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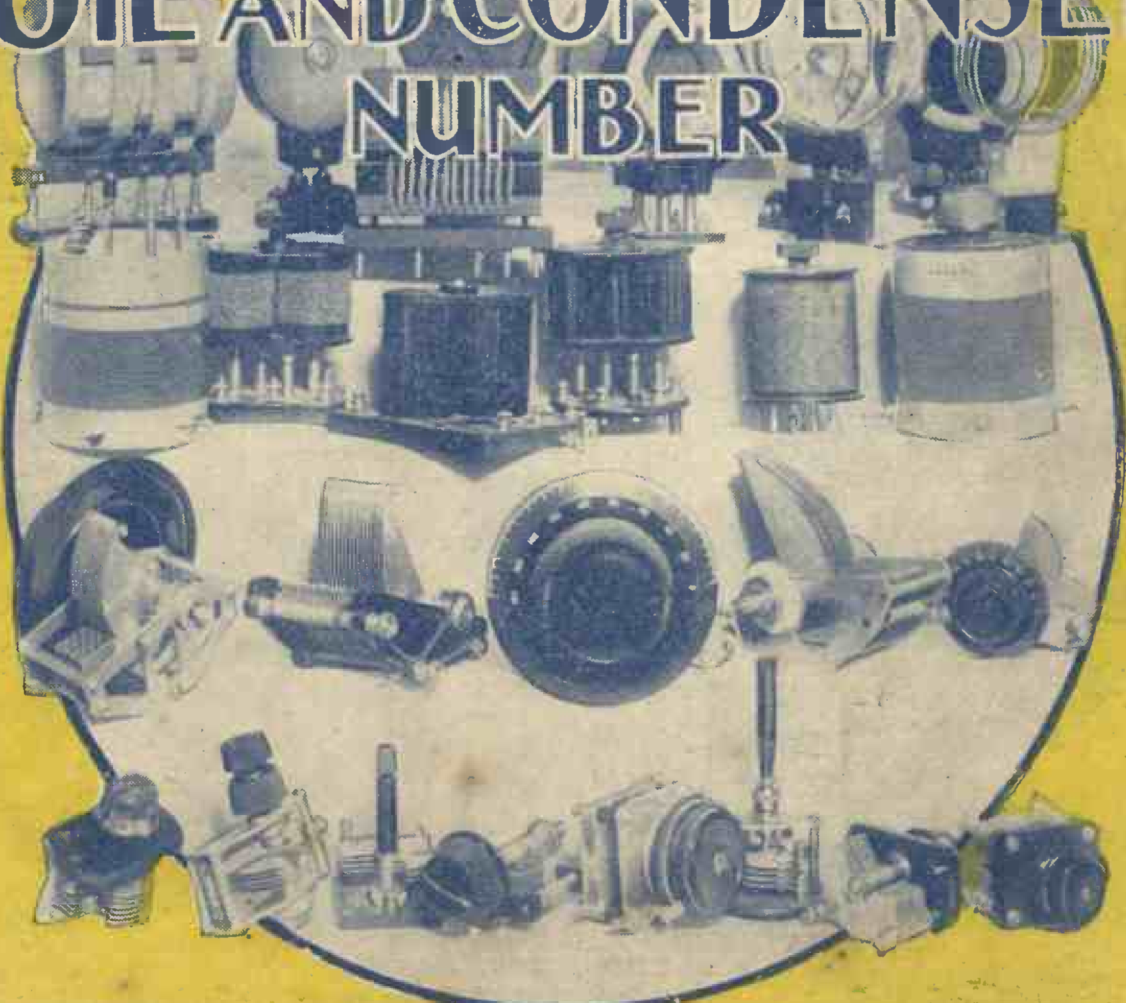

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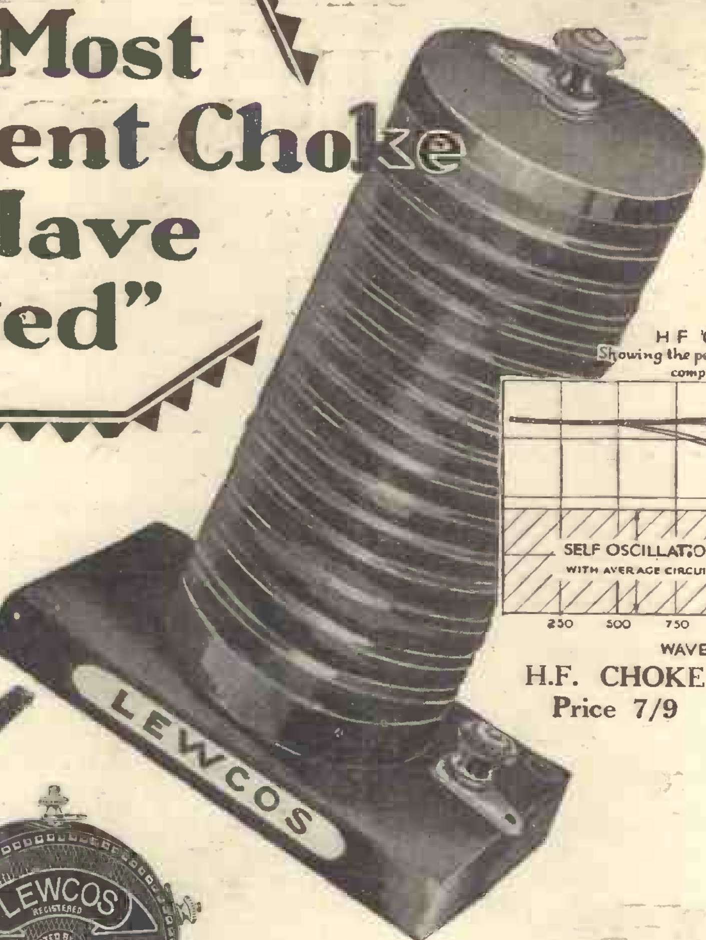

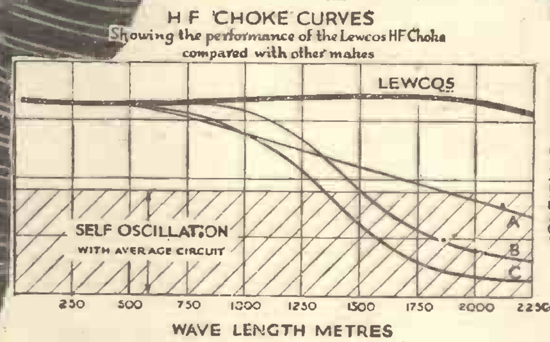

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Price 7/9

"We are pleased to report that the Lewcos H.F. Choke is, in our opinion, the most efficient Choke we have tested, there being no sign of instability even when using 150 volts H.T. on the Anode of the S.G. Valve. The construction is massive and well-finished, and its design places it in the front rank of high-class components."

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MORE RESEARCH NEEDED.
HISTORY BOOKS & RADIO.
"A SHY LITTLE VOICE."
THE SHORT-WAVE CLUB.

RADIO NOTES & NEWS

THE RADIO LURE.
HUSH! HUSH!
A TRIBUTE TO L. G. M.
"SOME" ORDER.

More Research Needed.

IN my present frame of mind the apparent inability of radio waves to annihilate green fly strikes me as a defect of Nature. Possibly Nature has more use for green fly than for roses; what would the ladybirds do without their little friends? However, I live in hopes of reading, (*a*) that a German scientist has killed a green fly with an invisible ray which couldn't hurt a rose if it tried, or (*b*) that according to a popular American "scientific" magazine a method of turning green flies red and harmless was devised in Chicago by a policeman.

Conscience in the Cotswolds.

DURING my little jaunt amongst the peaceful fields and pleasant folk of those hills which keep old Father Thames a-running, I was interested to see how thoroughly the radio habit had invaded even the tiniest hamlets. One cottager, whose garden was about twelve yards long, sported a two-wire aerial whose wires were separated by spreaders which looked to me to be quite eight feet long. But what amused me most of all was the fact that this conscientious fellow had strung on his aerial a considerable number of corks—doubtless to protect pigeons. I saw one pigeon in ten days' walking!

Another Knell.

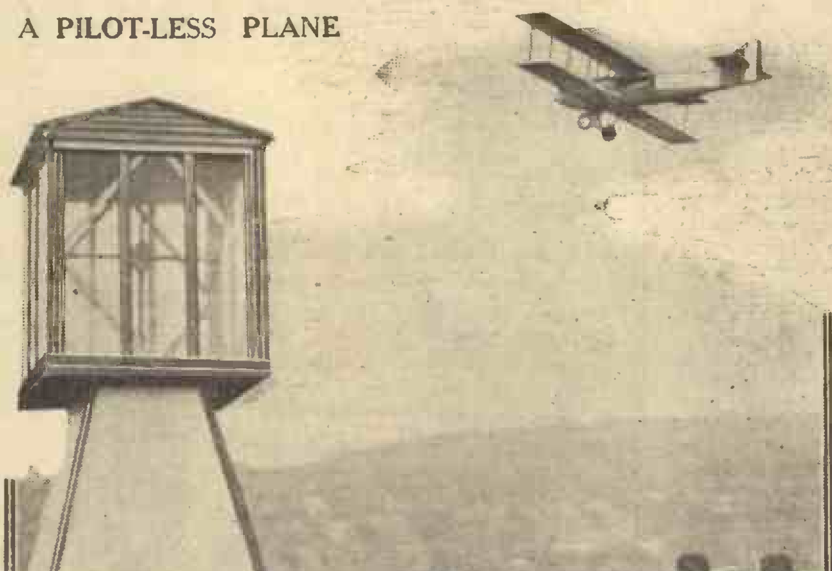
SO Stoke Poges Church is fitted with a radio-gramophone. This is typical of the acts with which the modern spirit is administering the *coupe de grace* to the old romance. In one of his novels Hardy describes the consternation of a village church choir when it was known that the vicar intended to replace their instruments—serpent, bassoon, etc.—by an organ. Vicars are evidently still innovators. Ah, well! the old churchyard and that "ivy mantled tower" which inspired the poet Gray to write that Elegy which soothed the mind of Wolfe in the shadows of the Heights of Abraham will resound to canned music—and that's that!

Returning the Compliment.

I LIKE that story about the nightingale down in Surrey. They say that it sings regularly outside the farmhouse window, but only if the farmer first switches on a musical programme from the loud speaker.

Is this a case of a shy singer waiting to be coaxed, or a canny nightingale with a well-thought-out idea of tit-for-tat?

A PILOT-LESS PLANE



This radio-controlled plane, flying without a pilot, is directed from the tower shown to the left of the picture. The French President watched it fly over Paris.

History Books and Radio.

THIS new Rome station that we hear (and what a kick it's got to be sure!) is not the only one to be placed on a site where history began. There is a powerful station at Carthage. *Carthage*, mark you, near the ruins of the city that was old when William the Conq. was a bit of a boy.

And now the Grecian Islands are to be linked with Athens for high-speed telegraphy and duplex telephony, and I suppose it is just possible that the radio engineers, looking for a good earth, will disturb the bones of men whose names are still household words after thousands of years.

Quaint thought for the week: I wonder what Homer and the rest of those literary chaps would have done if they had had a rapacious radio editor on *their* track every week for notes and news?

New Use for Radio Telephone.

ALTHOUGH the new White Star liner "Britannic" was built at Belfast, her trial trip was made on the Clyde 150 miles from the Belfast shipyards. In order to keep her in constant touch with her builders during her rush over the measured mile, she was equipped with a wireless telephone set, type Y.C. 4,500 watts. A similar set was installed in the offices of Messrs. Harland & Wolff at Belfast. Thus the experts aboard the vessel were able to report immediately to headquarters everything of importance which occurred during the trip.

"A Shy Little Voice."

A FEW weeks ago "Philemon" in his "For the Listener" notes mentioned a shy little voice which announces the names of the short piano pieces; he asked whose is the voice. Now that is, of course, only his little joke, for he is not half so wise as he wishes if he has not long since met the owner of that voice, which, I confess, has charmed me for some years.

(*Continued on next page.*)

RADIO NOTES AND NEWS.

(Continued from previous page.)

Bless me! We all know our "Auntie Sophie's" voice. And is she not Miss Cecil Dixon, that finished pianiste?

A Yorkshire Query.

YORKSHIREMEN have the reputation of being sometimes "near" and "careful," so I was not surprised to get a letter from a chap the other day asking me if he would be able to hear Moorside Edge on a crystal, "BOTH programmes?" What did surprise me, however, was to find that according to the map he is going to be only about six miles away from the new North Regional! Six miles and more power than London! And 500-ft. masts, instead of about 200, as we in the South are compelled to put up with! Yes, sir! You *will* hear Moorside Edge.

Why Have You No Radio?

S. G. BROWN'S have been making some very acute researches into the state of the market, with the result that it would appear that the greater part of the population doesn't listen-in. For instance, they say that in the area covered by the B.B.C. there are 10,811,077 families, but only 2,947,098 licences, so that there are 7,863,979 families who don't listen-in and are potential buyers. A jolly little sum, but although the arithmetic is right the logic is wrong. Some of the families are "pirates," some are too poor to indulge in radio, some are stamp-collectors, and some have given up radio out of disgust from being "jammed" by trams, bacon-cutters, and the like.

The Short-Wave Club.

MR. F. EASTER, of Cincinnati, U.S.A., has kindly sent me a copy of a little 10 cents 12-page magazine which is the official organ of the International Short-Wave Club. This little publication is full of the kind of material with which our own W. L. S. deals so ably. The address of the club is, Klondyke, Ohio, U.S.A. Mr. Easter tells me that this club is doing some useful work and *inter alia* has induced some of the South American stations to announce in English in addition to Spanish, and to put on special programmes in return for reports on reception. Good luck, long-life, and a long mailing list to the I.S.W. Club!

Hudson Bay Radio.

THE Canadian Government has informed the Imperial Shipping Committee that it has established an inter-communicating chain of four direction-finding wireless stations on the Hudson Bay route. Fully manned day and night, they give wireless bearings, weather forecasts, and navigation warnings to ships, free of charge.

Must be a cold sort of radio you get as a Hudson Bay D.F. Operator, but I'll bet those lads enjoy it. And if this meets the eye of one of them, well "Bung Ho," says Ariel to him!

What is Wrong With the News Bulletins?

"TOO much dull and unimportant foreign news."

"Too much dull home news."

"Too little human interest news."

That is a criticism I saw in "Everyman" the other day, and the writer backed it up with some pretty sound arguments.

He suggested that the B.B.C. should ask the editors of the leading London and provincial newspapers to take a turn at the bulletins, and let listeners say how they liked the change. As it shouldn't cost anything to try I hope the B.B.C. will take the hint.

The Radio Lure.

"SMASH and grab raiders threw a brick through the window of Mr. Lett, Burnt Oak, and escaped with a wireless set and accessories," says the report in the Press.

I like keenness in radio matters as well as anybody, but this brickbat business and running away isn't good enough, is it?

And it's useless me grumbling about it, I suppose, for chaps who would do a thing like that wouldn't be likely to read "P.W.," would they? Pity, too, for say what you like they were keen, and they can't really *enjoy* that set now, can they?

SHORT WAVES.

"Wireless for the *Weak*. The following is a list of the main items to be broadcast during the next seven days," we read in a provincial newspaper.

Reading down the list, we certainly agree. A strong man would never stand for it!

* * *

B.B.C. "MURDER." Listeners having a killing time.—"Daily Mirror."

* * *

"Wireless waves transmitted from a newly-designed apparatus fitted to a motor-car will start a motor which opens the garage doors without the motorist leaving his seat," we read in "Answers."

That, of course, is a decided advantage after one of those "Re-union" dinners.

* * *

ODE TO THE B.B.C.

You've given us the best from the confines of the earth,
You've brought to us the stars of melody and mirth;
We're really very thankful for all the jolly fun,
But we wish you'd get a gadget for tuning-in the sun.

"Evening News."

* * *

"Nearly all the disturbances which you hear on the wireless are not 'static' at all. They are the crinkling of the paper held by the people talking in front of the microphone," we read.

Well, even paper must have its way of showing indignation at some of the really dull talks broadcast these days.

Three Years' Good Work.

IF you happened to be not only poor, but bed-ridden, and somebody came along and said: "Like a wireless set? I'll get you one!"—you'd think the world wasn't such a bad place after all. It *isn't* such a bad place, either.

About three years ago some good folk in Manchester and Salford got together to do just that service for poor invalids, and in those three years they've installed and maintained *nearly* 250 *sets*. They'd like to go ahead still further, but there's a shortage of coin of the realm, so if you have any to spare of those little Jimmy o' Goblin things—or even a bob!—there's a chance for you to help. The address is Councillor T. Ackroyd, 17, Berkeley Avenue, Levenshulme, Manchester.

Hush! Hush!

I HATE to mention it while you are dabbling your toes in wet sand at Frinton, or bathing at Brighton, or keeping cool at Blackpool, or whatever holiday stunt it is you are engaged on; but alas! holidays don't last for ever.

And while the world and his wife have been listening to the band on the pier, the Radio Manufacturers of Gt. Britain have been up and doing, like the noble lads they are. They've finally fixed up about the next Radio Exhibition. Olympia again, September 19th to 27th.

And though you try to kid yourself that it's of no interest to you, you'll be right there with the rest of them. Keen as mustard you'll be. And so, as a matter of fact, shall I!

Watch for This Short-Waver.

ANY of you fellows that make a habit of hanging about on 21, 41·5, and 84 metres, might keep a look-out for a little stranger calling himself Z T 2 A. This station belongs to Mr. D. C. Shanks, who hangs out a very pretty aerial at Humansdorp, South Africa (P.O. Box 43).

Mr. Shanks would be awfully glad to hear from any "P.W." chaps who can report upon the kind of kick that Z T 2 A comes in with.

Miss Amy Johnson.

BEFORE some enterprising girlie flies to the moon and back, there is one little item about Miss Amy Johnson that I should like to unload on you. You probably heard her recent breezy broadcast from Australia, but did you know that the B.B.C. had booked her for a talk in the "My Day's Work" series, way back in February last?

Unfortunately she was ill a few days before she was due to speak, so she wrote to the B.B.C. apologising, and said she hoped she would be allowed to speak again sometime. But neither the B.B.C. nor Amy herself had any idea of the flutter she would cause over the world before she confronted the mike!

A Tribute to "L. G. M."

RECENTLY I had the sad task of chronicling the death of Leslie G. Mainland—"Uncle Leslie"—and I remarked on the affection with which he was held by all the kiddies.

A fellow I know who went to "L. G. M.'s" funeral tells me that he saw there a wreath that unexpectedly dimmed his eyes for a moment. It was nestling among all the big ones from all sorts of famous people. And who do you think it was from? Just "The Little Listeners Next Door."

What better tribute could "L. G. M." himself have desired?

"Some" Order.

IN connection with the British "Wireless for the Blind" Fund it is of interest to note that a contract for the supply of six thousand receivers has been received by Messrs. Burne-Jones & Co., Ltd., of Borough High Street, S.E. Very nice to be going on with, eh? The real point of interest about this—they will correct me if I am wrong—is that this firm began "in a small way," not so very long ago, as makers of choice components, I believe. Well, they have quickly established a name for the reliability and general excellence of their products. One of their Directors was a prominent amateur transmitter as early as 1922—he may still be—and I often used to listen to his tests.

ARIEL.

TRANSIENTS AND THE TRANSFORMER

By CAPT. P. P. ECKERSLEY M.I.E.E

I MADE a statement in my last article that I believed that quality could be improved by a different attitude towards acoustics, by the use of better microphones (which at present, all points considered, do not exist), and the elimination of all transformers.

Our Radio Consultant-in-Chief goes further into the important subject of quality transmission and reception.

Now let me explain my point of view about transformers. In the very old days transformers had shocking frequency characteristics. I therefore sang the praises of resistance capacity.

Transformers were, however, soon improved, and I was then at pains to point out that transformers had so progressed that one could not level at them the criticism that they reproduced only a few of the wanted frequencies. But one's understanding of the problem expands, and a year or so ago I began to be seriously concerned about another aspect of the matter—the reproduction of transients.

If you clap your hands the characteristic disturbance can be understood to contain a mixture of all sorts of frequencies having all sorts of different phases.

A pistol shot, an explosive voice sound, or, in general, all impulsive noises, can be eventually analysed into the sum of a number of harmonic disturbances of different amplitudes and different relative phases.

The Electrical Copy.

Now, the question of the shape of the electrical copy compared to the shape of the original disturbance is extremely important. If by changing relative amplitude and phase of the component frequencies the reproducer distorts the shape of the transient, poor quality results.

Now, circuits which do very nicely when analysed as regards their behaviour to steady sinusoidal disturbances may so mangle phases of a composite disturbance as to give transient distortion.

Theoretically, the transformer is likely to do this more than a *well-designed* resistance-capacity circuit, and so I say transformers are liable to give transient distortion more than the R.C. coupled type of connection.

Don't leap to the conclusion, however, that you must scrap your transformers; that would be out of all proportion. Why? (1) Because the B.B.C. use them, lots of them, and they use long lines, and it's no good your being more perfect than the B.B.C.; (2) because your loud speaker gives transient distortions probably greater than those produced by a well-designed transformer; (3) because the transformer is very practical and efficient.

Short Waves to the Rescue?

But I was discussing quality from the angle of the achievement of perfection, and I said I believed the B.B.C. must scrap their transformers, whereafter we people on the reception side can set about our problems once more.

The B.B.C. must set the pace; their transmissions should be better than our reception, partly because they have unified control, partly because they have economic problems like we have.

But, and still indicating a future, there is no use scrapping transformers without having in mind the eventual scrapping of the lines connecting studio and transmitter. Here we are up against a serious problem; transformers are a practical convenience; we might say lines are a practical necessity.

However, I meet Rumour, who winks her other eye and talks of ultra short waves doing the strangest things; as, for instance, waves of a few metres giving perfect results (and no transient distortion!) up to the limits of distance as between studio and *local* transmitter, e.g. the fifteen miles between Brookmans Park and Savoy Hill.

Who may not live to see such a wireless link consummated? Then good-bye to lines, transformers, and transient distortion. It's all a question of a sense of proportion.

Over-caution says that it won't scrap lines because transformers give distortion, and won't scrap transformers because lines give distortion. My attitude is get on and try—get on, get on! How I hate the phrase "You see, there are a tremendous lot of difficulties"! Of course there are, with so many people making them!

Seriously, I do believe that this problem wants most serious consideration. I understand it is getting it, and as long as that results in something we shall be satisfied.

And Then—the Receiver.

And so with lovely music rooms, musicians to choose the privileged acoustic position for the microphone, with that microphone so small as not to disturb the sound field, so perfect as to give the wanted response, with no transformers or lines to give transient distortion, we may come nearer perfection in music transmission.

Then we have the receiver problem to tackle. Here eventually, and looking at the problem in the same way, the receiver, aiming at being a musical instrument and not a noise selector, will foreswear the transformer, the time constant in resistance capacity, and it will be perfect enough to claim the perfect loud speaker also free from transient distortion.

To-day there are so many practicalities to consider, chief among them the partly inevitable failures of transmission, that it is useless fussing over acute academic problems; we must just balance practicality against perfection.

But there is to-morrow and the day after, so let us get on!

A WELL-APPRECIATED GIFT.

Old Merchant Service sailors listening with one of the radio receivers recently installed at the Royal Alfred Institution at Belvedere by the Marconi people.

INTERNATIONAL "S.B's."

An interesting account of the vast and complicated organisation that is necessitated by International broadcasts.

By OUR SPECIAL CORRESPONDENT.

I HAVE spent the last few months in various parts of Europe, interviewing the directors and chief engineers of most of the big Continental broadcasters.

One thing I always made a point of asking, when the strict business of seeing the station was over, is "What do you think of the B.B.C.?" A surprising thing is that often the officials knew more about the B.B.C. than I did, having been out of touch with England for some time, and being too busy to read English papers!

The First Step.

Now that there are International Broadcast phone lines between Stuttgart, Munich, Berlin, Nurnberg, Kiel and Emden, the Continent is not only in constant line touch with Savoy Hill, but can "pinch" the B.B.C. programmes whenever arrangements can be made.

These international lines have been spreading all the time I have been abroad, and just recently I had the opportunity of a long chat with a Reichs-Rundfunk technical man in Cologne about the way in which international "S.B.'s" are carried out.

Quite often the Berlin transmitter made radio relays of the old 2 L O, but while the radio link is reliable for a hundred miles or so, it cannot be relied upon for long cross-Channel communication. The B.B.C. realised this, and perhaps you remember the Menin Gate relay, which was only a partial success, some years ago.

All these troubles showed that good lines between England and the Continent, and between the chief European stations, were a vital need.

The first step was to get the London-Brussels line (running on the bed of the Channel) quite right.

From last August till last September the Rundfunk engineers and the B.B.C. carried out tests on several evenings a week. These relays were not broadcast, but were put on "closed" circuit, with amplifiers, tone-changers and phones.

Deliberate Distortion.

As not very much could be done to the line itself, the problem was to make it adaptable to the frequency range needed for broadcasting, which is about twice as great as that needed for ordinary telephone work.

While a cable will not always "accommodate" the frequency band as it is, it may be able to accommodate frequencies much higher (usually) or much lower than needed. So a tone-changer—a bank of resistances and condensers or resistances and chokes (according to whether the tone is to be raised or lowered)—is used at each end of the line so that the full frequency range can be carried, but distorted to suit the line and then brought back to the proper level.

After seven or eight weeks' hard work, the cross-Channel line was deemed satisfactory, and the next problem was to arrange for a further extension to the London-Cologne (via Brussels) existing cable.

One of the difficulties, though, was the problem of programmes and copyright. It wasn't much good going ahead with an S.B. line costing thousands of pounds if the use of it would be restricted by international copyright, so within three weeks a meeting was held in Brussels.

Here gathered B.B.C. officials (the meeting was at the B.B.C.'s invitation), broadcasting and Post Office authorities of the Reich-Rundfunk of Germany, and radio and technical authorities from Belgium. Unlike most international "conventions," something really did materialise from this Brussels October meeting, for most of the questions of finance, copyright, programme-exchange and so on were settled.

THE NEW NETWORK.

Here you see routes followed by some of the cables that are being used for International S.B.'s.

After this, the technical men could go ahead and make the whole line network suitable for broadcasting; but they met troubles in a big crop. For one thing, there as no direct line between Cologne and Berlin, and it was essential to connect Berlin, of course; the line had been tested as O.K. as far as Cologne, and the problem was to find a wide-frequency cable to cover the rest of the distance.

There were two lines, not direct, but one going *via* Frankfurt and the other *via* Hanover. One would not take frequencies higher than about 300 cycles per second, and the other had a cut-off at this point, but worked well up to 5,000 cycles or thereabouts.

By an ingenious method, the invention of a German Post Office official, Dr. Fiedler, both lines can be used at once, one carrying the higher frequencies, and the other taking the other side of the frequency scale.

New Lines Being Laid.

This is much more difficult than it sounds, because the time-lags of both lines have to be balanced, but it has been done. It is an expensive method, for two lines have to be used, but it is more reliable than a radio link.

None of these lines is the property of the broadcasting authorities in any country, of course, but they are owned by the Post Office or the cable companies. These bodies must make a handsome profit out of these international S.B.'s, but they are paying some of it back, I understand (at least, in Germany) by putting some of their best technical men on to the job of improving the lines.

New lines are being put down, but the network will not be finished for another three years.

WORKSHOP HINTS

Soldering is often simplified by filing the copper bit into a long wedge-shaped point.

* * *

One of the best rough and ready rules for soldering iron temperature is to let the iron heat until it "burns" with a green flame.

* * *

If you try holding the hot soldering iron about four inches from your cheek you will soon be able to estimate exactly when it is hot enough to work with.

* * *

When filing a point to clean it for soldering, remember that immediately it is clean it should be coated with flux to prevent oxidisation.

* * *

A pair of cardboard "jaws" fitted over your vice will prevent it from scratching a panel placed in it.

* * *

A little oil at the bottom of a cigarette tin is one way of keeping little used drills from rust

H.F. COUPLING QUERIES

Listeners who use high-frequency amplifying stages will be interested in this account of early difficulties and modern methods.

By P. R. BIRD.

LOOKING over the records of the "P.W." Technical Queries Department for three or four years discloses some very interesting facts about high-frequency coupling. "P.W." readers have never failed to pay adequate attention to this important branch of our hobby but the queries raised about it to-day are strangely different from those raised about two years ago.

Not only is the number now smaller, but the whole tone of the queries has altered. It used to be mostly S O S's.

"I cannot hold the H.F. valve down, and if you cannot help me I shall go mad"; or "The set is all right, except for the H.F. valve, which whistles and howls its head off every time I look at it."

A component which carries a heavy H.F. responsibility is the H.F. choke. This one is a Lewcos product.

They were the kind of queries which used to arrive but nowadays are almost unknown!

The reason, of course, is that H.F. coupling has passed from the "hold-it-down" stage into the well-behaved and normal circuit class. There is just as much interest in long-distance listening and more high-frequency amplifying being done to-day than at any time, but the modern pre-detector valve is as stable and decorous as the power valve. The neutralised stage and the S.G valve have, between them, saved the H.F. situation.

The most popular circuit of the neutralised type is the split primary, for which a coil unit having a tuned secondary is usually employed. Half the primary feeds the plate of the valve, and the other half or neutralising winding, in conjunction with its neutralising condenser, ensures stability.

High magnification and great selectivity are obtainable with such an arrangement, and, once adjusted correctly, there is nothing to go wrong with it.

A small but vital H.F. coupling component is the fixed grid condenser. This is one of the Ediswan interchangeable type.

The screened-grid valve is, if anything, still simpler. Enormous amplification is obtainable, and with a valve of this type successful results are mere child's play.

S.G.'s and the Tuned Anode.

The tuned anode circuit, with its enormous impedance at resonance, is particularly suitable for S.G. coupling, and though selectivity with this class of circuit is apt to be slightly inferior to that obtainable with a well-neutralised stage, in many districts it has proved satisfactory.

It was at first thought that the introduction of shunt-fed H.F. circuits might give rise to trouble, but this variation, too, has been particularly well handled by "P.W." readers, and surprisingly few failures have come to the Query Department for treatment. Incidentally, those that did were mostly due to poor H.F. chokes.

The ubiquitous plug-in coil is invaluable for H.F. coupling purposes. This specimen is a "Brownie."

Whatever form of coupling you use, the H.F. choke must *be* an H.F. choke, or you are in for trouble. Nowadays the average manufacturers' choke is good, so that trouble under this head occurs only very infrequently.

Until recently the two main troubles that readers complained of when using S.G. valves were non-selectivity and H.T. consumption. The non-selectivity has been attacked in several ways, and the Research Department's recent investigations into selector aerial systems and band-pass filters have provided plenty of interest in this direction. As regards selectivity, various X coil arrangements like that in the new "Magic" Four have cleared the way for regional scheme requirements before the regional stations are hardly "on their feet."

The Watmel D.X.2. H.F. Choke.

Economy in battery requirements has been effected by means of grid bias on the H.F. valve, and not only are the newer designs incorporating this where necessary, but particulars have already been given as to how the method may be applied to existing sets. Incidentally, the provision of grid bias helps selectivity as well, so that those who are running an S.G. valve without grid bias should consider seriously.

Even wave-change switching on high-frequency stages is now being carried out in a manner that a year or two ago was impracticable. Dual coils have helped here, and so have some of the "P.W." circuits with simplified switching.

In this connection one special point calls for comment. Now that H.F. stages are expected to function on two wavebands, proper screening must be taken seriously, and it must be realised that the spacing of the high-frequency end of the set, and the particular types of components used there, are invariably the result of careful consideration.

LATEST BROADCASTING NEWS.

HAIL! DICK SHEPPARD

THE WARWICKSHIRE PAGEANT—A BLACKPOOL RELAY—HOUSEWIVES' TALKS OFF IN AUGUST—MIDLAND'S ENTERPRISE AGAIN.

"DICK" SHEPPARD is to broadcast again! This is good news for thousands of listeners who have not heard the famous preacher's voice since he left the Church of St. Martin-in-the-Fields to seek the sun in Italy, a sick man, whose friends were despairing his life.

To-day the Rev. H. R. L. Sheppard, Dean of Canterbury, is much better, and he is sure of a magnificent welcome when he preaches from his old pulpit at the church in Trafalgar Square on Sunday evening, July 13th.

The Warwickshire Pageant.

A big event in the Midlands, the great Warwickshire Pageant, in which over 2,000 performers are to take part, and which is to be given in the grounds of Warwick Castle, should provide a particularly interesting broadcast from the Midland Regional transmitter on Wednesday afternoon, July 16th.

The Countess of Warwick, whose interest in historical subjects is so well known, is taking an active part, and Lady Bird as Mistress of the Robes will be responsible for the costumes which Miss Gwen Lally, the producer, insists shall be historically correct in every detail.

The Pageant has been written by Mr. Crompton Rhodes, who for many years has been dramatic critic of the "Birmingham Post," and whose knowledge of dramatic and historical research is unsurpassed by anyone in the Midlands.

The Prologue has been written by Mr. John Drinkwater, who is a Birmingham man, and this will be spoken by Miss Sybil Thorndyke and her husband, Mr. Lewis Casson. Lady Cynthia Asquith and Mr. Geoffrey Winn are also taking part in some of the scenes, which go back to the days of the early Britons and pass on to the arrival of St. Augustine with his Gospel of Christianity, and also include episodes dealing with Shakespeare, Queen Elizabeth, the Battle of Edge Hill, and many other interesting events associated with Warwickshire and the Midlands.

A good deal of the Pageant is in dumb-show, and on this there is to be a running commentary, but it is also hoped to broadcast a few explanatory speeches and bits from such scenes as are suitable for the microphone.

A Blackpool Relay.

Another relay from Blackpool is in the programmes for Northern listeners on Tuesday, July 15th, when the same artistes who took part in a former programme from this well-known Northern resort will be heard.

They are Mr. R. H. Dixon, who is giving selections on the great organ at the Palace Ballroom, Will Hurst and his Syncopators, most of whose music is composed by themselves, and Skeets Martin, a burlesque comedian and mimic whose humour is said to be very mirth-provoking.

Housewives' Talks off in August.

The morning talks for housewives are to be suspended during the month of August, partly owing to the fact that so many people are on holiday at that time, and partly to enable a fresh start to be made in September with several new series of talks, which it is hoped will make an even wider appeal to listeners than those given hitherto.

Among the new subjects for the Autumn will be talks on Industrial Welfare and Child Welfare. By the way, does *anybody* listen to these talks? Savoy Hill has no definite evidence about it.

Midlands' Enterprise Again.

Birmingham is to keep up its reputation for the regular inclusion of a first broadcast performance in its programmes when, on Tuesday, July 15th, an orchestral suite by Neils Wilheim Gade will be heard. The work consists of five separate numbers under the title of "A Day in the Country."

Another work is also to be given its first performance at the Midland Regional Station on Sunday evening, July 13th, namely, Cyril Christopher's Symphony in C minor. Mr. Christopher is a well-known musician and will conduct this work himself.

Here and There in the Programmes.

Banjahra, the Indian bass singer who specialises in Negro songs of all kinds and understudied Paul Robeson during the run of the "Show Boat" at Drury Lane, will be heard by Northern listeners in the course of an orchestral programme on Monday, July 14th. Among his songs will be "Poor Old Joe" and "Ol' Man River."

The Band of the Queen's Own Cameron Highlanders, conducted by C. W. Criggs, will be heard by Northern listeners on Wednesday afternoon, July 16th, when a special programme is being relayed from Morecambe.

ALL-THE-TIME RADIO.

This is Capt. Leonard Plugge, listening when motoring. He is such a great believer in plenty of programmes that he has recently arranged for broadcasts to British listeners from high-power stations on the Continent.

FOR THE LISTENER.

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

Who will long be remembered for those wise and witty broadcasts entitled "From My Window."

