it cuts off upper side-bands. But, and so it is said that, if we could only make a circuit of very narrow response but of high damping we could receive only a narrow band of the spectrum, but rely only upon the amplitude change of the carrier-wave to give us a sympathetic response in our receiver. *It would be, in fact, unnecessary to receive side-bands.*

But, even if this were true, we should still have to face another problem, because what is the good of having such a receiver if transmitting stations still emit side-bands? Because if we start pushing stations close together, their spectra will all get muddled up and the ultra-selective receiver cannot be so clever as to receive nothing on any wave-length and still give something!

For instance, supposing, thanks to this ultra-selective receiver, we tried pushing 5 G B and Langenberg 3 kilocycles apart; then we sit on 5 G B's exact carrier-wave frequency with our special receiver. We assume we hear something. Langenberg gets modulated by a 3,000-cycle note. This falls on the carrier-wave of 5 G B, and it must be heard even as an amplitude.

If it were unnecessary to receive side-bands, however, it would be unnecessary to transmit them. So our invention has just got to see, above all things, that the transmitter is stopped sending side-

bands. Then we can get on with the problem of reception.

Apart from the fact that low damping does not stop response at high frequencies, there are all sorts of fallacies in thinking that we can get pure amplitude modulation or response. If without going into too much detail we want to prove this, get a high-frequency amplifier of twenty stages of high frequency; don't magnify more than 1.1, about, times per stage, just to overcome losses and then listen to the resulting quality.

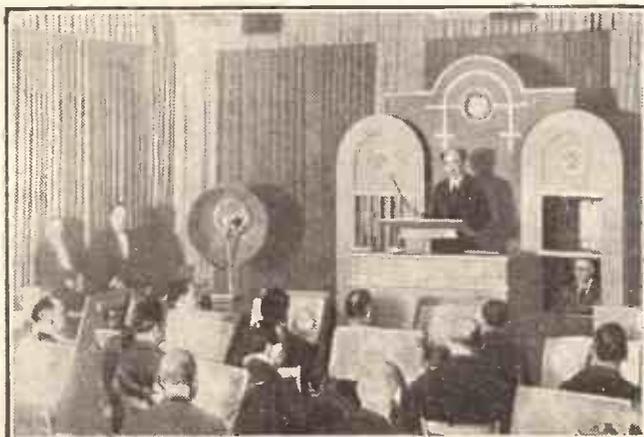
Other Ideas.

You do not have a single low-damped circuit in the whole outfit, and yet you will get no "top." And, if you put on a tipped-up low-frequency system at the end, you will find it just the same as a receiver with a wide response curve.

But there have been other ideas and the most persistent is that, instead of using amplitude response, you should use frequency modulation. Imagine that you have an ordinary transmitter with a master drive as a crystal. Now that crystal will change its frequency of fundamental oscillation according to the voltage impressed upon it.

(Continued on next page.)

ACHTUNG! HIER HAMBURG!

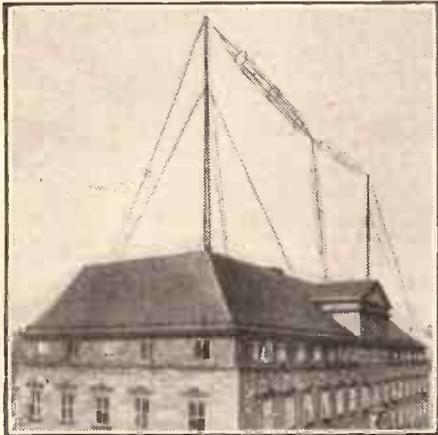


One of our most popular and powerful Continental "neighbours" is Hamburg, and here Felix Weingartner is shown conducting in one of the studios.

SQUEEZING IN STATIONS.

(Continued from previous page.)

So get a microphone and put the output of the microphone on the oscillating crystal. Play a note of 1,000, into the microphone. This makes the crystal change its frequency



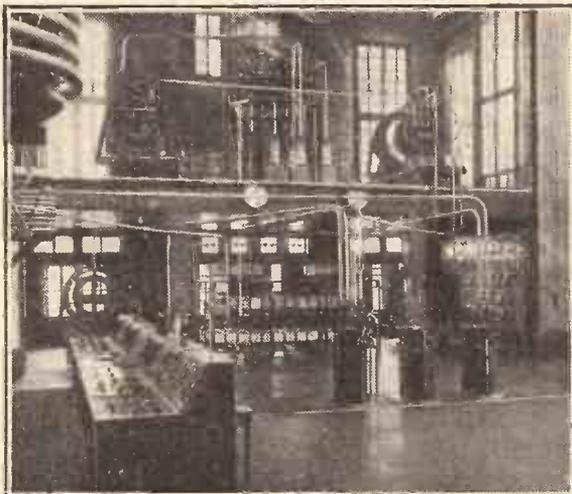
The Oslo station employs the mighty power of 60 kw., and gets over in fine style.

from, say, a million to a million plus five thousand, a thousand times a second. Then the frequency of the transmitter which we will say is a million is changed to a million five thousand and back to a million one thousand times a second.

There Must Be Side-Bands.

If you have a receiver with a sharp tuning curve it gives a response of, say, 10 units to the transmitter vibrations of a million a second, but 5 units to a million and five thousand and so, as our transmitter changes frequency one thousand times a second, so the receiver changes its response a thousand times a second, and we eventually hear the thousand note originally played into the microphone.

Surely, say the protagonists of frequency modulation (before you can interrupt and say it does), this creates no side-bands and you can have very selective receivers,



Here is the Rome transmitter. The new Rome station uses 50 kw. of power.

because the sine qua non of reception is a steep-sided response curve so that the response of the receiver shall change as much as possible with frequency.

The latter is true, the former is not. Frequency modulation does produce side-bands (as Carson proved in a paper written in 1916, and as Van der Pol has shown in a recent paper). So if you produce side-bands you must separate stations by a given amount, and your problem is still unsolved.

No Royal Road.

Indeed, and in the end we may as well face it, there is no royal road to a solution. It behoves everyone to partition up the ether according to the needs and importance of the claimant services, it behoves quiet and patient technicians to work on the basis of fact to do their best with things as they are.

Of course I dare not say that perhaps there is not some quantitative value in these new thoughts; they should not be too airily dismissed. Theoretical analysis sometimes leaves out an important quantitative practical fact. I would say that frequency modulation deserves a deeper study purely on quantitative and practical considerations. Good luck to those who won't be content with things as they are, but let us be terribly sure of all facts before we trumpet our own pet revolutions.

PRACTICAL HINTS.

The ordinary dry battery for flash lamps consists of three 1½-volt units connected in series, the total voltage thus being 4½.

The dry cells used for flash lamps are quite satisfactory as H.T. batteries for a two-valve set, but when a large power valve is employed these small cells are incapable of supplying the amount of current required.

Amongst the little-known cures for threshold howl (and one that is well worth trying) is to insert an H.F. choke between the grid of the L.F. valve and the transformer secondary.

Where H.F. currents appear to be getting through into the L.F. stages, it is often well worth while disconnecting the grid terminal from its wiring and inserting a grid leak at this position as an H.F. stopper.

REINARTZ REACTION.

A very large proportion of troubles with the reaction control on a Reinartz type of receiver is due to the use of unsuitable or unsatisfactory H.F. chokes.

Middle C on the average piano represents a sound wave with a frequency of 256 per second, the lowest note on the piano having a frequency of 26.6, and the highest note 3,413.3.

Raising the value of a grid leak in a short-wave set is one way of increasing sensitivity.

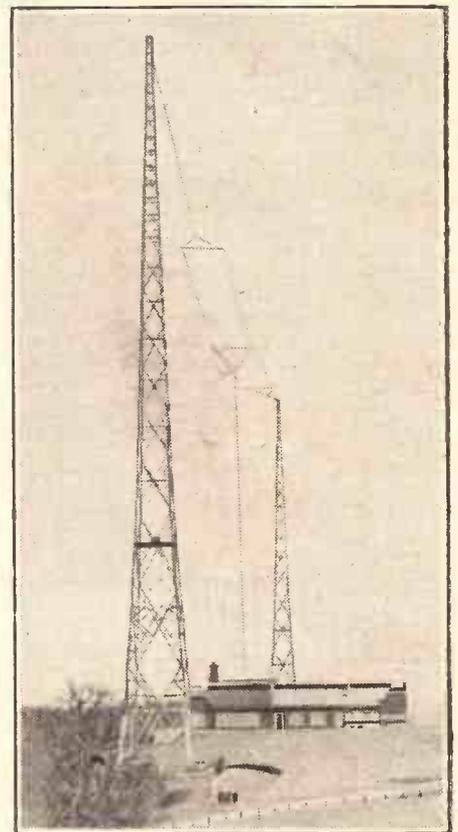
Although in the ordinary broadcast receiver the values

of grid condenser and leak are .0003 mfd. and 2 megohms, in a short-wave set .0001 mfd. and up to 10 megohms will be found to give better results.

FOR STAINING WOODWORK.

AS every amateur is aware, a few crystals of potassium permanganate dissolved in a cupful of water provide a cheap and simple stain for all kinds of woodwork, and particularly for the purpose of colouring the baseboards and woodwork of pieces of experimental apparatus.

Permanganate solutions quickly destroy the bristles of brushes, and, therefore, they should be applied to the woodwork by means of a piece of flannel. If required, two or three applications of the stain may be given



The lone towers of Langenberg.

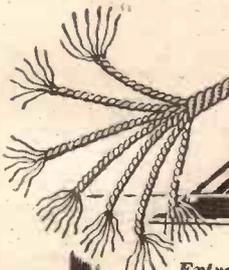
to the woodwork in order for it to reach any desired depth of colour.

Permanganate-stained woodwork is capable of taking a good polish if, after it has been given ample time to dry thoroughly, it is rubbed over with a rag moistened with raw linseed oil.

When working with permanganate stains the fingers invariably acquire a deep brown, and sometimes an almost black discoloration. This, however, may readily be removed by rubbing the hands over with a few crystals of sulphite of soda moistened with a little warm water. Photographer's "Hypo," acidified with vinegar, will also act in the same manner.

RESULTS PROVE!

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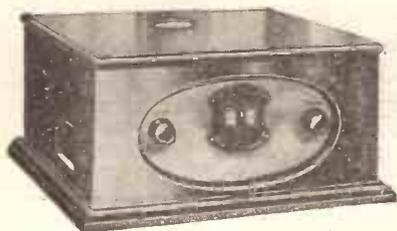
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SHORT-WAVE NOTES.

By W. L. S.

THE main event of the last week was the advent of an enormous crop of correspondence on the subject of G 2 G N and the “Olympic.” I have had letters from over fifty readers who were good enough to send me information on this subject, but only about four of them agree in any detail.

G 2 G N's wave-length is between 33 and 34 metres, although two or three readers appear to have been receiving his second harmonic just below 17 metres quite well. He also works occasionally on 24 or 25 metres, but most of the reports of reception are on the 34-metre wave-length.

He works with G 2 A A, W O O, Rugby, and F 8 B Z, Paris. One correspondent mentions G 2 G N's liking for a book about

situated for short-wave broadcast out in N.Z., as he reports reception of 17 Australians, 10 U.S.A., 5 Japan, 2 ships, and 29 Foreign short-wavers!

Including amateurs, he has logged 219 telephony stations. Two American amateurs were logged on telephony in the 80-metre amateur band. Now they are licensed for telephony on 20 metres this number ought to increase rapidly.

Sydney Audible Again.

No, “Seakew,” you will not hear any British phone stations on 80 metres, as they are not licensed for that wave-length at all. Many thanks for all the interesting information, and I should like to arrange a test with you myself some day.

Sydney is audible again in the afternoons if one strikes the right time. Two or three readers have heard him between 1.30 and 4 p.m., round about 31 metres, and at quite good strength. As I can generally listen at that time only on Sundays, when he isn't on, I must rely upon outside information on this subject.

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criminals, judging from excerpts read at various times; he wishes he would read on when it is getting interesting, instead of suddenly changing the subject.

One or two readers have also noticed the station on 17 and 32 metres that always appears to be broadcasting a tuning note! I have often heard him myself, but it is news to me that if one waits long enough it turns out to be Drummondville, Quebec. “R. W. S.” in particular mentions this, and adds that although P C J has lost nearly all his punch, nowadays, the conditions above 30 metres are steadily improving.

The Best Short-Waver.

I agree, “R. W. S.” Just listen round about 49 metres late one night to the little bunch of Americans and see what you think about conditions.

At times, nowadays, the Pittsburg station on 62.5 metres appears to be the best of all the short-wave broadcast stations. It is getting quite like old times, when K D K A used to come through on that wave, generally completely spoilt by fading.