Leslie Mainland.

HE made a secure niche for himself in the programmes. I never missed a Children's Hour when he was talking about animals and the Zoo.

He had that gentle humour which is characteristic of students of animal life, and his talks were always delightful. He will be missed by many besides the children.

Sport.

About this time each year we hold our unorganised national festival of sport. It has become even more national since the B.B.C. started the commentaries.

The nation will be present, on and off, at Wimbledon and Henley, as it was present at Nottingham and Hoylake. An eye-witness account is not quite so exciting as a "running commentary," but Mr. Darwin and Mr. Foster do their jobs well.

Thank heaven we are good enough sportsmen to cheer the foreigner who snatches the prizes from us.

Mismanagement.

There was an odd bit of mismanagement the other evening, which caused me personally much disappointment. A broadcast of Act 2 of Gounod's "Romeo and Juliet" from Covent Garden was to be followed by a recital by Hubert Eisdell and Lauri Kennedy.

(*Continued on page* 476.)

BUILDING BAFFLE BOARDS

A plain baffle board, while being quite effective from the point of view of reproduction, is rather ugly to have in a living-room. You will find it easy to make your loud speaker quite elegant by following the hints given here.

By H. BRAMFORD.

THERE are one or two details often overlooked in the construction of baffle-boards, and these I intend to deal with here.

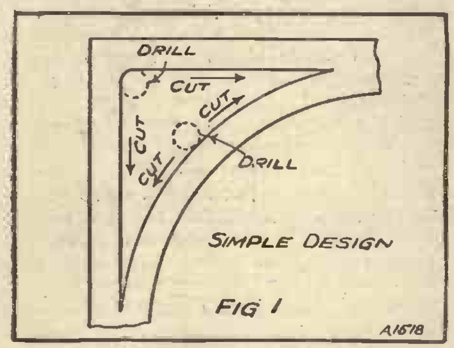
The first detail is wood. Naturally the baffle is fretted, and therefore the wood used should be of a nature which will not warp. For this reason plywood should be used, which is also stronger, when fretted to conform to a frail design, than any ordinary wood would be, and is also less likely to "boom."

Ample Choice of Wood.

With plywood we have ample choice, as there is alder, birch, ash-oak, oak, gaboon mahogany, Honduras mahogany, and black walnut, for example. We will deal with these in order.

Alder is cheapest, but of inferior quality and somewhat soft, so that for good work it is not very suitable. Birch is a white wood of good surface, hard, and quite suitable, while at the same time it is not expensive. Ash oak is also quite good, is well-grained and hard, and in consideration of cost is most to be recommended for general utility and artistic appearance.

STARTING HOLES.



Saw cuts should always be made towards sharp corners, as even a fretsaw will give a rounded effect which looks "amateurish."

More Expensive Types.

Oak is more expensive, as this is figured and beautifully marked, but is naturally more suited to work which is not to be fretted, as the fretting spoils the effect of the figuring. Mahogany is ideal for those who favour this shade, but is more fragile and not so strong for the purpose, and will easily chip on the face. The gaboon mahogany is light in colour, while the Honduras mahogany is the familiar dark, natural mahogany which is so much favoured, but this is the more expensive of the two. Black walnut is much the same as mahogany in texture and grain, which in both these woods is fine and not conspicuously marked, but the walnut is very rich in colour and the more expensive in price.

The question of thickness is of primary importance, and is governed by the size of the baffle-board and the type or design of the fretting. If the pattern is very open, thicker wood should be used than if the pattern is fairly substantial.

The baffle-board should merely be substantial enough to ensure against buzz or boominess, which would result if it were too flimsy.

In the cutting of the frets on a baffle-board there are one or two little points which, if attended to, will improve the appearance of the work. This in brief is sharpness at all corners and gracefulness of all curves. The common fault is blunt corner cuts and jagged edges, which quite spoil appearance.

Cutting the Fret.

To cut the frets of a baffle, if we set about it the right way, does not require great skill, nor yet special tools. A fretsaw is best, as it will make a fine cut, but even this must be used with thought. If a fretsaw is not available, than a small keyhole saw will suit.

In Fig. 1 I have shown how one should set about the work, by giving an example of a cut out, assuming that it is to be done with a key-hole saw. The same remarks will, however, apply to the use of the fret-saw, with the exception that the drilling will be with a fine drill instead of with a bit.

The positions of the holes, one in the rounded corner and one in the centre of the curve, are arranged because with the saw we can start by cutting from the rounded corner to one of the sharp corners, and go back to the starting point and cut to the other corner.

Then we start afresh from the second hole and repeat the process, and the result is perfectly sharp corner cuts where we need them. If, on the other hand, we try to turn the corner with the saw, even the fretsaw, it will as a result be slightly rounded where the turn is made, and the result quite spoils the appearance when finished, giving that amateur touch which looks so bad.

The Best Design.

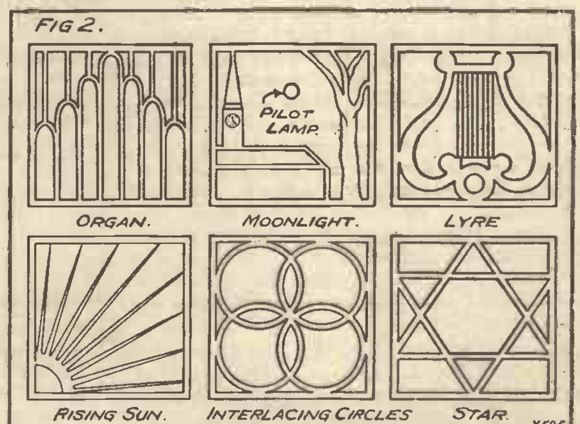
The question of design is a comparatively simple matter. There are innumerable designs to choose from, but if we make our own it should be simple. The simpler the better. Elaborate designs are all very well, but have little more effect than the simplest. Note the designs of commercial instruments of the super type and you will perceive that the fretting is very simple indeed, and the effect most artistic and pleasing.

Finishing Off.

The finishing touch is the lining at the back of the board. Here consideration must be given to the general effect, and the finish of the cabinet, and that which suits most purposes is old gold or gilded gauze. As an alternative silk may be used, which is obtainable in numerous shades of delicate texture and colouring. This should be well stretched, and glued at the back of the board round the edges.

Those who like effect might think it a good idea to have a small pilot lamp also at the back of the board, which can give an artistic lighting effect when the installation is used in a darkened room, and here a church spire, with moonlit effect from the lamp, is just the scheme for design.

BEAUTIFYING THE SPEAKER.



Designs for loudspeaker frets should be kept quite simple. Here are a few suggested designs, and you will find it easy to make up others for yourself.

The ordinary neutralising condenser gives quite a strong coupling between two capacity-coupled circuits.

* * *

If when tuning to a desired programme your condenser has to be placed "all in" or "all out" your coil is either too large or too small to tune to the particular station.

MR. WHITLEY PRESIDES

By THE EDITOR.

How the new Chairman of the B.B.C. is settling down to his task and some of the problems with which he will have to deal.

BY the time this issue of "P.W." is on sale, Mr. Whitley, the new Chairman of the B.B.C., will have presided at the first meeting of the Board of Governors to be held since his appointment was confirmed by the Prime Minister.

It is a well-known fact that in Mrs. Philip Snowden we have one of the most energetic and conscientious Governors of the B.B.C., for Mrs. Snowden, as we have pointed out before, holds strictly to the view that for the salary of £700 a year which she receives, it is her duty to work for British broadcasting.

However, some of her views are not in accordance with those held by Sir John Reith, the Director-General, who maintains that his administrative machine should not be interfered with in any shape or form whatsoever by the Governors. He bases his arguments primarily on the old adage that "Too many cooks spoil the broth," and as a result of this difference of opinion, it is well-known that Sir John Reith and Mrs Snowden sometimes clash.

His First Board Meeting.

Consequently, it was anticipated in some of the newspapers that at the first Board Meeting presided over by Mr. Whitley, that gentleman would have need of all his urbanity and experience as Speaker of the House of Commons in the exercise of his function as chairman.

However, we are given to understand on very reliable authority that the first Board Meeting passed off very satisfactorily and, in fact, *toujours la politesse* was the order of the day.

Mr. Whitley is now conducting an intensive study of the conditions at Savoy Hill, but it may be some weeks before he will be able to pronounce a verdict on the situation there. He will certainly not find the B.B.C.'s Royal Charter very helpful, for in it there are no references to the problems of administration. In fact, a renewal of the study of the Charter these days is rather interesting, for it becomes clearer and clearer that the Charter aims—despite some of its obscurantism—at throwing the onus of the conduct of the B.B.C. upon the Governors.

Staff Control.

In this Charter, Sir John Reith is named only as the Chief Executive Officer of the Corporation, and there is a good deal of obscurity as to the dividing line between policy and administration. Some critics have pointed out that, in connection with the B.B.C., it is almost impossible to separate administration from policy, and consequently one of the main issues which help to constitute the bone of contention between Mrs. Snowden and the Director-General is that of the question of staffs and programmes.

As the "Evening Standard" pointed out the other day, there is a clause in the Charter which bestows the right of appointing and dismissing staff members on the Governors, and not on Sir John Reith. Nevertheless, Sir John feels that he cannot be responsible for the proper conduct of his staff and the administration of his machine at Savoy Hill unless he has sole control of the staff and the methods of administration.

NIGHTINGALE BROADCASTS

Attaching the microphone to a tree in a thicket near Reading for a Nightingale broadcast. Sometimes the obstinate bird moves from one spot to another, making things very difficult for the engineers.

The Charter makes no reference to programmes, and so it is impossible to make up one's mind as to whether the Governors have the right to choose an entertainment programme policy, or whether this is at the discretion of Sir John Reith himself. Certainly it seems that Sir John has the final word about programme policy. The best example of this belief is the Sunday programmes. Many efforts have been made, and many criticisms fired off in an effort to obtain a lighter fare for the Sunday programme.

But Sir John Reith holds a rather puritanical view about Sunday programmes and, until the situation is clarified, as we hope it will be when Mr. Whitley has concluded his study of Savoy Hill methods, there is not much likelihood of any improvement in Sunday broadcasting fare.

Programme Policy.

If, however, the Board of Governors maintain that they have the right to control the policy of programmes, then we think listeners may anticipate in the near future some improvement at any rate in the Sunday programmes.

We understand that, although the present Northern Wireless Orchestra will shortly be disbanded, a new orchestra will be created to serve the North. Sir John Reith has given his assurance that when Moorside Edge, the Northern Regional station at Slaithwaite, near Huddersfield, is ready for broadcasting, one specific wave-length will be devoted to local music and other programme items of particular interest to Northern listeners.

Presenting a Petition.

Sir John gave this assurance to Mr A. M. Low, who recently presented Sir John with a Petition containing over 21,000 signature on behalf of the Wireless League. The Wireless League wanted a statement about the failure of the Northern Wireless Orchestra. They got it. According to Mr. Low, the B.B.C. have promised to give every possible consideration to the demands of the Northern listeners for their local-colour programme items.

Incidentally, a good deal of progress has been made with the building of the new North Regional transmitter, and it is quite possible the station will be ready sooner than was anticipated.

AN EARTHING STRIP.

THE following little arrangement will probably appeal to many home constructors. It is an earthing strip which runs round the top edge of the baseboard, and has various uses.

The construction is very simple, and was used on the writer's set in conjunction with a metal panel. A sheet of tin or copper is cut into strips about ½ in. wide and is fixed with screws, to the three edges of the baseboard, the ends coming into contact with the metal panel, being soldered thereto.

The overlap at the corners should also be soldered, and a good connection made to the earth terminal of the set. The advantages of this arrangement are that the set looks neat, and also there are fewer long leads which (even if they may be at earth potential) do not add to the appearance of the works. Any lead to earth can be taken to its nearest point on the earthing strip.

RADIO REMINDERS.

Asbestos tiles, as used for roofing, make excellent rests for soldering irons.

* * *

A milliammeter in the plate circuit of your last valve is an invaluable aid to quality reception.

* * *

If you keep your L.T. battery inside the set's cabinet, see that flex leads do not touch it, as its acid will play havoc with the insulation.

* * *

Don't buy an H.T. or grid-bias battery until you are ready to use it, as it will deteriorate with time as well as with use.

* * *

Keep your batteries out of the way of window, or covered well, as sunlight directly on them is harmful.

* * *

When holding a threaded metal rod in a vice, remember that stiff brown paper wrapped round it will protect the thread from injury.

* * *

When laying aside a spare variable condenser don't forget that to wrap it in clean paper will save endless trouble in removing dust from the vanes.

IS YOUR SET SELECTIVE?

Does your set achieve its selectivity at the expense of its sensitivity? That is the theme of this practical article which also points the way to a more satisfactory solution of the problem.

By G. V. DOWDING, Associate I.E.E.

THE regional stations have taught Londoners, at least, to appreciate the meaning of selectivity. And when powerful twin stations start operations in other parts of the country still more listeners are going to find that they will have to revise all their ideas regarding selectivity.

Selectivity is a quality that every modern set possesses in some degree. The trouble is that sometimes the degree is not high enough. Now let us set some sort of arbitrary standard, then we shall know where we are.

One of the most compact H.F. chokes on the market is the Magnum type seen here.

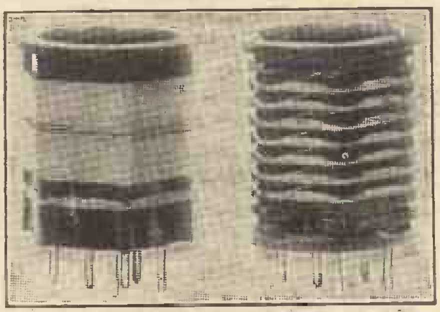
This is rather hard, because there are so many varying conditions in this radio business. However, I should say that a set that will tune out its most powerful station in a ten-degree movement of one or other of its dials can be reckoned as being fairly good.

On the other hand, if a station spreads over sixty or seventy degrees the set would, in my opinion, be very poor.

Start Early !

I am a great believer in "front-door" selectivity. That is to say, I think every effort should be made to prevent unwanted stations from getting as far as the first valve.

There are people who reckon it essential to have so many valves complete with their individual tuning circuits in order to achieve passable selectivity. On the other hand, there are folk who want a plurality of tuning circuits, but don't care much whether each has its valve stage.



The Colvern range of coils and accessories includes many interesting examples of moulded formers produced for a variety of special purposes.

Tuning circuits are all very well, but a bunch of tuning circuits means a bunch of controls or some system of ganging—which, even if it can be mechanically simplified, cannot be cheapened down to single-circuit costs.

I would rather have a set of a simple character having a moderate degree of selectivity used so that I could drag one hundred per cent of its selectivity out of it, than a super-selective set reduced to moderate selectivity through being worked incorrectly. Who wouldn't ?

And yet many super-selective sets are reduced to mediocre levels, and many quite respectably selective sets to very inferior grades, by their being used in a not-quite-right way.

The Common-sense View

The aerial and earth have quite a lot to answer for. I am not a believer in this insidious shorten-your-aerial cult that is being so earnestly sponsored by the B.B.C. Not that I blame the B.B.C. for their part in it, because, after all, the B.B.C. has no interest at all in distant listening—except World Radio !

The coils in your set have much to do with its selectivity. The plug-in specimen seen here is one of the Lissen range, well known for their efficiency and robustness.

Nevertheless, no one in their right senses would champion the cause of the very long, multi-wire aerial. Sixty or seventy feet, single, is as much as any one should need. But as much of that as is possible should be vertical.

A single wire sixty feet long erected vertically is vastly superior to a hundred feet length, having a large percentage horizontal.

I am not going to waste space telling you all the other things that a good aerial should possess, but I must urge you not to forget that earth. The earth connection has a very important bearing on this business of selectivity.

What you want to aim at is an earth connection of only an ohm or two of resistance. If you can make it but a fraction of an ohm, so much the better.

A water pipe, if it goes to the main and not to a tank, takes a lot of beating, providing the lead to it from the set is short (six feet or under) and thick (aerial wire is O.K.) and is soldered or clipped so that a permanent good contact results.

This Wearite all-wave tuner unit has a rotary reaction coil and a tapped aerial coupling system which helps to promote selectivity

Next to low resistance, comes capacity. And of this quality also the aerial system should possess the smallest possible quantity. You reduce the self-capacity of an aerial by keeping it well away from all objects and raising it as high as you can.

This brings to me a most interesting point and one that I have never seen mentioned in print. It is possible for metal objects such as drain pipes and metal gutterings and fireplaces and bedsteads, and so on, to have electrical characteristics that force them to tune-in broadcasting stations and re-radiate the signals into your aerial.

The Graham-Farish variable condenser is an extremely compact component.

SHORT-WAVE NOTES.

An exceptionally bad year for Short-wave work—Are conditions to become worse ?—The "eleven-year Sun-spot" cycle—Short-waves and X's—The Pentode in America.

By W. L. S.

THE apparently everlasting spell of bad conditions this year makes me wonder how much there is in the statement in a recent "QST" editorial concerning the "eleven-year sun-spot" cycle. "QST" says that this is the only cycle that Dr. Hoyt Taylor and the N K F people have not yet plotted, owing to lack of data in 1922. Certain it is, however, that sun-spots run in a kind of cycle of eleven years. A minimum occurred in 1922 and another is, of course, due in 1933. The exact reason why sun-spots should affect our short-wave conditions is not known, but it is almost certainly due to a change in the average height of the Heaviside layer, and it seems probable that the sun would exert a greater "pull" on the layer when sun-spots were at a minimum, thus giving a greater average height and therefore a greater skip distance.

Getting Worse ?

The sun-spot "maximum" should apparently have been in the winter of 1927, and this certainly was an extraordinarily good period for D X work, judging by my own log, and many others.

If these people are right, we are faced with the rather cheerless thought that throughout this year and next the conditions will get steadily worse. It may be that they are all wrong after all, and I, for one, sincerely hope so.

Personally, from my own findings, I think these blank periods are much more largely due to local weather conditions than is generally imagined. For instance, every time this year that there has been an anti-cyclone over the States and also over this country, receiving conditions between the two appear to have been quite good. (Incidentally it goes without saying that this has not happened very often !) Some tests I have been trying to carry out with New Zealand this year have been an utter and complete washout, although in previous years it has been child's-play to hook up with the Antipodes during the spring.

South Americans Good.

Even now there appear to be periods when the South American stations (I am speaking only of amateurs, of course) come over just as well as they have ever been known to do. In fact, I might say truthfully that the "bad" period of this year has been the best period for South Americans between 2200 and 2300 B S T that I have ever known.

This, surely, points to the fact that what we call "bad conditions" are not due to any freak of the ether, but to an unfavourable position of the reflecting layer which precludes the reception of signals from certain parts of the world.

It is an interesting thought that, with the exception of South America, these last few months might possibly be looked upon as extraordinarily good from the point of view of reception of some remote parts of the globe (possibly the great water areas) on which there are no active stations. Perhaps it just happens that when we, in the British Isles, are favourably placed for receiving these particular areas, we cannot receive the United States or the Antipodes.

Looked at from this angle, there are no such things as "good" or "bad" conditions—it is merely a question of the "transmitter-population" of those particular parts of the world from which it would be possible for signals to reach this country. Incidentally there must be some places on the globe where conditions are always "good" for some active continent.

Short-Waves and X's.

Several readers have lately called my attention to the fact that when atmospherics are severe on the broadcast band (as they have been of late !) they are quite negligible on the short waves. I have confirmed this myself times without number and quite fail to find a reason for it.

Even with quite a local storm, when the 261-metre transmitter at eleven miles or so has only been readable with difficulty, the background on 20 metres has been almost quiet. Surely the atmospherics produced by discharges within a few miles must take the form of shock excitation—and in this case how can one possibly fail to hear them on 20 or even 10 metres ?

The converse also seems to be true; when S W stations are blotted out by continuous crashes the broadcast band is fairly free of trouble. This, I suppose, is due actually to distant discharges in some part of the world like the Sahara (where I believe there is nearly always a thunderstorm in some part or other) which simply do not carry on the longer wave-lengths.

Have You Heard Him ?

A short-wave broadcaster that does not seem to attract much attention from listeners in this country is P L E, Bandoeng, Java, on 15·93 metres. He transmits regularly only on Tuesday afternoons, but is on at various other times. I believe he has 25 kw. in the aerial, which would account for the enormous strength with which he came over one day recently.

Letters from the Dominions indicate that Zeesen is *the* star short-waver from Europe nowadays. He is enormously strong even at this distance on occasions, but he apparently works a loud-speaker nicely in South Africa with a detector and 2 L.F. Next to him in the lists comes Huizen.

Sadly enough, 5 S W is not even mentioned at all in most of the lists !

The Pentode in America.

I hear from a reader in the States that the arrival of the pentode over there, recently heralded with many flourishes of trumpets in the American technical and semi-technical journals, has not caused a stir among the short-wave enthusiasts. The result is the same as in this country—one gets all the amplification that the average eardrum can stand with a triode ! For loud-speaker work, though, I should have thought the pentode would have become quite popular.

Incidentally a Canadian reader says he uses British valves and finds them more efficient than the average American "toob," but rather apt to bring up the background noises.

The reception competition does not seem to be very popular, and Mr. G. C. Allen holds the title at the moment. No one else has registered anything within a mile of his score of 92 countries. I shall begin to doubt the exploits of some of these people who claim to receive everything going unless I have some more letters on this subject.

A WELL-KNOWN SHORT-WAVE BROADCASTER.

This is a view of the control desk of the short-wave station near Rome, which operates on 80 metres.

REMEMBER THAT—

For quality reproduction from a pentode the output impedance must be a high one.

* * *

The colour of accumulator plates is a good guide to their condition.

* * *

In a fully-charged L.T.B. the positive plates should be of a deep chocolate-brown colour.

* * *

The loud speaker is one of the most inefficient of our instruments, for less than five per cent of the power put into it reappears as sound-energy.

MUFFLED MUSIC

A challenging article that brings forward a strikingly new viewpoint of broadcast reception.

By
VICTOR KING.
The Famous Radio Set Designer.

WE have heard a lot about what broadcasting is going to do in the way of education. Even the B.B.C. people have been at pains to state a case for radio in this way!

But there is one very big point that seems to have been overlooked. I hinted at it in an article I wrote for "P.W." a month or two back under the title of "Your Loud Speaker."

It is this: Radio is teaching the nation things that the B.B.C. folk would do well to pause and seriously consider. Through broadcasting, millions of people are learning to invest prominent artistes with loud-speaker voices and to acquire a taste for classical music in a loud-speaker guise.

Now, the best of loud-speaker outfits is far from being perfect. The *average* loud-speaker outfit may be pleasing enough to listen to, but it doesn't give you a true idea of what is actually happening at the "other end of the ether."

An Unfortunate Majority.

It is "P.W.'s" task to show amateurs how they can get results *above* the *average*, but if every "P.W." reader were able to move up into the moving-coil class instanta, they and their families, great though is their number, would represent but five or ten per cent. of the mighty listening public.

There would still be many millions of listeners harkening to the B.B.C. through badly distorting media. And it is with this huge majority that we would still have to deal.

But let us get back to the present, remembering that the vast circle of listeners pictured above is probably larger than it is pleasant to imagine.

They hear the voices of many of the world's leading scientists, artists, divines and other great personalities through apparatus that cuts off harmonics and eliminates bass.

"Loud Speaker" Voices.

Will they, automatically develop "loud-speaker" voices through the universal urge to emulate the mannerisms of the great? Or will they come to think of our leaders of art, science, thought, and wisdom as a godlike race apart—of stentors with constricted throats and metallic vocal cords?

These are questions I would urge the B.B.C. to give serious consideration.

The modern radio set is a wonderful device; it *is* miles ahead of the radio outfit of five years back—but the *average* set cannot give you anything approaching realism. It must lop off both high and low-frequency characteristics of speech and music and add a little foreign stuff of its own.

The Radio "Keyhole."

It is no good blinking at that fact. The reason why so many people buy "P.W." every week is, among others, because they sensibly realise the limitations of their outfits and are on the constant look-out for ways and means of getting a bit nearer to perfect results.

But if radio can alter the characters of voices, what can it do to music?

The average orchestra ranges over a vast field of frequencies that can only in part get through a radio set. Some frequencies don't even leave the broadcasting station!

Nothing much above 4,000 and below 150 can pass the "keyhole" of broadcasting in anything but a ghostly form of the original.

But it is said listeners are developing a taste for symphony concerts and the like. Of course, what is meant is that they are developing a taste for the loud-speaker versions thereof. A very different matter.

And if the Beethovens, Puccinis and Debussys of the future are children listeners who are "learning to appreciate" the great composers through the medium of broadcasting, music as a whole has a somewhat peculiar outlook, hasn't it?

Two thousand and thirty A.D. might well hear a series of "classics" built on "falling characteristic" lines. No bass and little treble, performed by orchestras composed of harmonic-less instruments such as thermionic valve oscillators, tuning forks and quartz crystals!

Obviously there would be no gain in having "brass," "wood-wind" and "string" if all were strained down to the one flute-like level.

Well, so far, I fear I have had little to say of a constructive character, so it behoves me to slip in a few words of suggestion before my space is filled.

Captain Eckersley's Advice.

But at least, I have advised the B.B.C. to give pause and consider the points I have brought forward, and that before they enter into any more grand-sounding and costly but rather fatuous musical engagements.

Unless they do so they are bound to fail in those very ideals they make such a song about, and which so many of us have but little time for.

As Capt. Eckersley, with his eminently sane judgment, so often says, there *must* be a closer link between the programme and technical people if broadcasting is to develop along proper lines.

I have the suspicion that the B.B.C. considers itself divided into two main sections—viz., those who matter, and necessary but rather annoying "mechanics"!

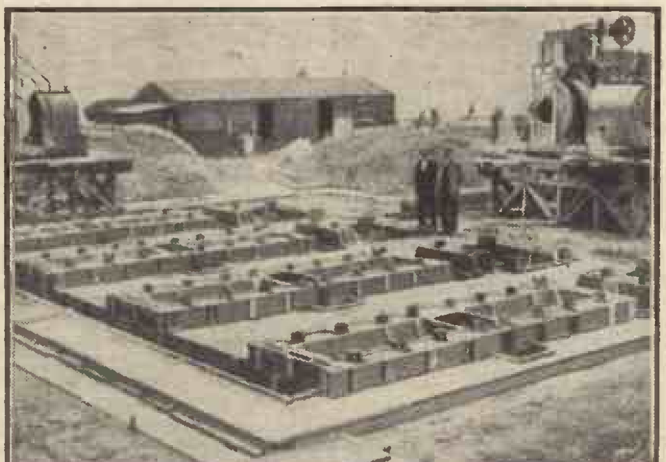
Remember the Receiver.

The truth is, of course, that the engineers have given the B.B.C. a better broadcasting service than it deserves.

The B.B.C. can do little to bring about a receiver-design millennium, but its programme arrangers can frame their programmes with the average set's limitations well in mind.

Talks should be narrowed down to the few who definitely have voices suited to the peculiarities of broadcast *reception*, and orchestras should be built up with the same sort of limitations in view.

GETTING DOWN TO IT!



Rapid progress is now being made at Moorside Edge in the building of the new North Regional station. Here you see the 600-ton concrete bed for the engine-room.

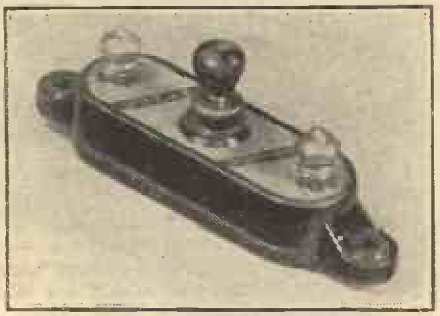
FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found-?

POLAR PRE-SET CONDENSER.

THE word "Polar," which is, of course, the trade name of Messrs. Wingrove & Rogers, is always associated in my mind with mechanical smoothness, and I am sure that no "P.W." reader has ever seen a Polar variable condenser that has not had an exquisitely smooth movement.

So smooth indeed are the slow-motion adjustments of some Polars that their knobs feel as free as though they were not doing any work at all.



The "Polar" Compression Type Variable Condenser.

The same high standard of mechanical perfection has been reached by the Polar people even in their new Pre-set condenser, the little adjustment screw of which runs down most silkily. The condenser is built into a brown bakelite moulding, and either the ·001 mfd. or ·0003 mfd. maximum can be obtained at 2s.

IMPERIAL SCREW SWITCH.

I have had some good words to say about the products of Mr. Lyons, of 39, Charles Street, London, E.C.1, for he has produced some good stuff, notably a crystal detector; but his Imperial Screw Switch has, as its name suggests, a screw action, and this, I am afraid, does not strongly appeal to me.

The action is quite efficient, indeed the switching from the electrical point of view is perfect, but I must say I like that definite click that accompanies the switching on or off of most ordinary switch types.

With a screw switch I go on turning until I can turn no more and leave it at that, feeling vaguely dissatisfied. However, that is a personal opinion, and maybe, the principle is one that appeals to many others.

NEW L.F. COUPLING UNIT.

The average constructor probably knows of only three methods of L.F. coupling, viz. transformer, resistance-capacity, and choke-capacity. There are other schemes, and among the latest and, by the way, one having distinct possibilities, is something in the nature of a "pot pourri," due to Messrs. Wright & Weaire, Ltd.

The scheme is embodied in the new Wearite Low-Frequency Coupling Unit. This is a compact device of about the size of an L.F. transformer, and it has four terminals on it which take the connections usual to such a component in a circuit.

Additionally, there is a small switch. The unit comprises a resistance, condenser and tapped choke. The energy is fed from the resistance-capacity shunt through to the choke, which acts as an auto-transformer. The switch enables a choice to be made between two step-up ratios, 1 to 3, and 1 to 1·5.

By the use of a high-permeability core the effective primary inductance of the auto-transformer is some 50 henries.

It was interesting, on test, to note how effectively the switch operates as a control of volume, although its function is primarily tone control. The Wearite unit enables as much amplification to be obtained as with an L.F. transformer, but its frequency characteristics appear to be exceptionally good.

A very strong point in favour of the device is that it seems to make for very stable working, particularly when used in the first position of a two-stage amplifier.

High magnification is possible with a smaller tendency to "spill over" than is usual, and in view of its construction it is obvious that this should be the case. "Detector and Two L.F." people particularly, should be attracted by this Wearite production.

NEW AMPLION LOUD SPEAKER.

It is quite apparent that the Amplion people are never going to stand still and rely for their future prosperity on the reputation of their past products. Fine as is the range of Amplion loud speakers, it is constantly being expanded and improved upon. No doubt, readers will have noticed that by the reports that have appeared in these pages.

The latest Amplion is the Senior Balanced Armature Cabinet model, which is known as A.B. 41. It is available in oak at £5 15s. 0d., and in mahogany at six guineas.

It is a development of the Standard Balanced Armature Loud Speaker, type A.B. 6; that is to say, in design it is similar, but is a better and more powerful model.

It is a large, fine-looking instrument, and of course, the woodwork and general finish are of high grade qualities.

I am sure that the real secret of the success of Amplion loudspeakers in general, is that they never have outstanding peaks.

You find this with even the cheapest of Amplions, there is nothing in the reproduction to antagonise the ear of the ordinary man in the street.

There is a fall off towards the base, and towards the higher notes as in the best loud speaker in the world, but there is no harshness and no stridencies to impinge on your aural nerves.

Of course, in the case of a senior Amplion such as the A.B. 41, there is in addition more bass and more high notes, so that the effect becomes very pleasing indeed even to the expert ear.

This A.B. 41 will, I predict, cause no falling off in the curve of Amplion prosperity, but will probably assist in giving it a rising characteristic!

WHEN YOU ARE BUYING—

(21). A BATTERY CHARGER.

A Trickle Charger is a charger that charges at a very low rate.—generally about a quarter of an ampere. It is no cheaper to charge slowly, although the necessary apparatus may be simpler.

The advantage of trickle, or slow charging, is that the accumulator can be kept up to scratch all the time and the charging reduced to an alternative switching instead of being a spasmodic operation.

It is much cheaper to charge small batteries from A.C. mains than from D.C. mains. These latter are expensive from a charging point of view; more expensive, probably, than ordinary charging at a garage, etc.

An A.C. mains charger needs a rectifier; a D.C. one does not.

A charger, like an H.T. unit, needs to be built in accordance with certain power requirements, and if it is not, it may be quite unsafe to handle.

The Amplion A.B.41 Loudspeaker.

I must not forget to mention the Amplion A.B. 45 loudspeaker. This A.B.45 embodies exactly the same type of unit and cone as the A.B. 41, but has a larger cabinet and a baffle or "sound board" fills up the space.

Thus the bass comes through with even more robustness. The A.B.45 costs £6 15s. in oak and £7 7s. in mahogany.

COILS AND CONDENSERS

You will find many things to interest you in this talk about some of the most vital components in your set, for it brings up points which are rarely heard of by the home constructor.

By G. P. KENDALL, B.Sc.

WHAT, I wonder, does the reader of "P.W." really want to know about the coils and condensers in his set? Does he want technical explanations about the theory of their working? Hints on how to pick good ones when he goes out to buy them?

I doubt it, for I think he usually knows as much as he feels is necessary about the first point, and his own common sense, coupled with his observation of the makes used in our designs, is a pretty good guide in the second one.

I rather fancy the reader will be better pleased if I do not attempt to deal with any of these questions in a formal sort of way, but instead devote my space to a general talk about all sorts of interesting and useful things which I do not think are so well known.

Why Mica Is Used.

In doing so I may occasionally stray into such matters as I mentioned above, but it will only be to clear up special points which I imagine are not generally understood.

Let us make a start with fixed condensers of the sort commonly found in receiving sets, that is, with capacities ranging from ·0001 mfd. to about ·01 mfd. We all know that such a condenser usually consists of a little moulded container with a couple of terminals on top, with inside a set of metal foil (generally copper) plates interleaved with thin sheets of mica. Here is a point, though: do you know why mica is used for the interleaving (called the "dielectric" by the learned)?

Well, the reason is to be found in a combination of electrical and mechanical advantages possessed by this mineral. In the first place, even a very thin sheet of it gives an extraordinarily excellent degre of insulation, with very little leakage and other losses, and will resist quite high voltages.

The Varley wave-change coil has an ingenious switching arrangement which enables the controls of a series of coils to be ganged and operated from a single knob.

Consequently it is possible to use sheets only a few thousandths of an inch thick, and that means that a condenser of the desired capacity can be made up in a very small space.

Among the practical advantages of mica is the fact that it can be split into extremely even sheets and graded into qualities possessing almost identical electrical properties, from which it follows that the manufacturer can easily turn out condensers in large numbers which will be very close to the intended capacities, and there will be few "rejects" when they undergo their tests.

What a Contrast!

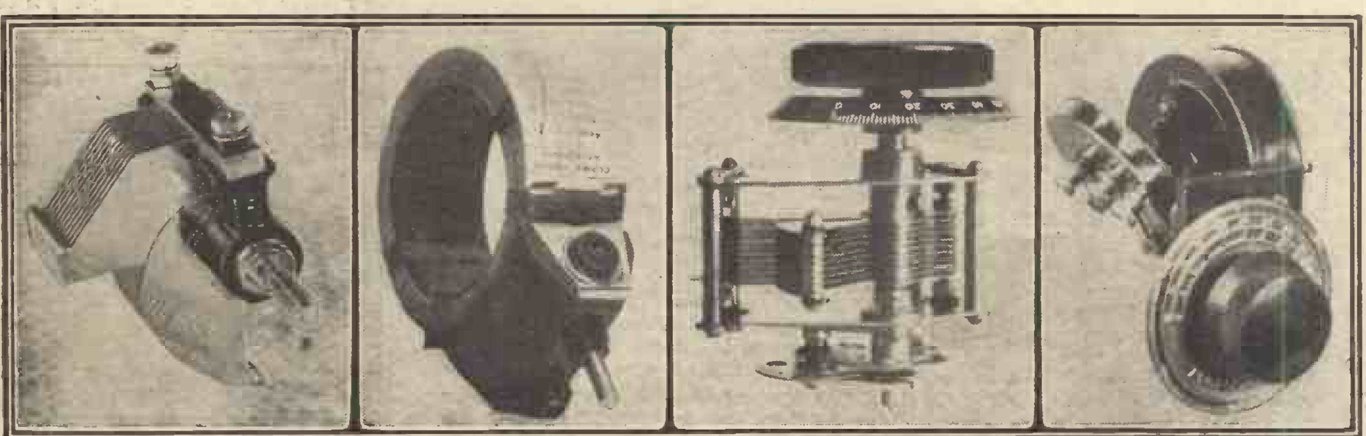
Here we find one of the factors which helped the makers to get fixed condensers down to their present low prices, prices, I would add, which would have been thought fantastic a few years ago.