I also have to acknowledge an interesting letter from Mr. Churton, of Auckland, N.Z., whose house bears the appropriate name of “Seakew”! They are, apparently, well

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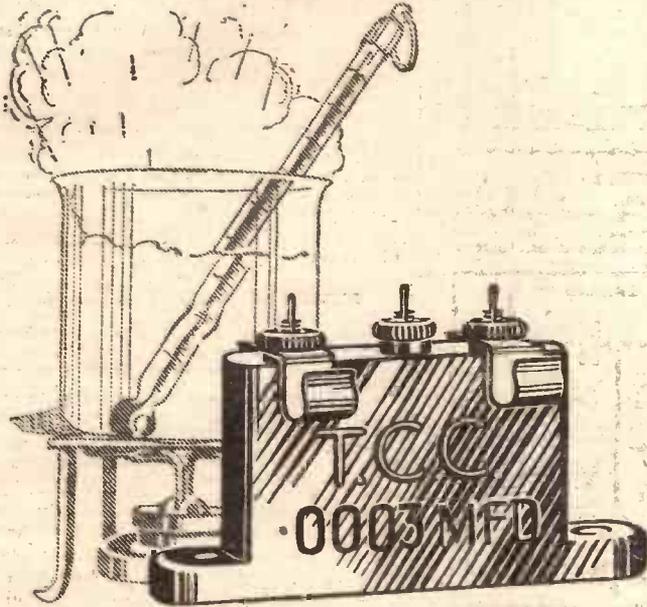
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STANDARDS



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THE "MAGIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thank you for the queries form received recently. I wrote to you in connection with my "Magic" Three which was giving very poor results. Afterwards I bought a new X coil, the best I could get, and on putting it into the "Magic" I could hardly believe my ears.

5 G B, which before took quite a lot of reaction to bring it up to good power, now comes in without any reaction at all, and has to be cut down on the volume control. Stations come in all round the dial. It is the finest three I have ever heard.

I am now going to build the "Four."

Yours faithfully,

Ealing.

C. H. L. GUNTH.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read with interest the many good reports regarding the performance of the "Magic" Three, and am surprised that so little mention is made of this set's efficiency and ease of handling on short waves. In addition to many French and German amateurs, I regularly receive several American stations, including Pittsburg (W 8 X K), Richmond Hill, N.Y. (W 2 X E), and Schenectady (W 2 X A F), using a .0003 fixed condenser in series with the variable, and a 5-megohm grid leak in place of the usual 2-megohm leak. For headphone work I find it an improvement to substitute an H.F. choke for the 25,000-ohm "antimob" resistance.

Thanking you for such a fine circuit.

Yours faithfully

Near Reading.

N. W. D. CHANDLER.

WHAT A DIFFERENCE!

The Editor, POPULAR WIRELESS.

Dear Sir,—I thank you for your information with regard to the "Titan" Three. While looking through some back numbers of your paper, I came across an article in the "Radiatorial" section, which emphasized the importance of spacing the components with the use of the scale, and so thinking perhaps this had some effect on the working of my set, I took it to pieces, and rebuilt it to the scale provided with the print, and was surprised what a difference it made. The foreign stations now come in louder, and there is a distinct improvement on 5 G B and London; but I will, as you suggest, improve my aerial. I am now a regular reader of the POPULAR WIRELESS, and have gathered many useful hints from it, and hope that it will continue to be as interesting and helpful as it is now.

Yours faithfully,

Southsea.

T. WILKINS.

CORRESPONDENCE.

The "MAGIC" THREE.

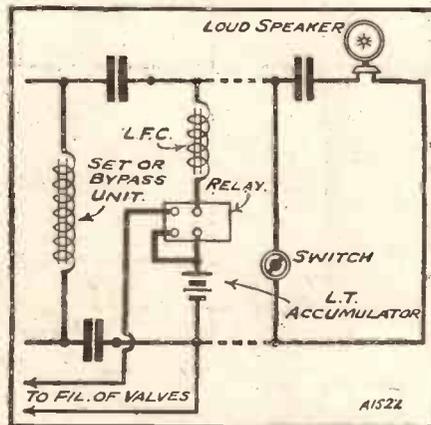
STILL ANOTHER SELECTION FROM THE HOSTS OF LETTERS FROM READERS WHO HAVE BUILT THIS REMARKABLE RECEIVER.

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

DISTANT TUNING.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having read your interesting article on "Distant Tuning," I am sending a diagram of this with a slight alteration in the connections, thereby



dispensing with the dry battery and using the ordinary L.T. battery of the set in its place.

Trusting you will give this your kind consideration. I am, yours faithfully,

Hornsea.

MAURICE SCHOTT.

A MAGIC SERIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having constructed for my own use the "Magic" Three and the H.F. unit (which I used in conjunction with the "Magic" Three) it is only fair to state that I found these so efficient that I immediately constructed the "Magic" Four out of the parts they contained. The "Magic" Three alone is a wonderful receiver, and when the H.F. unit was placed with it, was more wonderful still. Absolutely stable and selective. But living in a district closed in by mountains on all sides I consider the "Magic" Four the ideal set for the abnormal conditions. I have built many sets from time to time; but consider the "Magic" series better than any of them. The "Magic" Four, or "Magic" Three and H.F. unit, are the only sets which in this area can safely be said to bring in Cardiff at anything like enjoyable volume and clearness.

Yours faithfully,

C. D. HUTCHINSON.

Glamorgan.

BROOKMANS PARK CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—It gives me great pleasure to send you my very best thanks for the results I am getting from your unique circuit in the Brookmans Park Crystal Set.

Up to the time that you published this circuit I was puzzled to know, being a mug, I suppose, how I could get 2 L.O. or any other station for that matter, on a crystal set. For each one tried, and I tried a few, was a dud. Not even a crackle in the crystal was heard. Then comes this little set of yours, and, by Jove, it is wonderful. Not only do I get the two transmissions from "B.P.," but I also get 5 G B at quite good strength, thus shall I get the choice of three concerts when all are in full swing.

I built the set exactly as given in "P.W.," and I must say the results are great. I might add that, at this distance from "B.P.," the two transmissions are quite easy to divide and tune, if the dial of the condenser is used when tuning.

With renewed thanks,

I remain yours faithfully,

E. C. WICKENS.

Horsham.

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Dubilier Condenser Co. (1925), Ltd., Ducoc Works, Victoria Road North Acton, London, W.3.



NOTES FROM THE NORTH.

"The Northern Region can produce programmes comparable in quality and interest with the London programmes" says our Special Correspondent in this article in which he discusses the position of Northern listeners.

BBROADCASTING is going along steadily in the North of England. Already, although it will be many months before the great day arrives, we are eagerly and somewhat impatiently looking forward to the opening of the regional high-power station now in erection at Moorside Edge, near Slaithwaite.

In the meantime, the North Regional staff are preparing the ground for the time when they will have to produce a considerable quantity of material for broadcasting on the "Regional" wave-length of Moorside Edge, the other wave-length carrying the same "national" programme as broadcast by London.

High Standard of Performance.

Relations with other organisations—musical, dramatic, and so on—are being consolidated and new connections established; a constant search is going on for Northern talent of a sufficiently high-class standard to bear comparison with London talent; and the Northern Wireless Orchestra is setting itself such a high standard of performance that when it was relayed by London and Daventry recently some of the radio critics in the South made pointed comparisons with the London Wireless Orchestra.

The combination of high-power transmission by an up-to-date transmitter and performances at the Manchester regional headquarters, which is said to be the finest studio in the country, both in point of acoustics and accommodation, is something to look forward to.

The Scottish Regional.

The Scottish Regional headquarters at Glasgow are, one learns, to be brought up to date and reconstituted on the model of Broadcasting House, Manchester—but what are such premises without an orchestra worthy of them?

The abolition of the Northern Wireless Orchestra, as the Glasgow orchestra was disbanded, is unthinkable. One has only to be a Northern listener and to hear the Northern Wireless Orchestra, playing in the Manchester studio and relayed by a Northern transmitter, and then to compare the quality with that of the London orchestra relayed over 200 miles or more of tele-

phone line, to be convinced that landlines are not yet perfect and that facilities must be provided for providing listeners with a local alternative to programmes relayed from London.

At present the North Regional staff are working under the handicap of having very little programme time at their disposal (the main part of the programmes being relayed from London) and, in my opinion, of not having a sufficiently large staff to deal effectively with the great possibilities for broadcasting in the North.

Given its chance, I am sure that the Northern Region can produce programmes comparable in quality and interest with the London programmes; and an alternative programme service such as we are promised from Moorside Edge must be so comparable. But the Northern staff must be given a free hand to develop their service as they think fit.

My only fear for the future is of excessive interference from Savoy Hill. The

to view the matter from a local angle. There can be no doubt that the Newcastle transmitter, alone among Northern transmitters, will be retained in service when the high-power station opens, for it is considered impossible for the latter to give a service throughout 5 N O's area equal to, or better than, that now given by the local transmitter.

Since 5 N O was absorbed into the North Regional group and put on the common wave-length of 288.5 metres, the area of good reception has been reduced, for beyond a distance of about 40 miles from the transmitter one begins to pick up that slight but irritating burble due to other transmitters sharing this wave-length.

Avoiding Interference from 5 N O.

After the opening of the Moorside Edge transmitter, however, 5 N O will be given an exclusive wave-length again, and this temporary difficulty will disappear. If reception of Moorside Edge is tolerably good in the Tyneside district, it is possible that the Newcastle transmitter may be moved to a site outside the city, so that listeners in Newcastle may have no difficulty

in picking up the Moorside Edge programmes without interference from 5 N O.

This brings us to the important question of what programme will be broadcast from 5 N O. The B.C. itself does not know. The future of 5 N O programmes is absolutely uncertain. Apparently much will depend on the strength of reception of Moorside Edge.

There is just a possibility, if this is fairly good, that the Newcastle station may recover some of its one-time individual importance and prestige,

and may produce a fair amount of programme material again. At present Newcastle is virtually a relay station (how are the mighty fallen!) and merely contributes an occasional item or short programme to the North Regional group programmes. The spacious premises in New Bridge Street are being maintained, however.



Nowadays the high quality of the B.C.'s transmission is taken for granted, and rapidly the efficiency of sets and components made by our leading manufacturers is becoming definitely beyond question. To gain such a reputation needs a great deal of care, and an unerring test of every component. Here we see H.F. chokes and complete sets being put through their paces at the Varley works.

new rule that the North Regional Dramatic Producer may produce only plays of a Northern character or by Northern authors is of no great importance, but one trusts it is not a straw indicating which way the wind blows from Savoy Hill.

The question of Newcastle's future is of such interest that I recently visited 5 N O

MORE TELEVISION PROMISES.

The B.B.C. television experiments have now been carried on for a considerable period, and with 1930 well advanced the public are beginning to wonder if the claims made for television will ever be fulfilled, and what has become of the 1,000 televisors promised for January of this year.

ACCORDING to the "Scotsman," Mr. J. L. Baird's system of British television was "warmly defended" recently at a weekly luncheon of the Edinburgh Rotary Club, when Mr. W. Barrie Abbot, spoke to the members "On Being Televised and Noctovised."

Mr. Abbot said he believed Mr. J. L. Baird had been the victim of considerable injustice, and it gave him great pleasure to try to persuade business men to see that that young, brilliant genius had fair play. Like all other epoch-making inventions, television had had to fight hard for recognition.

"Incorporated in Programmes."

It must be emphasised that no system of television could possibly show what it could do until it was granted broadcasting facilities. British television had had to fight strenuously for two years to get official recognition in the land of its birth. The attitude of the B.B.C. seemed now to be more friendly. It was expected that television, accompanied by speech and music, would soon be incorporated in the ordinary B.B.C. programmes. The first batch of 1,000 televisors would be put on the market within the next few weeks. To get the best television, he understood that a five-valve wireless set was necessary.

He had asked Mr. Baird last week if the public would be able to look into the televisor and see the Varsity Boat Race or a Cup Final, and the answer was—"Yes, these things should be possible within two years." The time might come when people in Edinburgh would congregaté in picture-houses to see and hear the King or the Prime Minister, or to see their favourite horse winning the Derby, or Scotland beating England at Twickenham.

When he contrasted the niggardly treatment meted out to television in this country with the treatment given in America to the American system, it made him despair of Britain's ability to take advantage of a new industry, even in these dark days of unemployment. Sleepy old Britain could apparently afford to starve any new industry, and allow other countries to get in first.

Where are the Televisors?