I wonder how many of my readers realise what the prices of such components used to be in the early days before modern methods of accurate quantity production came in?

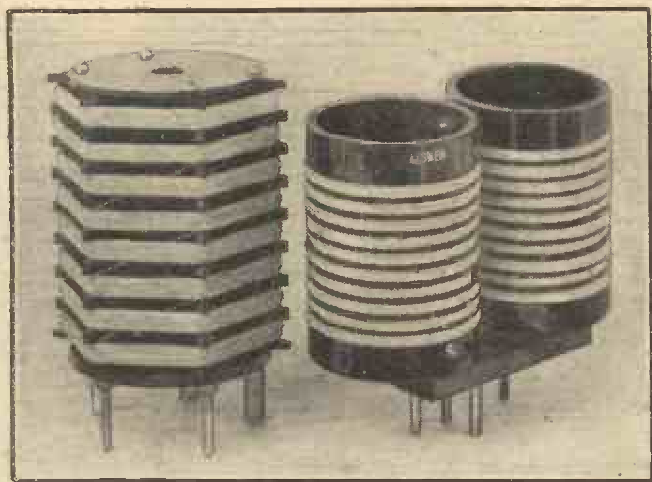
This will give you an idea: the first fixed condenser I bought after the war had a capacity of ·0003 mfd., and it cost me 7/6!

Mention of that condenser reminds me that I am sometimes asked why it is that detector grid condensers are so universally of ·0003 mfd. Perhaps this little point calls for a word or two, for there seems

(Continued on next page.)


An interesting group of standard tuning components. To the left is a Formo variable condenser, next an Igranic plug-in coil, then a Gecophone slow-motion condenser, and finally (on the right) a Lamplugh tuner unit with variable magnetic reaction.

Some Interesting Facts and Fig



A pair of special Lissen coils of the interchangeable type with sectionalised windings for long-wave work.

to be an impression in some quarters that there is something magical about this particular figure, and that nothing else will serve. The fact of the matter really is that there is nothing at all critical about this capacity, for it is merely an average figure somewhere about the middle of the range of suitable values.

If you were to try it out you would probably find that you could get satisfactory results with a ·0002 mfd. grid condenser, or one of ·0005, and the difference in the performance of the set would quite likely be very slight indeed. This is a point worth remembering if ever you are stuck for a ·0003 and want to try something out in a hurry.

The Effect on Reaction.

The effects of variations in the grid condenser capacity are rather interesting to observe. As a rule there is little change in the actual strength of signals obtainable, although with a given valve there is generally one capacity which is just slightly better than any other, but there is a considerable alteration in the behaviour of the reaction control.

What you will generally notice is that the larger the grid condenser the less reaction is needed to make the set oscillate. Hence, if you are ever trying out a rather small capacity here you may have to use a larger reaction coil than usual.

The Dubilier variable condenser has a very neatly arranged slow-motion drive.

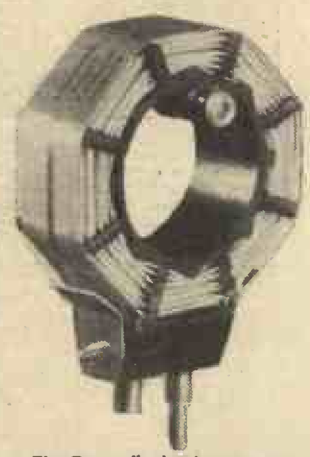
The reasons, then, why a ·0003 is practically always specified are that it is a good average value for almost any valve, alterations making only a trifling variation in strength in most cases, even when a particular valve is exactly suited, and that designers know that this size has been standardised so long that it is easily obtainable everywhere.

Now there are some interesting points about the larger type of fixed condenser commonly called a "Mansbridge," after the inventor of the process by which they were originally made.

The Bulgin wave-change coil has the switch mounted on the end, and is intended for either baseboard or panel mounting.

These are condensers of much larger capacity, of the order of whole microfarads instead of fractions as in the case of the mica type, and they are used for such purposes as mains smoothing in H.T. units, loud-speaker filter circuits, and so on.

The characteristic feature of this type is the use of a special kind of very thin, and usually impregnated, paper as the inter-leaving material, which enables a large capacity to be compressed into a wonderfully small space.



The Tunewell plug-in coil is an interesting example of a spaced winding obtained by very simple means.

You will appreciate this point if you compare the size of a 2-mfd. "Mansbridge" with, say, a ·002-mfd. mica condenser and reflect that the one has a capacity one thousand times as large as the other!

The compactness of this type is also due in part to the way the "plates" are assembled, for they do not consist of the usual series of rectangular pieces piled up with the dielectric material interleaved between them.

The usual method is to make the materials take the form of long, narrow strips which are rolled up into a compact mass containing an extraordinarily large amount of active plate surface.

How They Are Made.

The earlier method of producing paper dielectric condensers, by the way, was to use paper on which a thin film of metal had been deposited in such a fashion that it adhered firmly. This method had obvious practical advantages, but of late it seems to be going out of favour with the manufacturers.

Probably in the majority of cases, they are now using separate strips of paper and metal foil, so it is scarcely correct to use the term "Mansbridge" indiscriminately any more.

A group of large-capacity condensers from ... of a great variety of workin...

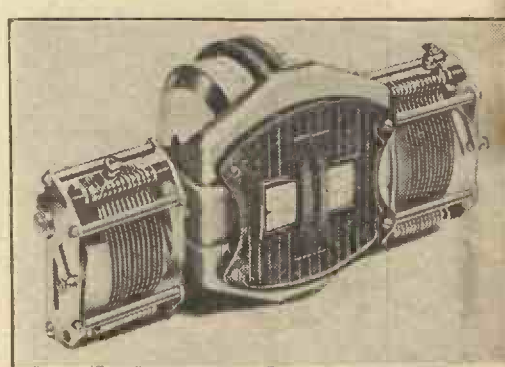
It would perhaps be more accurate to refer to "paper" and "mica" condensers, but the older term is so firmly fixed in our minds that I suppose we shall continue to use it to the end of the chapter.

A point about these condensers which seems to puzzle some people is the system of voltage rating employed by the makers. They are produced in types to withstand all sorts of different voltages, and it is essential to understand the matter if you are going to make, for example, a mains unit.

Voltage Ratings.

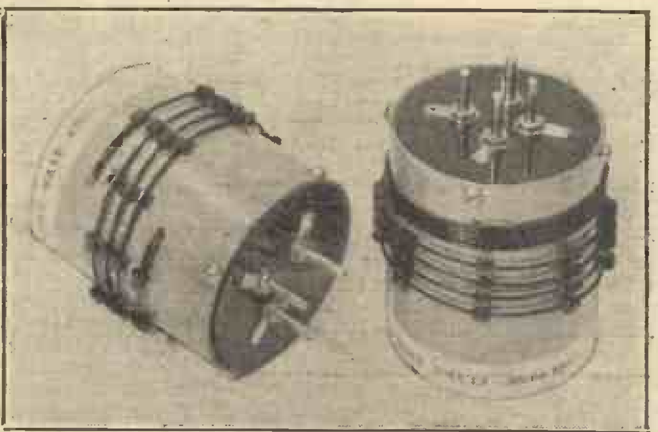
Well, in general, you will find that the manufacturers produce a standard "receiving" type, and then a series of high-voltage ones of various "test voltages."

The important point to grasp is the way these figures indicate the safe voltages at which the condensers may be worked. The general rule is that the maximum safe voltage for continuous working is *one half* the test voltage.



The Lotus double-drum condenser seen here is an attractive piece of work, with its handsome escutcheon plate and vernier drives.

gures about Vital Components



Two interesting short-wave coils produced by Messrs. Ward & Goldstone. Note the method of spacing the aerial winding.

Thus, if you want a condenser for use on 200 volts the minimum safe " test voltage " rating would be 400 volts. For the utmost reliability it is often considered good practice to go a little higher still and make it, say, 500 volts test rating.

A good many makers are now quoting both the " test voltage " and the " working voltage," and this certainly simplifies things for the beginner. Indeed, one may be pardoned for wondering why the makers should not just specify the working voltage in every case.

Reaction Condenser Losses.

A final point about this matter: the ordinary receiving type of paper dielectric condenser is only intended for use on working voltages up to 150, although in the case of one well-known make at least, the figure is 250, which is sufficient for a good many applications in mains units.

e Ferranti range, which includes types voltages and capacities.

Now we come to variable condensers, and here I feel rather at a loss to know where to begin, for the subject is such a big one and I have so little space to devote to it. Taking the plunge, let me begin by clearing up a query which I have heard raised rather frequently of late about certain types of differential reaction condensers.

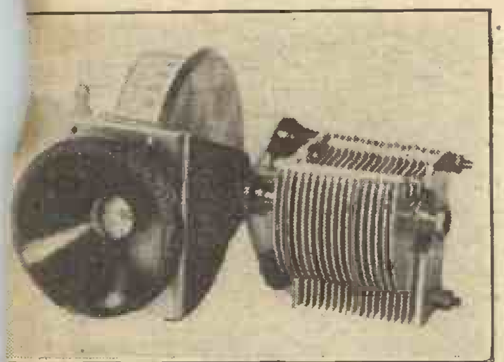
The point concerns those types which have an interleaving of thin sheets of bakelite or other insulating material between the plates, and the question raised is whether such condensers have not much higher losses than the kind with air spacing.

Where Losses Are Harmless.

The inquiry is a natural one, for we have heard so much about " low-loss " condensers in which the amount of dielectric material has been reduced to a minimum.

Fortunately, there is no need for me to attempt to answer this question directly (it is rather an involved matter), for the fact is that losses of any practical amount simply do not matter in the reaction circuit.

Even if the reaction condenser had actually quite high losses it is doubtful whether you would be able to discover it from the behaviour of the set. Possibly, you might notice that you would have to set the condenser a little further round to produce oscillation, but even that is by no means certain.



The Utility drum-drive condenser has a very neat peep-hole arrangement for the scale.

The old controversy about square law or straight-line-frequency condensers seems to be dying out at last, with the square law or some later form thereof winning the day so far as popularity is concerned.

The R.I. H.F. choke in its latest form, well known for its high efficiency and good appearance.

All the same, one still sees claims that some type of S.L.F. condenser " improves your selectivity." May I take this opportunity of saying once again, with all the emphasis possible, that the shape of the condenser vanes cannot affect selectivity one scrap ?

So long as you tune your set accurately to a given station the question as to whether you will or will not get interference from other stations depends on quite other factors in the circuit. The *losses* in the condenser may have something to do with it, but the *type* of condenser can have no effect whatever.

The Atlas plug-in coil seen here is of the " X " type. Note the porcelain mounting plug.

Do you know why ·0005 mfd. is now practically the standard capacity for a tuning condenser in an ordinary broadcast receiver ? The reasons are rather interesting, for they bring up some points which one does not often stop to consider.

The main deciding factor is that the waveband with which we are concerned is that from about 200 metres to well over 500 metres, and to tune over that band involves a wave-length change of something like a three to one ratio. Now, to produce a three-to-one change in wave-length requires a nine-to-one change in the capacity in circuit.

The ratio of maximum to minimum capacity of the average ·0005-mfd. variable condenser is something like ten to one or a little better, which appears at first to be a little more than we want. Remembering that there will be various stray circuit capacities always shunted across the condenser to increase its apparent minimum it will be seen that a ·0005 is just about the size to give as the nine-to-one ratio we want.

Now a final point concerning the purchase of a variable condenser; most constructors know well enough how to look for such desirable features as rigidity, freedom from looseness or excessive stiffness in the bearings, and so on, but very many overlook a rather important little detail, in the placing accessibly or otherwise of the terminals.

Terminal Positions.

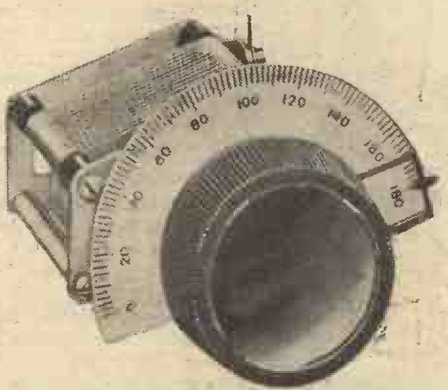
Some otherwise excellent condensers are marred by the fact that one or other of the terminals is tucked away in a most awkward position.

This is a point which is worthy of some attention if the set you are about to build is not very openly spaced as to its tuned circuits. It is particularly important in sets which have screens running at all close to the condensers.

Now let us see if there are some interesting points about coils which I can squeeze into the space available. I shall have to deal with them very briefly, so you must bear with me if I become a little disjointed at times.

First, let me say a word in defence of that

(*Continued on next page.*)



This very neat and compact little variable condenser is one of the latest additions to the J.B. range.

COILS AND CONDENSERS.

(Continued from previous page.)

good old friend, the plug-in coil. The increasing vogue of special wave-change units seems to be creating an impression that the plug-in type is obsolete, and not merely that, but that it is inefficient.

Two examples of large-capacity "paper" condensers from the comprehensive T.C.C. range.

Nothing could be further from the truth. Plug-ins of good modern make are fully comparable in efficiency with the wave-change type, and indeed are better than many.

It is true that certain early types *were* inefficient, but the H.F. resistance of the improved ones now available is quite creditably low.

Still A Useful Type.

This type has many advantages for the simpler kinds of set, and you may be sure I should not have chosen it for the "Magic" series of sets if there had really been anything in these rumours of its early decease.

I believe we shall see some interesting developments in wave-change coil units in the autumn, by the way. A great deal of work is being done upon them by the makers, and we should see some considerable strides made soon, chiefly in the direction of a better and wider control of aerial coupling, improved and more reliable built-in switches, and the more common use of systems of "ganging" the control switches so that a single knob may operate those of the several units required in a large set.

The Gambrell plug-in coil was one of the first high-efficiency types to appear upon the market. It employs a very ingenious but extremely simple method of securing an efficiently spaced winding.

Some makes already have these desirable features, but they seem likely to become almost universal in the coming season.

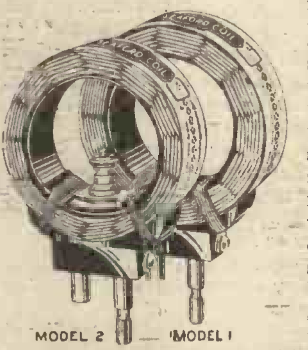
The six-pin type of interchangeable coil is another form which refuses to die in spite of the best efforts of the prophets. It is still quite a useful type, and can be made to give good service, but there is one point about it that I want to mention: it has six split pins which fit into sockets in the base and it is not safe to assume that they will continue to make good contact indefinitely. This is really the reason why some people fail to get good results with this type, I believe.

Make Sure Of It !

The only safe course is, in my opinion, to clean those pins at intervals, and open them out with a knife blade, and so make sure of a perfect connection to the base.

"Fieldless" or "astatic" coils have undergone a certain amount of development lately, but they have still not come into very general use.

They have certain special merits in large receivers, but their tendency to a higher resistance has been against them so far. In most cases with the simpler types of sets the desired effect is secured with the aid of a little screening, but here again we may change next season. Chiefly, I think, in wave-change units, where the prevention of interaction between one winding and another is sometimes important.



A pair of plug-in coils of Seaford manufacture. The smaller one seen in front is of the useful centre-tapped type.

The Hydra range of condensers includes types for mains smoothing, by-passing, etc., in a great variety of capacities and working voltages.

The popular Lewcos plug-in coil is enclosed in a very neat black moulded case. It incorporates a modern high-efficiency winding and is available in all the useful types and sizes.

Even this application, however, tends to become more restricted, because in a large proportion of the modern units the various windings are switched in parallel or otherwise arranged so that interaction between them is harmless. Indeed, in many types definite coupling between all the windings is necessary to the functioning of the unit.

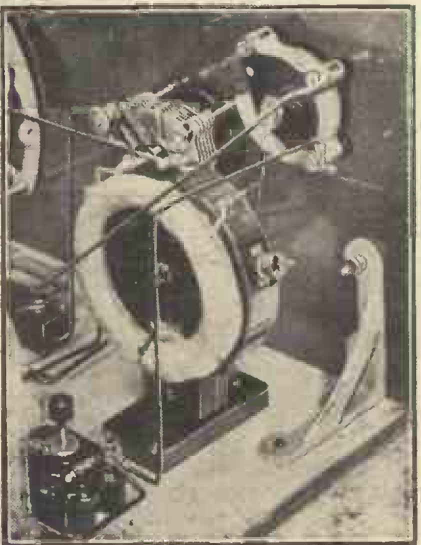
An interesting tendency which I believe we shall see in the newer types of wave-change coil units concerns the elimination of interference from the local station on long waves. This annoyance quite commonly occurs in the simpler kinds of sets.

This Polar drum-drive condenser has both slow-motion and direct drives. Note the two driving drums.

It now appears that it is feasible to devise a wave-change coil unit which is free from this defect. A great deal of experimental work on this problem has been going on lately in the "P.W." Research Dept., and I have something interesting up my sleeve about which you will hear more very soon.

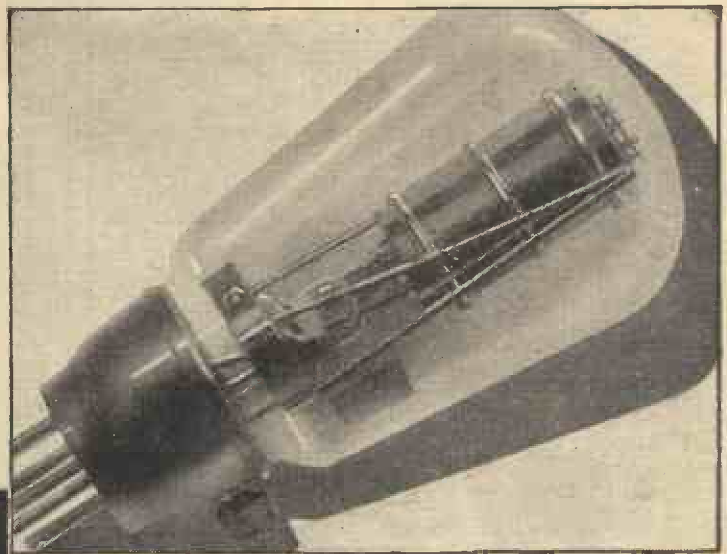
This 1- mfd. unit illustrates the method of rating large condensers as to test and working voltages. It is of Mullard make.

The problem is by no means a new one, but it has of late become of greatly increased importance. At one time it affected almost exclusively those listeners who were very close indeed to the local station, within a matter of a mile or so, and they would probably be using a rejector in any case. Now, however, the arrival of the enormously more powerful Brookmans Park transmitters has carried the trouble right out to the outer areas, even at ten and fifteen mile ranges in some cases.



The Ready Radio "Brookmans" type variable condenser seen at the top right-hand corner is extremely convenient for fitting into receivers where space is limited.

The first . . INDIRECTLY HEATED PENTODE



EDISWAN LEADS AGAIN WITH THE MAZDA AC/PEN

THIS new power output valve marks an important step in the history of Radio. The indirectly heated Cathode absolutely prevents hum, and the AC/Pen is the most sensitive pentode in existence.

With a grid swing of only ten volts it will give wonderful results when used with a good cone speaker, and is ideal for operating a moving coil speaker such as the R.K.

PRICE 30/-

The Amazing

MAZDA RADIO VALVES

CHARACTERISTICS

Filament volts	4.0
Filament amps (approx.)	1.0
Anode volts (max.)	250
Auxiliary Grid Volts (max.)	200
Mutual A.C. conductance (mA/V)	2.2

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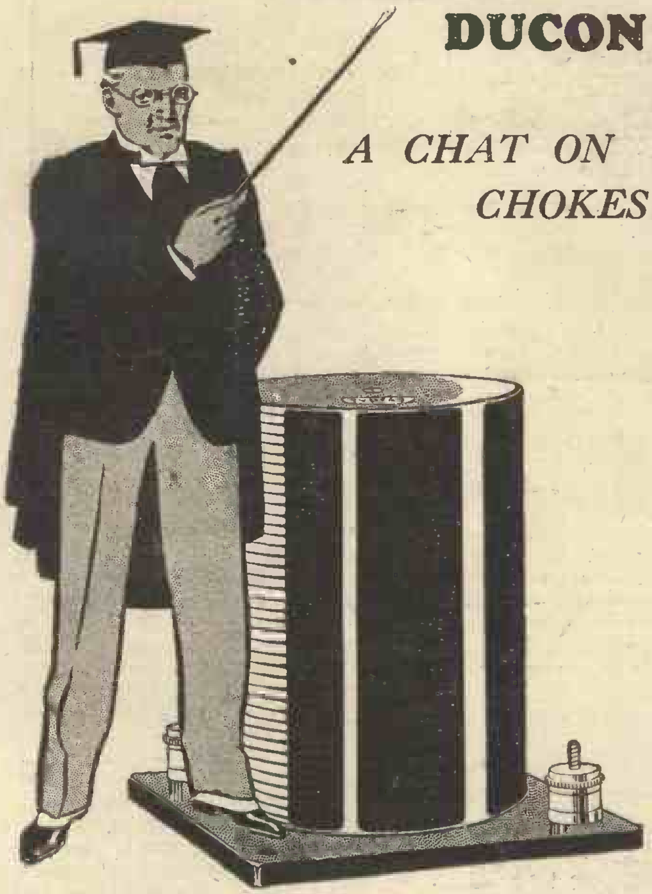
V.56

CONDENSED CHATS

By

DOCTOR DUCON

A CHAT ON CHOKES



It is often assumed that if an H.F. Choke is suitable for one purpose it is suitable for another. This is incorrect, as, if the finest results are to be obtained, a choke must be chosen to suit the particular needs of the circuit in which it is to be used.

Dubilier H.F. Chokes are therefore produced in four types, as follows:

- TYPE 12. For connection in the anode circuit of a detector valve or any similar position where its object is to prevent the passage of R.F. currents.
- TYPE 40. A general purpose choke.
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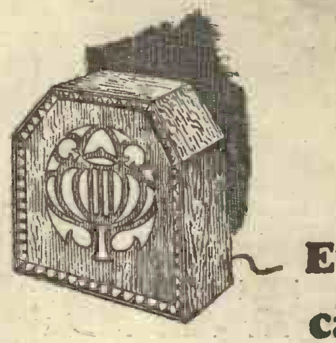

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CAPT. ECKERSLEY'S QUERY CORNER

HOWLS WHEN THE DETECTOR VALVE IS REMOVED—PLOP! PLOP! PLOP!—A QUESTION OF RANGE—THREE L.F. STAGES—RAISING THE AERIAL.

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 received by the Query Department in the ordinary way will be dealt with by him.

Howls When the Detector Valve is Removed.

J. H. T. (Raynes Park).—"My set is a detector followed by two transformer-coupled L.F. stages, and in the ordinary course of events is perfectly stable in operation.

"Quite recently, however, I noticed that if I pulled out the detector valve, the L.F. side immediately went into oscillation and a loud howl resulted. Although the set is giving perfect results, I am wondering whether the effect mentioned is due to a tendency towards instability.

"Would all transformer-coupled sets tend to howl upon the withdrawal of the detector valve?"

Oh yes! I mean it's a bit hard on the circuit, isn't it, to withdraw its input impedance altogether and leave it with its sensitive end in the air, coupling to the output maybe!

Most circuits would bawl in these conditions, and you need have no particular fear because yours does so when unkindly treated!

* * *

Plop! Plop! Plop!

B.-M. (Erith).—"My set—a single valve Reinartz—has just produced a curious trouble, which I have been unable to trace. Until a few days ago it was working very well indeed, and then suddenly this curious effect occurred:

"When I switch on the set it works quite well for a minute or so, and then a plop, plop, plop commences and continues at regular intervals. I am suspicious of my grid leak, which is one of unknown make—could this be the cause?"

Yes! You have hit the nail on the head. If the grid leak goes to a high resistance it makes the valve grid go to a very high negative value if ever oscillation should start.

Thus what happens is that the system may, owing to any spurious cause, start oscillating. Then the too-high value of grid leak causes the grid to go very negative and stops the oscillation. Then the grid leak slowly disperses the charge until oscillation starts again, which again automatically paralyses the system, and so on.

This effect may take place once a second, once a thousandth, or once a ten-thousandth of a second proceeding from plop, plop to an almost inaudible squeak. We used to compare resistances with one another according to the note they made and called the device a squeaker.

A Question of Range.

J. D. C. (Rochester).—"I am situated roughly 30 miles from Brookmans Park, and I am thinking of constructing a crystal receiver to receive the National and Regional transmissions.

"I have facilities for erecting a good outside aerial, and would like to know whether I stand a reasonable chance of getting good headphone reception on a crystal set at this distance."

It's a bit borderline for the shorter wave. But I see your address is Rochester, and I believe that you have a fairly clear line between your situation and the transmitter.

If you were in the heart of London I would advise against the adventure because the short wave gets badly shielded in the heart of London. But with a clear run and if you are not badly surrounded by houses, I think you are safe to go ahead.

Get a good aerial and low-resistance coil, a decent crystal and be sure you are in a fairly open position.

* * *

Three L.F. Stages.

J. L. B. (Erith).—"I have been endeavouring to obtain more amplification from my set by adding another stage of transformer-coupled L.F., making three stages in all. Unfortunately the result has been chronic howling and whistling, and a friend who is also a wireless fan, tells me that it is not possible to get three stages of transformer-coupled L.F. amplification to work properly. Is that so?"

It's not impossible to get three stages of L.F.-coupled valves either transformer or resistance-coupling, but it's a job for someone possessed of more than ordinary practical and theoretical knowledge.

I do not say that even without this equipment some people may not be able to do it but I hint that this may be more luck than judgment if the maker is not possessed of the latter quality. It's a question of the greater instability introduced by higher magnification and of eliminating any back coupling. If you want to persist, try series resistances to each transformer (about 500 ohms). Try reversing this or that primary or secondary in the chain until it stops howling.

Don't use too great a step-up nor too large impedance valves. Much better add sensitivity by *high* frequency, however, because you can add selectivity too, that way, and no set is much use if it's highly sensitive but not selective.

* * *

Raising the Aerial.

C. N. (Dartford).—"I have an opportunity of increasing the height of my aerial from 20 to 30 feet. I have been wondering whether this will give me better signal strength and range.

"If the increased height will improve my range, then the alteration will be worth while, otherwise I shall leave my aerial as it is at present. Can you advise me, please?"

Theoretically the increased height of the aerial should bring about increased signal—*But!*

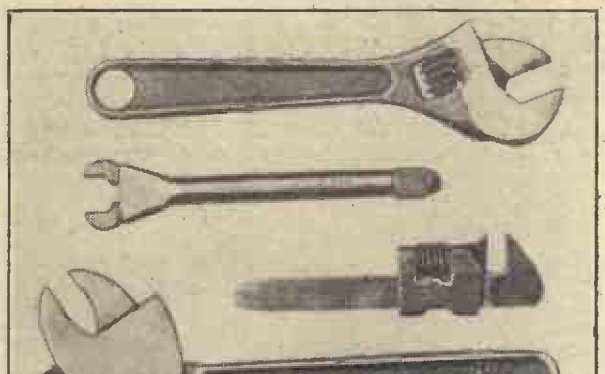
If there is considerable capacity between aerial lead-in and earth, i.e. if the lead-in cannot be run very free from any metallic objects.

If the earth is poor anyhow.

If the coils are of high resistance or if there is heavy damping in the aerial—it is unlikely you will benefit much.

It's very difficult to advise without knowing the full particulars.

FOR YOUR WORKSHOP!



Here are some tools of types which you will find extremely handy in the workshop. At the top is a small Clyburn-type wrench, below it a little adjustable spanner, and next a "Bidget" spanner. The wrench at the bottom of the picture has serrated jaws.

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

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

QUESTIONS AND ANSWERS.

MOVING-COIL "BOOM."

L. H. L. (Aberdeen).—"My moving-coil loud speaker is excellent on low stuff, but seems to be rather too 'boomy' for faithful reproduction of higher notes.

"The brass, for instance, is there, but not very brassy. In fact, I think that although I have got the low notes all right I get it at the expense of the high.

"Do you think the method of holding the moving-coil cone to the surround framework affects the boominess of results? At present I am using a sort of chamois leather support. This certainly looks 'soggy' enough to affect reproduction.

"Do you think it could, and would very thin rubber be satisfactory, and could I support the cone in different places with strips instead of all round the edge?"

It is quite possible that much of the sogginess of reproduction you are experiencing is caused by the use of an unsuitable material for holding the cone in place. Both your suggestions are good, and experiments along these lines are likely to effect considerable improvements in your case.

One difficulty with the use of strips is that by leaving a free space at the edge of the cone they allow an air-path which "short circuits" the effect of the baffle board.

You might be able to get over this, and in any case there is another possibility open to you which attacks the same trouble from a different angle. We refer to the use of a pentode instead of the valve at present employed. You might find an immediate improvement in high note response would result from this.

ZINC RODS FOR LECLANCHE BATTERIES.

"INTERESTED" (London, S.E.6.).—"How can I re-amalgamate zinc rods for Leclanche batteries? I am unable to make the mercury adhere to the zinc."

Probably you are just cleaning the zinc with sulphuric acid before rubbing the mercury on, and thus allowing too much time to elapse between the cleansing and the application of the mercury. They must be practically simultaneous.

Try dipping the rag with which you are applying the mercury into the sulphuric acid immediately before use so that acid is being wiped over while the mercury is applied. This should get over the difficulty.

WARNING.—As sulphuric acid and mercury are both poisonous, great care should be taken when tackling a job of this kind to see that the hands are absolutely free from cuts and abrasions, and a pair of gloves, old clothes, and scrupulous cleanliness are all advisable.

WHAT DOES THE FORMULA MEAN?

F. S. (Cheltenham).—"Trying to find out the total value of a number of resistances connected across each other, I looked it up in my electricity book. I am not much wiser, for it says that in such a case

$$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$$

etc.

"I do not understand this, because I do not want to know what $\frac{1}{R}$ equals at all. What I want is effective value of all those separate values. What does the formula mean?"

The reason why the figure 1 has been introduced into the formula is not easily explained in a few words, unless you can remember what you were taught at school about "reciprocals." Perhaps you have forgotten all about it, but they used to tell us that when any number is divided into one the answer is called the reciprocal of that number.

For instance, if you divide 2 into 1 you get $\frac{1}{2}$, and so $\frac{1}{2}$ is the reciprocal of 2. Similarly, if you divide 40 into 1 you get 1/40th, and 1/40th is the reciprocal of 40.

So also with fractions, so that if you divide ·25 into 1 your answer is 4, and thus the reciprocal of ·25 is 4.

Although when at school one may be inclined to regard this reciprocal business as being something of a time-wasting wangle, it is really extremely handy in wireless and electrical work, and it comes into the present case because the formula shows the reciprocal of the resistance which you desire to find out is equal to the sum of the reciprocals which you know.

You can go all through it mathematically if you wish; the easiest way is to take an example or two and work them out on the following lines.

Suppose we have three different resistances which we will call respectively R1, R2, and R3. R1 is 50 ohms; R2, 50 ohms; and R3 100 ohms. We wish to find their effective resistance "R" when they are connected in parallel.

The first thing to do is to put each resistance down in turn, and this gives us 50, 50, and 100.

The next step is to divide each of these numbers into 1; this gives us 1/50th, 1/50th, and 1/100th. Adding these together, we get first of all 2/100ths + 2/100ths + 1/100th = 5/100ths = 1/20th.

This adding together of the three reciprocals is the second step, and all that remains after this is to divide the answer into 1. The answer to the above was 1/20th, and this divided into 1 gives us 20.

This 20 is the answer, and thus the formula shows that if a 50-ohm resistance is connected across another 50-ohm resistance, and the 100-ohm resistance is placed across them both, the effective resistance of the arrangement will be 20 ohms.

Other examples may be worked out in the same way, and it will be noted that when resistances are connected in parallel the answer is necessarily *smaller* than the value of any one of the resistances, which, of course, is just what would be expected when parallel paths are offered for the current.

DOES THE L.T. SWITCH CONTROL H.T.?

T. A. (Bury).—"Does the low-tension switch on the 'Magic' Two cut off the high-tension as well?"

On all sets, no matter what the type of circuit, the cutting off of the filament current automatically cuts out the high-tension battery, provided, of course, that really good insulating material is used in the construction of the set, and that its circuit connections have been carried out properly.

A BIG L.F. STEP-UP.

B. L. (Rotterdam).—"Being a wireless operator on board ship, I look at 'P.W.' with rather different eyes to most of your readers. Although I should like to go in for quality reception, etc., I have to pay more attention to the short-wave hints and long-distance circuit stuff for Morse rather than music.

"In connection with getting big L.F. amplification, I am interested in the stunt of joining a resistance between H.T. + and the plate of the detector instead of the L.F. transformer. The primary of the transformer then goes to filament at one end and to a coupling condenser at the other, the secondary to grid and grid bias as usual.

"As no D.C. can flow through the primary, could I use a 10 to 1 L.F. transformer for this circuit, if I experiment with resistance and coupling values?"

(*Continued on page* 474.)

WHAT DO *YOU* THINK ABOUT THIS?

So pleased was a Leytonstone reader with his new D.C. H.T. Unit built from "P.W." that he showed the whole thing to a friend, disconnecting it and displaying the inside, etc., to prove how easy it was to make and use. "It never runs down or goes wrong," he said proudly when it was safely re-connected—but before the words had left his mouth he switched on and found it wouldn't work! The dead silence persisted, though the mains plug was in, external leads all O.K., and the internal wiring had not been interfered with.

WHAT WAS WRONG?

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 solution to above next week.)

"What was wrong" last week was the grid-bias battery itself, which, though marked + and − as usual had been placed "backwards" into its case, so that the + was actually at the negative end and the − at the positive end of the battery. When the G.B. was reversed the set worked properly again.

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 472.)

Yes, you should get good results in this way, especially if you are prepared to experiment a little. It might be possible to get a much higher step-up giving good enough quality for Morse, but the 10 to 1, if on hand, may prove to be all you need.

As you say, the high ratios would be a great diadvantage if high quality is essential.

A "LIVE" OUTPUT FILTER.

H. W. (Clapton, E.5).—"I have recently put an output filter in my set, and having read that this isolates the H.T. from the loud speaker, I was surprised to find on touching the loud-speaker terminals, that I received a shock. I have checked up the connections. Would you explain why this occurs?"

Although you have "checked up the connections," it may be that you are using an old-fashioned form of filter-circuit with which slight shocks can occur, despite the fact that no direct current is supplied to the plate through the loud-speaker windings.

Another possibility must be taken into account if you are running the set's H.T. from D.C. mains, as in those circumstances it often occurs that all filament wiring, earth leads, etc., are at a different potential from a person handling the set, unless special precautions are taken with the wiring.

Even with an efficient filter circuit it is possible to get a "tingle" across a loud speaker if very great volume is being handled, so without further details of your set, etc., it is not possible to say why you got a shock on this occasion.

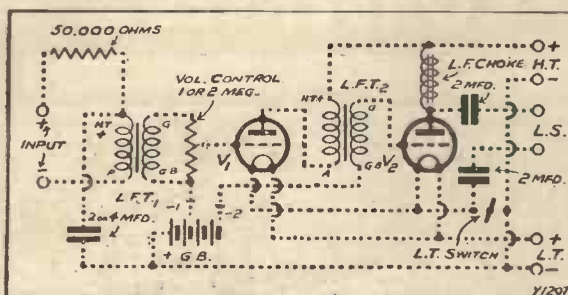
THE BEST INDOOR AERIAL

L. N. P. (near Brent Bridge).—"I am told that indoor aerials are quite satisfactory here, and I should like to use one because one of the outdoor type would spoil the appearance of the house, in my opinion. (It is a new house, and as there are no trees suitable, I should have to put up a pole.)

"The difficulty, however, is that I am rather keen on getting foreign stations on Sunday evenings, etc., so if I use an indoor one I should like it to be as good as possible so as not to tie me too tightly to 'local reception' only. Is the loft the best place for an indoor aerial. and, if so, how should it be arranged to get the best results possible with this kind of aerial?"

Usually the loft is an excellent place for it, but to take advantage of that fact you must place the set where the lead from the loft will be fairly short.

POPULAR "WIRELETS" No. 13



Here are the connections of last week's two-valve amplifier, shown by the dotted lines. It can be used with a crystal or small valve set and will give great power and purity, with the advantages of volume control and choke-filtered output.

You should bear in mind the fact that none of the wires must be placed too close to walls, ceilings, etc. if the arrangement is to be efficient, and the lead to the set must be reasonably short.

In most modern houses the following arrangement gives good results, when properly installed.

Three or four copper wires (preferably 7/22, but insulated "bell-wiring" is good) stretched parallel and about 18 in. or more apart right across the loft. At one end (or in the middle, if necessary) all the wires come down to a V, to which is soldered the lead-in wire that goes to the set's aerial terminal.

All the separate wires must be insulated, and none of them should run within a yard of a roof or other conductive surface (A roof is quite a good conductor when it is wet.)

Especial care must be taken with the lead-in, which should *not* be run behind a picture rail or round the walls, but should go as directly as possible to the set, being supported where necessary by "stand-off" insulators which keep it 12 in. or so from the wall.

Probably you will find such an arrangement gives you plenty of foreign stations as well as good power from the local, though it may be necessary to alter the loft aerial's position a little until the best results are obtained.

AMPLIFICATION OF L.F. TRANSFORMER AND R.C. STAGES.

W. G. G. (London, N.22).—"I have made several 'P.W.' sets, including 'Magic' Two, Three, and Four valvers. Now I have your latest 'Neutype' Four, and I must say that I was surprised with the most remarkable volume of distant stations, and more particularly the tone, which was most natural of all the sets I have made. Will you kindly explain to me what is the difference between a transformer and R.C. coupling as regards distance getting? Which is the better amplifier?"

Theoretically the transformer is the better amplifier, but it does not follow from this that you would get still better results from the "Neutype" Four if you took out the resistance-capacity stage, and inserted a low-frequency transformer in its place.

The theoretical advantage of the transformer lies in the fact that it affords a voltage step-up because its secondary winding has many more turns than its primary. The resistance stage, of course, provides no voltage step-up.

In practice the difference in volume between the two methods is often much less than would be supposed from theoretical considerations alone. The fact is that one resistance-coupled stage and one transformer-coupled stage will often be found to "hang together" in a circuit in a way that two transformers (or two R.C. stages) would not.

In such cases the gain of a voltage step-up from two transformers is off-set by an unsuspected loss elsewhere. What really matters is the overall amplification of the set, its quality, and its running costs, and as you are finding with the "Neutype" Four all these items can be thoroughly satisfactory when one R.C. stage and one transformer are used, instead of two transformers.

In getting foreign stations the H.F. and reaction circuits are even more important than the low-frequency amplification step-up, so every long-distance loud speaker set has to be designed with this latter factor related to all the other factors. And in certain circumstances the *overall* result—which is what really matters—is better when the R.C. stage is used.

X-COIL SELECTIVITY.

S. J. (Harborne).—"I bought an X-coil for the aerial because it was supposed to give sharper tuning. Instead of that it is worse, and then I remembered seeing the same symptoms (flat tuning) referred to in 'P.W.' some months ago. What was the cause in that instance?"

Probably the instance you have in mind was that of a Hertfordshire reader who had connected up the coil holder wrongly. The normal X-coil requires that its coil holder be joined with the *pin* to earth, etc. If your socket of the coil holder is connected to earth, reversal of the connections will overcome the flat tuning.

H.F. CHOKE FOR "ANTIPODES" ADAPTOR.

"Aussy" (Cape Town).—"The blue-print is marked 'H.F. Choke Socket' against an ordinary plug-in coil socket. Does this mean that the 'Antipodes' Adaptor uses a plug-in coil as H.F. choke, and, if so, what size?"

Yes, an ordinary plug-in coil is used, and this can be of about 70 turns. Either a 60 or 75 will give good results, and if you have both sizes it is a good plan to try them in turn when operating on very weak signals to see which is better.

TESTING A CONDENSER'S INSULATION.

S. M. J. (Newmarket)—"I have a very sensitive microammeter which would show up small leakage currents, but I don't see how I can test the condenser's insulation with this. The capacity of the condenser is 4 mfd., and if I put the microammeter in series with high H.T. there will be a big current flowing till the condenser is charged.

"This big 'charging' current would presumably damage the instrument, and I am afraid that if I try to charge the condenser first and then insert the microammeter I shall allow the charge to leak away and get the same trouble again. Is there an easy method?"

All you need do is to include two ordinary make-and-break switches in the circuit. They can be of the L.T. on-off type, or "tumbler" switches, or, indeed, any kind that will open and close the circuit. Join one of these *across* the microammeter terminals, and the other switch *in series* with the battery-to-condenser lead.

Arranged thus, all you have to do is to keep the switch across the microammeter in action—i.e. in the "on" position—except just for the moment when you are taking a reading with the instrument. For this purpose the switch is "opened" for a moment and any current flowing in the circuit will then be passing through the microammeter and will thus indicate a leak.

The other switch is used to make-and-break the main circuit, and prior to a test, it will be open, with the switch across the microammeter closed. When the main switch is closed also the charging current will flow across the microammeter's switch.

As soon as conditions are "steady" the microammeter shorting switch may be "opened" to see if any leakage current is flowing. The closing of this switch again will then protect the instrument as soon as the reading has been obtained.

TECHNICAL TWISTERS

No. 17.—

RESISTANCES IN PARALLEL.

CAN YOU FILL IN THE MISSING LETTERS?

The total value of resistances in parallel is always . . . . than that of any separate value.

When resistances are connected in parallel the current . . . . and some flows through each branch.

Thus if 2-ohms and 10-ohms are in parallel, most of the current will flow via the . . -ohms branch.

Last week's missing words in order were: Increasing; Sum, Resistances, proportional resistance.

SHIFTING CONDENSER READINGS.

M. S. (Bristol)—"Reading that a neglected earth plate was the cause of condenser readings shifting from time to time, I poured no end of water down to cure this annoying habit of my set.

"You will not be surprised to hear it made no improvement when I tell you that later I found the tuning dial itself was shifting round the spindle to which it is 'fixed' by a small screw. The latter is very awkward to get at because there is only a small opening to get at it through the dial. Any suggestions?"

You will have to tighten that screw properly, so if you can't borrow a very small screwdriver we should advise the careful filing of a large bradawl or some similar "pointed" instrument which will lend itself to the purpose and yet be small enough to go down the aperture.

Another point worthy of attention is the spindle itself. If this is perfectly rounded there may be a difficulty in getting a small screw to bind or grip the surface properly. In this case, file a little niche or "flat" on the spindle to give the small screw a chance.

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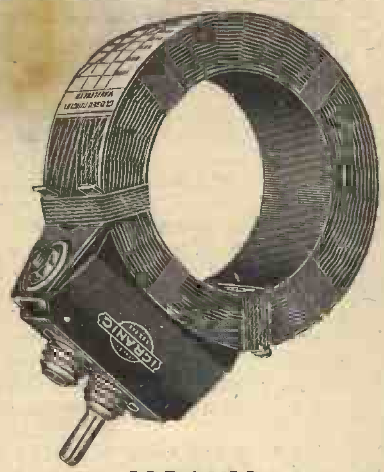

IGRANIC
Honeycomb Inductance Coil.

Walthamstow, E.17.
June, 23rd, 1930.

Dear Sirs,
I have two of your "E" Type Transformers, a 5-1 and 3-1. These were purchased by me over 3 years ago; the test labels still attached give their date as 1926. They are incorporated in a 3-Valve Receiver, "Magic 3," and give perfect results. I have had to take no steps whatever to stabilise these. So far as I can judge, they give perfectly good reproduction with enormous volume. I think this is indeed good for Transformers which were designed and manufactured over four years ago, and which have been in constant use ever since, in quite a number of different types of Receiver. In my opinion this fact proves that, at least, this class of Transformer is perfectly suitable and stable to use in any Receiver employing two transformer stages.
Thanking you for your excellent products,
I remain,

Catford, S.E.6.
June 20th, 1930,

Dear Sirs,
I thought I would like to write to you and thank you for the quality of reproduction which I have been able to attain via your standard plug-in coils.
The results which obtain now are fully 100% better than those which I was able to receive with an inferior make of coil.
Thanking you for this very fine component,
I remain,

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... takes the place of the present H.T. Battery in PORTABLE, transportable or practically any Radio receiver. For voltages from 200/250 A.C. Price £3 15s. 0d. Complete.

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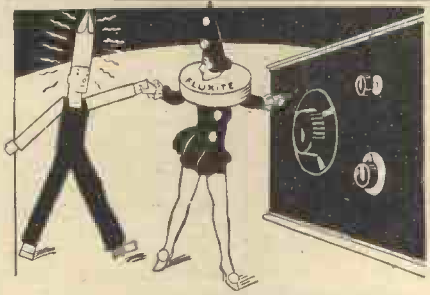

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For WE make Soldering
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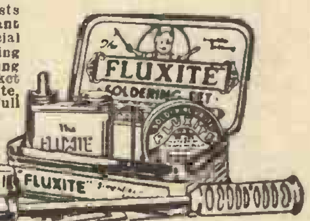

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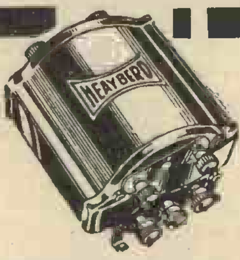

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FOR THE LISTENER.

(*Continued from page 458.*)

I wanted to hear the recital very badly. But the Opera lasted for so long that the recital was cut down to a mere musical interlude of a quarter of an hour.

There was a bad hitch somewhere. The official programme allowed only half an hour for the second act of the Opera—which, on the face of it, is absurd.

Money.

It is curious how interesting it is to hear a financier talking about Money. My only knowledge of money is a grim struggle against the threat of an overdraft, but I have listened to Mr. F. W. Hirst on "Modern Aspects of Finance" with a queer kind of thrill, as if it had been a Treasure Hunt or a High Romance!

Full Marks.

I do not know whether Florence Marks and Mabel Marks are sisters or otherwise closely related; but after listening to the former crooning her lovely Irish songs, and the latter with her bright and original ditties, I assure them that they are united in my heart!

Florence must be a brunette, and Mabel a blonde; and though gentlemen are supposed to prefer blondes, I swear I couldn't choose between them!

Snorty.

Mr. James Agate was very snorty the other evening. He has his knife into the London theatre-going people. "London entertainment," he said, "has nothing to do with European culture." But he told a good story.

A very famous Swedish actress was leaving England after playing for a short season to very thin houses, apparently rather disgusted with her reception; and, as she turned to view the white cliffs of Dover, she waved her little hand and said "Good-bye, England; I quit you—with despise!"

Phantasmagoria.

It is really a most awful word! Sounds like a cross between the hiss of a snake and the growl of a bear! But for all that, I liked "Baghdad in New York." There was a good deal less noise than I had fearfully expected.

It was pitched in a quieter key. Even the American twang was subdued. The singing was excellent; and what background of noise there was, was ample to give the necessary atmosphere. I congratulate John Watt.

Mabel.

Likewise, I congratulate Miss Constanduros. She is always breaking out in new places—a very delightful form of measles! Her Comic Opera (en casserole) "The Dragon's Bride" was light and airy and Gilbert-and-Sullivanish, and very pleasant. Miss Colleen Clifford made a charming Princess, and Harold Clemence a very engaging villain.

I liked Miss Dorothy Summers, too, as Jujube the maid, but she seemed to have some difficulty in holding on tight to her cockney accent. Altogether a good little show. Please, Mabel, break out again!

TECHNICAL NOTES.

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

A Super-Power Output.

I HAVE a letter from a reader who is using a set employing a screened-grid valve and one low-frequency amplifier, and he wants to obtain additional power from the set and also to introduce a convenient form of volume control. This experimenter is in the same position as many other correspondents, and, of course, so far as adding low-frequency amplification is concerned, there are various ways, as you know, in which this can be done. Probably the simplest way is to add a power valve by means of transformer coupling in the ordinary way, taking care that the added valve is capable of a sufficient power output.

The best results may not be obtained from this final power valve unless the preceding valve, which has now become the first L.F. stage, is properly adapted for its new function. In some cases you will find that when the additional valve is added to the output stage better results may be obtained by using in the first L.F. stage a valve of a higher magnification.

Volume Control.

As regards the volume control, this can be secured in a number of ways, but where the screened-grid valve is used, a convenient method is to vary the filament current of this valve by means of a variable resistance in the usual way.

Reverting to the question of the first and second L.F. stages, it is very important to observe the specifications supplied with the valves, and, in particular, to use the grid-bias which, according to the instruction note, is appropriate to the high-tension voltage which you apply. I have several times mentioned this question of grid-bias voltage, but it is a point the importance of which is often overlooked.

Experimenters have a natural desire to apply a high value of H.T. voltage, but they do not seem always to realise that this can actually, in some cases, do more harm than good unless it is "tempered" by the appropriate grid-bias voltage. It is particularly important to give attention to these points when using power valves or super-power valves.

Summer Atmospherics.

Now that the summer is here—at any rate according to the calendar—atmospherics have again become more troublesome, particularly on long-distance reception.

As you know, the atmospheric "crackles" are mainly due to lightning flashes which, of course, are continually occurring in different parts of the world. The "transmission" from a lightning flash is often very powerful, so that it is able to affect a wireless receiver even after it has travelled many thousands of miles.

There is never any shortage of lightning flashes throughout the world, and as these are more abundant in summer weather, this is the season when atmospheric interference with reception becomes most troublesome.

(*Continued on page 478.*)

TECHNICAL NOTES.

(Continued from page 476.)

Type of Excitation.

A point which is not perhaps generally known is that atmospherics interfere more seriously with long-wave than with short-wave reception. This is due to the fact that the particular type of excitation produced by atmospherics causes more effect in a circuit tuned to a comparatively low frequency than in one tuned to a relatively high frequency.

The practical importance of this, so far as radio reception is concerned, is that it teaches us to stick to short-wave reception when atmospherics are about, and only to indulge in long-wave reception when conditions are fairly clear.

Aerial Precautions.

In this country, fortunately, atmospherics are not nearly so serious a nuisance as they are in countries with much hotter climates and, as a matter of fact, the atmospherics from which we suffer mostly originate from outside our own land.

If the horizontal part of the aerial is kept fairly short, this you will find gives some measure of protection against the reception of atmospherics; a frame aerial is still better for cutting out atmospherics.

The action of a frame aerial in rejecting atmospherics is partly due to its comparative insensitivity, partly to its effect upon the resonance conditions in the circuit, and partly to the fact that it can be rotated so as to be in the *worst* position for reception of the atmospherics.

Long-Distance Reception.

Innumerable attempts have been made to eliminate or minimise atmospheric interference, but only with a very limited measure of success, and a good deal more investigation still remains to be carried out in this direction before long-distance reception can be relied upon at all times.

Protecting Portables from Jolts.

The portable gramophone, and now the portable radio receiver, have become almost indispensable to a successful picnic. But when taking the radio receiver out

(Continued on next page.)

TRADE ITEMS.

SUBSEQUENT to the publication of our Portable Number on June 7th, we have heard that the Amplion portable, which had just been placed before the public, is breaking all records, and that the works are being hard pressed to keep up with the demand.

There are also rumours that a new Lissen portable is shortly to appear, but as yet no details are available. Also Columbia have altered their portables somewhat; the Model 303A, which, by the way, is *not* a screened grid set as stated in our issue of June 7th, is supplied with a strap carrying-handle at the top instead of the side handles. It is also available with single-dial tuning.

While talking about portables it is surprising that, as far as we know, no commercial model utilises the Loewe multiple valve. This valve is made in this country, and is extremely useful for certain classes of portable work.

Finally, we should like to draw the attention of readers to the fact that the Triotron U.D.2 valve is *not* a detector, but a super-power valve of low impedance, and except for power detector purposes it would be quite unsuited to that type of work. Also Messrs. Benjamin Electric wish us to point out that their Vibrolder, described in our June 21st issue as a rigid valve holder, is, although the moulding is rigid, nevertheless of the anti-microphonic type, the sockets being sprung.

TECHNICAL NOTES.

(Continued from previous page.)

in the car you want to observe a few simple precautions.

For one thing, you should take care against the set being jolted, as this is bad for the valves. In some portable receivers thick layers of very soft sponge rubber are provided which, when the lid is closed, press on each side of the row of valves so that these are very nicely cushioned.

If your set is not already provided with these valve cushions, it is a simple matter to pack around the valves with cotton-wool.

Remember that when valves are held in springy sockets, and if the valves are close together, as they are in a portable receiver, the jolting which the set gets when in the car on the road may be quite sufficient to cause the valves to strike against each other, with unfortunate results. So always take care to guard against this by some simple provision such as that mentioned above.

Not Too Near Ground.

If the receiver is not intended to work with any aerial or earth connection, it is a good plan to place it fairly high up from the ground. If possible, it should not be placed in the car itself, as you will find that the metalwork of the chassis and body of the car acts as a screen to the radio waves, and will often greatly reduce the volume of reception. It is better to take the receiver a little distance away from the car and, as I said, not to place it too near the ground.

A Temporary Aerial.

If the set is intended to work with an aerial and earth, you can easily arrange the aerial by the well-known dodge of slinging a piece of insulated wire over a branch of a tree and connecting the near end to the aerial terminal of the set.

For the "earth," a connection may be made to a wire fence or, in the absence of any such convenient object, a metal spike (one of the spanners from the tool kit) may be stuck into the ground and the earth wire connected to that.

The chassis of the car forms quite a good capacity earth, and you will often get good results by connecting the earth wire to any convenient part of it.

Safety First.

Talking about radio on the car, I need hardly remind you that the passengers in the car should never have the radio set working whilst the car is on the road, as this is apt to distract the driver's attention and lead to trouble.

In some radio-equipped cars now on the American market a simple arrangement is made whereby the radio set cannot be operated whilst the car is in motion.

This is a very useful safety-first dodge which should always be remembered.

Radio Absorption.

Radio reception out in the open often provides an interesting comparison with that in the centre of a large town, and listeners are sometimes surprised that the reception of a local station is better out in the country, even if the distance is greater, than it is in the town.

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

The explanation, however, is perfectly simple; it is a question of absorption of the radio energy, and although in the town the distance is shorter, the absorption is much greater; whilst out in the country, even though at a greater distance, owing to the smaller absorption, the reception is louder. Of course, this is not always the case, but in some circumstances it can be noticed quite distinctly.

Dial Readings.

Referring to the question of the earth connection of a receiver, I mentioned a short while back that this may affect the dial readings for particular stations. I have received some further letters from readers on this point which only go to prove how frequent poor earth connections must be.

For some curious reason, many people regard the earth connection as of little or no importance. Its importance, however, is very clearly proved in a case where a bad earth connection is replaced by a good one; not only will the volume be greatly increased, but quite probably the set will need to be re-calibrated.

The summer is particularly the time to give attention to the earth connection, owing to the fact that the ground may become dry, and an "earth" which was good in the winter may become poor in the summer.

Where connection is made to a cold-water pipe, probably there will be very little difference between summer and winter conditions; but where a plate or a rod buried in the ground is used for the earth connection, the old trick of pouring a bucket or two of water around the spot in dry weather will prove very useful.

FROM OUR READERS

THE "REGIONAL" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—I suppose I had better put a good word in for the "Regional" Four.

Well, so far I have the set working on three valves—as I am hard up and can't afford an S.G. just yet—and it is great. On the long wave I can get the following: Hilversum, Paris (Radio), Paris (Eiffel Tower), and National. Low wave: London Regional, London National, Brussels, Berlin, Barcelona, and Hamburg.

Nearly all these stations are at full loud-speaker strength and have to be de-tuned slightly. I am almost afraid of giving the loud speaker a shock when I get the S.G. valve, as I am only using an indoor aerial.

I do not know anything about wireless, for this is the first set I have ever had, or made, but I do know that this is a wonderful set, because the volume is tremendous and everything is so easy to control. All I did was to buy the components specified and follow the blue print.

With best wishes for the "P.W.," which I take in every week now,

Yours truly,
Forest Hill, S.E.23. R. J. RIMMELL.

THE "TINY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have recently made up the "Tiny" Two, and wish to thank you for details of such a wonderful set. I have built the set in a cabinet which includes space for a cone unit and all the batteries.

Using an aerial in the roof, I am able to obtain both the Brookmans Park transmitters at very good loud-speaker strength. I am 35 miles from London, so I think that this is a wonderful performance. I only use 60 volts H.T.

I am sure that the above facts will interest many of your readers, as the "Tiny" Two is not only cheap to build, but cheap to run.

Yours faithfully,
R. A. M. ROBERTS.
Leighton Buzzard, Beds.

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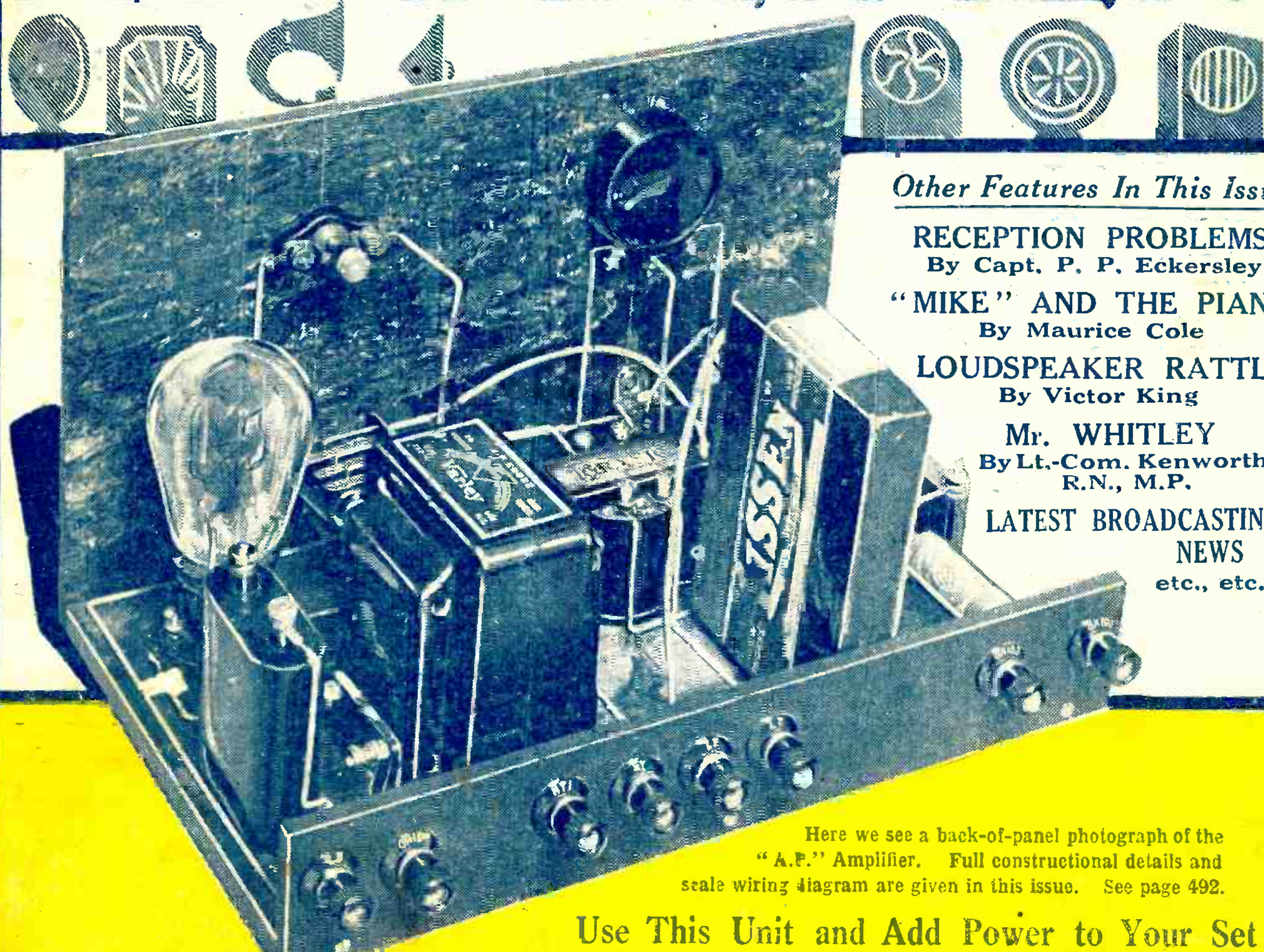


Other Features In This Issue

RECEPTION PROBLEMS
By Capt. P. P. Eckersley

"MIKE" AND THE PIANO
By Maurice Cole

LOUDSPEAKER RATTLE
By Victor King

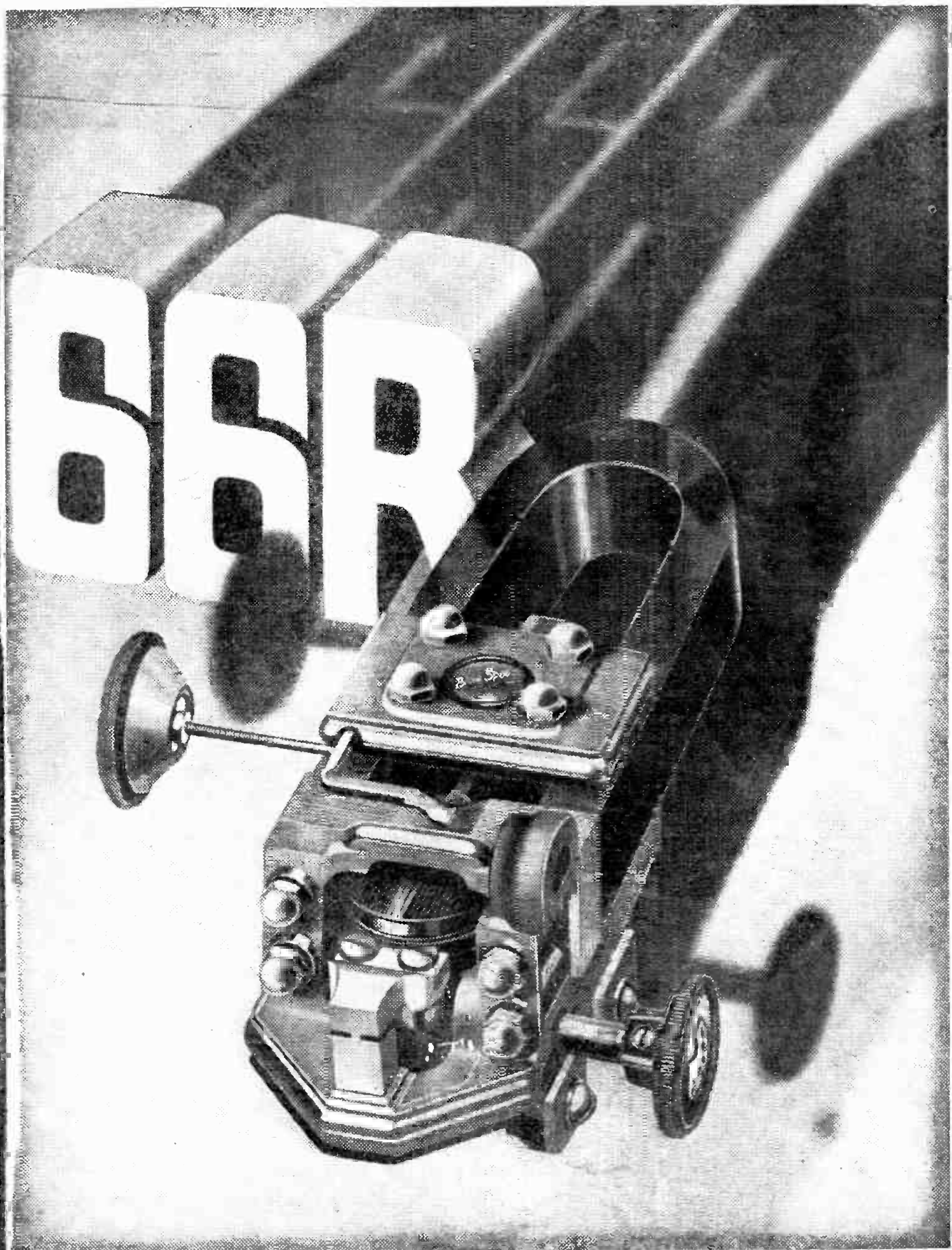
Mr. WHITLEY
By Lt.-Com. Kenworthy, R.N., M.P.

LATEST BROADCASTING NEWS

etc., etc.

Here we see a back-of-panel photograph of the "A.P." Amplifier. Full constructional details and scale wiring diagram are given in this issue. See page 492.

Use This Unit and Add Power to Your Set



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RADIO NOTES & NEWS

The Worm Turns.

AT last the French radio manufacturers have turned to rend their Government because of the chaotic condition of the wireless industry and the broadcasting arrangements of the country. And I am not surprised. Their definition of the Government's methods as dilatory is moderate and restrained. It is now sought to introduce a certain amount of State control over the stations—just eight years behind "perfidious Albion"!

"I Told You So."

REMEMBERING that in these notes, some considerable time before the present trouble in India began, I plainly urged the desirability of making more use of broadcasting there, not only for propaganda purposes, but also for advising isolated or distant English groups of—well, never mind what!—it is amusing to me to observe that in Volume 2 of the "Simon Report on India," the greater employment of broadcasting is recommended, by Lord Burnham, I believe. The Government of India has in this connection undoubtedly lacked either foresight or enterprise by neglecting such a valuable ally.

"Experts" and Ladies.

VERY pleased to hear from W.L.E. (Caudry, France) again. He tells two little yarns which, being (as he guaranteed) true are more palatable than fiction. A local "expert" fixed a customer's aerial to a telegraph pole and when tackled about the humming which interfered with reception, replied, "Oh, perhaps the aerial is not yet accustomed to its position!" That is typical French humour. Next, our friend says that his wife, indulging in friendly competition with another lady about the performance of their respective sets, asked, "And have you listened to Bruxelles Number Two yet? I think their modulation is very good!" Friend, not to be beaten, answered, "Oh, yes! We heard that the first time it was played!"

The Sleeper Wakes.

THERE is a distinct sign of wakefulness apparent amongst a number of Governments who have in certain radio matters dozed for many years. Italy is now rousing up to the fact that a large proportion of its listeners is unlicensed. In order to find out what's what, a census is to be instituted and all householders, etc., will have to declare and describe the sets which they possess. What will happen to Italian "pirates" in future one hardly dare think, judging from some of the penalties devised in Eastern Europe. Boiling oil is interesting, I believe!

THREE BEARS BROADCAST.

These bruins of the Bronx Zoo, New York, seem to be enjoying the novelty of participating in a radio broadcast, and the kiddy audience also seems to be very interested in the proceedings.

Note on My Grammy.

ABSTINENCE from music for ten days during my plunge into Glos., caused me to overwork the gramophone on my return. I have lighted upon a needle which is two-pointed and fits into a tiny tube which screws into the usual place on the sound-box. This fellow is said to be good for 200 playings, but although that sounds comfortable, I find that as a rule by the time we get to about the fiftieth I become "windy" over the state of my records, for the scratch sounds very loud. Nevertheless, these needles do bring out details which fibres miss, and the whole reproduction is most crisp and sweet. Quite a find!

"Off With His Head!"

I HAVE seen it reported that in Bulgaria a Decree has been passed under which any person who is found guilty of using a receiving set without a licence may be imprisoned, with "solitary confinement," for a term not exceeding a year, and fined any amount up to 5,000 liva. Why this savagery? I often thank Heaven for the distinction made in the more civilised countries between civil and criminal offences, for the tolerance and humanity of our laws, and for the great gift of a "sense of proportion" enjoyed as a general rule by those who administer them. Solitary confinement! Phew! Positively medieval!

The Helping Hand.

AN excellent example of the good which may come in unanticipated measure from helping even the humblest is provided by the story of Miss Eileen Joyce, whose piano-playing was broadcast not long ago. Until she was nine years old, this lady lived in a tent in the Australian bush. Then a priest, to whom be honour, secured her an education. Later, the great pianist Backhaus was attracted by her playing, and had her sent to Leipzig. And here she is! Backhaus and the unnamed priest have indeed laid up treasure which will be bright when the light is dim for them.

The Biggest Yet.

IN conjunction with Mr. J. D. Rockefeller, Jun., the Radio Corporation of America and its subsidiaries have undertaken the building of what has been termed a "radio metropolis" in New York at a cost of 9 million pounds sterling. Three blocks are to be demolished and in their place will

(*Continued on next page*).

RADIO NOTES AND NEWS.

(Continued from previous page.)

arise a low oval building; the ground floor will be shops, the first floor a bank and the roof will support a restaurant. Behind this building will be a 500 feet wide plaza, containing fountains, statues etc., at the far end of which will be a 60 storey building comprising 27 broadcasting studios, four theatres equipped with broadcasting gear, and goodness knows what else besides. Tons of money!

Correspondent Wanted.

JOHN MUIRHEAD, 103, Roslea Drive, Dennistoun, Glasgow, E.1, would like to correspond with a wireless enthusiast in Germany. John is 14 years old and still at school. He says that the correspondent may write in English or German as he pleases. Good for you, John! Here is your opportunity to serve the cause of international amity.

The Queen's Hall Concerts.

DO not forget that the Queen's Hall Promenade concerts are planned to begin for this year's season on Saturday, August 9th, and will continue nightly for eight weeks, the last concert taking place on Saturday, October 4th. Sir Henry Wood will conduct, and a number of the concerts will be broadcast. If you are a music lover and have not yet attended a "Prom" you have a joy yet to come.

Days of my youth and late-Victorian London, when Queen's was an enchanted hall in which I could stand for hours without fatigue, and when Sir Henry was not a Sir, but a god who directed a sublime harmony—I do not weep for you, but you are very good to recall!

Wisdom Over the Wireless.

WITHOUT a blush but with gratitude to the Australian "Wireless Weekly," I reproduce the following gem from a Woman's Talk given in April from 2 B L: "There are two sides to a question, and the other side may be equally right with yours, and yours entirely wrong." Yes, that seems familiar stuff! And doesn't its beauty grow, the more you ponder on it! Bless their little hearts!

Personal Note.

I REGRET to record the death, which occured on June 14th, of Mr. Jack Cave, one of the little group of men chosen by Marconi to assist him in his early work. Mr. Cave was selected in 1897 to join the inventor's personal research staff, because of his skill as an instrument maker and, in particular, in glass-working, an art which was necessary to the production of "coherers". Later on, when the coherers went into obsolescence, Mr. Cave became foreman of the machine shop in the Marconi Works, and when he died he was holding the post of Chief Rate Fixer at the Works.