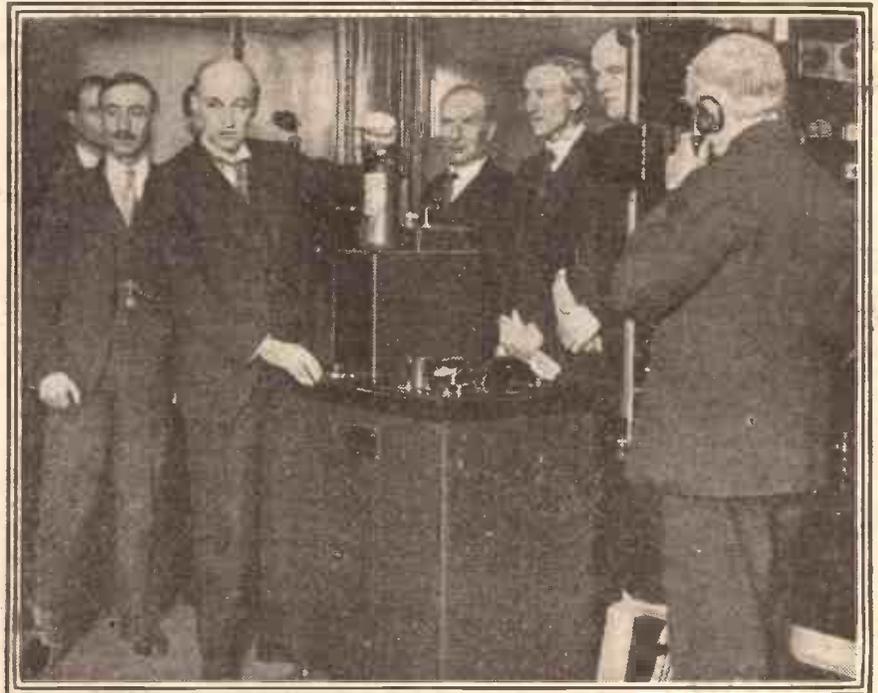
Thus, the "Scotsman's" report of what must have been a rather interesting affair: interesting for more than one reason.

To begin with, our readers will note that Mr. Barrie Abbot (who seems to have constituted himself another enthusiastic but non-scientific, disciple of television) believes that Mr. Baird has been the victim of "considerable injustice." On what grounds does he base this view? In our opinion Mr. Baird has been very fairly treated—especially by the B.B.C., and the public. The public has shown a patience and a sympathy worthy of better reward

Television has not had such a very hard fight for recognition. The five main television systems, including Baird's, have all had recognitions according to their individual merits; while some, notably Baird's, have also had strong financial support and publicity beyond the dreams of the average inventor.

Mr. Abbot stated that it was expected that television, accompanied by speech and music, would soon be incorporated in the ordinary B.B.C. programmes. We take leave to doubt this. The B.B.C. is generous, but not stupidly so, and until the

THE P.M.G. AND THE PICTURES.



The British Postmaster-General (second from the left) and the German Minister of Posts recently inaugurated a new telegraph service for pictures between London and Berlin. Signatures, copies of documents, portraits, etc., can be sent by this method, but it is entirely different from television, which aims at the instantaneous electrical transmission of moving scenes.

long-promised televisors are on the market, and the public has given its verdict, the B.B.C. would not dream of being so foolish as to incorporate television in its ordinary programmes.

About these televisors. They have long been promised—the first thousand of them; but up to the time of going to press we have not seen, or heard, of one being on sale. We ordered ours in 1928.

Mr. Abbot also refers to a question he put to Mr. Baird re seeing the Varsity Boat Race or a Cup Final by television "Yes," replied Mr. Baird, "these things should be possible within two years." Always these references to the future!

When will enthusiastic disciples of television realise that a bird in hand is worth two in the bush? Or to murder that old proverb: "A Baird in action to-day would be more interesting than promises or speculations about the future."

"Seeing is Believing."

And as for sleepy old Britain starving a new industry, Mr. Abbot really should be more patriotic, and more accurate. This country believes in "looking before leaping." A wise precaution.

And just as "seeing is believing" we shall wait, perhaps complacently, for Mr. Abbot and his friends to deliver the goods, including the televisors, before we take much heed of televised boat races in two years time.

When putting up a new aerial never allow kinks to form, but take the utmost care to guard against these, as they will develop into weak places when straightened out carefully.

With powerful receivers mechanical efficiency of the aerial wire is absolutely essential, as a broken strand or poor contact is capable of causing loud crackling noises when amplified by such a set.

Not only does the provision of a suitable grid bias improve quality but it effects great economy in the high-tension consumption.

Every aerial possesses a certain amount of inductance and of capacity apart from the coils and condensers associated with it.

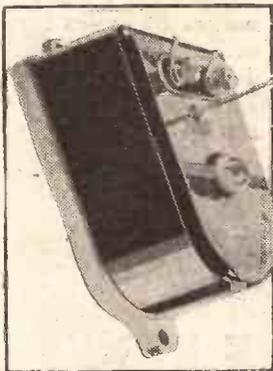
If one condenser is connected in series with another condenser, the total capacity of the circuit is reduced.

The smaller the condenser which is added to another condenser in series, the greater is the reduction of capacity.

MOVING-COIL TONE *from* WONDERFUL LISSEN FOUR-POLE BALANCED ARMATURE SPEAKER



**COMPLETELY
ASSEMBLED
for
22/6**



**UNIT ONLY
TO BUILD YOUR
OWN SPEAKER**

In brown moulded case with attachment for fitting to any type of cone. PRICE **12/6**

Cast aluminium Chassis, specially designed to give the best results from the Unit. Price 7/6
13-in. Cone for use with the above, 2/6.

The Lissen 4-Pole Balanced Armature Unit brings something approaching loud-speaker perfection within the reach of everybody who owns a radio set. You can build any type of cone loud speaker with it; you can use it with a big baffle board, or put it in a cabinet. You can build a linen-diaphragm loud speaker with it, or you can buy it completely assembled and ready to connect up to your set. It has a fine adjustment, and you therefore get the utmost volume from it without chatter.

PRICE COMPLETELY
ASSEMBLED **22/6**

LISSEN

FOUR-POLE

BALANCED ARMATURE

LISSEN LTD., WORPLE ROAD, ISLEWORTH, MIDDLESEX. and Edmonton.

CURRENT FROM YOUR LIGHTING MAINS SMOOTH STEADY CHEAP!



Lissen H.T. Eliminators deliver smooth, steady current from your house electric supply, and cheaply. The Lissen Eliminators can be put into your set as easily as any battery. From the four types made there will be one to suit you. Send a deposit of 5/- and we will arrange for delivery of the eliminator to suit you and for it to be properly installed in your set. Send 5/- only. Leave the rest to us. You pay the balance in one sum after installation or by extended instalments.

D.C. Model "A." 100-110 or 200-250 v. Cash Price 27/6 or 5/- down and 5 monthly payments of 5/6.

D.C. Model "B." 100-110 or 200-250 v. Cash Price 39/6 or 5/- down and 8 monthly payments of 5/-.

A.C. Model "A." 100-110, 200-210, 220-230, 240-250 v. Cash Price 60/- or 5/- down and 10 monthly payments of 6/6.

A.C. Model "B." 100-110, 200-210, 220-230, 240-250 v. Cash Price 75/- or 5/- down and 10 monthly payments of 8/-.

LISSEN

A.C. or D.C.

ELIMINATORS

Factories also at Richmond (Surrey)
(Managing Director: Thos. N. Cole.)

**SPECIALLY WOUND
BY PATENT PROCESS
WHICH ALLOWS
NO H.F. LOSSES**



No screening is necessary with the Dubilier Toroid Transformer. By the ingenious method of winding, the field is totally confined within the limits of the Coils. There being thus no external electro-magnetic field, there is no inter-action. The Toroid obviates unwanted "pick-up" from a near-by powerful station, and improves selectivity.

Seven ranges—Prices (complete with Holder) from 10/6 to 15/-

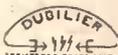
If unobtainable from your dealer, write direct to us giving his name and address.



Every Dubilier Toroid is supplied complete with holder as illustrated above.

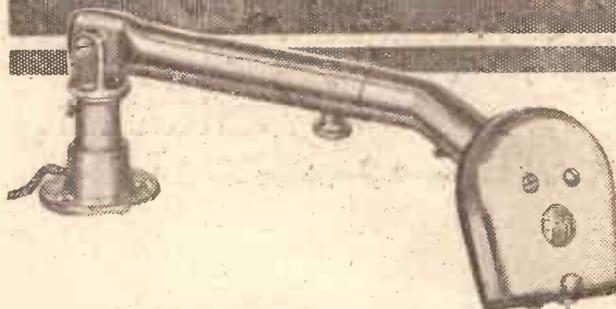
DUBILIER TOROIDS

Have you got the Booklet—"A Bit about the Battery"? If not, ask your local dealer for a copy.



Dubilier Condenser Co. (1925) Ltd., Ducon Works, Victoria Road, N. Aston, London, W.3.

**THE
FINE PICK-UP
WITH THE
FINE PERFORMANCE**



The new B.T.H. pick-up has been specially designed to give fine tonal quality throughout the whole musical range.

The degree of damping has been very carefully balanced so that unwanted resonances are avoided on the one hand and record wear is avoided on the other.

The B.T.H. pick-up is used in the best known makes of radio gramophones—good reason why you, also, should make use of the undoubted advantages of the more music—less wear pick-up.

PRICE 45/- COMPLETE

Pick-up and Adaptor for Standard Tone Arms,

Price 27/6 Complete



PICK-UP & TONE ARM

**"THE MORE MUSIC — LESS
WEAR PICK-UP"**



THE EDISON SWAN ELECTRIC CO., LTD.,
Radio Division,
1a, Newman Street, Oxford Street, W.1.
Branches in all the Principal Towns.

EDISWAN



CAPT. ECKERSLEY'S QUERY CORNER

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those coming to the Query Department in the ordinary way will be dealt with by him.

Is "Brookmans" Directional?

H. H. (Coventry).—"Are the signals from Brookmans Park in any way directional?"

Not markedly so, but there is a little distortion of the horizontal polar diagram due to the masts. I don't think the horizontal polar diagram taken at a distance of five miles is more than 20 per cent (+) or (-) a mean value anywhere on either wave-length.

How Wave-traps Affect Strength.

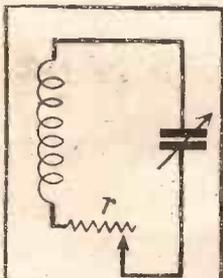
P. L. (Chiswick).—"I find that a wave-trap will be necessary with my set to cut out the new Brookmans Park transmission. Will it have any effect on the strength of distant stations, which are none too loud as it is?"

If it's a good wave-trap it will cut down the distant signals only very slightly; not enough to make a real difference, I should say.

An H.F. Volume Control.

P. K. (Edmonton, N.18).—"What is the best method of controlling volume on the H.F. stage—losser, screen-grid volts, or filament?"

Put a variable resistance (r) in the high-frequency circuit, thus:



The coil and condenser shown comprise the tuned H.F. stage, the variable resistance (r) being inserted to act as a "losser."

About 200 to 400 ohms will do, one of those small, circular ones with a rubbing contact.

The advantage of this is that when the volume is too high, it is liable to come from the local station, and the resistance not only cuts down volume, but it also flattens out the resonance curve, cuts off less top, and so gives, for the local station where one wants it, better quality.

Far-away stations cannot give good quality anyhow, and so it doesn't matter cutting off top, where you've got to cut some off to get rid of that station's neighbour.

Hum with M.C. Speaker.

P. T. C. (Woolwich).—"My set is designed for complete operation from 50-cycle A.C. mains. It was originally supplied with a cone-type armature-driven loud speaker, and the combination gave excellent results. The mains unit employs a half-wave valve rectifier.

"Recently, I installed a moving-coil loud speaker of the permanent magnet type, and although reproduction is undoubtedly improved, I find there is now considerable mains hum, whereas before changing the type of loud speaker none could be heard.

"Since my moving-coil is in no way connected to the mains, how is it that the hum is now audible?"

Because the characteristic of the two loud speakers is different. Your cone loud speaker gave hardly any reproduction at 50 cycles (the frequency of the mains); your moving-coil does give reproduction at that frequency so if there's any mains hum in the set the cone cuts it off, the moving coil reproduces it. Cure your set of mains hum.

Earthing Eliminators.

H. D. P. (Sydenham).—"Why is a short-wave set normally used without an earth and perfectly stable and manageable with battery supply, impossible to use with an H.T. eliminator unless the earth is connected? There is a bad hum and reaction control is hopeless."

You ought to earth most eliminators so that the leads themselves do not pick up H.F., so that the centre point of the filament is at earth potential and to "steady the boat" generally.