Wonders Will Never Cease.

THE incredible has happened! For the first time since 1492, when Columbus went blundering into the West, a tax on radio receivers is to be levied upon citizens of the U.S.A. And South Carolina is the apostate! Verily, a tax of 50 cents per annum is to be laid on sets valued at 50 dollars, with proportionate increases according to value. Say two shillings a year! What a tragedy! I wonder what the Governor of North Carolina will say to the Governor of South Carolina now.

Indian Affairs.

THE new Indian Central Broadcasting Committee has now been set up. It consists of the member of the Government of India for Industries and Labour, who is its Chairman; two officials from his Department; two non-official Indian members of the Legislative Assembly, from Bombay and Calcutta respectively; and two non-official English members from the same two cities. It seems to be a sound layout, and the Chairman is known to be popular with Indians and Anglo-Indians alike. May they do useful work for the country and its people.

The Latest Sort of Job.

I CANNOT but admire the ingenuity of the young lady of Wandsworth who is reported to earn her living by providing music publishers with daily statistics of the broadcasts of songs etc., so that the relative popularity of the "numbers" may be estimated. Surely this matter is proof that even in these hard times grit and the will to work can still wring a living from the world. Doubtless, radio in one branch or another, has room for many more workers with the knack of using their brains!

SHORT WAVES.

Salesman: Our stock of wireless receivers and loud speakers is a most comprehensive one. Can I show you anything just now?
Customer: No, thank you.
Salesman: Is there nothing at all I can interest you in?
Customer: Yes—complete and utter silence!

* * *

DANGERS IN DEFERRED DEBTS.

"This is the Blah Radio Company, broadcasting from F O B. We are speaking for the agent in your town: 'Unless all back payments are made on sets bought, your name will be announced from this station on Saturday night.'"

Before Saturday a bank had failed, five men had committed suicide, and several attempts had been made to dynamite station F O B.—"Radio News."

* * *

"Whispers are around of a revolutionary wireless discovery that will make possible a crystal set that will be portable and even work a loud speaker without valves," we read in the "Empire News."

As long as they do only "whisper," that's O.K. with us.

* * *

"A lead ceases to be a lead if it doesn't lead the current it should lead to the place you want it lead (pronounced 'led'). And it cannot be called an efficient lead if it leads the current to the wrong place," a contemporary informs us.

Well, it sounds logical enough anyway.

* * *

IN THE TRAIN.

Wireless Fiend (with portable set): Now, what station would you like?
Victim: The one you get out at.
"Punch."

Forest Murmurs.

NEWS from Vienna is to the effect that a professor of its University has devised an apparatus which is capable of measuring a movement as small as a ten-millionth part of a millimetre. Needless to say, it is electrical. By its means the movements of a growing plant were registered in the form of sounds which were broadcast by radio. I must take the views of our jobbing gardener on this. He is certain to drag the conversation round and scold me again about my lupins, though!

More Morse-iana.

CONTINUING my notes about the invention and the inventor of the Morse code, it is worth while to record that in March last Mrs. Leila Morse Rummel, Morse's daughter, arrived in New York from her home in Paris, for the purpose of presenting to the Phillips Andover Academy the self-portrait of her father. A point of peculiar interest in connection with this is that until she made this trip Mrs. Rummel had never heard a radio receiver in action. It appears that the lady resides in a very quiet part of Paris and none of her friends there happened to have a radio set. It is understood that she is going back to alter all that.

The First Melba Broadcast.

JUNE 15th, the tenth anniversary of what was virtually the birth of popular broadcasting here, brought back some delightful memories of Melba's first broadcast. I was one of a privileged few who assembled in company with Lady Northcliffe in the "Daily Mail" office and shared a pair of telephones in order to hear the golden voice which was going out from the Marconi Company's experimental station at Chelmsford. *Seven-valvers* were used, and no loud speaker! But that was ten years ago.

Offer to Transmitters.

MR. N. M. BRAY, St. Kew Highway, near Wadebridge, Cornwall, having heard G 2 X O (London) and E 15 D (location unknown), states that he would be pleased to give them reports from time to time on the reception of their signals. If they would like this to be done will they please send their addresses to Mr. Bray.

Announcers' Voices.

ROTARIAN A. S. Court is reported to have told the York Rotary Club, "If there is one thing that fills me with terror it is the voice of the average broadcasting announcer. It is anæmic, drained of all vitality. It seems to come from a man with an empty inside, whose veins are filled with mineral waters." I agree that the hearty good humour and natural sympathy of the voices of Arthur Burrows, Rex Palmer, etc., has been replaced by a trained, forced, Robotlike politeness—with certain exceptions—but I warn Rotarian Court not to go to Harrogate!

"Keep Your Eye on the Ball."

AND talking about drinking, let me record with joy that a gentleman who signs himself "Royal Stuart" writes to a Scottish newspaper, asking why there are no wireless sets installed in Glasgow public houses. There are the ingredients of several vaudeville or "Radio Revels" types of joke in this, but I will not anticipate the rich and spontaneous humour of the professional rib-ticklers. The scientific explanation of the phenomenon which caused "Royal Stuart" to use some ink is that deeply ingrained in every Scot is the conviction that in order to succeed one should concentrate on the business in hand. No true Caledonian mixes his liquor with anything save Burns or the pipes!

ARIEL.

MR. WHITLEY

by Lt. Commander the Hon. J. M. Kenworthy R.N., M.P.

A highly interesting account of the career and activities of the B.B.C.'s New Chairman, by one who has known him personally for many years, and who was a parliamentary colleague of his for a long time.

IT would be difficult to exaggerate the importance of the position of Chairman of the B.B.C. The great medium of wireless broadcasting already plays a great part in the intellectual, educational, and artistic life of the people. And it will become of even greater importance in the future.

The direction of B.B.C. policy is no sinecure. It is impossible to please all the people all the time. Yet the public who, by paying for the licences find the "sinews of war" for the year's programmes and the whole cost of the service, has the right to get what it wants.

Religion and Politics.

In the case of a newspaper, for example, it is soon possible to know whether the public is satisfied or not with the contents and "make-up" by the sales returns. A theatre or cinematograph hall proprietor can tell from week to week by his box office receipts whether the public is getting what it wants.

But though plenty of people write to the B.B.C. if they are dissatisfied, and a *few* when they are satisfied, there is no way of knowing whether they are representative of the listening public as a whole. There is, again, the very thorny question of what controversial matters shall be allowed; how far religion and politics should enter into the "Talks."

In connection with politics there is the vexed question of how much freedom should be allowed to the Government of the day in using the ether, and what use of broadcasting should be allowed to the other parties not in office.

No doubt it was this latter question that had much to do with the choice of the Rt. Hon. John Whitley to be the new Chairman on the Earl of Clarendon proceeding to an appointment in the Dominions.

His Early Political Days.

For Mr. Whitley was not only, in his day, a great House of Commons man, but one of the most successful Speakers who has ever presided over that most difficult and exacting assembly. I have known Mr. Whitley personally for many years, and for long before I entered active politics. And for ten years I was a colleague of his in Parliament. During the first of those years, from 1918–21, he was the Deputy-Speaker, and presided over the House of Commons in Committee when the all-important financial business was being discussed. From 1921–28 he filled the high office of Speaker.

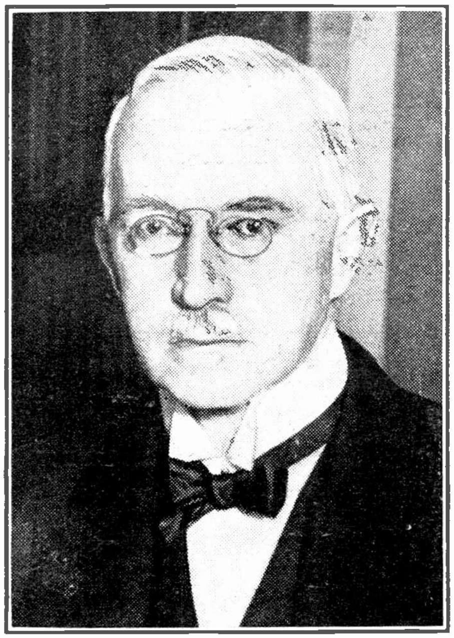
"Harry" Whitley, as he was affectionately known to us, first entered the House of Commons in 1900 as Liberal M.P. for Halifax. He retained that seat for twenty-eight years. In his early political days his party was in opposition, and a small opposition at that.

Most Oppositions, especially if they are in a big minority, seek to defend their position by obstruction. By holding up Government business they are able to bargain on policy.

If they can hold up the Cabinet's programme the Government must, in its turn, buy them off with judicious concessions. As an obstructionist Harry Whitley was highly successful, and played the Parliamentary game, which, it must be remembered, has its serious uses, with the best of them. He was the hero of many an all-night sitting. Never rattled, he could talk on any subject for any length of time, and was the despair of the Government Whips.

On one occasion an exasperated supporter of the Government so far forgot himself

THE NEW CHAIRMAN.



Mr. Whitley, who succeeds Lord Clarendon, was one of the most successful Speakers who has ever presided over the House of Commons.

as to shout across the floor of the House to Whitley, "Shut up, you smooth-bore." This nickname, the exact meaning of which is, of course, an old-fashioned cannon, though quite inappropriate, stuck to Whitley until he himself became a Whip and a Government supporter, and was automatically muzzled.

An Impartial Outlook.

On the Liberal party coming into office in 1907 he became a Whip in his turn. And, after four years as a poacher turned gamekeeper, he went into the Chair as Deputy Chairman of Ways and Means, and then as Chairman and Deputy-Speaker, as I have described.

Altogether he was in the Chair for eighteen years. He there acquired, as only that training can make possible, the judicial and impartial outlook, the faculty of seeing all sides of a question and every point of view that will be so valuable to him in the great office that he has now been called upon to fill.

Valuable War Work.

During the War period, Mr. Whitley was made much use of by the War Governments as British representative on various Inter-Allied Commissions, as, for example, the one for rationing-out the available shipping for commercial purposes between the Allies in the war. This was a very delicate and difficult task.

He proved himself an astute bargainer with the French and Italian representatives. This part of his work was extraordinarily valuable, but the general public knows little of it. And all the time he carried on the exacting duties of Chairman of Committee in Parliament.

As Speaker he upheld the office with great dignity, mixed with the necessary touches of dry humour, and enjoyed an enviable reputation for absolute fairness and impartiality.

His first years of office as Speaker were particularly onerous: for in 1922 the Labour Party came back to Parliament after that election not only in considerable numbers (for the first time in its history), but in a very aggressive spirit.

We had had a period of comparative calm since the days of the Irish Nationalist Party in its prime; but then came a group of wild spirits, some of whom have since sobered down in the political sense, while others remain rather violent and obstreperous.

Saving An Awkward Situation.

It takes all manner of men to make a parliament. The situation might have been awkward. But Whitley handled it with superb tact and won the respect of those who, then and now, were, and are, never tired of proclaiming their contempt for the parliamentary machine and our somewhat variable and, indeed, antiquated procedure. And I myself can testify as to how irritating that procedure can be to those who are in a hurry to get things done.

One of the most tactful things I heard him say was on the occasion when he quelled what might have been a serious disturbance, when a certain gentleman on the other side of the House addressed Ellen Wilkinson as "Miss Perky."

In those days we weren't as used to the

(Continued on next page.)

MR. WHITLEY.

(Continued from previous page.)

presence of lady members as we are now, and there was a great deal of resentment at this ungallant conduct. In fact, the taunt was taken quite seriously.

Whitley saved an awkward situation by reminding the member who had made this remark to Miss Wilkinson that it was his duty to address the Speaker in the Chair. The idea of addressing the sedate Speaker, in his wig and gown, as "Miss Perky" was too much for the House of Commons, members dissolved into roars of laughter, and the incident closed.

Mr. Speaker Whitley, for all his stern appearance, had a great sense of humour, and often used it with great effect. On one occasion, when Russia was being debated in the House, a subject which still arouses a good deal of passion and hot temper, the late Sir Alan Burgoyne was hammering away at the Labour opposition, getting more worked up every minute, and quite forgot to address the Chair, talking only to the Opposition, whom he addressed as "You . . ."

Sir Henry Slesser rose on a point of order, and asked Mr. Speaker if Sir Alan Burgoyne was in order in calling the Speaker all these names ?

Restoring Good Humour.

Very mildly Mr. Speaker Whitley replied that he was beginning to wonder what he had done to be accused of all these crimes. This gentle reminder to Sir Alan that he must address the Chair, made the House laugh, good humour was restored, subsequent debaters taking care not to fall into the same error as Sir Alan Burgoyne.

When I was in opposition, I was anxious to bring up the question of the presence of our soldiers on the Rhine so long after the conclusion of the war, but the only opportunity I could find was on the vote for the Army estimates.

Yet whether we should keep an army of occupation on German territory or not was a matter of high policy, and out of order on the Army vote, when only administration could be discussed.

Always Perfectly Fair.

I tried to get round it by drawing attention to the fact that the British Tommies were marrying German girls through propinquity in their billets. Holding the Army estimates in his hand, Mr. Whitley rose in

Lt.-Commander the Hon. J. M. Kenworthy, R.N., M.P., the author of this article, knows Mr. Whitley intimately.

his chair and asked me, "If these ladies were carried on the vote ?"

But, for once, I got the better of him.

"Oh, yes," I replied, "there is a vote for married allowances, and some of these German ladies become automatically British subjects and receive these allowances."

Whitley capitulated and allowed me to make my points.

I confess myself that I was a thorn in his side on many occasions in those days ; but he was always good-humoured, right in his judgments, and perfectly fair.

Seven years in the office of Speaker, certainly the most exacting post in Parliament, is enough for any man. And Harry Whitley retired in 1928.

Characteristically, he asked leave to refuse a peerage, the usual mark of the Royal honour bestowed on a retiring Speaker. But he did not retire to rusticate. Indeed, he accepted the important duty of Chairman of the Special Commission on Indian labour conditions, second only in importance to the Royal Commission, or Simon Commission, as it is generally known.

A Successful Business Man.

I was in India when this committee was in the midst of its labours. Everywhere I heard the highest praise of Whitley's work. He had to preside over a mixed body of Europeans and Indians, employers, Trade Union leaders, and politicians. And he managed the team with adroitness and efficiency. Their report is now being printed and will be a State document of the highest importance.

Before entering Parliament Mr. Whitley had achieved success as a business man in managing the important factories founded by his family a hundred years ago in Yorkshire.

The above is a brief account of the career and activities of one of our elder statesmen who has been a business man and politician of the highest distinction.

He comes to the B.B.C. with wide experience, ripe judgment, and a knowledge of the world and of men that promises much success in the difficult post of Chairman of the British Broadcasting Corporation.

NOTES FROM THE NORTH.

From OUR SPECIAL CORRESPONDENT.

THE attendances at the recent Northern Promenade Concerts were better than was anticipated. They were approximately :

20,000 during the fortnight's season at Manchester ; 11,000 during the week at Liverpool : and 10,000 during the week at Leeds.

"Considering the time of the year," said Sir Hamilton Harty, the conductor, to Press representatives after the final concert, "the response has been amazingly good. One of the most gratifying features was the youth of many of the audiences, the majority of them being young people between the ages of 16 and 25.

"I firmly believe that people hearing good music on the wireless or on gramophones are more and more anxious to come and hear the real thing at the orchestral concerts."

Successful Hallé Concerts.

The B.B.C. and the Hallé Society, who jointly organised these concerts, never expected them to pay. They did not. Nevertheless, the experiment is considered to have been a success, partly because the organisers are not judging results merely on financial grounds, and partly because the "programme value" of the concerts from the B.B.C.'s point of view has to be taken into account.

Mr. E. G. D. Liveing, the North Regional Director, tells me that while the "Proms" were being broadcast there was naturally a saving of funds that would otherwise have been required for studio programmes.

Remembering this, and the general public interest aroused, Mr. Liveing says that the experiment was justified.

It seems probable that in these concerts we have the foundation for what may be a very important artistic innovation in this country. Alone the Hallé Orchestra could not have held the Northern Promenade Concerts. B.B.C. money made them possible, and B.B.C. programmes profited in return.

Thus, the familiar cry for a State subsidy for classical music is answered in rather an unexpected way. There has been a similar call for a State subsidy for the drama. Will it also be met in the same way ?

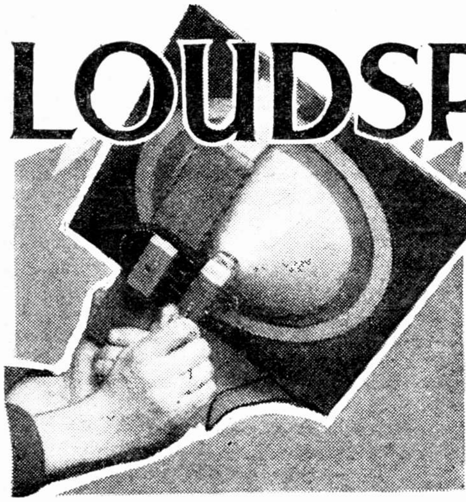
During the period of the concerts the programmes radiated from North of England stations were rather over-weighted with symphony music. If the "Proms" are held again next year it will be possible to avoid this, as by then the North Regional station at Moorside Edge will be in action, and Northern listeners will have alternative programmes. At present there are no alternatives in the North, and during the "Prom" season it was symphony or nothing on many evenings.

Truly Regional Programme.

I am reassured that the Regional programme to be radiated from Moorside Edge will be much more truly regional than the London Regional programme. In this programme there is little "local interest." In fact, paradoxically, London's so-called regional programme often comes from Birmingham !

But in the North the B.B.C. will have a wider scope for local interest. Outside broadcasts promise to play a big part in the North Regional programme. Already the North Region is probably doing more "O.B." work within its own borders than any other provincial region.

LOUDSPEAKER "RATTLE"



by VICTOR KING

Don't try to remove a fault by "brute force" methods—there are nearly always better schemes.

QUESTION.—"What causes loud-speaker rattle?"

Answer.—"One cause is the absence of a reservoir condenser of adequate capacity across the L.S. terminals."

Would you believe it? Not, I mean, the veracity of the reply, but the fact that the above appeared in a daily paper in this very year of grace.

But it did. Ten years ago, perhaps even only seven or eight years ago, it would have been excusable, for such periods were the dark ages of this young science of radio.

To-day, however, abysmal ignorance of that kind is quite inexcusable. And yet we come up against quite a lot of it.

Seldom such a bad case as that, although in a minor way there is an incredible amount of bad radio advice being proffered to the radio public.

Becoming An Expert.

Poor old wireless hasn't yet achieved proper recognition as a science. And the lay press doesn't seem to understand that before you can be "expert" at radio you have got to get a grip on the fundamentals of electricity, and that means training and experience.

The theory of wireless is not a mere matter of a handful of facts anyone can learn by heart in half an hour; take a qualified electrical engineer and let him study radio for a further two or three years and he may begin to get a real grasp of the subject.

Then let him have a few years of practical radio engineering experience and, if he has applied himself diligently to his work and has aptitude, he might turn out to be quite an "expert."

Or he might, on the other hand, acquire the standard of only the second-rate engineer.

More Tragic Than Humorous.

I wonder how the B.B.C. would get on if it chose its engineers in the happy-go-lucky way some newspapers seem to pick up their experts.

Seemingly anyone who can use a few nice words such as "heterodyne" and "component" qualifies!

One of our national dailies once gave constructional details of a selectivity device the purpose of which was stated to be to stop 5 G B from interfering with 5 X X!

That in itself was sufficiently ridiculous for one day's venture into radio, in all conscience, but the device itself was so terribly hopeless as to be more tragic than humorous.

Had the whole article appeared in "P.W." labelled "this week's joke," you would all have laughed heartily, and then the matter would have ended.

As it was, the cause of radio suffered another very nasty jolt.

But to revert to loud-speaker rattle. It is obvious that the "expert" who wrote the above answer knows very little about radio. I am not one who likes to criticise brother scribes and I would never rush into print merely to vent an "expression of opinion."

Loudspeaker Buzzing.

The reason why I have dragged this particular business into the limelight is so that I can do my little bit towards suppressing a common fallacy, and this fallacy is perfectly illustrated by the question and answer.

It is, in part, that the majority of buzzings and rattlings that one encounters in radio originate in a loud speaker and, in part, that a fixed condenser is "a smoother of irregularities."

Let us handle these points in order. A "mechanical" scraping or rattling or buzzing in the loud speaker can be caused through all sorts of things in a set. Valve overloading is a frequent source of such trouble.

Of course, loud speakers themselves do develop their own rattle, but my point is that often there is something else at fault.

Now, wherever the trouble lies, what effect has a fixed condenser joined across "the L.S. terminals."?

(There shouldn't *necessarily* be one there at all, so the "adequate capacity" bit is all "bunk." Generally speaking, it is quite wrong to connect a fixed condenser across the loud speaker.)

Effect of Condenser.

Well, the only real effect is that it would cause a falling-off in the high notes.

Now you can see how such a scheme can cure loud speaker "rattle"—that is, if the "rattle" is a high-pitched one.

The "rattle" is cured because the loud speaker is rendered very inefficient over the band of frequencies where the "rattle" occurs.

That, you might say, is quite legitimate. But you would retract when it was explained that a parallel fixed condenser doesn't just nip off one or two notes, but causes a wastage over an extended range.

And the greater the capacity the worse the drop!

Now enough high notes are inevitably lost at other points without a further massacre being possible without very serious results.

The fixed condenser doesn't exactly "smooth" it just kills those high notes.

Effect on Tone.

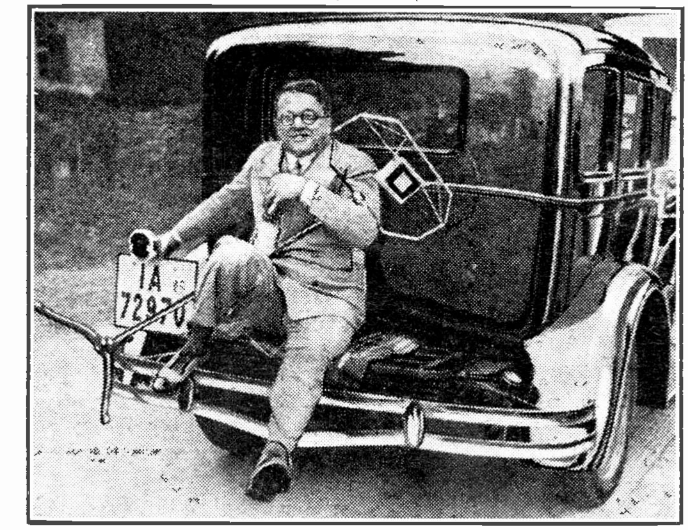
You see, the higher the frequency the less a condenser's resistance to L.F. current. The condenser joined across the L.S. offers an alternative path to the energy that should all go to the loud-speaker and the path becomes an easier one and diverts more and more of the energy the higher up the scale of notes you go.

The effect of chipping off high notes is to drop the tone of the loud speaker. You get smoothness and mellowness—but at what a price!

Don't think always in terms of bass and mellowness—remember the high notes, they contribute much more to the character of broadcasts and really are worth cultivating.

Don't take any notice of the parallel condenser mellowness fake, look to your set and valves, and, of course, loud speaker, and treat this last as an electrical device—not as a musical instrument.

ABSENT-MINDED?



Herr Franz Baumann, the famous German radio singer, takes the microphone home with him after giving a broadcast recital.

LATEST BROADCASTING NEWS.

NORTH REGIONAL CONCERTS

AN AVIATION BROADCAST—FROM WALES—NOTABLE RUNNING COMMENTARY—CHOICE PROGRAMME MOMENTS.

It is seldom that a week's programmes are so truly representative of the whole of the Northern Region as those arranged for the period beginning on Sunday, July 20th. In addition to the relay of organ music from Manchester Cathedral as part of the evening programme that night there is also a church service from Manchester; and concerts from Harrogate, Scarborough, Morecambe, Whitby and Buxton in the same week, as well as one or two talks from Leeds.

The programme builders at Manchester are apparently endeavouring to get into their stride with really representative Regional programmes in good time so as to avoid being "caught napping" when they become responsible for feeding one of the two transmitters now being erected at Slaithwaite, near Huddersfield. Work on these transmitters has been going on since last autumn, and will probably be finished in about six months.

An Aviation Broadcast.

Mr. Ashley Hall, who is a pilot officer in the Royal Air Force Special Reserve, a director of the Bristol and Wessex Aeroplane Club, and a member of the racing committee of the Royal Aero Club, is to give a talk to West Regional listeners on Saturday, July 19th, on the International European Air Race which is to start from Berlin on Sunday, July 20th.

This race, which is second in importance only to that for the Schneider Trophy, is over a course of thousands of miles, covering Belgium, Holland, France, England, Spain, Italy, Austria, and Poland, and this year has attracted a record number of entries.

Among the six British pilots to compete are Captain H. S. Broad, who secured second place in last year's race, and Mr. A. S. Butler. who formerly lived at Bristol and who will fly one of the new Puss Moths. Competitors are due to arrive at the Bristol Airport on Monday, July 21st.

From Wales.

Llanelly has been chosen, for the third occasion, as the venue of this year's Royal Eisteddfod of Wales, the other dates being 1895 and 1903. One of the features of the event will be the Arts and Crafts Exhibition which is to take place in the Coles Hill Central School adjoining the Eisteddfod grounds, where a wonderful collection of old masters, as well as works by living masters, collected from all over the world, will be on view.

There will also be a section devoted to competitors' works, of which there are over 10,000 entries from Great Britain, the Continent, Egypt, India, America, and even the Argentine. A talk on this exhibition will be given for West Regional listeners by Mr. E. Willis Jones on Thursday, July 17th.

Notable Running Commentary.

By arrangement with the Dublin broadcasting authorities, Ulster listeners will be able to hear running commentaries on the second Irish Grand Prix Motor Race which this year is to take place in Phoenix Park on Friday and Saturday, July 18th and 19th. Actually there are two distinct races of 300 miles each—one on Friday and the other on Saturday, the time for starting being fixed for 2.15 p.m. on each day.

Friday's race is for small cars, with engines not exceeding 1,500 c.c., while on Saturday the battle of the giants takes place between big cars, driven by such famous motorists as Wolf Barnato, Glen Kidston, Malcolm Campbell, S. C. H. Davis, Earl Howe, and Carraciola, the German crack driver who won the race which last year took place on the Ards Circuit.

The prizes, in addition to the Phoenix Trophy, which is the Irish Grand Prix award for the car putting up the best performance during the two days, include two gold and eleven silver cups. The commentator will be Mr. F. M. Summerfield who will describe the progress of the race on both days from the start until 3 p.m., and also the final part from 6.30 to 7 p.m., when the winner will be known. This should provide some thrilling broadcasts.

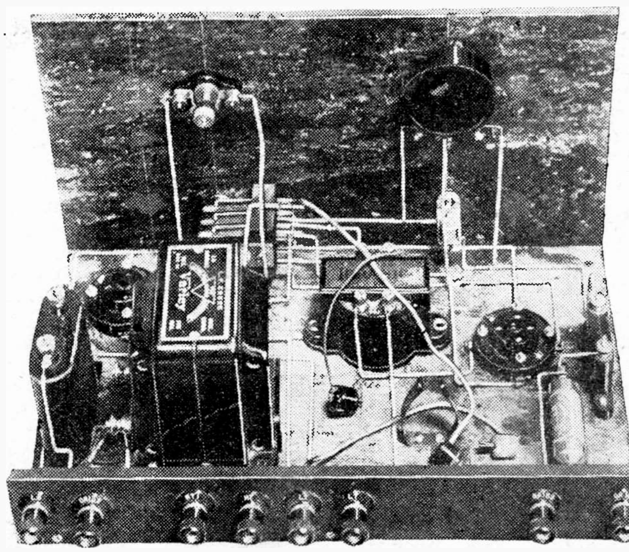
Choice Programme Moments.

Paul Robeson, the famous negro singer who has made several appearances in the broadcast programmes during the last few months, will appear in the name-part of the "Emperor Jones"—his original role on the stage—if the discussions, which are now taking place, for the broadcast of the work in the autumn can be satisfactorily settled. Further details of this will appear as they come to hand.

Lupino Lane is taking part in a vaudeville programme for National listeners on Saturday evening, July 19th, in a bill which also includes Flotsam and Jetsam, Nora Blaney, Stuart Robertson, Tommy Handley, and the Two Pairs—Claude Hulbert and Enid Trevor, Paul England and Pat Paterson. This will be Mr. Lane's fourth appearance before the microphone since his return from Hollywood; the first being a surprise broadcast, the second an extract from the "Love Parade" talking film, and the third the recent excerpt from "Silver Wings."

Bruno Frank's German play, "Twelve Thousand," is to be produced in the London studio by Cecil Lewis for the evening programme on Friday, July 25th. The theme of the play deals with the time when the States of Germany were ruled by autocratic princes who sold their subjects as conscripts to foreign powers.

A POWERFUL AMPLIFIER.



Another view of the "A.P." Amplifier, a powerful unit that is fully described in other pages in this week's issue of "P.W."

FOR THE LISTENER.

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

Who will long be remembered for those wise and witty broadcasts entitled "From My Window."

A Great Day.

For once in a way, Saturday was a great day. I seem to be falling into rhyme! Hooray! End of said poem, as Stainless might put it. We had the Britannic leaving Liverpool on her maiden voyage, Wimbledon, Hendon, the Test Match, the third chapter of "Behind the Screen," and—Albert Whelan. It was like a glut of strawberries. Just the sort of programme for a Portable in a Punt.

The Britannic.

I liked this O.B. very much, especially because I know the Landing Stage at Liverpool very well. It was very brisk and business-like. The peep into the Purser's Office and the chat with Captain Summers on the Bridge were excellent examples of how to do it.

The fellow who occupied the microphone on the landing stage, when the ship was getting on the move, tried his best to create the atmosphere of "parting," and suggested streaming eyes and quivering lips. Somehow, I don't think! Not in these days. But with the help of the sirens he gave us a good idea of the scene. The good ship Britannic had a great send off, and a voice wished her a "good trip and soldier's weather."

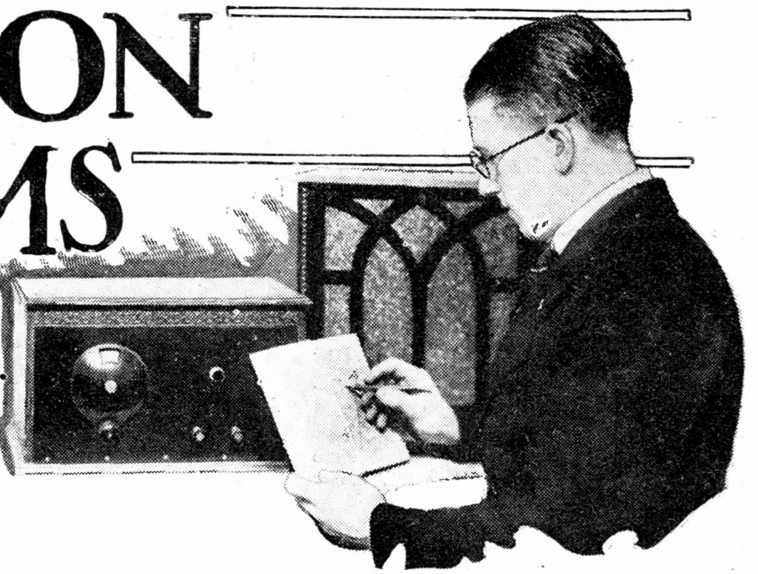
There is something very impressive about 27,000 tons of steel moving under her own steam down the tideway and out to sea.

(Continued on page 500).

RECEPTION PROBLEMS

by

Capt P.P. ECKERSLEY M.I.E.E.



Our Radio Consultant - in - Chief continues his fascinating survey of the problems of achieving better quality in Radio reception.

IN two previous articles I indicated the probable main requirements that had to be fulfilled if progress is to be made towards better quality of reproduction.

I held that possibly we have been too long held by the tradition of the dead studio, and that music rooms should fulfil the needs of music, and that there was too much finicky purism in the attitude towards acoustics in general.

I indicated that probably the reproduction of transients in their pristine form was as important as the equal reproduction of actual frequencies between defined limits.

Where Receivers Fail.

I hinted that there was little or no use refining the receiver which in its best form does full justice to the transmission, before transmission itself reforms in the matter of transient reproduction.

Thus while the transformer is theoretically inferior to properly designed resistance-capacity connection, I indicated that it would be useless to scrap transformers before reformation in transmission overtook us.

But assuming prefection in transmission, wherein does the receiver fail? Firstly, and this applies to the present as much as to the future, linearity of valve response over the portion of the characteristic used in practice would seem to be the first desirable requisite in any and every receiver.

I have heard people forgive high-frequency valves a non-linearity. I cannot feel in agreement with such a view. Any non-linearity must introduce second power terms and produce new frequencies not present in the original disturbance.

Distorting Detectors.

The same with detection. The same with low-frequency amplification. Designers would be repaid in a study of the dynamic characteristics of all valves. Grid current must be foresworn unless the circuit is loaded by a resistance small compared to the effective resistance of the grid filament circuit.

In the new type of transmitter used by the B.B.C. it was necessary for efficiency to use the fullest possible sweep of the characteristic curve of the output high-frequency valves, and both the positive and negative regions of grid potential had to be swept through.

Thus distortionless high-frequency magnification legislated for a constant resistance between the grid and filament of the high frequency valve, which resistance was *less* than the effective grid filament resistance of the output high-frequency stage.

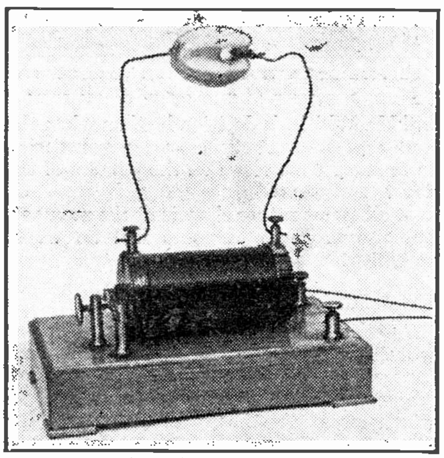
There is, however, no necessity for such an arrangement in receivers as long as the grid excursions on the high-frequency stages are limited to the negative region of the grid volts anode current characteristics.

The problem is made easier as the anode voltage is increased (within reasonable limits), and it surprises me to find in certain designs a shyness in this respect; the criticism is more particularly directed where mains are available and the battery problem not paramount.

As to detection, some admirable work has lately been undertaken by the B.B.C.

It is clear from the experimental and theoretical explanations that straight-line detection is possible using grid leak rectification. True, for some years past, Mr. Kirke's circuit (I have never known if he can claim this circuit, but it is commonly called the Kirkifier!), where positive grid bias is essential fulfils the need of linear rectification, but the circuit has certain practical disadvantages, as wasting the battery power, and a lack of sensitivity compared with the grid leak method.

TESTING AN INSULATOR.



A small induction coil can be used to provide a fairly good indication of the efficiency of an insulator.

But Mr. Greenwood shows that grid leak rectification can be both practical, efficient, and linear, provided the detector stage is treated as a partial power stage, and provided the value of the grid resistance is not made too high.

Bottom-bend rectification is, in light of modern requirements, clearly out of the running, most particularly because with the new type of transmitters the depth of transmitted modulation is much greater than of old.

"Bottom Bend."

The very term "bottom bend" quarrels with the idea of linearity, but, of course, in older days, and with a limited modulation depth, the excursions of grid voltage are largely confined to the straight parts of the characteristic.

Mr. Greenwood shows that there are certain inherent advantages in using push-pull connection, for grid-leak detection if the very best is required. It is hardly worth time and space to discuss the question of linearity vis à vis the low-frequency side of a receiver, the methods of achieving linearity being so well known.