It all depends on the connections of the set and general arrangement, and does not apply necessarily, although it's always best to earth with eliminators, otherwise you'll be taking a nasty shock.

The Dangers of Changing Grid Bias.

A. W. L. (No. wood).—"Why does it harm power valves to change the grid bias without switching off the H.T.?"

When you remove the grid bias plug on a power valve you get a sudden great increase of current flow through the valve. Look at your characteristic curve. See that at, say, 200 volts and grid negative 20 volts you get, say, 20 milliamperes (I guess at random). But with grid negative 0 (which is what it gets to quickly when you remove the grid-bias plug), and 200 volts you get 70 milli-

amps perhaps—3½ times as much emission as the filament was designed for.

Reversing the L.T. Leads.

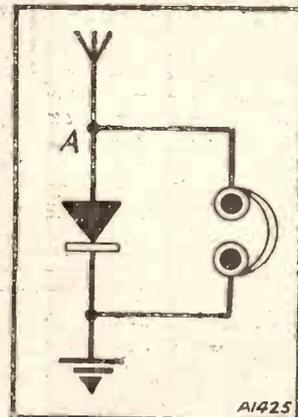
S. M. (Gillingham).—"On my det. and one L.F. set I get much better reaction control when I reverse the accumulator connections. Why is this, and is it likely to cause any damage to the receiver?"

You are probably putting positive on the grid of your detector valve and, with the circuit you are using, this gives better reaction conditions. This is not uncommon.

You will do no harm to your set, provided you are careful to use only one earth lead.

Those Clicking Switches.

J. L. (Lyn gton).—"Is there any way of stopping the crackling noises in my receiver which I get every time a light is switched on?"



Why should signals be received with a "circuit" like this? Read Capt. Eckersley's reply to the question asked below.

In my opinion, none in most circumstances. Sometimes, with D.C. mains, a condenser and resistance across each switch minimises the trouble, but it's a bit elaborate. I have a rotten time in my

flat, because not only do my switches make a row, but everyone else's in the neighbourhood.

Reception Without a Coil.

D. V. (Leith).—"When I remove the aerial coil from my crystal receiver I hear very fast Morse signals. Why should this happen with no coil in the set?"

Your detector is connected direct to the aerial, as depicted in the small diagram. There is no tuning at all, and just "volts" arrive at A, get rectified, and you pick up all sorts of signals otherwise shunted away to earth by your tuning coil.

COMING events cast their shadows before them, and there is little doubt that the coming of full-time twin transmissions from the B.B.C.'s Regional Stations is casting a shadow which has already begun to darken the lives of readers with simple receivers, delicate bank balances, and a liking for distant reception.

If to these is added the fact that one has established one's residence within a radius of 15 miles or so of a Regional transmitter, the position is apt to become serious.

The Thumping Twins!

There are, no doubt, distinct advantages in having a choice of two thumping signals on one's doorstep, so to speak, but, to the man who likes to tour the ether occasionally, the elimination of both these strong signals in favour of less robust ones from afar is likely to prove embarrassingly difficult with the Det. and L.F. types of receiver.

To meet the requirements of such listeners the unit about to be described was designed, and is certain to be welcomed by those who still wish to "reach out" in spite of Brookmans Park, or their own particular local station.

The problem which has to be solved is the old, old one of selectivity, and we wish to achieve this desirable quality without reducing sensitivity—a thing which is not always easy to accomplish.

There is one safe and satisfactory way of obtaining selectivity without sacrifice of sensitivity and that is to add an H.F.

amplifying valve. Indeed, the result is to increase the distance-getting properties of a set.

Nowadays, the mere suggestion of H.F. amplification gives rise to apprehensive visions of complicated screen-grid circuits entailing high expenditure on new valves with enormous appetites for H.T. milliamps, together with the use of new and expensive components.

There is no need to regard the addition of an H.F. stage in this light at all because, fortunately, the three-electrode valve is still with us. Its possibilities come as a boon and a blessing to people with small H.T. batteries, modest accumulators and, perhaps, a spare H.F. valve.

This, then, is our excuse—if any is needed—for resurrecting the neutralised H.F. stage. It *does* amplify; it makes but moderate calls on our H.T. and L.T. supplies; it makes the set selective and it utilises a type of valve which is (as valves go) inexpensive.

It's Cheap to Run.

Very few components are required to construct the unit, and none of them calls for special comment except one. The coil L_2 must be centre-tapped. This is absolutely essential for the proper working of the unit. Coils which are tapped at points other than the centre are not suitable.

As far as the actual construction of the unit is concerned, it will be found to be an exceedingly simple and straightforward task. The photographs and wiring diagrams which accompany this article will, with the aid of the following constructional details, enable anyone to build a successful version of the unit.

Since the unit is designed to afford additional selectivity, tuning will probably be somewhat sharp and it is as well to use either a slow-motion dial or a condenser in which a slow-motion device is incorporated.

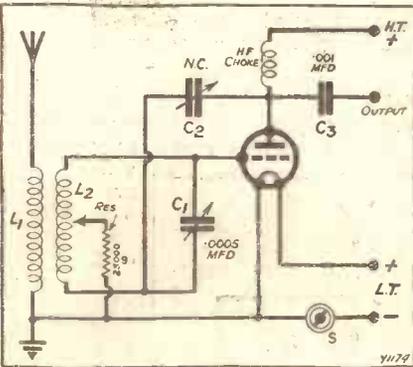
First of all, the panel should be prepared, and the one used in the illustration was 7 in. wide. The height is perhaps a matter best left to the discretion of each individual constructor,



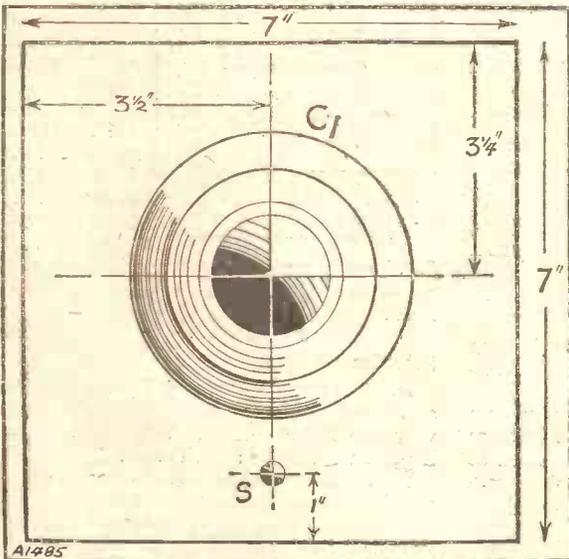
The variable condenser is disposed along a line drawn down the centre of the panel from top to bottom. If the condenser is of the "one-hole fixing" variety only one hole will be needed to take the shaft of the condenser.

In the photographed unit this was drilled $3\frac{1}{2}$ in. up from the bottom edge of the panel, but, if the constructor likes a neat appearance, it will perhaps be preferable to fit the condenser on the same level as those of the receiver.

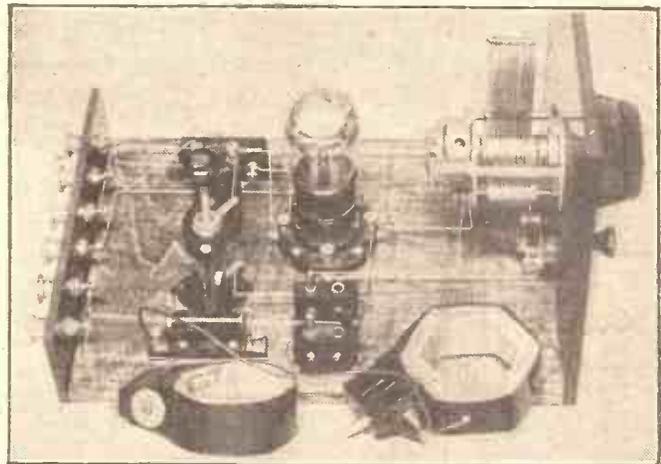
On the same line another hole is drilled to



A simple circuit, but an extraordinarily effective one.



An on-off switch and one tuning dial. Nothing tricky to operate, is there?



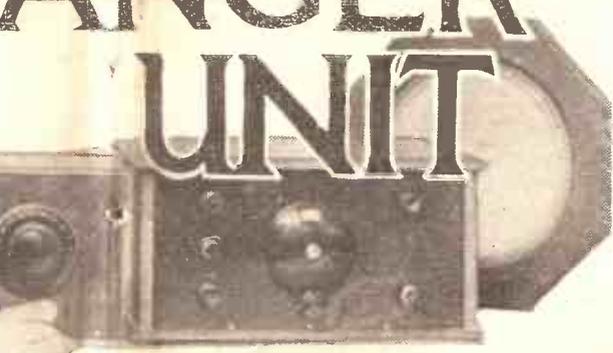
Here is the unit. Note how simple is the layout and wiring.

since it will enhance the ensemble appearance of the unit and the receiver with which it is used if they both have panels of the same height.

take the switch and this should be, about 1 in. from the bottom edge of the panel. The panel is held by three screws in the edge of the baseboard. The hole for the centre screw can be drilled on the line on which the switch and condenser are disposed.

CUT OUT THE LOCAL AN

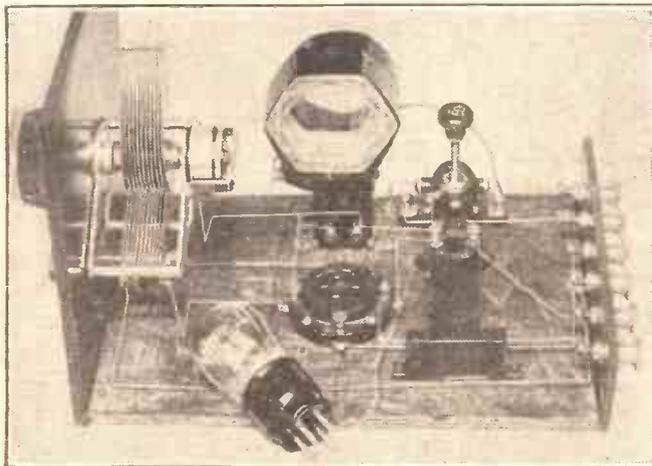
The P.W. "RANGER" UNIT



Are you bothered by the local station? Do you wish that set of yours could bring in more transmissions? You can increase the selectivity of your set as well as increase its sensitivity by the addition of this wonderful little unit. No alterations to your set are necessary, but with a few extra components neatly arranged in a little box which is connected to your present receiver you will find there is a new series of programmes from which to choose, fresh fields to conquer, in short, you will have all the advantages of a completely new receiver.

Designed and Described by
THE "P.W." RESEARCH DEPARTMENT.

This hole should be drilled at a distance from the bottom edge of the panel equal



Ease of operation and high degrees of selectivity and sensitivity are outstanding features of the "P.W." "Ranger" Unit.

to half the thickness of the baseboard. The remaining two holes are drilled the same distance from the bottom edge, but $2\frac{1}{2}$ in. on either side of the centre line.

When these five holes have been drilled the components should be mounted on the

panel, which is then laid on one side while the terminal strip is prepared.

The terminal strip is 7 in. long and can be of any convenient width. A line is drawn along its length $1\frac{1}{4}$ in. from the edge which is to be the bottom edge. Marks are then made at intervals of 1 in. along this line—six in all—and holes large enough to give a tight fit to the terminal shanks are drilled at each of the marks.

The Baseboard Layout.

The terminal strip is held to the baseboard by three screws in the same way as the panel, and the positions for these can be found by using the panel as a template. To do this the panel is laid over the terminal strip so that their two bottom edges coincide and then the places for the screw holes on the strip are marked by passing the point of the scriber through the panel screw holes.

Operations are next commenced on the baseboard, which is 10 in. long by 7 in. wide. It is a good plan to have this of moderate thickness (say half an inch) as then the holes in the panel and terminal strip for the fixing screws are a $\frac{1}{2}$ in. from the edge of each.

This considerably lessens the risk of the ebonite splitting, as might be the case if an attempt were made to drill holes much closer to the edges of the panel and terminal strip.

A line is drawn across the baseboard 3 in. from the edge to which the terminal strip is to be fixed, and a similar line is drawn $2\frac{1}{4}$ in. distant from the first. Along this second line are disposed the valve holder and the two coil holders. The centre of the valve holder is 3 in. from the left-hand edge of the baseboard.

The coil holder L_1 is mounted at right angles to the line about $\frac{1}{2}$ in. in from

is already fixed to the board. The other coil is then inserted in the other holder before fixing to the board. The coil and coil holder still to be fixed are then placed alongside the coil L_1 , so that the two coils just do not touch. The positions for the screws to hold the second coil holder can then be marked on the baseboard through the fixing holes on the holder itself.