However, Mr. Rupert Carpenter, who has done so much and received so little recognition for what he has done towards better quality reproduction, has devised an ingenious method of low-frequency amplification which has the basic advantage of push-pull linear amplification.

The "perfect" reproducer would, in my opinion, do well to rely upon the work of Greenwood and Carpenter and push-pull to the output stage. However, it would seem redundant to push-pull the high-frequency side.

Push-Pull Expensive.

Of course, the supreme disadvantage of the push-pull method is the cost of valves.

The output stage is a bothering matter; if whole capacity is used we are defeating transient transmission; if transformer connection the same trouble arises, and if we stick the loudspeaker slap in the anode, impedance may not match and the whole speaker is alive. The former disadvantages are killed in push-pull connection, the last-mentioned can, after all, be guarded against, since a lamp or a vacuum cleaner is, after all, equally alive too, and is a common domestic appliance.

ANOTHER B.B.C. DILEMMA.

How far the B.B.C. should permit political broadcasts and keep abreast of current controversies is a question that is causing a good deal of hard thinking at Savoy Hill, and this article summarises a piquant situation.

By THE EDITOR.

AT the moment of going to press a peculiar situation has been created in view of the fact that Lord Beaverbrook's proposed broadcast talk will be of a political nature.

When Lord Beaverbrook applied to the B.B.C. to be allowed to broadcast a talk on Empire Free Trade (which "Popular Wireless" reported exclusively some time ago and, in fact, long before Mr. Whitley took over the chairmanship of the B.B.C.) the matter was postponed from time to time for certain reasons. It is obvious that if Lord Beaverbrook is to be allowed to broadcast a political talk on Free Trade, his opponents must also be allowed to broadcast. This is but in keeping with the B.B.C.'s policy of fair play.

Although it is understood that Mr. Lloyd George will broadcast a reply to Lord Beaverbrook, the question of the claims of other political leaders still presents a difficult problem. If Mr. Whitley allows Lord Beaverbrook and Mr. Lloyd George to broadcast, it is obvious he cannot refuse to allow the Prime Minister to make a reply if he wishes to. And how can he refuse Mr. Baldwin? After all, Mr. Baldwin is very much involved in this argument about Empire Free Trade, and from the point of view of the public, Mr. Whitley could hardly refuse to let the leader of the Opposition express his view.

No Escape?

And if, in fact, the leaders of all four Parties are entitled to broadcast on a matter of political controversy, under what rule can Mr. Whitley deny, say, the leader of the Communists broadcasting? Or why shouldn't the leader of the Scottish Nationalists have a word to say as well?

It has been suggested that Mr. Whitley might get out of this dilemma by deciding that all these proposed speeches are not political at all, but are simply a public entertainment. But again, would Lord Beaverbrook, Mr. Lloyd George, Mr. Baldwin, and others, be satisfied to have their political policies described as public entertainment? We think *not!*

We are rather inclined to think the "Daily News Chronicle" is right when it says that Mr. Whitley and the B.B.C. have been caught in a net from which there seems no real escape.

Attempts have been made before to regulate political broadcast speeches, but it seems now that such an attempt is really absurd, and in any case is doomed to failure. It is really the public, and not the Government, nor the B.B.C., which will eventually decide what politics it wants to hear by wireless.

Already Lord Beaverbrook's application for a broadcast talk has given rise to a good deal of argument at Savoy Hill. We know for a fact that Lord Beaverbrook has had a talk with Mr. Whitley and Sir John Reith, and Lord Beaverbrook (not at all pleased, we understand, at having his talk postponed, as it has been in the past from time to time) more or less demanded a decision *re* his application for permission to broadcast a speech on Empire Free Trade.

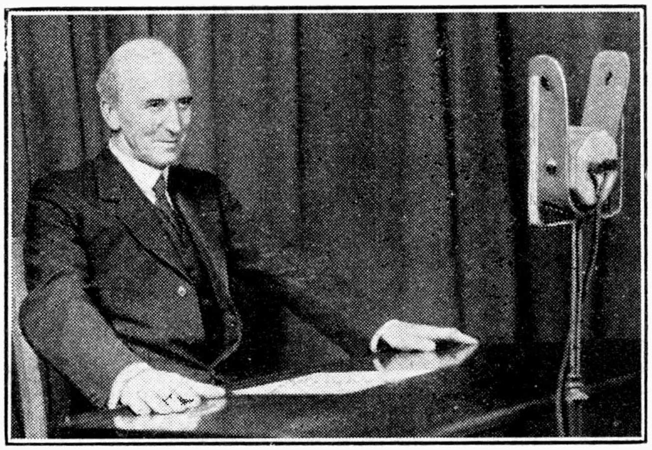
A Chaotic Position.

The result of this meeting was, we understand, that it was stated that if Lord Beaverbrook decided to broadcast so must Mr. Lloyd George be allowed to reply to him. Exactly what will happen if Mr. Baldwin decides that he wants to reply as well remains to be seen; and the question is still further complicated by the fact that the Prime Minister and other Labour Party leaders may want to broadcast their views! We may hear a lot of political broadcasts in the near future!.

And supposing, as is quite likely, somebody else starts a new Party shortly? What will Mr. Whitley's decision be then, when the leader of that Party asks for permission to broadcast his views on the politics of the day?

It all seems rather chaotic at the moment, but the ultimate outcome will be worth watching.

A MOMENTOUS BROADCAST



Sir John Simon broadcasting his wonderful summary of the situation in India as investigated by the India Commission.

Those Sunday Programmes.

Another problem which Mr. Whitley will have to solve very shortly is that concerning Sunday programmes. As our readers know, there is one school of thought which maintains that Sunday being a day of rest there should be no broadcasting at all, while another school of thought maintains that because of the very fact that Sunday is Sunday the B.B.C. should choose programmes on that particular day of the week which are of the brightest and cheeriest possible.

These two extremes of opinion are constantly clashing, the battle rages and sways back and forth, but no real decision seems yet to have been taken about the matter. Obvious it is, of course, that Sir John Reith leans towards the first school of thought, viz., that the programmes should be rather "chaste and severe" on Sundays, with a very strong dose of religious broadcasting matter in them.

Pleasing a Minority.

It has been said with truth that the main consideration to be borne in mind when considering this problem is that it is no use the B.B.C. pleasing 10,000 people if, at the same time, they irritate a million.

But we should like to know what evidence the B.B.C. has for assuming that the majority of listeners in Great Britain would be shocked by jazz or vaudeville on Sundays. From evidence in newspapers, at any rate, it seems pretty clear that the majority of listeners in this country are all out for better and brighter Sunday programmes. But the B.B.C. has taken it as an axiom that the people who would be upset by brighter broadcasts far outnumber those who would like more entertainment.

It must be remembered also that, on Sundays, the hours devoted to broadcasting are limited by arrangement with the churches. Some time ago the B.B.C. was asked not to broadcast during the hours when religious services are being held, and Sir John Reith was undoubtedly right in paying heed to this request, coming as it did from the highest ecclesiastical quarters.

It is really difficult to find a formula for the Sunday programmes, for one constantly hears people say that the concerts broadcast on Sundays are not in any sense highbrow, and that what is highbrow in the programme—for example, the Bach Cantatas—are usually broadcast in the afternoon, when the majority of people are not inclined to listen in.

"Evidence"

The B.B.C. says it has evidence to show that these Sunday programmes meet with general approval, but the B.B.C. is constantly saying it has "evidence" for this, that or the other. Why doesn't it produce it; and why not form an impartial committee to consider, on its merits, the "evidence" which the B.B.C. maintains it holds and which supports its Sunday programme policy?

As a matter of fact, the solution really is at hand. We are supposed to be having alternative programmes these days, but if you observe the Sunday programmes you will notice that the National, the Midland Regional and the London Regional stations all devote a considerable amount of time to religious broadcasts, and that in practically all three cases the entertainment side of the broadcast does not begin until nine o'clock.

Surely one of these stations every Sunday could be "excused" from broadcasting a religious service, and could devote its transmitting energy to the propagation of programmes which would satisfy the clamourings of those who want better and brighter broadcasts on Sundays?

"MIKE" AND THE PIANO

by

MAURICE COLE

A famous radio artist describes some of the difficulties and pitfalls that confront the studio performer. Mr. Cole, however, does not agree that a "special technique" is necessary for successful broadcasting.

SINCE broadcasting first commenced, we have heard much of the new so-called "microphone technique." What this phrase actually means it is difficult to say, but that broadcasting does, in certain classes of entertaining, demand a different technique from concert work is undeniable.

No "Special Technique."

Comedians and singers especially have found it necessary to approach the microphone in a manner quite foreign to the old-established traditions of the platform. Indeed, I have heard it said that when an artist enters a wireless studio, he should forget all that his previous experience has taught him.

As a pianist who broadcast before the earliest days of the old British Broadcasting Company, it might be assumed that I have by this time thoroughly acquainted myself with all the difficulties and pitfalls of microphone technique as applied to pianists. But I have not done so. I have evolved no special technique for my wireless performances in the whole eight years of regular broadcasting in this country.

I am fully aware, of course, that certain styles of playing are more suited to broadcasting work than others, and I will enumerate later those special qualifications which I believe necessary to the success of any pianist on the wireless. But it is a fact that I have never attempted to alter my natural style of playing to suit the whims and foibles of the microphone.

As far as I am concerned, a wireless studio and a concert platform are one and the same thing, although, of course, one misses the atmosphere of a concert hall in the studio, and can never be in close touch with one's audience.

In this attitude I am not alone, for I have yet to meet the wireless pianist who considers his success due to a studied form of wireless technique.

Play Naturally.

From which it may be gathered that the natural style of playing peculiar to each individual pianist is more responsible for his success—or otherwise—than any specialised technique. Here, then, we see that the radio pianist is in quite a different class from the many other forms of wireless entertainer.

One must remember that an individual style of playing must come as naturally to the really good pianist as an individual style of games comes to a really good sportsman. What happens if that sportsman attempts to alter his style? His game immediately goes to pieces.

Similarly, the pianist who attempts to change his natural style of playing to suit a new medium of entertainment is courting trouble. Although it may be said that in time a new style will be perfected, I do not believe that real success can be obtained as the result of a change of method.

Consequently, a successful wireless pianist must have certain natural qualifications which will suit his style to wireless work. If a pianist lacks those qualifications then he is unlucky, for they cannot be thrust upon him, neither can he acquire them with any great prospect of doing well.

In this short article it is not possible for me to detail every attribute which I feel is needful for the success of the radio pianist. I can, however, outline the main essentials. They are three in number, and are all equally important.

First of all, there is the question of touch. This must be clear and precise, free of hardness, and capable of producing a large variety of tone. Secondly, there must be neat pedalling—a point of weakness with many pianists.

Lastly, there must be a generally "tidy" conception of the works to be played. By this, I mean that the pianist should be well acquainted with the works he intends to perform, and should have a well-defined idea of the manner in which he intends to interpret them.

Watch the Details.

If you are a pianist, you may point out that the essentials I have mentioned are those that are necessary for ordinary concert work. This I readily admit, for I have always maintained that they must be present for *any* kind of public performance.

It does not necessarily follow, however, that the successful platform pianist will be a successful radio pianist. Defects in any of the three points I have mentioned might possibly pass unnoticed in concert performances, but they would be considerably accentuated by the microphone.

If a pianist possesses these attributes—and other minor ones which I have not set down—and does not attempt to force his style in the broadcasting studio, he will stand an excellent chance of becoming a successful radio artist. Without them his chances are extremely poor.

From the arguments I have outlined, it might be assumed that wireless broadcasting is less trying to the average concert pianists than to any other class of entertainer. This might be so—at any rate, after one has become accustomed to playing in the studio.

The First Broadcast.

But it is generally agreed that the first broadcast performance, whether of a pianist or anyone else, is always something of an ordeal if only on account of the novelty of the experience. And the pianist who plays under the excessive nerve strain of a "first appearance" is not likely to do himself, or the composer of the works, full justice.

ANOTHER GREAT PIANIST

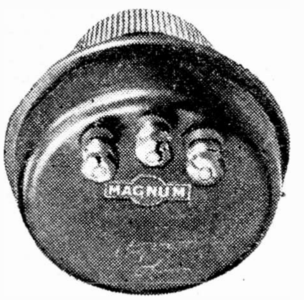
Solomon, the great virtuoso, who has frequently given recitals for the benefit of radio listeners.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

MAGNUM WIRE-WOUND POTENTIOMETER.

THE latest Burne-Jones component is the Magnum Wire-Wound Potentiometer. It is available in the following resistances: 5,000; 10,000; 25,000 and 50,000 ohms, all priced at 7s. 6d. each, and each will carry 10 milliamps. Its uses are manifold.



The Burne-Jones potentiometer.

I was particularly struck by its very smooth adjustment, and this is obtained through the employment of a floating disc contact arrangement which, incidentally, prevents wear being imposed upon the fine wire used.

MAZDA A.C. PENTODE.

Here is some news of particular interest to the "all-from-the-mains" enthusiast. The Ediswan Electric Co., Ltd., have produced a Mazda A.C. pentode valve, with a normal A.C. filament rating, that can be used with any of the standard Mazda A.C. valves.

It has a four-volt heater taking one ampere. Requiring only 250 volts maximum, it has the exceptionally good mutual conductance for a pentode of 2·2.

It makes a fine output valve and the "high note lift" that results provides excellent compensation for any of those moving-coil speakers that tend to be boomy.

On the other hand, of course, when one of those rather high-pitched speakers is used, a resistance capacity by-pass needs to be joined across the output terminals as advised by the makers of the valve. Very considerable amplification is given by this new pentode, and it certainly does go a long way towards saving a complete stage.

DONOTONE LOUD SPEAKER.

The Donotone people, whose address is 40, Furnival Street, Holborn, London, E.C.4, announce that they have a new catalogue ready and are prepared to forward a copy to any reader upon request.

LISSEN FOUR-VOLTERS

Lissen, Ltd., have now very greatly increased their range of valves by the introduction of a bunch of 4-volters. Actually there are eight types in this 4-volt range, including pentode, screened grid, and super power valves. There is also a full-wave rectifying valve. I notice too, that Lissens now have a big 6-volter, the TX 61, which has an impedance of only 2,000 ohms, and an amplification factor of six.

A VALUABLE BOOK.

The Department of Scientific and Industrial Research has now published the report of the Radio Research Board constituting a critical review of literature on amplifiers for radio reception. It is available at all H.M. Stationery Offices, price 5s. net.

There are copious notes and the bibliographies cover a much wider range than perhaps the price of the publication would suggest. No one with any pretensions to real radio enthusiasm will miss getting a copy of the report.

THE FERRANTI VALVE TESTER.

This is a multi-range instrument with which practically all the necessary testing measurements, etc., can be carried out, while the set is still in operation. There is a neat little meter having a small rotary switch for selecting the various ranges. And there are two leads, one for a grid bias connection and the other joined to a plug that is inserted in the set in place of any one of the valves. (The valve itself takes its place in this tester plug).

The rotation of the selector switch gives the following readings: L.T., 0 to 10 volts; an indication of the continuity of the grid circuit; grid bias, 0 to 10 and 0 to 100 volts: H.T., 0 to 100 and 0 to 300 volts in the type B.21 Ferranti Tester. (In the type B.22 the H.T. ranges are 0 to 100 and 0 to 500 volts). Anode current 0 to 10 and 0 to 100 milliamps.

Also, leads are provided to enable the valve tester to be used as an ordinary voltmeter or milliammeter. And it is possible to get a special adaptor which enables five-pin valves to be tested quite as easily.

The Ferranti Valve Tester by its name might seem to imply certain limitations as to its use, but a moment's thought will show you that to test all the valves while they are in use in a set is equivalent to testing the set itself, and it would be hard to conceive a more thorough or quicker test of a set than to run round the valve stages with the Ferranti valve tester.

The instrument is particularly robust, and an accidental overloading does not hurt it in any way. It is equipped with a fuse and a spare fuse is provided. The meter is, of course, accurate and its fine, sensitive needle is alert yet dead beat in action.

The scale is wide and close readings are possible. The resistance of the device is 1,000 ohms per volt, and it does not matter whether a mains supply or battery H.T. is employed.

Altogether I consider the Ferranti valve tester an excellent proposition, and one that should be in the hands of every serious radio experimenter and constructor. Its price, £6 15s. 6d., is reasonable in view of the wide range of duties it fulfils. Separate meters would cost much more and would be much less simple in use.

When you are Buying—

22.—A VOLTMETER.

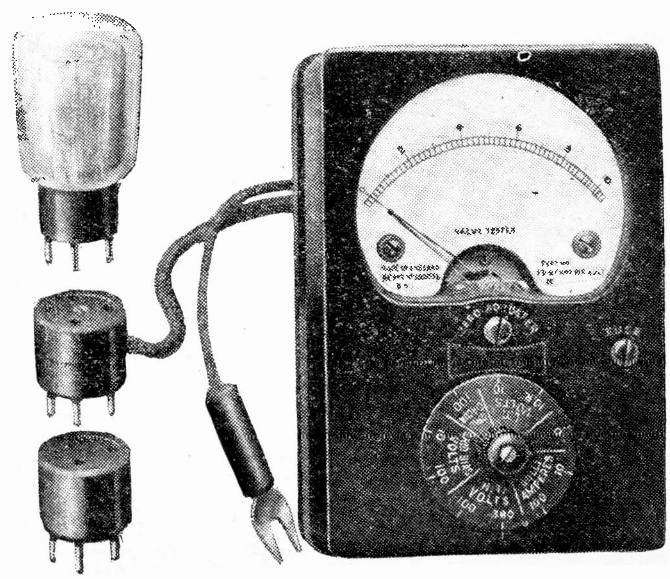
You do not want a "scientifically" precise and expensive voltmeter for checking L.T., G.B., and H.T. battery pressures.

You will find that the medium quality "moving-iron" types of not too low resistance are quite good enough for such jobs.

Nevertheless, you want one having a wide scale and a moderately fine needle. Also the action of the needle needs to be fairly "dead-beat." By this we mean that it flies over to a reading and stays there without waggling agitatedly about, as this makes taking readings a great nuisance.

Also you want the voltmeter to be of such design that it will read equally well in almost any position.

A high-resistance voltmeter (1,000 ohms per volt or so) is needed for giving accurate mains unit voltage readings, and such high-resistance meters are more expensive.



Showing how the Ferranti Valve Tester plug takes its place between a valve and its ordinary holder.

CORRESPONDENCE.

OUR REJECTOR IN AUSTRALIA.

THE "ECONOMY" THREE—THE "MAGIC" TWO—THE REGIONAL SCHEME.

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.

OUR REJECTOR IN AUSTRALIA.

The Editor, POPULAR WIRELESS.

Dear Sir,—It might be of interest to English readers to know that the "Brookmans Rejector" was very much appreciated here in Perth, W.A. 6 W F, the local station, until about six months ago, had a wave-length of 1,250 metres, but when the Commonwealth Government took over broadcasting, the wave-length was brought down to 435 metres, and for some time 6 W F was all round the dial, and with the coming of winter, listeners in Perth found it hopeless to tune into the Eastern States, but the good old POPULAR WIRELESS found the very thing, and there was a rush for "Brookmans" Condensers.

I also tried the "Rejector" using a variometer, described by Mr. Randall in a later issue, which gave splendid results.

In your Free Booklet, the short-wave station 6 W F on 104·5 metres is now off the air.

Broadcasting conditions in Australia are showing a marked improvement, although W.A. is somewhat isolated from the Eastern States. It is only in the winter that Eastern States stations can be received without very bad static.

There are what are known as A Class and B Class stations. A Class stations receive revenue from licence fees of which the annual fee is 24s. The B Class rely solely on advertising for revenue. 3 L O, Melbourne, is about the most popular station in Australia, and can be received in W.A., 2,000 miles away on 1 H F., D.F. and 2 audios on the loud speaker as loud as the local station on three valves.

Short-wave work is very popular here, as there is less static in the summer-time on short waves. 5 S W can be received here, but not very strong, also Manila comes in very strong on 48 metres. This station alters its wave-length very frequently. Several Dutch stations around about Java are also strong.

It is very disappointing to see the large number of electric sets of American manufacture on the market here instead of the British products.

Wishing POPULAR WIRELESS every success.

Yours faithfully,

J. REID.

Hollywood, W. Australia.

THE "ECONOMY" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have made the "Economy" Three, and I am so pleased with the results from this simple circuit that I have just had to write and let you know. Having a badly-screened aerial only 25 ft. high at its highest point, and only using 90 volts H.T., I have logged 20 foreign stations at (good) L.S. strength on the medium-wave coils. When conditions are good Toulouse, Turin, Leipzig, Munster, and Cologne come through as loud as the London stations. The set is very selective, and by using the most selective tapping on the X coil 5 G B can be tuned out by 3° and the two B.P. stations by 1½°. I hope to try the set on the long and the short waves later on, and if I have any success on the short waves I will write and let you know. Wishing "P.W." the best of luck,

Yours faithfully,

D. BAINBRIDGE.

Leicester.

THE "MAGIC" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am enclosing two photographs of what I consider is your best effort in two-valve sets yet. (We reproduce one of them.—Ed.). Although my construction is hardly according to instructions given, I feel that it might interest some of your readers who like to make their own cabinets.

Perhaps by now you have guessed the set in question is the famous "Magic" Two, and is completely self-contained. The lower part contains the speaker (Squire chassis and cone, No. 97b, and Blue Spot Unit) and also the H.T. and L.T. batteries and the upper part the set and G.B. battery.

This makes the set, while not exactly a portable, the next best thing, as the only outside connections are the aerial and earth.

It has the advantage over a portable in that it contains full-size components all properly spaced. For efficiency, well, it comes as a revelation as to what can be done on two valves when working under proper conditions.

Thanking you for this wonderful circuit, and wishing your paper every success.

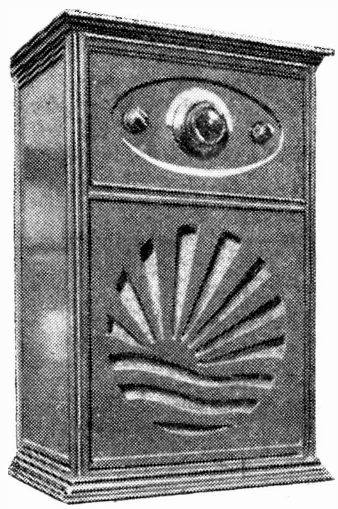
I remain,

Yours faithfully,

HAROLD W. FLOYD.

Forest Hill, S.E.23.

AN ARTISTIC "MAGIC"



Mr. Floyd built his "Magic" Two into this fine cabinet, which he also constructed. The cabinet accommodates the batteries and loudspeaker

THE REGIONAL SCHEME.

The Editor, POPULAR WIRELESS.

Dear Sir,—Now that this scheme has got well into its swing, it seems appropriate to draw attention to its very serious limitations, at least, from the point of view of the writer, and, he believes, of many other people.

The apparent aim of the B.B.C. is to supply the whole country with one programme, or, at the very most, two; a recent Sunday evening being a typical example when every station in the country broadcast the same programme.

As compared with the service of a few years ago this seems a very retrograde step.

Further, the power of these new stations is so great that it would appear to be the intention of the B.B.C. that everyone shall be in a position to operate their moving-coil speaker from a crystal set, whilst at the same time making foreign reception out of the question to anyone who cannot afford a small fortune for a multi-stage receiver capable of cutting down the local stations adequately.

The position is, of course, not yet at its worst, but I would suggest that the ideal solution of this, probably from the B.B.C. point of view, would be to shut down all stations except 5 X X, which everyone can receive, although possibly this might have the unfortunate effect of giving listeners too much latitude in the way of being able to listen with ease to continental transmissions that actually have the merit of being more interesting for a greater part of the time than the majority of B.B.C. transmissions.

Finally, the B.B.C.'s idea of contrasted programmes on the rare occasions when such are given, frequently takes the form of, on the one hand, chamber music, and on the other, symphony concerts. Each of these forms of entertainment is acceptable, but that one should be considered as an alternative entertainment to the other is somewhat strange.

Yours truly,

F. BAGGS.

Manchester.

SHORT-WAVE NOTES.

By W. L. S.

THANKS largely to the special facilities granted to them by the G.P.O. for the purpose, members of the R.S.G.B. were able to pull off an excellent piece of work during the two week-ends preceding June 23rd, the birthday of H.R.H. the Prince of Wales, the Patron of the Society.

Messages of loyal greeting to the Prince were received from amateur radio societies in the following parts of the Empire: South Africa, Iraq, Canada, Jamaica, Ceylon, Egypt, Newfoundland, and the various divisions in Africa apart from the Union.

As a result, two days afterwards, the stations concerned were asked to forward the following return message: "The Prince of Wales sends you sincere thanks for your good wishes, which His Royal Highness much appreciated."

Amateur Successes.

It is a pity that conditions throughout this year have been so bad that it was quite impossible to receive messages from Australia and New Zealand, but perhaps next year the whole of the British Empire will be able to take part in the "Birthday Relay."

The "Southern Cross" flight also provided amateurs with a good opportunity of proving their mettle, and I know personally of one who kept watch for fifteen solid hours, during which time he hardly lost a single word of V M Z A B. And he assures me that the thrill was worth the price of the ice-bags that were required next day, not to mention the aspirin tablets! Listening to a weak signal on headphones for fifteen hours is no mean feat.

Looking through my files lately, it struck me that hardly a single important expedition has set out during the last two years without short-wave radio equipment on board.

The doings of Commander Byrd are, of course, famous. Many of the smaller fry, however, doubtless found their short-wavers just as indispensable, and, what is more, economical.

Please will some of the "big brains" in radio get down to it and devise a "mush filter." Apart from the more violent interference that we all know, one of the bugbears of short waves is the gentle "sh-hh-h-h" going on all the time at just sufficient strength to swamp out those signals that are interesting because of their very weakness.

A "peaked" L.F. amplifier appears to do a little towards it, providing the peak is in the right place, but I have not yet had the success I should like in filtering it out.

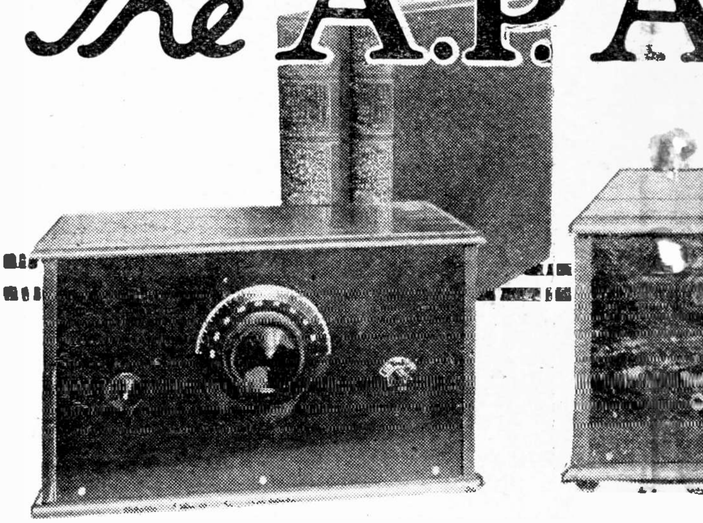
Bringing Up the Mush.

I believe I am right in saying that the general favour of readers is towards a series aerial condenser on short-wavers other than those using a stage of S.G. This, to my mind, is a pity, as, while it undoubtedly improves signal-strength, it certainly also brings up the mush quite a lot. Whether the proportions are the same I don't pretend to know.

The amateur "3·5 megacycle" band (from 75 to 85 metres) should be interesting if only enough amateurs could be persuaded to start up thereon. It is a cross between the "local" 150-metre band and the more long-range 40-metre wave, which is, after all, just what is wanted for good work in this country and with the nearer European countries.

At present it is only open to British amateurs during the week-ends, but, so far as I know, there is no one there at present I

The "A.P.A



THIS article is addressed to one special section of "P.W." readers—the noble order of headphone wearers. Are any of you getting tired of cramped ears and that tethered feeling? Yes? Well, then, what about taking the plunge and graduating to loud-speaker reception?

It's not necessarily a very expensive business, you know. Really good loud speakers can be bought very reasonably nowadays, while if you care to assemble one for yourself with the aid of a frame and one of the excellent "units" now available it need not cost you more than about twenty-five or thirty shillings.

An Economical Method.

Remember, too, that it is *not* necessary to scrap your present set and build a new one. There is a much easier and less expensive way of doing it, and that is to build a good two-valve L.F. amplifier, and tack it on to your present outfit.

Then, practically every station which you were previously able to hear at all will be boosted up to loud-speaker strength, and you can sit back and enjoy yourself, or move about when you want to without being tied by the ears to the box of tricks which used to keep you anchored in one spot.

We have designed a special amplifier for you to enable the conversion to be carried out to the best advantage, and it has some special advantages which we think you will like.

For one thing, it has been arranged so that it can be used as an electric gramophone when desired, and if you give it a suitable super-power valve and plenty of H.T. it will provide tremendous volume and superb quality.

With any reasonably sensitive pick-up the volume available under these conditions is even adequate for dance purposes.

Under more normal conditions of a moderate sized power valve and just the usual 120 volts H.T. it will still give most excellent quality, but, of course, you will not be able to get so much volume without overloading.

It will still be sufficient, however, for domestic purposes, so do not let us give you the impression that here is an instrument which calls for a big output valve and colossal H.T. to make it work properly.

On the contrary, you can treat it just as you like, and give it much or little H.T. and a small or large power output valve just according to the volume of undistorted output you require.

As a matter of fact, this amplifier is a particularly suitable one for anybody who has not got much H.T. available, because it has a volume control of a specially effective type which enables you to adjust the strength very accurately.

Important for Quality.

Hence, you can turn it up to a level just short of the point at which distortion due to overloading begins, and so be sure that you are working it to the best advantage.

The experienced reader will appreciate the importance of this point, for he will know how absolutely essential it is never to overload your power valve if you want real quality.

To follow out the rest of the special arrangements of the amplifier it will be easiest to go over the various diagrams and photos, so let us set about it.

You will already have noted that the instrument contains two valves, and a glance at the circuit diagram will show you that the first one is resistance-capacity coupled to the detector valve in the receiving set which will precede it.

The anode resistance can be identified by the marking R_1, the grid condenser is C_1, and the grid leak (actually the volume control) is R_2.

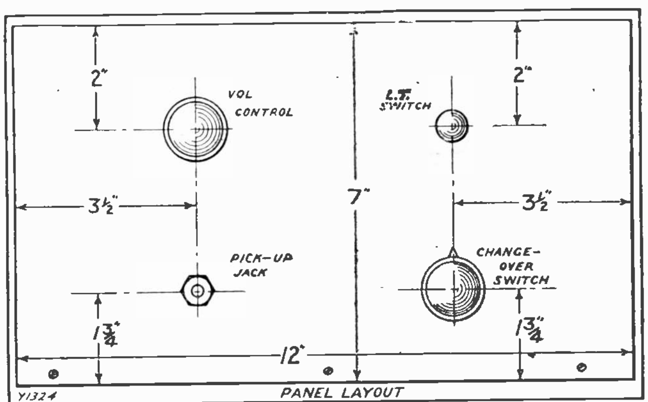
An Excellent Combination.

Transformer coupling is provided between the first and second valves, the transformer being marked "L.F. T." in the diagram. We thus have the popular and efficient arrangement of one resistance and one transformer stage, which we have found best suited to the special purposes for which this amplifier is intended.

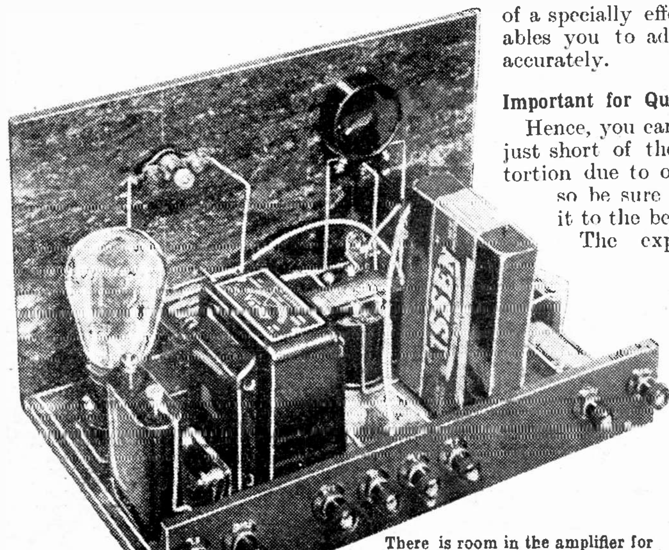
It gives a very good combination of excellent quality, extreme stability and sufficiently high magnification.

The arrangements for inserting a gramophone pick-up in the circuit you will see are located in the "R.C." stage. They are very simple indeed, and take the form of a jack of the "single

A NEAT PANEL.



The panel lay-out is perfectly symmetrical, so you can do your marking out on the back without troubling about right and left.



There is room in the amplifier for the grid bias battery if it is placed on end. If more than 9 volts is required, just place two units side by side and connect them in series.

Here is a design f... pose" two valve... with which you ca... your headphone se... electric gramophon... of other usef...

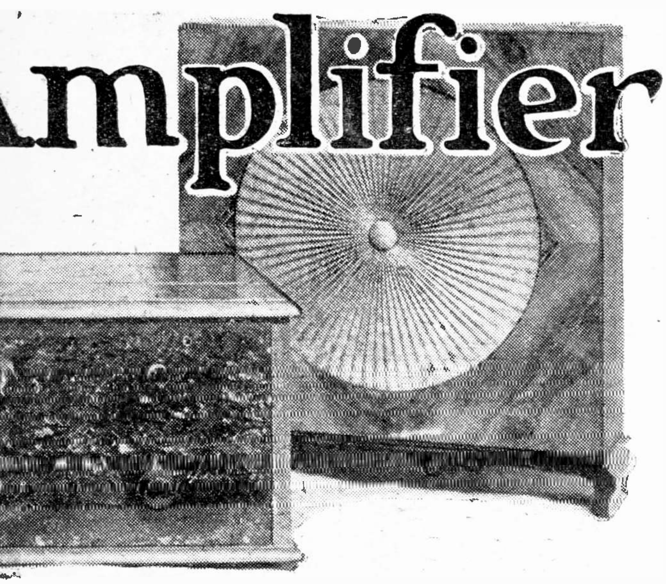
By The P.W. RE... CONSTRUCTI...

THE COMPONENTS

1 Panel, 12 in × 7 in. (Lissen or Paxolin, Trolite, etc.).
1 Cabinet to fit, with baseboard 9 in. or 10 in. deep (Camco or Pickett, Osborne, Lock, Artcraft).
1 ½ or 1 meg. potentiometer type volume control (R.I. or Lissen, Varley, Gambrell, Wearite, etc.).
1 L.T. switch (Lissen or Igranic, Benjamin, Lotus, Ormond, Re... Radio, Jewel, Bulgin, etc.).
1 3-pole change-over switch (Wearite or similar type).
1 "Single open" jack (Bulgin or Ormond, Igranic, Lissen, etc.).
2 Sprung valve holders (Lotus, Benjamin, Igranic, Lissen, W.B., Junit, etc.).
1 250,000-ohm anode resistance (and holder if required: see text) (Lissen or Igranic, R.I., Dubilier, ...

A POWERFUL MAGNIFI...

Amplifier



...or an "All Pur-
...L.F. amplifier,
...n add power to
...t, assemble an
...e, and do hosts
...ul things.
...SEARCH AND
...ON DEPT.

"open" type wired across the volume control. To use the pick-up you just place upon the end of the flex lead therefrom a plug to fit the jack, insert it in the latter and switch off the wireless receiver.

With any of the modern sensitive types of pick-ups you will find that you get ample volume from just the two valves in the amplifier. Indeed, you will quite likely have to keep it down a little with the volume control to prevent overloading in many cases.

Left or Right?