The rest of the components take up their positions along the other line. The .001-mfd. condenser is fixed at right-angles to the line $1\frac{1}{2}$ in. from the left-hand edge, and the 25,000-ohm resistance is similarly placed 1 in. from the right-hand edge. Between these two components the H.F. choke and neutralising condenser are placed on the line, so that approximately equal space exists between adjacent components.

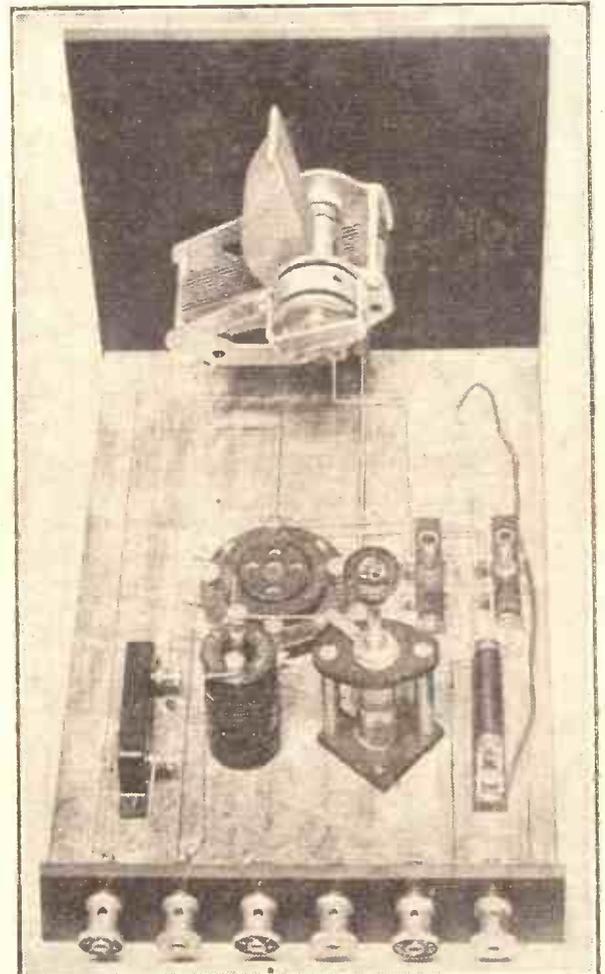
Screw-down or Solder?

When all the components are mounted on the baseboard, the panel and terminal strip are each screwed to their respective edges of the baseboard and wiring can be commenced. This should be done strictly in accordance with the wiring diagram.

Soldered connections are to be preferred, but clamping the connecting wires under the terminals of the components is perfectly in order, providing the terminals are screwed down tightly on to the wires.

(Continued on next page)

PULL IN MORE PROGRAMMES



A variable condenser, H.F. valve, two plug-in coils and holders, a choke, valve holder, and a few other odds and ends, and there you are. Simple to build, but a demon for distance.

ND, FETCH IN THE FOREIGNERS

THE "P.W." "RANGER" UNIT.

(Continued from previous page.)

The connection to the centre tap on the coil L_2 has to be made with a short length of rubber-insulated flex, as, when coils are changed, this connection has to be temporarily broken and re-made when the new coil is inserted. The other end of this flex

is permanently connected to one end of the 25,000-ohm resistance.

The connections of the unit to the set are very simple. The L.T. plus and minus may be connected to the L.T. terminals on the receiver, positive to positive and negative to negative.

Connecting to Your Set.

It will be noticed that, although there is the usual positive H.T. terminal, no provision is made for H.T. negative to be connected to the unit. This omission is quite intentional, as it is assumed that the unit will be fed from the same batteries as the receiver to which it is attached.

The negative H.T. is already connected to the set, and there is no need to duplicate the connection at the unit as well. Besides, should the unit be connected to a receiver which has L.T. plus connected to H.T. minus, running a lead from the unit to H.T. negative would involve risks of short circuits.

The H.T. positive terminal on the unit will, of course, have to be provided with a lead to the H.T. battery where it will be plugged in at about 90 to 100 volts.

The aerial and earth will have to be removed from the receiver. The receiver's earth terminal can then be given a holiday, since no sort of connection has to be made to it. The terminal marked "output" on the unit is then connected to the aerial terminal of the set, and the aerial itself is then attached to the terminal "A" of the unit.

To Neutralise.

When all these connections are made the unit is connected to the set, and is ready for trial. An important point to remember is to place the unit as near as possible to the receiver as it is very desirable to keep short the lead connecting the output terminal on the unit to the old aerial terminal on the set.

The process of neutralising the valve will be found to be very simple indeed. In almost all cases

there will be scarcely any instability to balance out with the neutralising condenser. It is best to start with the neutralising condenser set at its minimum, and an attempt should then be made to tune in stations at various tuning settings.

With some receivers it may be found that on certain tunings there will be a tendency for the set to fall into oscillation with very little adjustment of reaction. If this occurs a slight increase of the neutralising capacity will bring the behaviour of the set back to normal, and, when no signs of uncontrollable oscillation appear all round the dials, no further adjustment of the neutralising condenser will be needed.

The Coils and Valve.

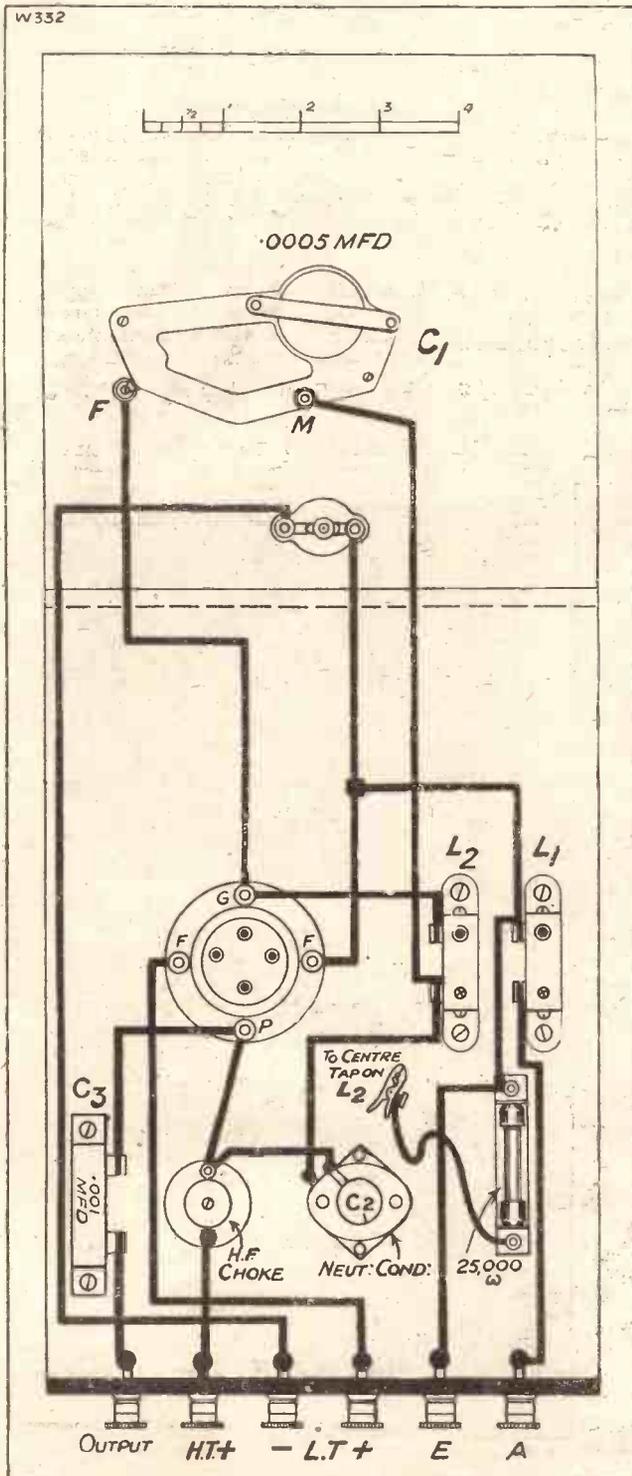
For "local listening" in most cases you simply switch off the H.F. valve. But in some cases cutting out the unit will involve the not very arduous task of disconnecting the aerial from the input terminal of the unit and attaching it, in the ordinary way, to the aerial terminal on the receiver.

THE PARTS YOU NEED.

- 1 Panel, 7 in. x 7 in. (Becol, Goltone, Lissen, Resiston, "Kay-Ray," Keystone, etc.).
- 1 Cabinet and baseboard, 9 in. or 10 in. deep.
- 1 .0005-mfd. variable condenser (Dubilier, Lissen, J.B., Burton, Lotus, Ormond, Utility, Raymond, etc.).
- 1 Slow-motion dial if needed (Condenser shown is of slow-motion type).
- 1 L.T. on-off switch (Lissen, Benjamin, Lotus, Igranic, Wearite, Magnum, etc.).
- 1 .001-mfd. fixed condenser (Lissen, Goltone, T.C.C., Mullard, Dubilier, Clarke, Magnum, Graham-Farish, etc.).
- 1 Sprung valve holder (Lotus, Igranic, W.B., Benjamin, etc.).
- 2 Baseboard-mounting single-coil holders (Lotus, Lissen, Raymond, Wearite, Ready Radio, etc.).
- 1 H.F. choke (Keystone S.G., Lissen, Lotus, Varley, Ready Radio, R.I., etc.).
- 1 Baseboard-mounting neutralising condenser (J. B., Gambrell, etc.).
- 1 25,000-ohm wire-wound resistance (Ready Radio, R.I., Igranic, Varley, Mullard, Dubilier, etc.).
- 1 Terminal strip.
- 6 Terminals (Eelex, Burton, Igranic, Belling & Lee, etc.).
- Wire, screws, tapping clip for coil, flex, etc.

The best valve to use in the unit will be one of the H.F. variety, but an R.C. valve can be used successfully if one is available. It will, of course, have to be of the same filament voltage rating as the valves in the receiver. The value of the H.T. voltage applied to the unit will be that recommended by the maker as suitable for H.F. amplification, and usually will be about 90 or 100 volts.

For the medium broadcast band of wavelengths, a No. 60 centre-tapped coil should be used in the socket marked L_2 , and a No. 35 (or 25 with a big aerial) is suitable for use in the coil holder L_1 . For 5 XX and other long-wave stations, L_1 will be a No. 75 or 100, and L_2 a No. 250.

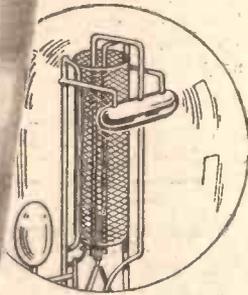


You will find no difficulty in wiring this amazing little unit.



The NEW A.C. Mains DETECTOR VALVE

OSRAM M.H.L. 4 (With Indirectly Heated Cathode)



NOTE the gauze anode which assists in the ready dissipation of heat and maintains the initial efficiency of the valve throughout a long and useful life.

Recommended by leading wireless journals after exhaustive practical tests as a Detector Valve of the highest quality.

The OSRAM M.H.L.4 is designed with an adequate clearance between electrodes to ensure greater mechanical strength, absolute reliability and consistency of performance.

Osram Valves

Characteristics

Filament Volts	4.0
Filament Current	1.0 amp.	approx.	
Amplification Factor	16
Impedance	...	8,000 ohms.	
Anode Volts	200 max.

MADE IN ENGLAND

Sold by all Wireless Dealers

PRICE 15/-

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



BENJAMIN TURNTABLE.

THIS production of Benjamin Electric, Ltd., is a very sound proposition, and bristles with good points. It is, of course, for use with a portable set and



The Benjamin turntable with its legs unfolded.

enables this to swing easily in any direction. It does not matter how heavy the set is, the movement is still free, as the device incorporates ball bearings.

There are rubber buffers on the top to prevent the set from slipping. Folding legs are fitted.

When the turntable is stood on an ordinary table it rests on three more rubber buffers, the three pointed legs opening out when you want to stand it on the ground.

There are two advantages in this. In the first place, the legs accommodate themselves to unevenness and, secondly, the set is stood away some three inches from the earth. This enables a better performance to be obtained, as the frame will then have a lower capacity to earth.

Altogether, as I have said, it is a very satisfactory article, and I can freely commend it to all portable-set enthusiasts. It costs 7s. 6d.

HYPERMU TRANSFORMER CURVES.

Radio Instruments Ltd. are now circulating a leaflet which reproduces a set of new

N.P.L. curves taken with the Hypermu used in conjunction with the very latest modern valves.