The volume control, as we have remarked, takes the place of the grid leak in the R.C. stage, and there are a couple of points we must mention about it. First, please note that it *must* be of the high resistance potentiometer type, of ½ or 1-megohm. The ordinary ·200 or 400 ohm potentiometer will *not* do.

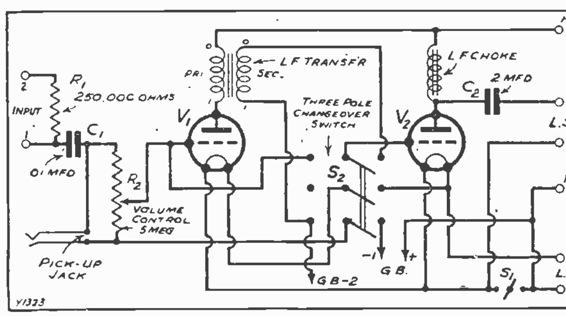
Next, about the direction in which it operates. In our original instrument we arranged it so that it comes into action and cuts down the volume when the knob is turned to the right, so that to obtain full volume you must turn it right round to the *left*. If you like your volume control to work the other way (it's a matter of taste), just reverse the two wires going to the two outside terminals on the component.

In your examination of the circuit diagram you will have observed a rather complicated-looking switch marked S_2. This is a three-pole double-throw component, but it is not really so complicated a business as it looks at first sight, and all it means is just a little care in following out the wiring diagram.

The special sketch thereon will make it all quite clear, and you will find it perfectly easy to identify the various contacts when you have the switch before you. Just note, though, that "B" on the diagram means the contacts nearest the panel, and "F" means furthest from the panel.

This switch is actually one of the very special features of the amplifier, and its action was worked out with a deal of care. What it does is to enable you to use either the full two stages, or just the last valve by itself, and it turns off the filament of the unused valve in the latter case.

SIMPLIFIED SWITCHING.



The switch S_2 gives you the choice of one or two valves. In the one valve position it also turns off the filament of the unused valve.

Using One Stage.

When the knob is turned to the left both valves are working, and when turned to the right you have just the last one by itself, giving only one stage of amplification. The idea of the scheme is to enable you to avoid the violent overloading which is so apt to result when receiving the local with a set of the "H.F. and det." type in front of the amplifier.

We have accordingly arranged so that, the R.C. coupling is in circuit when only the one stage is working, so as to keep the "mag." down to a figure which we have found suitable. In all other cases—i.e. when receiving more distant stations or when a less powerful set is in use, the normal procedure will be to employ both stages and adjust matters with the volume control.

This system of switching has many other advantages, besides the important one we have explained, and, indeed, it is one of the only really efficient methods we have encountered. One of its minor attractions, by the by, is that the volume control remains fully effective whether one or two stages are in use.

There, that completes our general survey of the design, beyond pointing out that a properly arranged output filter is provided and there is space upon the baseboard for the grid-bias battery.

Mounting the Anode Resistance.

Now there is just one constructive point to which we must draw your attention, and then we can leave you to get on with the job.

The point we have in mind concerns the 250,000-ohm anode resistance R_1. The one we used in the original amplifier was provided with terminals, so that a holder was not needed. We just "hung" it in the wiring, but if you use some other type you must remember to furnish it with the usual holder.

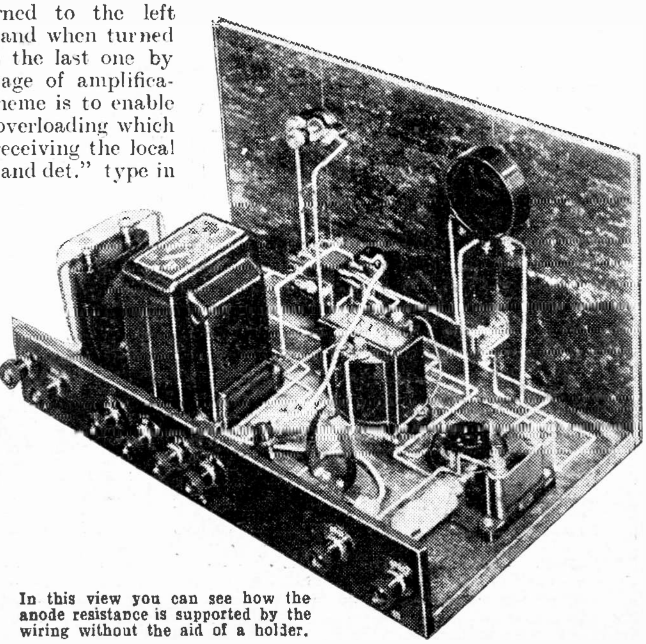
All the rest of the work is quite straightforward, so now all you want are some instructions for putting your finished instrument into operation. The battery connections are all quite obvious, except in one detail. You will see that there is a terminal for H.T. negative on the amplifier.

If you run the amplifier from the same L.T. accumulator and H.T. battery as the receiver, make *no* connection to this terminal. If you use a separate battery for either purpose (L.T. or H.T.) connect up as usual, also if you use the amplifier with a crystal set, or by itself as a gramophone amplifier. Be careful over this, for it is important.

(*Continued on next page.*)

YOU REQUIRE.

...Ready Radio, Varley, Mullard, etc.).
1 Low ratio L.F. transformer (Igranic or Lissen, Ferranti, R.I., Telsen, Varley, Mullard, Lewcos, Lotus, etc.).
1 Output filter choke (Varley or Lissen, R.I., Ferranti, Wearite, etc.).
1 ·01-mfd. fixed condenser (T.C.C. or Dubilier, Lissen, Mullard, Igranic, Goltone, Ediswan, Ormond, Atlas, etc.).
1 2-mfd. condenser (Ferranti or Lissen, Dubilier, Hydra, Mullard, T.C.C., etc.).
1 Terminal strip, 12 in. × 2 in.
8 Terminals (Igranic or Eelex, Belling & Lee, etc.).
Wire, screws, G.B. plugs, clip for G.B. battery, etc.



In this view you can see how the anode resistance is supported by the wiring without the aid of a holder.

...ER FOR ANY RECEIVER

THE "A.P." AMPLIFIER.

(Continued from previous page).

For use with a valve receiver, connect the "input" terminals on the amplifier to the 'phone terminals on the set. If you get only weak signals or none at all, reverse the two connections to "input 1 and 2" on the amplifier terminal strip.

With a crystal set, you can proceed in exactly the same way, or you can plug in to the jack with a plug on the end of a twin lead from the 'phone terminals of the receiver. Reverse the connections if necessary exactly as before. This latter scheme is usually better with a crystal set. (It must *not* be used with a valve receiver).

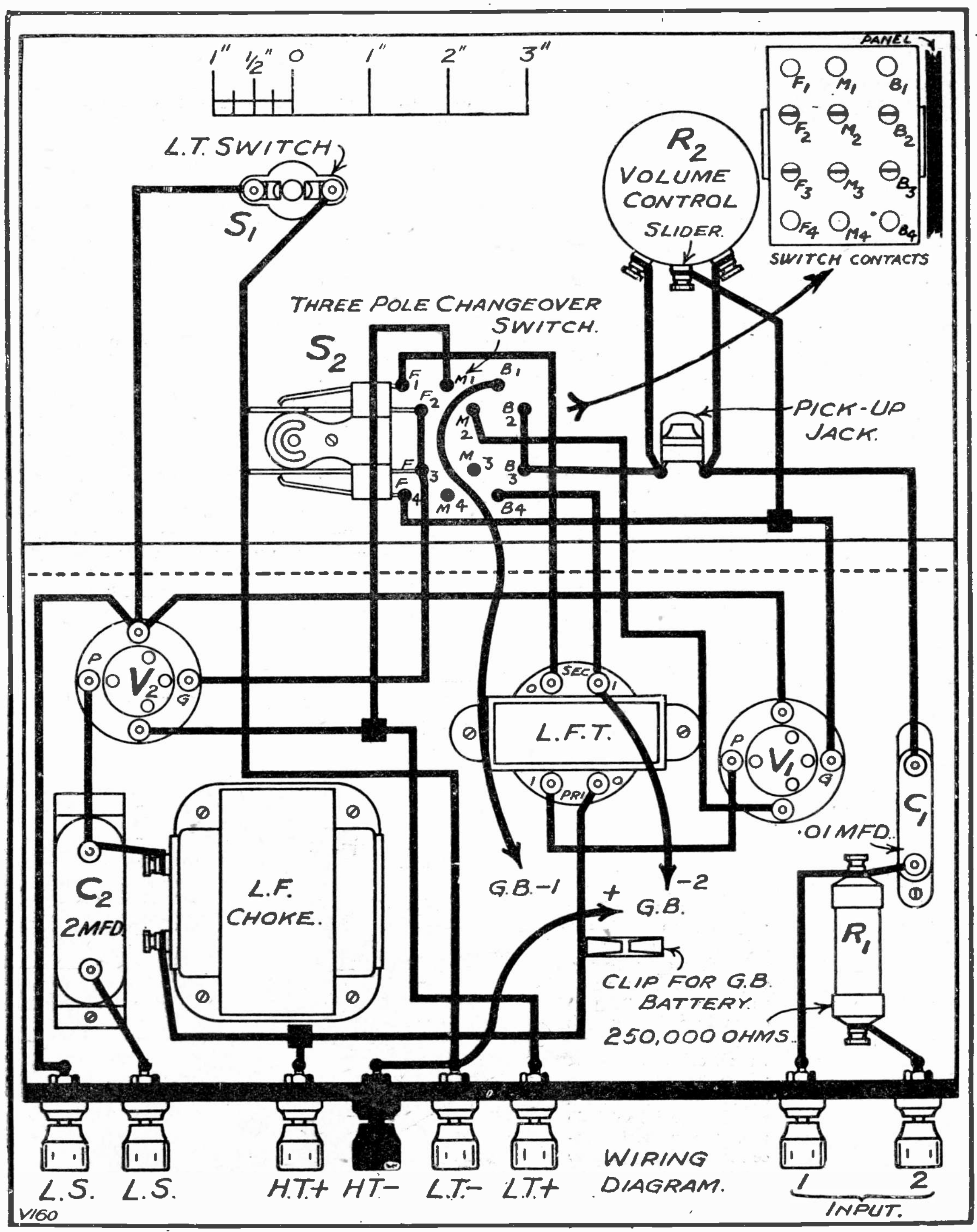
Now, you just want the valve types to use, and we have done. Valve V_1 should be of the L.F. type, with an impedance of about 10,000 to 18,000 ohms for normal purposes, although if you will be dealing mainly with very weak signals, one of the H.F. type is to be preferred. For V_2 you want either a power or super power type, as usual, and grid bias should be adjusted according to the valve maker's instructions.

We have just had a final look over the wiring diagram below in search of any little points which might be the better for additional explanation and it seems that the switch S_2, and its connections could be made a little clearer. The key diagram in the corner gives the positions of the contact points to which you must solder, and this will be a sufficient guide if you understand the viewpoint from which S_2 was seen by the draughtsman in making the sketch.

He was looking along the back of the panel from the end nearest these words of type, *i.e.*, he was seeing the switch from the direction of the pick-up jack.

Note, too, that his key letters "B," "F" and "M" mean back, front and middle respectively, "back" being nearest the panel and "front" furthest from it.

CHECK UP YOUR CONNECTIONS.



The wiring is easy enough to carry out, but just a little care is needed in making the connections to S_2 and checking them up. There is a key to the positions of the various contacts in one corner of this diagram which you will find makes everything quite plain when you have the switch before you. The H.T. negative terminal is marked in black to emphasise an important point which is explained in the text.

DID YOU KNOW THAT?

To halve the effective capacity of a condenser all that is necessary is to connect another condenser of the same capacity in series with it.

* * *

Pentode valves of the indirectly-heated filament type are now available.

* * *

Three-quarters of a metre (75 centimetres) is one of the wave-lengths allocated by the U.S. Government to amateurs for experiments, transmission and reception having already been carried out on this wave-length.

* * *

Take care not to kink your aerial when putting it up, as this may lead to a liability to break at some future date.

CAPT. ECKERSLEY'S QUERY CORNER

SHOULD SCREENS BE EARTHED?—HOW MUCH GRID BIAS?—BALANCED-ARMATURE L.S.—"PHANTOM" TUNING—CHECKING DISTORTION—A SMOOTHING PUZZLE—POOLING RECEIVED SIGNALS.

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 received by the Query Department in the ordinary way will be dealt with by him.

Should Screens be Earthed?

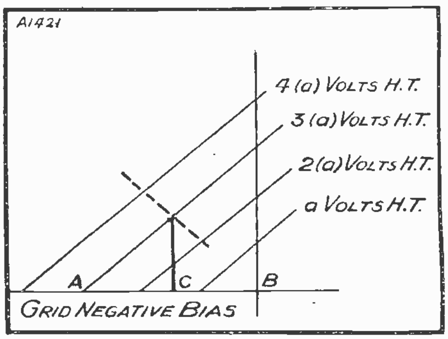
J. H. T. (Camborne).—"When totally screening a coil in an H.F. stage is there any advantage to be gained by earthing the screen as against leaving same free?"

There's not much in it, but it's a good general principle to earth a screen.

* * *

How Much Grid Bias?

P. A. V. (Crantock).—"Is there a rule of thumb by which to calculate the



approximate amount of grid bias to use with any given valve?"

Not one which is easy. Look up the valve characteristic curves, and you'll find something like the arrangement shown in the accompanying figure.

I assume you work with an H.T. corresponding with 3 (a) volts. Then find a value of grid negative to bisect A B at C. I am using transformer connection. Put a bit less with resistance capacity.

It is much the best way to get a milliammeter in the plate circuit and adjust the grid negative until, on modulation, the milliammeter does not flick.

* * *

Balanced-Armature L.S.

T. D. (Hemsley).—"What is the difference between a balanced-armature loud speaker and one with an ordinary reed movement?"

A balanced armature is worked "push-pull" electrically. The ordinary reed movement comes back to its static position by virtue of its elasticity.

* * *

"Phantom" Tuning.

D. B. U. (Uxbridge).—"Why is it that when 2 L O is eliminated on my det. and L.F. set by means of a wave-trap, 5 G B is received at three separate positions on the tuning dial at equal strengths?"

The rejector is probably in some way giving, by its associated condensers and capacities, separate natural periods to the aerial (1) (say) through inductance to aerial terminal through tuning device to earth; (2) (say) through capacity to aerial terminal through tuning device to earth; (3) (say) through a combination of rejector, condenser inductance and tuning device to earth. It's all rather strange though!

* * *

Checking Distortion.

F. T. G. (Southampton).—My set seems to distort a little. What is the best method of making sure that I am applying the correct grid bias to my power valve?"

Get a milliammeter and put it in the plate circuit of your valve. Does it go up with modulation? Then put *less* negative in the grid. Does it go down with modulation? Then put *more* negative on the grid. Find a place where it is steady on modulation or just kicks up a fraction.

* * *

A Smoothing Puzzle.

G. S. W. (Streatham).—"My neighbour and I have similar sets run off the mains. Why should I need more smoothing with my full-wave rectifier than he does with a half wave?"

I want to start by saying I'm not very confident in my explanation. *But*, double-wave rectification gives (say) 100 impulses into the set, single (say) 50. The loud speaker is a great deal more sensitive to frequencies of 100 than to those of 50; so although it's easier to smooth in the case of double-wave rectification, it's much easier to eliminate single-wave rectification in the loud speaker. I mean, the loud speaker does it for you, showing the great advantage of cutting out the bass even if it is wonderful stuff!

* * *

Pooling Received Signals.

"CURIOUS" (Egham).—"I have been told that fading on short waves is very inconsistent, and that whereas a signal may disappear on one receiver, the same signal on another receiver at the identical moment may remain at full strength.

"This being the case, to make a success of transatlantic relays why should not the B.B.C. use, say, three receivers in different localities, coupling the outputs for modulation purposes?"

This in effect is exactly what they *do* do, and is what in effect happens with the Marconi Beam system.

AN ADMIRING AUDIENCE.

Girls Guides on holiday taking great interest in the operations of the radio section of some troops carrying out local manœuvres.

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

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

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

QUESTIONS AND ANSWERS.

THE CAUSE OF CRYSTAL-SET FALL-OFF.

G. M. (nr Slough).—" Mine is a crystal set, and it used to be very loud indeed, but during the last month it seems to have fallen off quite badly, and although I have had two new crystals nothing seems to result from that. Do you think it is the 'phones or how else can you account for it ? "

It might be the 'phones, for if you have dropped them you may have injured the magnetism (which is liable to suffer from mechanical shock), or you may have allowed them to get rusty, which often impairs their sensitivity. In either case, they may be repairable, but it is not advisable to unscrew the earpieces and interfere with the " internals " unless you have had some experience of this kind of thing.

CAN WE HELP YOU WITH YOUR SET ?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception ?—Or one of the batteries seems to run down much faster than formerly ?—Or you want a Blue Print ?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

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

A postcard will do. On receipt of this, an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form, you will know exactly what information we require to have before us in order to solve your problems.

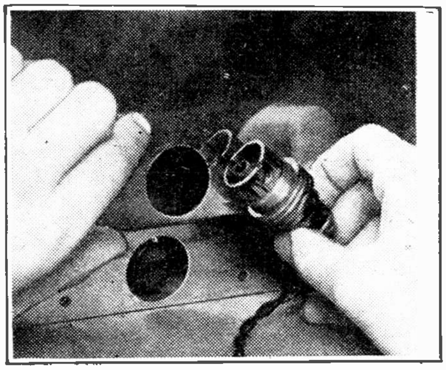
LONDON READERS PLEASE NOTE: Inquiries should **NOT** be made by 'phone or in person at Fleetway House or Tallis House.

Quite possibly it is not the 'phones at all, but your aerial or earth system which is causing the falling-off in signal strength. The lead-in contact may have become dirty, or high resistance may have developed in the joints of the aerial wire, if you were not wise enough to put it up " all in one piece."

Where joints *must* be included in the aerial they should be soldered if possible, and do not forget that from a crystal-set point of view the earth connection is just as important as the aerial, and a poor earth is a certain source of poor results. Not only the wire's joint to the earth plate, but the latter's connections with the surrounding soil should be made as good as possible. During dry weather it is often necessary to pour water over a buried earth in order to keep proper contact with the surrounding soil.

USING THE MAINS WITH SAFETY.

C. L. (Lowestoft).—" Instead of using batteries I should like to get my high-tension from the mains, but I have been told that



A " close up " showing the beautiful simplicity of P. W.'s Safety First scheme.

there is always danger in such cases. Is this an 'old wives' tale,' or is there really more likelihood of trouble with H.T. than there is with running a vacuum cleaner from the electric light ? "

" Old wives' tale " is right. There is no more danger about the running of a properly made H.T. unit than there is in the use of any other electrical machinery.

As a matter of fact, the current taken for H.T. is ridiculously small compared with that for a vacuum cleaner or a lamp. In all cases, fuses protect the wiring, and many other precautions are taken, so that the only danger comes from people interfering with the " internals " of a mains unit whilst the current is switched on.

To overcome even this possibility we have designed the " P.W." Safe Power series of mains units. They really *are* safe, too !

From the accompanying illustration you will see that the connection from the supply mains is made by a flex lead terminating in a lamp holder. This engages with the unit's wiring when plugged in, but to do this is passes through two holes *one in the cover*, and one in the mains unit itself.

That hole in the cover is a stroke of genius. To get at the " internals " of the unit—however much of a hurry you are in—you have to take that cover off. And to get it off you simply *must* disconnect that mains plug first !

Having disconnected the plug, the " internals " of the unit become accessible, but they are then harmless, because the mains are disconnected !

" HALF A MO ! "

" STUDENT " (London, S.E.6).—" My only contact with electricity in practice has been by wireless sets made under the direction of 'P.W.' And I found electrical theory rather stodgy stuff until I came across the 'mho.' I said to myself, 'Half a mo', I shall have to ask 'P.W.' about this.' What *is* a mho ? "

A " mho " is the unit by which conductivity is measured. As you know, resistance, which is the opposite of conductivity, is always measured in ohms.

Conductivity being the opposite to resistance, you can always remember exactly what a mho is if you remember that it is exactly the *reverse* of ohm, in letters as well as in effect.

You can express the relationship in figures by remembering that the mho is the reciprocal of the ohm. The higher the ohms the lower the mhos.

AVOIDING INSTABILITY.

" CONSTRUCTOR " (Aberdeen).—" Can you tell me some of the practical points to watch to avoid instability ? I do not mean so much battery coupling and circuit stuff as the actual work behind the panel and on the baseboard, which is liable to give rise to trouble when the complete receiver is hooked up ? "

There are so many causes of feedback that yours is a rather difficult question to answer satisfactorily and yet briefly. However, the following hints cover practically all the ground, and should always be carefully watched when making a set for which an exact " pattern " or blueprint is not available.

The question of spacing the coils is very important. Not only will they couple or interlink if not placed far enough apart, but the strength of coupling depends upon the orientation of the coils, being at a maximum when the coils axes are placed in line and at a minimum when they are at right angles.

Coils should usually be of fairly small dimensions, and where binocular coils are specified it is useless to expect good results if other types are employed, as these " binoculars," or field-less coils, are specially used by designers on account of their non-coupling characteristics. Remember that H.F. chokes are a form of coil and their positions should always be carefully chosen in order to avoid the possibility of their coupling with other components.

Tuning condensers should be kept well apart and on no account must bypass condensers be omitted for economy's sake, for in a properly designed set they are one of the most important guards against instability.

The wiring itself may cause instability if the grid leads and plate leads are not as short as possible, and well separated from one another. Wires which run parallel to one another or close to H.F. chokes, tuning coils, etc., are often a source of unsuspected feedback, so all the wiring should be kept as well separated as possible.

Proper shielding of the stages with metal screens is necessary when using modern valves for high-frequency amplification, and both the size of the screen and its exact position are important. Similarly, the spacing of L.F. transformers and L.F. chokes must be watched carefully. If mounted close together they are a likely cause of trouble, and, in general, the spacing and arranging of the components is a job for the expert, and is better left to a set designer.

(*Continued on page* 498.)

WHAT DO *YOU* THINK ABOUT THIS

When 2 L O was moved to Brookmans Park a St. Albans reader of " P.W." raked out a big old-fashioned crystal set to take advantage of the now powerful local station. He had a new panel put in, the brass-work re-lacquered and the whole set re-wired and " poshed-up " But it wouldn't work, even on a good aerial, though all the new connections were as shown in the instructions, and another set tried on the same aerial and earth worked well.

Could you have told him

WHAT WAS WRONG ?

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 solution to above next week.)

Last week's Leytonstone poser was a very easily-made and easily-corrected fault. All that had happened was that in putting back the mains plug it had been reversed in the wall socket.

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 496.*)

INSERTING A SPARE H.F. CHOKE.

H. H. (Keighley).—"I have a three-valve set (Det. and Low-frequency) with a tuner unit. I have a spare high-frequency choke which I would like to use in my set. Would it be of any advantage, and what would be the best way to put it in? (I am enclosing a spare wiring diagram.)"

Probably the choke will make but little difference if you are using the exact L.F. transformer which was specified for this set. But if you are using a different transformer it might make a world of difference both to quality and to ease of handling.

As you have the choke we should certainly try it in any case. All you have to do to give it a trial is to disconnect the H.T. and L.T. batteries first, and then wire the H.F. choke between the points marked 36 and 37 on your diagram.

Then join up the batteries again and see what difference has been effected in the results obtained.

If you notice a big improvement it will be because the primary of the first L.F. transformer was not acting as an H.F. choke as well as the designers intended, but needed another H.F. choke in series with it to separate your H.F. and L.F.

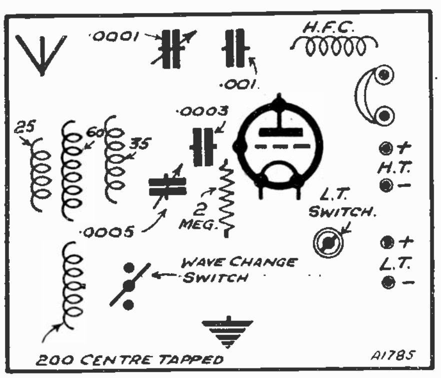
SHORT-WAVE COIL WINDINGS.

S. M. (Lound).—"Left over from a previous set I have a tubular coil and a coil holder of the type which has four pins in a straight line, one being spaced well away from the other three. I want to use this for going down on the short waves.

"My idea is to have a tapped aerial primary coil close to a grid coil and a separate reaction coil. The coil former has eight ribs, and is 2 in. diameter and nearly 3 in. long. Would 24 D.C.C. wire be all right for the coils, and if so, how many turns should I want for 20 to 35 metres?"

For this wave-band we should use a 5-turn primary tapped at the second and third turns as well as at the ends; a 6-turn secondary or grid coil; and 8 turns for the reaction.

POPULAR "WIRELETS" No. 14



Here are the "components" required for a plug-in-coil one-valver, with easy switching for long waves. The coil sizes are shown (near the three-contact wave-change switch), and very good results can be obtained with the set connected up for condenser-control of reaction. To do this a separate aerial coil is used for lower waves and half the long-wave aerial coil is brought in series with the reaction coil for long waves. Could you wire up the circuit? (Look out for the answering diagram next week.)

Between the first pin and the edge of the coil wind on the five turns for the primary (24 D.C.C.), allowing tapping places at the second, and, if you like, at the third and fourth turns as well as at the end of the coil. Next, between the first and second pins on the former, and spaced about three-eighths of an inch away from the aerial coil, wind on 6 turns for the secondary winding, the direction of the winding being the same as the aerial.

Finally, on the other side of the second pin, and spaced about three-eighths of an inch from the secondary winding, wind on the reaction coil of 8 turns, the direction in this case being the same as for the other two windings.

Connect up one end of the grid coil to the first pin, this being the grid end. The other end of the grid coil (or "secondary") goes to the beginning of the aerial coil and to the second pin (which goes externally to earth, filament, etc.). The reaction coil goes across the other remaining pins, one of which will make contact with the H.F. choke, and the other with plate, etc. (If reaction effects are not at first obtainable, simply reverse these two windings).

EARTH WIRE EFFICIENCY.

D. D. N. (Chistlehurst, Kent).—"I am very keen on trying the short-wave stations, and with this in mind, have arranged a really good aerial. But my earth lead cannot possibly be good.

"However I arrange it there will have to be a long run across concrete, and I am told this may be a great drawback to short-wave reception. Is the earth connection very important on the very high frequencies used in short-wave working?"

A good earth wire connection is always well worth while if it can possibly be arranged, but you need not despair if you are unable to arrange a short direct connection to earth, as the same effect may sometimes be obtained by means of a "counterpoise."

This, as you probably know, takes the form of a "False Aerial," being simply a well-insulated "aerial" system placed close to the ground intead of high in the air, and connected to the earth terminal in place of the usual direct connection.

Such an arrangement is usually very efficient on the short waves, in fact, more so there than on ordinary wave-lengths, and you may find that with quite a small counterpoise in conjunction with your good aerial you will get good reception.

Often in similar circumstances the American short-wave broadcasters can be picked up even without any earth-wire at all, or with such a simple "counterpoise" as is made by a coil of insulated wire joined to the earth terminal and placed below the table on which the set is standing.

"WHO'D A THOUGHT IT?"

V. G. T. (Derby).—"I had a rather annoying breakdown which has taken me a week to locate and incidentally enlarged my flies' skating rink. Of course, I ought to have known better, but I did not, and have now learned something else.

"The symptoms were, it just faded nicely away and never a sound or an oscillation could I get. I tried fresh valves, coils, tested L.T. and H.T., but nothing doing. Every wire was alive and no connections broken.

"My set, by the way, is the 'Magic' Three, which contains a 25,000 ohms resistance, and whilst moving this, holding both ends, music suddenly burst forth. I said, 'Who'd a thought it!'

"The component was what I thought a reliable make, and I cannot understand it breaking down. Can you explain it?"

Although a breakdown in such circumstances is very rare there are many ways in which it might be caused. Sometimes it is an imperfectly-made joint between the sections of the resistance itself, and sometimes it is a connection between one end of this resistance and the terminal or end-contact that makes connection with the external wiring of the component.

Wire-wound resistances are less likely to give rise to such breakdowns because mechanically the strength of wire is very considerable, and nothing in the way of expansion or shrinkage is likely to affect its electrical contact. This is not always the case with other types of resistance, and it sometimes happens that conductivity is greatly affected by temperature, etc., instead of remaining constant as it was designed to do.

In your case there was evidently a complete break until your fingers bridged across from one end of the resistance to the other, thus restoring a conductive path momentarily, and putting you on the track of the fault.

CENTRE TAP OR X COIL?

T. L. (Middlesbrough).—"Which is the more selective for an aerial coil, a centre-tap or an X coil?"

The X coil gives greater selectivity as only a small proportion of its turns are in the aerial circuit instead of the 50 per cent. which a centre-tapped aerial connection gives.

WIRELESS DIRECTION-FINDING.

"Zonc" (Torquay).—"When a ship is approaching a foggy coast and wants a wireless indication of her whereabouts, does this come from a direction-finding station on shore, or is the necessary apparatus on the ship itself?"

Various direction-finding (or "D.F.") systems are employed, in some of which the direction-finder is on the ship, and in others a direction-finding station ashore sends out a radio beam, like the revolving beam of a lighthouse, which tells all ships within range in which direction the radio lighthouse lies.

A further development which is actually under trial in the Clyde uses a microphone close to the syren of the lightship or lighthouse. With this system the wireless operator first hears the syren in the headphones, and later picks it up by ear, the time interval between the two (ether waves and air waves) giving the distance of the ship from the source of the waves.

TECHNICAL TWISTERS

No. 18.—THE LEAD-IN.

CAN YOU FILL IN THE MISSING LETTERS?

Like the aerial, the lead-in must be well . . . . or signals will leak away to . . . . .

The lead-in must be spaced well away from metal surfaces, gutter-pipes, etc., or capacity leakage may take place across the . . . . so formed.

As the lead-in should be as . . . . . as possible, the set should be placed as near to it as can be arranged.

The lead-in wire should be a continuation of the . . . . . . if possible, as losses will be likely to occur at any . . . . . however well made.

Last week's missing words (in order) were: Less; Divides; Two.

TEST VOLTAGES FOR CONDENSERS.

S. T. B. (Clapham Common, London, S.W.).—"I have been surprised to notice that although it is usual to find condensers used for wireless have a sort of "safety margin" (in that they are tested on a higher voltage than the working voltage), there seems no fixed relationship between the two voltages.

"Sometimes twice the working voltage is specified, e.g. the "tested-at-500-volts" condenser in a 230 D.C. mains unit. Sometimes more than twice is said to be necessary. Why should there be these differences of opinion? What is the real position as regards safety?"

The differences that you have noticed are partly due to the fact that condensers are used for very different purposes, and partly because they are employed on mains of different classes.

Full details of the insulation requirements that are considered necessary for radio by The Institution of Electrical Engineers can be obtained on application to the Secretary of the Institution, at Savoy Hill, London, W.C.2.

It will be found that where radio apparatus is connected to the ordinary type of direct current supply mains, the minimum test voltage for most "mains" condensers is twice the supply voltage.

Where the apparatus is connected to Alternating Current (A.C.) mains, the minimum test voltage should be *three* times the R.M.S. value of the A.C. volts across the condenser. (For the purpose of this requirement any condenser connected through a rectifier to a source of A.C. shall be deemed to be operating at that voltage.)

When a condenser is used in an output filter circuit to isolate loud-speaker terminals from the anode voltage, the minimum test voltage shall be *three* times the D.C. voltage used to energise the anode (or anodes) of the last valve, or valves.

THE "NEUTYPE" FOUR.

J. N. (Haarlem, Holland).—"The 'Neutype' Four. I cannot have the publication from my newspaper agent in Haarlem. Where is it I send to obtain?"

The "Neutype" Four was described in "P.W." No. 417 (May 31st issue). Any back number of "P.W." which is still in print can be obtained from The Amalgamated Press, Ltd. Back Number Department, Bear Alley, Farringdon Street, London, E.C.4. Price 4d, post free.

FOR THE LISTENER.

(*Continued from page 486.*)

Hendon.

Hendon was difficult to visualise, in spite of the noble efforts of Squadron-Leader Helmore and Captain McCulloch. It is something to be seen with the bodily eye—a crowd of a quarter of a million, and fifty 'planes in the air at one time.

The lively commentators did their job in a light-hearted almost boyish rivalry, turn and turn about, weaving their tale, and—yes, once or twice they helped me to see quite plainly. I saw the airship R 101, and I saw Major Sandbag drop with a bump from the flaming Blimp. But, next year, by hook or crook, I shall be one of the quarter of a million—with a very tired neck at the end of a perfect day!

Wimbledon.

As it happened, I had been to Wimbledon the day before, so I had the background perfectly; the gallery of packed faces turning in unison now to the right and now to the left as the ball flew; the green of the court, worn bare of grass on the baselines; the voice of the loud speaker shouting the score continually in the ear; the sighs, the cheers.

The umpire on his high step-ladder with the microphone arching his head, and the lithe, muscular, amazing players. Captain Wakelam's quiet and tense commentary, shot by shot, was a work of art. Yes, sport is great stuff, and I hope I shall never have to choose between Bill Tilden and Chamber Music!

Albert Whelan.

Mr. A. C. MacLaren, sounding rather gruff and slightly peeved, had depressed me with his account of the second day of the Second Test, but Albert Whelan's stories put me right again. Albert at his best is a top-notcher.

He can serve up an old story with his own sauces and flavours to make a chestnut taste succulent as a pod of green peas just picked from the row. I liked that one about the captain of a ship and his engineer who changed places. I like the old ones. There is that lovely story about——(Quite so! Also, tut, tut!—Ed.)

The Brass Bottle.

Cecil Lewis's production of Anstey's amusing fantasy, on July 10th, should be worth listening to. Fakrash-el-Asmash is a name to conjure with. So is any Oriental bottle, for that matter. Any amount of fun came out of this brass one.

Belinda.

May I introduce you to Belinda? We are going together to Italy to-morrow. It may sound a bit scandalous, but "Honi soit——" She is, to be precise, my Portable. I call her by a feminine name because she is capable of talking all day and all night without stopping, and if ever she does stop it isn't her fault. I will tell you next week how she behaves on the journey. She wears a mackintosh, and carries her luggage inside her. So I hope she may get through the customs all right. She is well-charged. I shall probably be overcharged! But I want you to meet Belinda. Please meet Belinda!

TECHNICAL NOTES.

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

Wave-Traps.

I HAVE at various times been told by readers that the addition of a wave-trap to a receiver has not only had the effect for which the trap was intended—that is, separating out interfering stations, but has actually increased the volume of reception.

This increase in volume is not merely an imaginary increase (due to the cutting out of the interfering station), but is a real independent increase of volume.

Questions of Efficiency.

At first sight it seems rather queer that a wave-trap, which in one sense is nothing to do with the set itself, should increase the efficiency of the set. Probably the reason is that the wave-trap in the aerial circuit may have the effect of preventing oscillation in the circuit—or rather of making the set less liable to oscillate—in which case the operator is able to adjust the circuit to a condition of greater efficiency.

Thus on this theory the wave-trap does not *directly* increase the efficiency of the set, but rather helps to remove other causes which were previously preventing the set from being worked at its maximum efficiency.

At any rate, whatever the explanation may be, it is useful to know that a wave-trap often does two good things at once—cuts out interference and also improves receiver efficiency.

"Boomy" Reproduction.

A letter from a reader says "I have constructed a moving-coil loud speaker which gives a very 'deep' response and appears to have no high note output. Can you please tell me how I might improve it? I believe my set is above suspicion. I believe you were discussing this question some time ago, but I cannot find the reference."

The question of the particular characteristics of moving-coil loud speakers and the comparative efficiency of this type of speaker and others is always cropping up, and readers who wish to take advantage of the volume obtainable from a moving-coil speaker often complain of the fact that the reproduction is "boomy."