These curves make a wonderful showing. When the transformer follows an indirectly-

WHEN YOU ARE BUYING—

(2) A LOUD SPEAKER—

bear in mind that it may sound very different on *your* set in *your* house. Always endeavour to hear it operating under the conditions that will be imposed upon it.

Keep to the well-known makes—it always pays. The well-known firms have reputations to uphold and will help you should trouble develop.

Pay as much as you can afford. A small loud speaker does not necessarily deal with a small output better than a large loud speaker.

Endeavour to consult someone who has heard a fair number of other loud speakers, but don't be too much prejudiced by what anyone says about particular makes; your judgment may be better than his!

heated valve of the A.C. H.L. type, enormous amplification in a practically straight line from 25 to nearly 8,000 cycles is given.

EFFICIENT COIL HOLDER.

I was rather glad that the Jewel Pen Co., Ltd., sent me samples of their coil holder for test. I was glad for it gave me the
(Continued on page 1212.)

STOP INTERFERING!

WITH the new regional transmitters do you find it more difficult to separate programmes? This can easily be overcome by simply fitting a Watmel Wave Trap between your aerial and the set. It does not matter what length your aerial is, this Wave Trap will sharpen tuning and make reception clearer and more powerful.

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Genuine four-pole unit. Highly sensitive. Perfect reproduction of both high and low frequencies. Will handle large volume without overloading, and is particularly suitable for operating linen diaphragm speakers as well as cones.

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Does away with all coil-changing. Highly selective and can be incorporated in any receiver. Complete with wave-change push-pull switch.

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8'6

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TWO VOLT prices

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 Resistron 1 amp 5/6
 Super H.F. 15 amps 9/6
 Super Power 15 amps 1/5
 Hyper power 3 amps 9/8

FOUR VOLT Prices

Universal 0.75 amps 5/8
 Resistron 0.75 amps 5/6
 Super H.F. 0.8 amps 5/6
 Super Power 1 amp 7/6
 Hyper power 15 amps 9/6

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PENTODION**

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2 v. 15 amp.
4 v. 0.75 amp.

2 v. 3 amp.
4 v. 15 amp.



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Great resources are behind the manufacture.

And a great firm stands behind the product.

That is your security

FERRANTI LTD. HOLLINWOOD LANCASHIRE

TESTED AND FOUND—?

(Continued from page 1210.)

opportunity of saying a few words regarding the importance of these ubiquitous items. Familiarity undoubtedly breeds contempt, and we are all rather apt to take familiar objects for granted.

Whereas the constructor may very carefully weigh up the pros and cons of various types and makes of E.F. transformers and such-like components, he will generally purchase such items as valve holders and coil holders without giving them much consideration. Yet in their way such items are just as important as anything else in a set.

Perhaps you noticed that one of our correspondents recently experienced a complete failure in a "Magic" set through using valve holders of doubtful origin. And bad coil holders have been the cause of similar trouble.

On test I find the coil holders of the Jewel Pen Co., Ltd., to be of trustworthy quality. The single-coil holder costs only 1s. It is provided with a base having four holes for mounting screws, and there are two conveniently placed terminals.

The two-way coil holder costs 4s., and it has a worm drive. The movement is smooth and very precise adjustments are possible.

There is not the slightest suspicion of backlash.

JUVENTA H.T. BATTERIES.

Messrs. Allen, Craig & Co. (London), Ltd., recently sent me a 120-volt Juventa battery which is a product of a Hamburg concern. The battery is tapped in 1½-volt steps up to 10½, after which it goes up in tens of volts. The voltages are plainly lettered in gold on the casing of the accessory.

It is a well made battery, and I particularly like the deep, easily fitted sockets.

For the first period of my tests I subjected the battery to four-hour daily periods

of discharge at 7 milliamps. After a month of this the voltage per cell dropped to 1.3 and it is interesting to note that the depreciation was even.

The battery was still in excellent condition and retained the above voltage for some time, after which a gradual drop was indicated. It was moved to the various parts of the laboratory where there are varying temperatures, to see whether these would affect it. No appreciable effects resulted. In my opinion this is a good battery and one that "P.W." readers need have no hesitation in buying should it come to their attention.

LISSEN REGIONAL SELECTOR.

The Lissen Regional Selector is a very good wave-trap. It is built into a moulded case of handsome appearance. On the top are seven sockets, one for the aerial connection, and into any other of the remaining five a plug can be inserted in order to achieve varying degrees of trapping.

There is a nice, large milled knob which controls the variable condenser. The coil employed is an efficient solenoid.

I asked the Lissen Regional Selector to suppress the new 2 L.O. at a few miles distance, on a det.-two L.F. The tuning dial of this set in the ordinary course of events gives nothing but Brookmans Park at about the same strength all the way round. With the Lissen Regional Selector in circuit B.P. was brought down to about two degrees, which compares most favourably with the results given by the standard "P.W." wave-trap. The Lissen Regional Selector covers the wave-band of 200 to 600 metres, and it sells at 12s. 6d.



This is the Lissen Regional Selector.



RELIABLE IGRANIC COMPONENTS.

You can purchase an
IGRANIC

**GUARANTEED COMPONENT
TO REPLACE ANY
COMPONENT IN ANY SET.**



**IGRANIC "J" TYPE
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A RAPID GUIDE TO RADIO

A JUMPING-OFF SERIES FOR THE NEWAMATEUR

By "Pentode"



THE interesting thing about Resistance-Capacity and Choke-Capacity L.F. coupling is that both operate in practically the same way. Their circuit connections are similar in that for either arrangement everything else stands, and you use either an L.F. choke or a resistance, as the case may be.

A further interesting point is that the theory of working of either corresponds with the theory of H.F. Choke-Capacity or H.F. Resistance-Capacity coupling; the only real difference is that the frequencies of the currents with which they deal are vastly different.

At Fig. 1 you see a Choke-Capacity coupling, and this would be a Resistance-Capacity coupling if the L.F. Choke were taken away and a resistance inserted in its place.

The object of the Choke is to introduce a high-impedance and, as you know, it can do this without having much resistance. It consists of a large number of turns of wire wound on an iron core; thus that factor Inductance is built up to a large measure.

Chokes and Resistances.

Inductance and Capacity and Resistance are the three things any or all of which can build up impedance. The L.F. Choke gives you a lot of the first and little of the last two. An anode Resistance, on the other hand, will give you some tens of thousands of the third factor, Resistance, and practically nothing of the other two.

The impedance of an Anode Resistance hardly varies with the variations of the frequency of the current it handles, and

Let me amplify this a little, for it is an important point, and one that often crops up. Think of the valve as a resistance of so many tens of thousands of ohms joined in series with another resistance (representing the Choke or Anode Resistance) and an H.T. battery.

We want to get a certain voltage difference across the plate and filament of the valve. In the case of an L.F. valve as much as 150 volts may be necessary for its proper working.

"Volts On The Plate."

The percentage of the total H.T. battery voltage that is developed across the plate and filament of the valve will depend upon the ratio of the two resistances (that of the valve itself and that of the Choke or Anode Resistance). If the two resistances are of equal value, you will get half the H.T. volts "on the plate." The actual formula is

$$V_2 = \frac{V_1}{R_1 + R_2} \times R_1 \quad (V_2 = \text{"Plate Volts."})$$

As we say in our familiar way, "you drop so many volts" across the resistance of the Choke. Obviously, the drop or loss will be small when you have a Choke of

This is "Pentode's" last article, at least in the "Rapid Guide" series. However, he will contribute further articles to "P.W." from time to time on various aspects of radio reception, and we are sure all readers will look forward with pleasure to these.

20. MORE ABOUT L.F. AMPLIFICATION.

low resistance and high when there is an Anode Resistance of many hundreds of thousands of ohms.

Don't confuse Resistance with Impedance. In dealing with resistance above I was referring to the resistance offered by the Choke or Anode Resistance to direct current of unvarying intensity. The moment this current is made to fluctuate, Impedance becomes the limiting factor, as any Capacity or Inductance that are present begin to affect the circuit conditions.

Grid Leak and Condenser.

The fluctuating current in the plate circuit of the first valve (which might be a detector valve) has to pass through the L.F. Choke.

The grid and filament of the second valve are tapped across the Choke and H.T. battery and across these points the fluctuating currents set up a fluctuating potential difference.

Your knowledge of Ohms Law will tell you that the voltages will be Current Differences times Impedance (A.C. Resistance).

This being so, it might be thought obvious

that it would be to our advantage, if we want the loudest signals, to have as great Current Differences and Impedance as possible. Well, the Current Variations will be just what that first valve can develop in its amplifying activities (or what we let it develop in our good or bad treatment of the valve!) and the Impedance will depend upon the efficiency of the L.F. Choke, whose design is limited by one or two other considerations, or the value in Ohms of the Anode Resistance, if such be used.

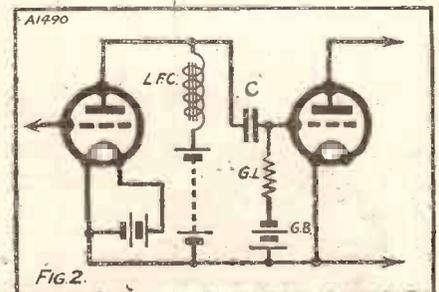
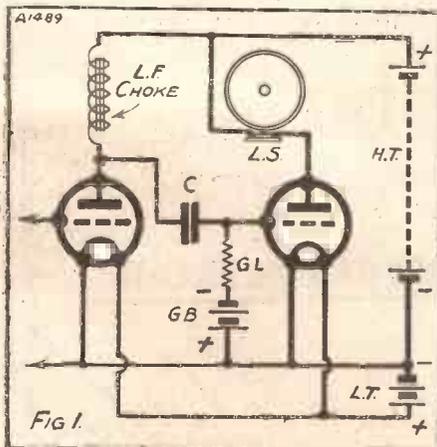
And you know now why an Anode Resistance must not have too many thousands of Ohms, don't you?

Why do we have a grid condenser? Merely so that the H.T. battery shall not find a direct path through the Choke (or Resistance) to the Grid of the second valve. Why do we have a Grid Leak? So that the Grid shall not get choked up with electrons, and so that Grid Bias can be applied.

There is much more that you must learn about L.F. amplification, but you will be able to do this by reading the articles on the subject as they appear in "P.W." By now I feel sure you will be able to turn to practically any "P.W." article and read it intelligently.

And In Conclusion.

Obviously, I should have to write, not twenty, but a hundred articles if I wanted to cover the whole ground, but this wouldn't be fair to those thousands of readers who are fairly conversant with radio theory.



we want the Impedance of our coupling component to be consistent. But you will see that, although the Impedance of the L.F. Choke might not prove as completely consistent over the whole band of audio-frequencies, its much smaller resistance has less effect on the H.T. current supply to the anode of the valve.

However, don't hesitate to drop me a post card on any point you want specially elaborated. The Query Editor has promised to deal with as many as possible in the "Radiatorial" columns. But please don't expect individual replies by post. Finally, the Editor has invited me to contribute further occasional articles so that even if, which is most improbable, nobody else tells you all about R.C. component values, Valve overloading, L.F. Output circuits AND PENTODES, perhaps, after all, they will be discussed by, yours sincerely, PENTODE.

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Unrehearsed incidents in the broadcasting studio are always of interest, and our radio favourites tell us in this symposium, about the accidents which comprised their "worst" broadcast moments.
By A. ALBERT.

MABEL CONSTANDUROS, the Originator of "The Buggins Family."

I'M afraid I have not much to tell you—for, after all, when all is said and done, what dreadful things can happen to the broadcaster? Forgotten lines and lost scripts have probably happened to every, single person who has faced the microphone.

I can but mention a certain broadcast concerning the Buggins Family which I made with Michael Hogan. Half-way through this, Michael dropped the script from which he was reading, and this contretemps made me so nervous that directly he picked his up, I dropped mine, and there we were for a full three minutes, sorting out the pages and gagging away like wildfire.

The next day, Michael was accused of forgetting his words, but apparently no one seemed to consider me as the cause of the trouble.

MICHAEL HOGAN, the Popular Wireless Actor.

I THINK my worst broadcast experience occurred some time ago, when I was acting in a very serious play which was being put out by a certain Northern station.



Michael Hogan is frequently heard as "Father" of the Buggins family.

In the play I was supposed to be lost in the snow, and I think that I may say without boasting—it was the best performance of my life! My acting was inspired. I lived in the part. For a solid half hour I really was the man in the snow, and by the time I had finished I was completely exhausted by the performance.

I ached in every limb, I perspired, I trembled—I was absolutely done! And then an apologetic official entered the studio—there had been a breakdown and not one word of my performance had been transmitted!

WISH WYNNE, Famous for Her Character Studies.

Although I have more than once suffered from microphone fright, I do not think I have ever had a very bad broadcast experience.

The waiting is always so much worse than the actual show. "Have I lost my music? Shall I forget my words? Will anyone be listening?" These are questions I always ask myself when waiting to broadcast; but everything always goes right.

A suspender might burst, my voice might crack; but neither of these things happen. The worst points about broadcasting are all fantasies of the brain!



Wish Wynne, who often delights us with her character sketches.

DAVY BURNABY, the Compère and Comedian.
As a funny man, I find it almost second nature when I am asked a question like this to invent imaginary complications. I could tell you wonderful tales of how I once sat down to the piano in No. 2 Studio at 2 L O and how the piano stool gave way, or how I once went to pass through the double studio doors and got jammed between them; but they wouldn't be true.

In real life I fear that dreadful things like that do not happen very often, and so the best that I can tell you is of the occasion when a few other Co-Optimists and myself gave a Surprise Item in the studio.

As the audience were there entirely by our invitation, we had whisky and sandwiches passed round; and this, I believe, is the only time Savoy Hill has assumed such an appearance of festivity.

To enable listeners to get the right atmosphere, I thought I would leave the microphone "on" without my friends knowing, for in those days it was manipulated by a single switch; but this idea proved my undoing.

The remarks were a little too convivial, and such phrases as "What'll you have, Davy?" or "Jolly good whisky, this!" were broadcast to the world. The next day, two dozen spinsters wrote in to complain of the "drunken orgy."

REGINALD FOORT, whose Cinema Organ Recitals are often heard.

I think I had better tell you of the time when I was giving a special broadcast and accordingly made arrangements for a good programme of music which would fit the film as well as the microphone.

Unfortunately, however, the cinema management decided to have four performances of the main picture—a Buster Keaton film—instead of three, and so my arrangement could not possibly be a perfect accompaniment to the picture owing to the change in the time sheet. It wasn't, and listeners heard nothing of my broadcast except laughter from the cinema which, of course, they thought due to the film.

They only guessed half the truth. The people were laughing at me, for whilst Buster Keaton was falling off trains and fooling about in a variety of ways, I was playing the "Flower Song" from "Carmen"!

GRACIE FIELDS, the Well-known Comedienne.

It is impossible to tell you about my worst broadcasting experience—I have had such a number! In fact, I might almost say that every other broadcast makes me tremble!

Some wireless folk complain about the lack of a studio audience, or else grumble because there is one; but my trouble is that the wireless performer is often expected to work under both conditions. For a few broadcasts, I shall be working in a big room,



Gracie Fields, one of our most delightful comediennes.

(Continued on next page.)

FOR THE PRACTICAL MAN.

Some Useful Hints and Tips for the Home Constructor, dealing with both set assembly and set operation.
FROM A CORRESPONDENT.

L.F. INSTABILITY.

SOMETIMES a receiver may suffer from a certain amount of L.F. instability which will show itself in the form of a howling tendency of greater or lesser extent.

When searching out the cause of this trouble the set owner should bear in mind that this particular form of annoyance may sometimes be traced to mechanical vibrations passed from the speaker itself to the receiver. Especially is this the case, of course, when the speaker is mounted on top of the receiver.

Naturally, this will not be found to be the cause of the trouble in every case, but it is a possibility to bear in mind, and, therefore, it may sometimes be the means of rapidly solving a troublesome mystery.

TERMINAL TAGS.

IN an endeavour to turn out their products uniform with a large amount of present-day radio apparatus, manufacturers have a habit of supplying nickel-plated brass soldering tags.

Such articles, it is true, have an extremely good appearance, but the snag about them is generally realised when the radio owner comes to the job of soldering them in position. The nickel is apt to separate from its foundation.

Therefore, when trouble occurs in the soldering of such tags, it will generally be

found to be the best plan to file away some of the nickel-plating, and to solder directly on to the brass underneath.

Some terminal tags, however, whilst having an appearance similar to the nickel-plated ones, are in reality tinned copper or brass articles. In such cases, no trouble will be found in the soldering operations, solder running very freely on tinned copper surfaces. Indeed, such tags are about the best for average purposes.

When Soldering Nickel.

If, however, it is vitally necessary to make a soldered joint to a nickel-plated tag, or to the surface of any other nickel-plated article, without scraping away the plating, the surface of the article should be well rubbed over with one or two rags dipped in methylated spirit. This will



A useful method of keeping solder ready to hand.

remove the thin film of grease which generally adheres tenaciously to plated articles and therefore the soldering operation will be less troublesome.

SAVING SOLDER.

SOLDER is a curious commodity. It has a most exasperating knack of hiding itself away among the odds and ends of the work-bench at the very moment it is required for use. Collar studs are proverbially bad in this respect, but small bits of solder in the hands of many an industrious constructor are often apt to be several times more evilly-disposed.

The simple gadget illustrated herewith will put an end to this form of annoyance once and for all.

Procure a large-sized cotton or thread bobbin, and wind round it a supply of strip solder. If the solder is not ready to hand in strip form, melt up a few odd pieces of the material in an iron spoon, and then pour out the molten contents along a cold slab or metal plate. In this way, a long strip of solder of any desired width can be obtained.

Never Becomes Dirty.

Wind the strip of solder on the bobbin, and then slip the latter over a large nail or screw which has been fixed to some convenient area of the work-bench.

A readily available supply of solder will thus be provided. The solder will never manage to lose itself at a particularly awkward moment, and, what is more, a considerable saving of the material will be effected, for by applying the heated end of the soldering iron to the projecting strip of solder, even the smallest amounts of solder may be transferred to the iron without any wastage whatsoever. Moreover, solder which is utilised in this manner never becomes dirty through contamination with surrounding objects.

and then, when I get used to this and to an audience, they plunge me for the next few broadcasts into a tiny and deserted studio.

Directly I have accustomed myself to this medium—or, so it seems—they put me back in the large studio. Apparently, the whole idea is to keep me fresh. Surely I don't need keeping?

LEONARD HENRY.

Oh, I say! Why bother me? To be serious, however, I can only recall two occasions when I felt at my worst in a broadcasting studio.



The inimitable Leonard Henry.

One of these was when I was appearing—rather, speaking—in an Irish programme, and got so nervous at this slightly unfamiliar part that I mixed up all my words, and called the heroine

MY WORST BROADCAST MOMENT.

(Continued from previous page.)

“Lazy Mary” instead of “Lady Mary.” The other time was when I was informed that a certain member of the studio audience had come because he wanted to see me in the flesh. At this, I puffed myself out with righteous pride, but a moment later collapsed like a pricked balloon. He had gone home saying, “I’ve nothing to fear!” Apparently his wife was in love with my voice.

CHRISTOPHER STONE, the Gramophone Critic.

I have only made one bad *faux pas* on the wireless, and this was when I was playing a very important record and realised that the motor had run down; and since I do not hear every record broadcast, knew only that it had fallen “flat” in both senses of the word.

Of course, I have often put on the wrong record, but that fault is easily corrected. Allowing the gramophone to run down, however, was quite inexcusable and the realisation that I had done this was for me a very bad moment.

TOMMY HANDLEY.

My worst broadcast experience must have been the time when I was drowned to make a Roman Holiday for listeners.

In order to get the right effect of a man swallowing gallons of water and crying for help at the same time, I tried speaking whilst drinking a glass of water; but, as luck would have it, when the actual broadcast took place, everything went wrong. I choked before I had even commenced speaking, spilt the water all over me, and floundered on, choking and gasping, feeling that all the Announcers had conspired against me.

The next day, all my friends congratulated me on my realistic impersonation of a man coming up for the third time.



Tommy Handley, one of our foremost microphone mirth-makers.

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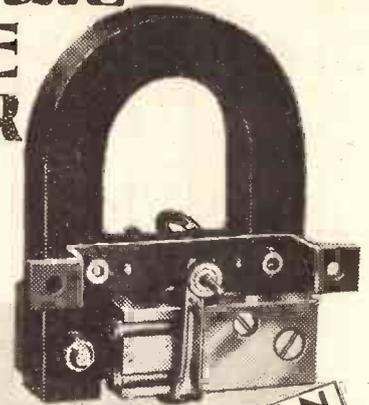
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RADIOTORIAL.

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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 subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

CONNECTIONS TO A THREE-POINT SWITCH.

H. R. (Beckenham).—"I have a panel-mounting switch with three contacts, viz. two terminals, and one connection to the screw on the plunger. When the switch is pulled out the two terminals make contact with the plunger, and when it is pushed in they are all three separated.

"How can I use that for switching off H.T. as well as L.T.?"

You can treat the two external terminals just like an ordinary filament on-off switch, wiring them in the leads of the filament circuit so that when the switch is pushed in, the circuit is broken, but when it is pulled out the low-tension current flows via the metal plunger. Instead of joining the H.T. on the battery to the filament circuit by means of the ordinary connection take a flexible lead from the H.T. terminal and run this to the switch's metal plunger.

You will see that when the switch is in the off position the H.T. is connected only to the metal plunger, which is insulated from the others. When, however, the low-tension switch is pulled out to "make" the filament circuit, the high-tension negative is automatically joined to this at the point where the plunger is carrying the filament current.

LOW-FREQUENCY FEED-BACK.

C. J. (Southend-on-Sea).—"What are the symptoms of and cures for L.F. instability due to feed-back?"

The usual symptoms are:

1. A continuous howl, the howl taking the form of a musical note, which does not vary with the tuning adjustment.
2. Very bad distortion, frequently accompanied by a rushing or noisy background, which in many cases indicates that the L.F. stages are oscillating at a frequency above audibility.
3. "Motor-boating" which takes the form of a noise not unlike that of a single cylinder petrol engine, that is, a steady pop, pop, pop.

In the majority of cases L.F. oscillation is due to a coupling effect in the H.T. supply circuit. It is, therefore, necessary first of all to make sure that the source of H.T. is "clean." If dry cell H.T. batteries are employed, the voltage should be taken with the aid of a high-resistance voltmeter, after the set has been working for some time.

The fact that the battery is a new one does not prove that it is in perfect condition, since dry cells deteriorate if they are kept in stock, even though they are not in use.

In addition, a single defective cell can in itself produce E.F. troubles.

H.T. accumulators can cause trouble if they are in a partly run-down condition, or if any of the cells are sulphated, or there are poor connections between the cells. All contacts on top of the batteries must be kept perfectly clean.

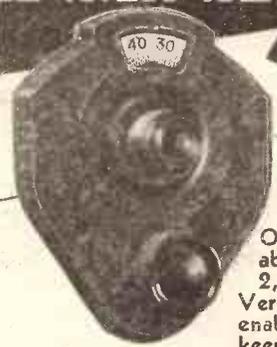
In the case of H.T. eliminators, it is essential to see that the output is adequate. If the set is a large one, and has a super-power valve in the last stage, it may take 20-30 milliamperes. It is, therefore, quite useless to expect a small mains unit with an output of 15-20 milliamperes to supply the necessary current.

In any case, such overloaded units cannot give their rated voltages.

Also, sets with three, four or five valves should have separate H.T. "feeds" to each valve or group of valves when used with a mains unit.

(Continued on page 1220.)

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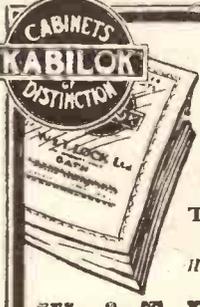


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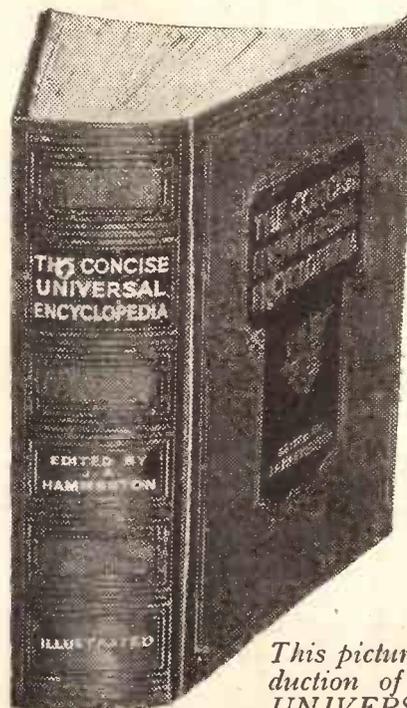
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1218.)

For instance, one H.T. tapping should be taken to the H.F. side, another to the detector, and another to the L.F. stages, and so on.

If the H.T. is found to be up to standard, the following schemes should be tried:

1. Reverse the leads to the secondary terminals of one of the L.F. transformers.
2. Earth the cores of both transformers.
3. Connect a .25-meg. resistance across one of the secondary windings.
4. In the case of R.C. coupling, try reducing the size of the coupling condenser or of reducing the value of the grid resistance.

It should be pointed out that an output filter unit with one side of the loud speaker taken to L.T. is a very useful method of improving the stability of the L.F. stages.

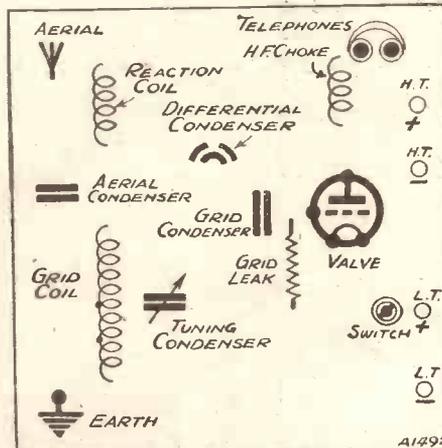
Another very good scheme is to insert an "anti-motor-boating" device in series in the H.T. lead of the detector valve (as often described in "Radiotorial").

DISCONNECTING THE H.T. BATTERY.

S. M. (Hull).—"As a reader of your paper I take a special interest in your feature 'Radiotorial,' and may I make a suggestion? I have noticed many queries recently by curious readers as to the advisability of disconnecting the H.T. as well as switching off low-tension.

"May I point out that it has been your usual practice in the design of a set to put the L.T. switch in the positive lead? Now as negative L.T. and negative H.T. are usually

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Here are the "components" for a one-valve set, employing a differential reaction condenser. Can you "wire up" this circuit? Look out for the answering diagram in next week's "P.W."

connected together somewhere or other in the circuit, my suggestion is could you not arrange that in future L.T. — and H.T. — should be joined together, and instead of taking them to separate terminals as you do now, take them to the terminal which is connected direct to the on-off switch?

"By this method there will be a direct make and break for both the L.T. and H.T. batteries, instead of relying as you do now on the theoretical perfectness of condenser insulation, etc. Incidentally it would do away with another terminal. (By the way, I have only seen one circuit published by you in which the switch is in the negative lead, this being the 'Every Purpose' Three.)"

We thank you for the suggestion, which at first sight appears to be a good one! But years and years ago we found there was a snag in it. The snag lies in the fact that even when the set is not in use the low-tension accumulator will still

(Continued on next page.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

be connected across the low-tension terminals. Forget for a moment that it is an accumulator and think of it as a connector of only a few ohms resistance. You say, "negative L.T. and negative H.T. can be joined together and instead of taking them to separate terminals as you do now take them to the terminal which is connected direct to the on-off switch. By this method there will be a direct make and break, etc."

But you will see that if you join H.T. - to L.T. - and leave your accumulator connected to L.T. - terminal and to L.T. + terminal the H.T. - will be connected by the accumulator and to all the valve filaments, etc., which is the very thing you wish to avoid. In other words, you cannot disconnect both the H.T. and the L.T. batteries with an ordinary make-and-break switch.

"VOLUME CONTROL USELESS."

"DISGUSTED" (Wembley).—"The volume control is absolutely useless. On the loud stations I can hardly tell where it is, and I twist it round where I like without the slightest difference as far as you can make out. On very weak stations it does make a difference. I do not call that volume control."

"In other ways the set is so good that it makes it all the more disgusting. The leads from the end of the potentiometer to the valve

WHAT DO YOU THINK ABOUT THIS?

A Birmingham reader of "P.W." found one day that his crystal set was much weaker than it had been in the previous week. In looking for the fault he accidentally found that signals were restored to normal strength if the person wearing the phones sat on the floor! But they "went off" again as soon as he stood up!

WHERE WAS THE FAULT?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the answer to above next week.)

The Southampton reader whose portable set was mentioned last week as an example of "sulkiness" eventually located the trouble in the first L.F. valve's holder, where the grid leg of the valve was making faulty contact with its socket.

are short and well soldered, and also the one to the grid leak from the slider, so I am sure it is not the wiring at fault.

"The only effect of turning the potentiometer back is to make the reaction a little unsteady when hunting for distant stations, so poor as it is, I only use the top end of it. What is wrong?"

You are. We hate to say it, "Disgusted," but this "volume control" that you are talking about is not a volume control at all!

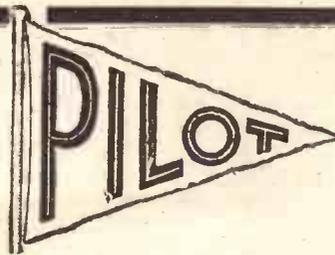
There are other uses for a potentiometer besides controlling volume and one of them is to get smooth reaction effects. Your potentiometer allows you to do this and that is what it is for (incidentally that is what makes the set so good on distant stations).

To control volume you would require not only the potentiometer wired up quite differently from the way you have it at present, but you would also need a different type of potentiometer, the one you have being of comparatively low resistance (probably less than 500 ohms), while for volume control a very high resistance potentiometer is required—a quarter megohm or more.

GRID BIAS FOR H.F. VALVE.

T. L. (Birmingham).—"Can I use one of the little pots from an ordinary flash-lamp battery for 1½ volts negative bias to the H.F. valve, and if so, which is the negative end?"

This will serve quite well for your purpose and the negative "terminal" will be the zinc container.



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P.W. 22/2



FOR THE LISTENER.

(Continued from page 1194.)

The Engineers.

Beethoven's Fifth Symphony, performed by the Frankfurt Orchestra and conducted by Weingartner, was magnificent. I liked the shy German announcer, with his soft, hesitating voice, who spoke in English for our benefit. But the most gratifying thing of all was that in my little room—heaven knows how many miles away from Frankfurt!—I heard the music as clearly and as fully as if it had come from the Queen's Hall. Hats off to the engineers!

The Censorship.

The debate between Mr. Desmond MacCarthy and Mr. Gerald Barry on "Freedom of Speech" was good. Mr. Barry was "for" the censorship and Mr. MacCarthy "against." For once in a way Mr. Barry played second fiddle, and did little more than ask questions.

Mr. MacCarthy had the fat part; and, whether or no you agreed with him, it was very pleasant to hear his quiet, easy voice, his ready answers, and the sense he gave of mature wisdom. I am glad that the programme committee has found Mr. Barry another job, for, when his talks on "London Week by Week" came to an end, I feared we might lose him. He is far too good a man to lose.

A Brighter Sunday.

Something will have to be done about the Sunday programmes which, although Sunday must be the big listening day for multitudes of people, are the dullest of the week. The other Sunday, for example, Mr. Dale Smith's second group of songs—some old English ditties admirably sung, but lasting only about ten minutes—was the one bright moment during the whole of the broadcasting period.

Berlioz' "Childhood of Christ" was good in its way, but hardly relaxing. Personally, I congratulated myself on finding in Paul Hermann's delightful 'cello recital an alternative to Dr. Waterhouse's religious talks, which for the last few Sundays, probably owing to his inability to deliver them himself, have been unhappily flat. A brighter Sunday is much needed.

The Tragic Mabel.

I have a grudge against Mabel Constanduros. Her short play (with Michael Hogan) "The Witchwife," was almost unendurably heartrending. And I had comfortably settled down by the fire to be amused by her as usual!

My fault! I ought to have known how versatile she is, and how near tears are to laughter. A fine little play, it was—but, oh, the terror and agony of that poor girl at the end! Why did you do it, Mrs. Buggins? But please do another!

Vaudeville.

At the moment the outstanding thing about the vaudeville programmes is that the B.B.C., yielding to the pressure of criticism, has abandoned the vile practice of announcing them "through the band." And, as if relieved by the removal of this incubus, the programmes have been distinctly better!

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TECHNICAL NOTES.

Anode-Bend Rectification.

THE subject of anode-bend rectification upon which I touched in these Notes recently, is evidently one of interest to a large proportion of readers, judging by various points which have been raised by correspondents.

It seems that certain important characteristics of the anode-bend rectifier are not always appreciated, and it may perhaps be useful to sum up the advantages as well as the peculiarities of this type of rectifier.

How It Operates.

In the first place, as you know, the imposition of the speech-frequency upon the carrier-wave has the effect of varying the strength of the carrier in accordance with the sounds transmitted. This combination of carrier and speech frequencies (otherwise the modulated carrier) is impressed upon the grid of the valve and the mean voltage of the grid is thereby varied in accordance with the transmitted sounds.

The variation of the grid voltage produces corresponding variations in the anode current which, of course, will be a replica of the variations applied to the grid. If the grid bias applied to the valve is such that the valve is operating somewhere near the mid-point of the straight part of the characteristic curve, that is, let us say, roughly half way between the top and bottom bends, the signal will be amplified in the usual way, and the positive and negative half-cycles will be amplified to about the same extent.

Effect of Bias.

If now the valve be biased so as to operate at the bottom bend, the amplification of one half of the signal is very much greater than that of the other half, owing to the shape of the curve, with the result that the incoming waves are virtually rectified. It is important in some ways, although not for our present purpose, to bear in mind that the rectification is not complete; in proper conditions it is, however, sufficiently so for all practical purposes.

It is these rectified or uni-directional impulses which produce the change in current observed on a milliammeter in the anode circuit of a detector valve, when the tuned circuits are brought into resonance with a carrier-wave, the extent of the change being a measure of the strength of the carrier.

Distortion.

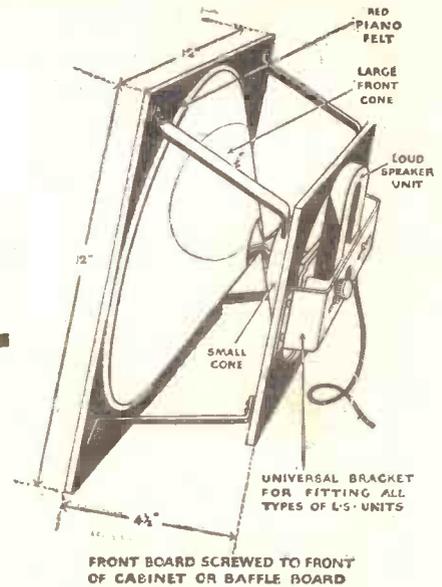
Now, an important point to note is that, if only a very weak signal be applied to the rectifier, so that the curved part of the characteristic curve, as distinct from the straight part, comes into play, the amplification of the low-frequency impulses will vary, with the result that the signal will be distorted.

For this reason, the high-frequency input should be larger than a certain minimum and, in fact, as is well-known, the distortionless character of the anode-bend

(Continued on next page.)



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TECHNICAL NOTES.

(Continued from previous page.)

rectifier depends upon this condition being fulfilled. In addition to being virtually distortionless under proper operation conditions, the anode-bend rectifier has the further important advantage that it will handle quite a large input and, therefore, may be preceded by an efficient high-frequency amplifier.

In some cases, where an alternative method of rectification is used, a definite limit is placed upon the amount of high-frequency amplification which may be used before the detector.

Effect Upon Input Circuit.

The load thrown upon the input circuit by this type of rectifier is very small compared with that of other forms of rectifier, whilst the rectifier can be neutralised in the same way as an ordinary H.F. amplifier, in which case the load thrown upon the input circuit is practically nil.

With the anode-bend type of rectifier a comparatively large low-frequency signal can be passed on, without distortion, to the L.F. amplifier.

On the question of sensitivity, provided the input is comparatively large, the anode-bend rectifier is probably superior to any other type.

A New Ammeter.

The measurement of aerial currents and other high-frequency oscillatory currents is not the simple matter it might at first seem. The well-known method of determining the current by its heating effect, that is, by the use of a hot-wire ammeter and so on, is open to certain serious objections.

For one thing, the instrument must be designed in a special way in view of the fact that these high-frequency currents tend to travel along the surface of the conductors and, furthermore, this effect, known as the "skin effect," depends upon the frequency.

It has been proposed to use conductors of very thin strip formation in order to minimise skin effects, or rather to make the effect definite and easily calculated, and this arrangement has been used in the past with some success.

But hitherto no really satisfactory method has been found, and as the accurate determination of the value of high-frequency currents is extremely important in many branches of radio research work, this is one of the subjects which has been taken up by the Radio Research Board for investigation.

As a result of experiments, it has been found that mercury in a narrow glass tube forms a very simple and reliable indicator of the heating effect due to the high-frequency current. Simplified, the arrangement is a kind of mercury thermometer in which the current to be measured is passed through the mercury column, thereby raising its temperature and causing it to expand, the device being its own indicator.

Instead of measuring the temperature ultimately reached, however, what is wanted is the rate of heat production, and this is determined by noticing the rate at which the mercury expands. By careful calibration and working between definite temperatures, so that the heat-losses are constant, this method has been found very accurate and can be employed with comparatively heavy high-frequency currents.



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