The High Notes.

As a matter of fact, you will quite frequently find this quality from the moving-coil speaker. Indeed, some people actually prefer this particular type of speaker for this very reason. It brings out some types of reproduction particularly well—for instance, the drums and many kinds of musical instrument.

So far as the high notes are concerned, these generally do not come out so well, or if they are reproduced at proper strength they often seem still to have a certain "boominess" surrounding them.

Raising the Frequency.

The natural resonance frequency of the moving-coil speaker can be raised by reducing the mass of the moving parts—that is, making the moving coil itself and the diaphragm as light as possible, and also by stiffening or tightening up the diaphragm controls.

Instead of leaving the diaphragm almost freely floating, it may be supported at its edge by paper having a little extra stiffness, and this may be shellac varnished or cellulose varnished.

Anything which reduces the mass of the moving system, or increases the restoring force called into play when the moving system is displaced, will raise the natural frequency, and consequently will tend to make the speaker more responsive to the higher frequencies.

Test the Amplifier.

Incidentally, I suspect from the above letter that the receiver itself is *not* all that might be desired, and that the fault does not lie entirely in the moving-coil speaker. This, however, can very simply be discovered by trying one or two other types of speaker on the same receiver.

Personally, I have always had a great fondness for the moving-coil type of loud

(*Continued on page 502.*)

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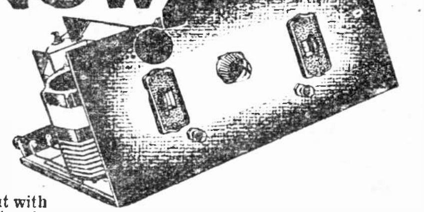

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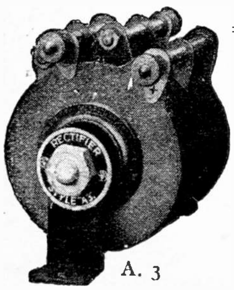

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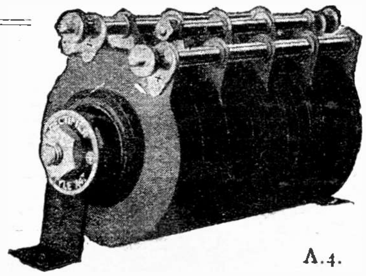

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TECHNICAL NOTES.

(Continued from page 500.)

speaker, notwithstanding its rather boomy quality, as by attention to simple precautions in the receiver and in the speaker this effect can be reduced to a minimum.

The baffle board is an important and essential feature of a moving-coil loud speaker, to which careful attention must be given if the best results are to be obtained.

Local Interference?

Another of my readers wants to know whether he is likely to suffer any inconvenience owing to the fact that in the neighbouring house two different radio receivers are usually in operation in two different rooms, one being a three-valve receiver working on an outdoor aerial, the other a portable set comprising five valves.

He says that "Inasmuch as there are eight valves in close proximity to my own three-valve receiver, there is probably a serious adverse effect caused to my reception."

It is extremely unlikely that the portable set will cause any interference whatever, and the only other possibility is that the three-valve set with the outdoor aerial receiver may produce some interference, but this again I think is very unlikely.

It is not a question of how many valves are employed in the aggregate, but rather the type of *receiver* in which they are used and the *manner* in which it is operated.

I should say that, in the circumstances in question, any interference from these two sets would be entirely negligible, and even the "absorption" effect would be quite inappreciable.

Receiver Design.

Ever since the early days of broadcast reception attempts have been made to produce a simple and practical receiver which can be operated on the "press-the-button" principle, so that an entirely unskilled listener can instantly receive any desired station within the range of the receiver.

To a certain extent these attempts have been successful, and, so far as a single station is concerned, there are plenty of radio sets which can truly be described as "press-the-button" sets.

When a number of different stations are to be included in the range of the instrument the problem, of course, is not quite so simple, but it has been solved with more or less success by providing a series of "buttons" marked with the different stations, or a dial upon which the names of the stations are marked and which only has to be turned to the desired station.

Simplified Operation.

Variations in the operating conditions of the receiver itself (as well as slight variations in the transmitted wave-lengths) have always made this problem a rather difficult one. Still, there is no doubt that to a large extent the receiver of the immediate future, at any rate so far as its really popular appeal is concerned, must be reduced to something like "press-the-button" simplicity of operation.

In the United States the radio industry is giving serious attention to this aspect of the design of wireless receivers, and at the forthcoming Radio Exhibition in London

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

there will be several examples of wireless sets designed and constructed with this object in view.

"Losser" Volume Control.

One of the many methods of volume control which, in certain cases, is particularly convenient is to introduce a variable resistance of fairly high value into the secondary circuit of the receiver (for example, a detector and, say, two low-frequency amplifiers).

The resistance may be up to about 500 ohms, and when used in this way it has the advantage that it does not interfere with the quality of the reproduction; this, of course, is an essential to any proper system of volume control.

There are some methods of volume control which introduce distortion, and therefore cannot be considered as pure volume control methods. For instance, the simplest of all volume controls consists in slight detuning, but this is liable not only to cause bad quality of reproduction, but also actually to bring up (in the case of a selective set, and with two stations very close together) actual interference from a second station.

Flattens Tuning.

The method mentioned above, which is sometimes described as the "losser" method, although it does not upset the quality of reproduction, has the effect of flattening the tuning and consequently of diminishing the selectivity of the set. If you are working with stations close together on the dial, where selectivity is very important, this method of volume control may for this reason be unsuitable.

In a case where the losser method cannot be used, for the reasons mentioned above, it is better to use some form of volume control on the low-frequency side.

Counterpoise.

Although we are always advised to use a very short earth lead, many people find it impossible, owing to local conditions, to use a lead of less than, perhaps, 20 to 30 feet in length. I have several times been asked whether it is better in such a case to employ a counterpoise earth, that is, a kind of dummy aerial near the ground, or, at any rate, below the true aerial, which gives a counterpoise capacity effect similar to that produced by the earth itself.

It is difficult to state any general rule in the matter, but I should certainly say that in most cases it would be better to use even a longer earth lead than to go in for a counterpoise.

For one thing, the counterpoise is apt to be troublesome to instal, and for another thing, it is not so efficient as even a moderately good earth connection. The main point to bear in mind about the earth connection is not so much the length as the resistance and inductance.

Its inductance will almost certainly be negligible compared to the inductance already in the aerial circuit, and provided its ohmic resistance is kept very low (by using stout copper wire) there should be no serious drawback in an earth lead even 20 feet long or more.

FURTHER NORTHERN NOTES.

From our SPECIAL CORRESPONDENT

THE strange silence of the B.B.C. with regard to the disbandment of the Northern Wireless Orchestra has been cleared up by a decision which is surprising and totally unexpected.

Although the Glasgow orchestra was disbanded months ago and the B.B.C. announced its decision in April to disband the Birmingham orchestra next September, no definite statement concerning the future of the Northern Wireless Orchestra at Manchester has been made until I secured an announcement of policy from a B.B.C. official, the other day.

Local Talent, and Octets.

Previously it was known that the Manchester orchestra had been re-engaged on contracts which expire in September, and it was generally assumed that the Northern Wireless Orchestra would disappear at the same time as the Birmingham orchestra.

After the definite announcement regarding Birmingham, a similar statement was expected concerning the Manchester orchestra, but for two months B.B.C. officials met all the inquiries with non-committal answers; which leads one to assume that there has been a good deal of discussion on the subject within the B.B.C.

Now, however, I am told officially that the Northern Wireless Orchestra will certainly not be disbanded until the end of this year. Indeed, its existence may continue into the first quarter of next year. And then—

"The policy in the North Region will be the same as that in other regions," I am told, "namely, that instead of maintaining complete B.B.C. orchestras, tangible encouragement will be given to local orchestras and local talent generally. It is believed that smaller formations, such as octets, will be adequate for studio purposes."

Apparently the Northern Wireless Orchestra is to continue to exist until the North Regional station is in full service, after which North Regional broadcast orchestral music will be obtained from "outside" orchestras supplemented by an octet at Manchester.

Summer Relays.

During the summer concerts are regularly being relayed from such holiday resorts as Scarborough, Blackpool, Harrogate, Buxton Southport, Bridlington, and Whitby, and recently there have been such outstanding events as the running commentary on the T.T. motor-cycle race, on the "Britannic's" departure on her maiden voyage from Liverpool, and on the historic Tynwald Ceremony in the Isle of Man.

The Tynwald relay was part of the "Manx Week" featured by Northern stations, in which an excellent effort was made to "put across" something of the rich history, the haunting music, and the lore of the Isle of Man. An enterprising spirit was shown in these broadcasts—so far as they went. One could wish, however, for a little more showmanship.

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By

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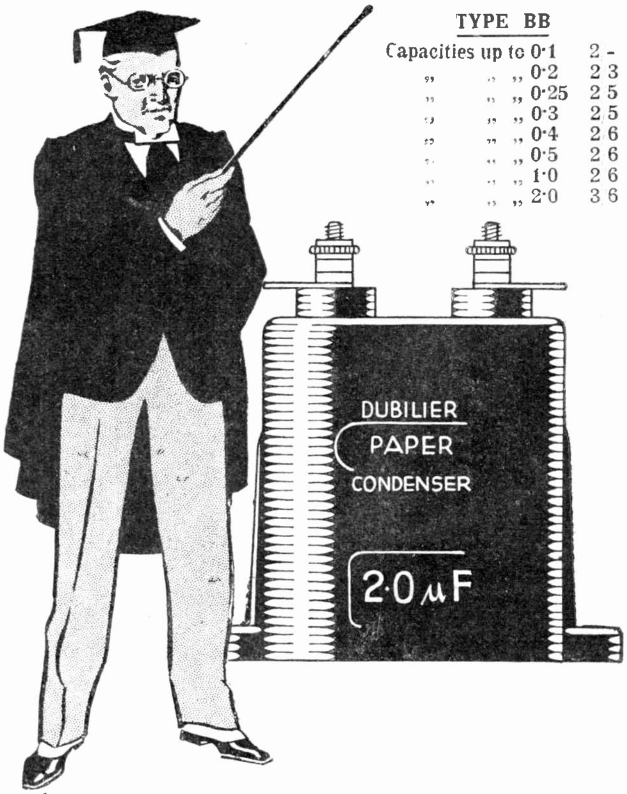

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THE LATEST MIRACLE—NEWS FROM AFRICA—THE "MAGIC" DOES IT—WINNIE'S WORDS—

RADIO NOTES & NEWS

"ARIEL'S" FORECAST—THE "P.W." INDUCTOR—SMART WORK—ALF'S BUDGET—

An Accumulator Question.

IF there is a radio gang where you are staying—I don't suppose there will be; they get broken up by girls!—you might like to ask some of them whether they "top up" their batteries with distilled water. If they answer in the affirmative ask them why. Why do you do so yourself, anyway? If anyone vaguely mentions impurities, ask what impurities he is anxious to keep out of his battery, and *why*. I hope to have some reports about this from some or my keenest readers.

Wonderful Wireless.

I HAVE been rather short of good stories lately, about radio music coming freely from dog chains, gridirons, rat-traps, hanging shovels, and so on; hence I bid welcome to the statement of Canon Peile in the "Church Times" for June 30th. Writing of the church at Bonavista, Newfoundland, he says: "The new church has a copper roof, and in wet weather this roof, somehow or other, catches the wireless waves from Canada and America. As you stand there you can hear a confused mass of wireless programmes coming across the air."

The Latest Miracle.

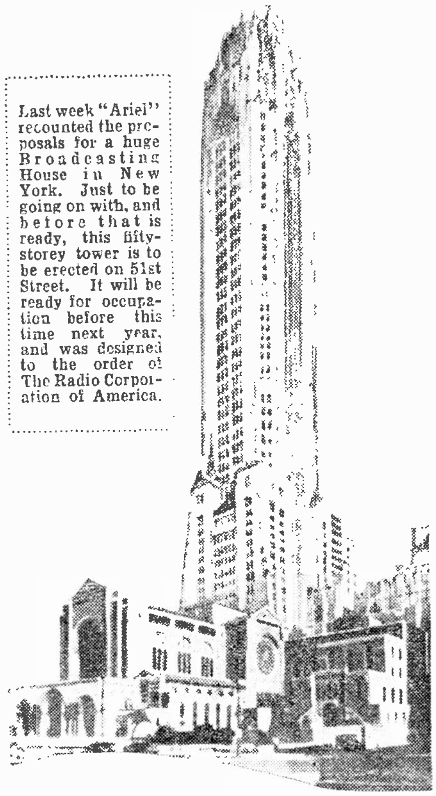
I'LL wager that the Canon has never heard the confused "mass" himself. However, having struck a good vein, he continues: "The church has no wireless instrument, but its roof catches these waves in the air, and the good folk of Bonavista can be seen standing beneath their church at times listening to their roof." M'yes, and the bad folk buy receivers! Well, well, these true stories of receiverless radio are similar to that of the Indian rope trick: you never meet a person who will say that he has himself seen it.

News from Africa.

A READER kindly adds the following example to my collection of English as written by African natives: "Your name was highly recommended to me by the confidential friend of mine that yow are the Best manufacture in a Graed City of london therefore as I wish to take Graed company with you kindly endeawour to forward your yealy catalogwe as well as sample s park. Hoping this will induce yow much proprietor to forward me per retureing mail coming, I am, etc." After all, there are much foggier bits in some of Browning's poems!

Diagnosis Extraordinary.

I HAVE already recorded the wonderful diagnosis made by a German doctor after examination of photographs of eyes, sent from Buenos Aires to Berlin by radio facsimile service. Even more remarkable is the correct diagnosis of heart disease, made by Dr. Calandae of Madrid. His patient was in Buenos Aires and he listened to the heart by direct radio telephonic means. The microphone was placed over it, the heart-beats thus being transmitted by radio. Will the year 2000 see us, Robot-like, courting our sweethearts by means of graphs, records of pulse acceleration and radio photographs of our heart action?



Last week "Ariel" recounted the proposals for a huge Broadcasting House in New York. Just to be going on with, and before that is ready, this fifty-storey tower is to be erected on 51st Street. It will be ready for occupation before this time next year, and was designed to the order of The Radio Corporation of America.

Longer Waves Score.

MAJOR KINGSFORD SMITH has put it beyond all doubt, in a telegram to Marconi's, that his radio equipment was vital to the success of the great flight to New York. He speaks of the "tremendous service it rendered me." What chiefly interests me in connection with the equipment which he took is that when the airman arrived here his machine was fitted with short-wave apparatus. At the last minute it was decided to add a transmitter for 600-800 metres, and this proved to be a "brain wave," for it was due to his ability to communicate with ships and coast stations that he got his bearings in the fog and so found his way to land.

The "Magic" Does It!

L. F. P. (Higham Ferrers) considers that one of his greatest radio thrills was his reception of some of the messages radiated from the "Southern Cross," another instance of the interest which the ability to read Morse adds to amateur radio work. He did the job with the "Magic" Three, which shows that the set is capable of handling a ticklish job when called upon. This particular interception, by the way, was done between 1 and 2 p.m.!

Overseas Papers, Please Copy!

I HAVE to thank L.F.P. for his friendly letter, though he *does* wag a forefinger at me for having stained my page with politics, a crime for which I plead mercy in spite of the fact that I do not realise that I am guilty. Take it as granted that any political flavour, real or imaginary, which is observed in "Notes and News" is a defect due to my ignorance of which is the best radio party. (Mr. L. F. Parker, 20, Wellingboro' Road, Higham Ferrers, Northamptonshire, would be pleased to correspond with anyone in Canada, Australia, U.S.A., etc. He is interested in short waves.)

Winnie's Words.

OUR lady secretary (Kitchen Dept.)—isn't that nice?—mentioned that her young man has made a "Sweetbread" receiver. Which, being translated, means "screened grid" receiver. The same young "Mrs. Malaprop" told her mistress—if the word be permitted!—that when she goes to "Weston Souvenir" for her holiday she will wear some lovely "grape machine" garments! No prizes for correct solutions.

Angling from a New Angle.

I WAS astonished the other day to see a photograph of Scots fishing in Loch Leven apparently to the accompaniment of a portable receiver, a Pye. I have

(*Continued on next page.*)

RADIO NOTES AND NEWS.

(Continued from previous page.)

never been allowed to make the slightest noise near anglers, except possibly far out at sea. They appear to think that fish won't eat if a man blows his nose in the same parish. My theory is that the Scots were trying to ascertain whether the fish would rise without bait. Why waste worms?

The July "Modern Wireless."

IF absence from the old home town, or some such pre-occupation this holiday season has caused you to forget "Modern Wireless" this month, you will probably be sorry when you know what you have missed—if you miss it. It is perhaps not too late to collar a copy. A special illustrated supplement about the Low-Frequency Transformer renders this number unusually valuable to all home constructors, and the issue contains also full details of the "Star-Turn" Four and the "Star Turn" Crystal Set, both of which incorporate the new "M.W." system of selective tuning. Do it now!

Playing on the Loud Speakers.

A READER down in Somerset has sent us a neat model of a switch devised and used by him for operating three loud speakers in series, or singly or two at a time, all from the same valve set. We are exceedingly obliged to him for his nice letter, and kindness in making the model. The idea of using several loud speakers and of altering the adjustments of the set to suit the kind of music being received is gaining ground, especially in America, and I should not be surprised if in time to come radio receivers have to be "played."

"Ariel's" Intelligent Forecast.

OH, by the way, I was passing the door of the room where our technical men are allowed to play all day with what not, and as I heard from within sounds which indicated that something above sea-level was happening, I put on my best "innocent enquirer" look and entered. Were Messrs. Kendall and Rogers doing an Apache dance, or did my eyes deceive me? And that Mr. Dowding should slap Mr. Bird on the back is almost unthinkable! I must have my spectacles corrected. Anyhow, there was something special in the wind—THE "P.W." INDUCTOR.

The "P.W." Inductor.

IT will no doubt interest a large number of our readers to know that we shall shortly publish the details of a device which we have named the "P.W." Inductor, the purpose of which is to cut out interference from the local station on long waves. We believe that this will comfort many users of the simpler type of set, especially now that we have Brookmans Park working. The device can be added to sets externally or incorporated in new designs. It is admittedly simple. So was the first radio circuit, but it was rather useful, too. When one comes to ponder the matter, so many of the best ways of doing things are the simplest ways. Look out, then, for this little masterstroke of simplicity!

Smart Work.

THIS late listening-in into the small hours of the morning has its advantages. Not long ago two detectives were doing it in a Flying Squad van, and a voice from Scotland Yard informed them, in no uncertain terms, that a motor-car (registration number so-and-so) had been stolen. Indignant at such goings-on, the detectives kept a sharp look-out, and at about 3.30 a.m. saw the said car gaily careering along Northumberland Avenue.

Explanations followed, and the result was a charge at the Marylebone Police Court before Mr. Bingley. Which all goes to show that not everyone who can drive a car can "get away" with it.

Alf's Budget.

AGAIN seven pages by our active reader, A. W. M. of Middlesbrough. Having dragged his net through the ether and caught most of the telephony worth picking up, he is now learning Morse. When he can read at 25 w.p.m. he will find that he has occupation for the rest of his life. He advises would-be long-distance aspirants as follows. "Make an absorption wavemeter, calibrate your coils, keep a log and data book and correspond with others in other parts of the world." He states that his results have been got with an inside aerial and a poor "earth," and that he has nowt to do with any receiver unless the moving vanes of its variable condensers are at "earth potential."

SHORT WAVES.

"An American inventor's scheme to keep entire families warm in unheated houses in the coldest weather by means of radio is understood to be quite distinct from the idea of utilising hot air from the loud speaker."—"Punch."

* * *

Mrs. Waine: "I'm so worried. Tommy is five years old, and he cannot talk plainly yet."

Mr. Waine: "Don't worry. He'll probably turn out to be a wireless announcer."—"Answers."

* * *

THE HOWLING INFANTS.

A writer in a radio paper reminds us that "wireless is still in its infancy." That may account for the howls and general bad behaviour of the receiving sets one hears through so many open windows of an evening.—"The Bulletin & Scots Pictorial."

* * *

A WARNING—which only the wise will need!

Ah, woe unto the man who gives a friend,
Or sells, perchance, with money in the vend,
A radio. That man sure loseth all,
And seeks for peace the madhouse in the end.
"Radio Design."

* * *

Critics of wireless in the Free State complain that too much Erse is broadcast. Listeners-in have difficulty in distinguishing their own language from atmospherics.—"Punch."

* * *

Those wonderful Wireless Announcers,
Have gained "Double Blues" as pronouncers.
Take words such as idyll,
Or Cholmondeley or Fidyll,
They never trip over these nouns, sir.—
"Nonsericks."

* * *

Pat: "I see they are equipping all the new Fords with radio sets now."
Mike: "Sure, begorra, and why?"
Pat: "So they can get out-of-town!"—
"Radio Digest."

Learning Morse.

LETTERS continue to dribble in from obliging readers who are expert telegraphists on the subject of the "stance" which is best for manipulating the Morse key. E. S. C. (N.W.1) went to a lot of trouble and produced a set of rules, with diagrams, and we are grateful to him. Chair to left-hand of key, first and second fingers on knob, and thumb underneath; third and fourth fingers hanging free. Send from wrist; hand and forearm level and in line with key. Do not rest arm or wrist on table. Grip on key should be loose, and whole action of sending free from rigidity or constraint. That's E. S. C.'s advice.

New S.W. Stations.

IN Melbourne there is a new short-wave station operating, with the call-sign V K 3 U Z, on a wave-length of 32 metres. It is crystal controlled, and the power is about 40 watts aerial output. Reports will be welcomed by Mr. L. Glew, Engineer, V K 3 U Z, Bowke Street, Melbourne.

A new Serbian transmitter has been observed to be testing at Belgrade on a wave-length of 30 metres. Its interval signal is in the form of metronome beats about 50 per minute. Listen for it on Mondays between nine and ten p.m.

Belgium Wakes Up.

ACCORDING to recent reports the "piracy" in Belgium has been very widespread, less than 10,000 licences being in force, although it is known that nearly a quarter of a million sets are in use. A Decree has now been issued providing for the registry of all sets. The licence fee is only seven shillings per annum, and failure to pay it is now punishable by a fine up to 2,000 francs and eight days in gaol.

A Fan's Gossip.

OUR valued correspondent Mr. Fred Easter, of Cincinatti, Ohio, packs his letters with information. Here is some of it. W 3 X A U, Philadelphia, works on 49·5 and 31·28 metres, 500 watts. Hours: 13.00 to 05.00 G.M.T. From 13.00 to 17.00 the 49·5-metres wave is used and from 17.00 to 05.00 the 31·28 metres, except on Thursdays and Fridays, when the 49·5 metres is used all day in order to avoid P C J.

K A 1 X R, the S.W. transmitter of K Z R M, Manila, now occasionally uses 25·36 metres.

The stations of the New York–Buenos Aires commercial telephone service are W L O on 14·1 metres and L S N on 14·15 metres. These sometimes use a distorting system.

An Early Riser.

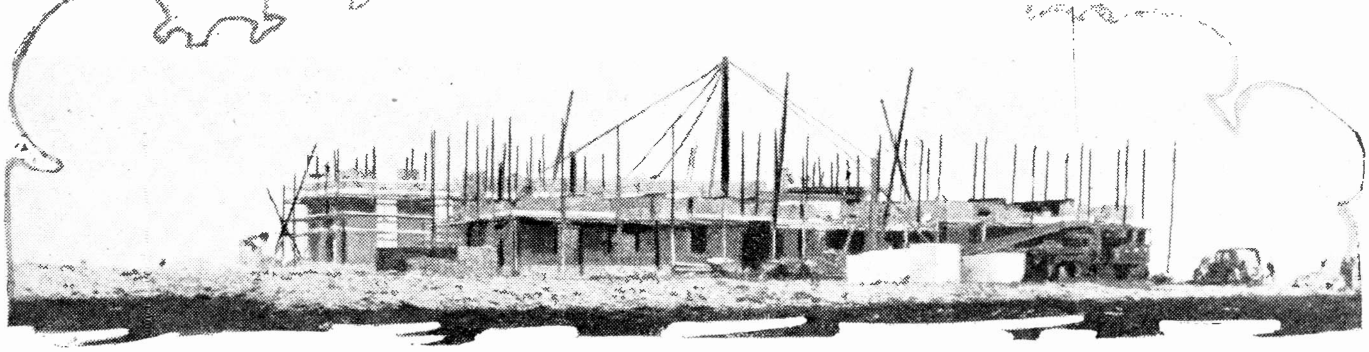
MR. DOUGLAS BRIGGS, Austin Friars, Newport, Mon., begs to report that, using the call signal G 2 Q I, he may possibly be heard working on 163 metres between nine and nine forty-five in the morning. C.W. and telephony. He works on 40 metres also, but at indefinite times. He would welcome and acknowledge reports on his transmissions, so if you stumble across him be matey and drop him a postcard full of report.

Hodge, the D.F.

THE Bradford Radio Society held a man-hunt at the end of last month, an endeavour to track by means of direction-finders a transmitter hidden on a moor. According to the "Bradford Telegraph and Argus" great interest was shown by the moor folk in the proceedings, and one old countryman, seeing a frame aerial being revolved, first one way and then the other, kindly said, "If it's t'wind tha'rt botherin' wi', ah can tell tha it's sou'-west!"

ARIEL.

"SLEWIT"



SLAITHWAITE'S station grows apace. Every day the future home of the B.B.C.'s North Regional transmitter increases in height and in frontage, though it must be confessed that at the present juncture the building is so completely surrounded with a maze of scaffoldings and other building appurtenances that it is not at all an easy matter for the visitor to make out even its main features.

In general design, however, the North Regional station will comprise a rather squat though spacious building. It is being built almost entirely of red brick—perhap by way of contradistinction to the Brookmans Park station, which is constructed mainly of grey stone.

The second station of the Regional Scheme is rapidly rising from the moorland just outside Slaithwaite, at Moorside Edge. Here are some interesting details of this North Regional station, which is to operate on 301·5 and 479·2 metres. From Our SPECIAL CORRESPONDENT.

A Stiff Climb !

Anyway, the building of the station is being pressed forward with all possible speed at the present time, for, owing to its high site and severely exposed position, constructional operations are able to proceed but slowly during the winter-time.

The station occupies a site on the crest of Moorside Edge, a moorland hill some 1,000 feet above the little Yorkshire woollen town of Slaithwaite. The aerial masts to be erected will be 500 feet high, thus enabling radio energy to be flung into space at an altitude of 1,500 feet above the neighbouring town.

You get a good bird's-eye view of Slaithwaite and its grey stone mills from the site of the broadcasting station on Moorside Edge. If you approach the station from the town of Slaithwaite you have a stiff climb of two miles before your destination is reached.

Nevertheless, your half-hour or so of uphill climbing is well worth the effort, for, quite apart from witnessing the steady growth of the B.B.C.'s North Regional station, you have from its site a view of moorland country and of the Pennine ranges second to none in the district.

The Proposed Wavelengths.

One thing is quite certain. The engineers at the future North Regional station, whoever they may be, will never suffer from any lack of fresh air, for on the calmest day the moorland breezes blow with a velocity that makes you pull your hat over your ears and walk through the stubble grass with a more than ordinary determination.

Slaithwaite is, of course, very proud of its new station. Perhaps it hoped to gain extensive publicity by the presence of the B.B.C.'s transmitter in the district, but, if such be the case, the industrious town has been doomed to disappointment, for the transmitter is to bear no other name than that of the "North Regional Station."

The North Regional station at Moorside Edge is to have the wave-lengths of 301·5 and 479·2 metres allotted to it.

The 479·2-metre wave-length is expected to give good service, for there will be a power of 50 kw. available for transmissions on this wave-length. The 301·5-metre wave-length will have a similar power available, if necessary, but it is not expected that transmission on this latter wave-length will cover so large an area.

The precise service-areas of the North Regional station's future transmissions are, of course, not known. It is calculated, however, that with either of the wave-lengths signal strength will be stronger east and west of the station than it will be north and south. There is no point of disadvantage here, however, for the greater mass of the north country's population is concentrated mainly to the east and to the west of the station.

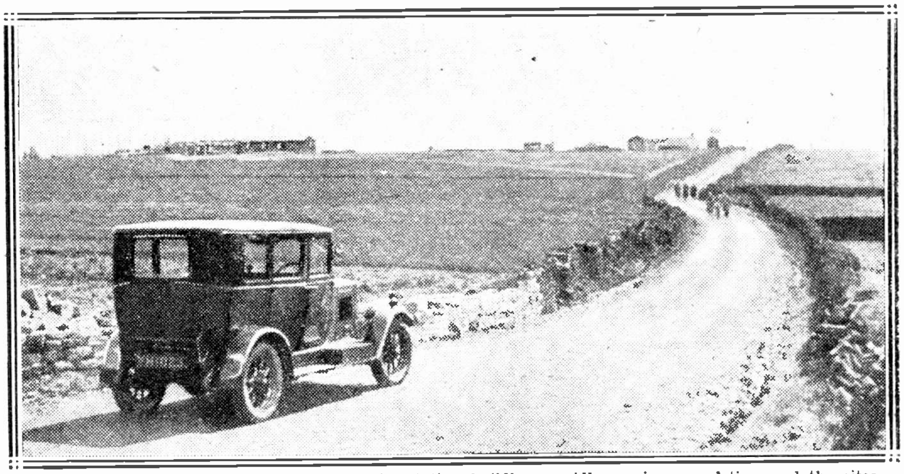
Installing The Apparatus.

The North Regional station will obtain its programmes by land-line from Manchester, and, to a lesser extent, from the Leeds studio. Leeds will constitute the "S. B." centre for this station.

The building of the North Regional station is proceeding at a rate which makes it probable that the transmitting plant will be installed in late September, or in October next. The installation of the necessary electrical gear, however, will not be an easy matter at that time of the year, for the fine summer weather will have departed, and any severe rains will render the conveyance of heavy materials to such a high site very difficult.

This fact, however, has been appreciated by the B.B.C. people, and they have gone to the trouble and expense of remaking and consolidating many long stretches of moorland roads in the vicinity of the station

VOICES FROM THE NORTH



A recent photo of Moorside Edge showing the station buildings rapidly nearing completion, and the sites of the three aerial masts, which are to be 500 feet high, the tops being 1,500 feet above Slaithwaite.

B.B.C. . PROGRESS

A review of the financial advance made by our Broadcasters during the past year—That Empire Short-Wave—Broadcast S.O.S. and charity appeals—"The publicity fires of Television."

By THE EDITOR.

LICENCE figures still continue on the up-grade, and it would be a bold prophet who ventured to forecast "saturation point." The recently-issued B.B.C. report shows that there are now well over 3,000,000 licencees in the country, and there is every sign that broadcasting still continues to claim increasing numbers of new adherents.

Last year's figures showed an increase of 328,344 on 1928, and brought the total in force at the end of 1929 to 2,956,736. Since then the three-million mark has been passed, so that the B.B.C. is quite justified in claiming that there are no signs of retrogression. The financial return is also good, since it shows an income of £1,470,000 from licences, of which the B.B.C. received £944,301, against £871,764 in 1928, the Post Office £183,750, and the Treasury £341,949.

The latter sum may be regarded as a sort of unofficial entertainment tax, but when it is considered in relation to the money expended on programmes, which amounted to no more than £546,676, the listener has surely the right to ask whether the Exchequer is entitled to such a lion's share. And despite this "rake-off" the Government continue to haggle with the Colonies about the vexed question of an Empire short-wave station! Why not use some of the cash, which the Treasury has deducted from listeners' licence fees, to build an Empire Station?

S O S Successes.

During last year there were 881 S O S messages broadcast by the B.B.C.—an increase of 130 in the total compared with the previous year. There is the dramatic and often the pathetic in these calls. This is the reason why everyone listens with close attention as soon as S O S is announced. Less than half the calls have any success. Last year 41·6 per cent were successful, 54 per cent unsuccessful and in 4·4 per cent the result was unknown. The other appeals—those for help for deserving causes—had good responses. Forty-eight national appeals for charity resulted in £60,000 being sent, and local appeals brought in £4,000.

In soliciting aid for charity we doubt whether the B.B.C. has a more successful rival anywhere in the world. The figures given above speak for themselves.

Ambitious Plans.

We understand that plans for a big amusement centre, in which wireless television may ultimately play a part, are being developed, and Mr. John Rockefeller, junior, is now taking an interest in the proposal of Mr. Owen D. Young and other leaders in the electrical entertainment field to use the Rockefeller property, which the Metropolitan Opera Company rejected, as a new site.

According to the "Morning Post," while thus far television has been in too experimental a stage for public use or the practical dissemination of programmes from a central theatre, recent developments foreshadow the time when it may be possible to send programmes from one central point over a wide area.

When and if that time arrives the new amusement centre would send its programmes to millions throughout the country in theatres and private homes.

A Beautiful Vision!

This is but an example of the sudden flare up in the publicity fires of television. From America stories ha[ve] lately that certain expe[riments] perfected—or are about whereby the cinema and up and so enable, for exa[mple] be shown in London, or seen in theatres all over th[e]

A beautiful vision! W[e] clined to break into lyrical like this: The day is not when the whole world will performance at home—the being operated in Timbuctoo on. The style, however, has done to death. Perhaps it is a student of television," writes C Robinson, in the "Observer," sudden announcements of wor[ld] new art with considerable amusement, and with some envy of the publicity organisation of the commercial interests concerned with the art in the United States." True. Too true!

SIGNALS FROM THE "SOUTHERN CROSS"

Mr. Old, a Nottingham Radio enthusiast who kept in touch with the "Southern Cross," during its epic transatlantic flight, and passed on many personal messages.

RECEPTION WRINKLES

If you use the cat's-whisker type of crystal set, avoid scratching the crystal heavily. A light pressure is usually far more likely to give good results.

* * *

When adjusting a double crystal type of detector always draw the adjusting control knob back before attempting to find a fresh surface, as in this way you avoid scraping the two crystal surfaces together.

* * *

Do not readjust your crystal more often than you need, as not only is this bad for the crystal but it often interferes with neighbours' reception.

Always be careful not to jolt or jar a crystal set unnecessarily as it is bad for the detector.

* * *

If your signals tend to fall off in weather it will probably be found that the aerial insulators are inadequate in number or that rain is spoiling them and making a conductive path across from aerial to "earth."

* * *

An ordinary H.F. choke inserted in the negative lead from an H.T. unit is often efficacious in getting rid of hum or distortion.

* * *

If the wrong voltage is applied to its screening grid the average S.G. valve misbehaves in a way that ordinary valves cannot do. Such a wrong voltage may send the valve into oscillation, causing unsteady and erratic reception.

* * *

Good contact is particularly important in a crystal set where resistance losses can be serious in the aerial or earth circuit.

TONE and TUNING

By

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

FOR my last article I had something to say about the importance of linearity of response throughout the receiver. I indicated that advantages in push-pull resistance-capacity magnification could be argued, but, practically, we were limited in our advance to technical perfection by the cost of valves.

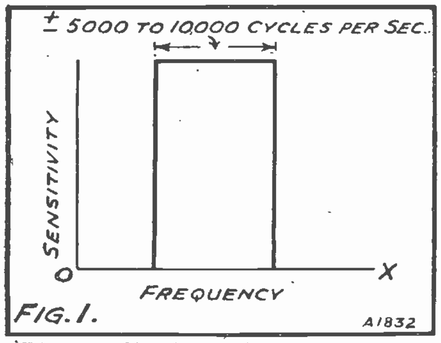
But there are other aspects of receiver design which are relevantly discussed when dealing with this question of quality of transmission.

In this article, "P.W.'s" Chief Radio Consultant explains how quality is affected by selectivity.

Ideal Response.

We select one ether disturbance from another by the use of tuned circuits. A tuned circuit may present either a much higher or a much lower impedance depending upon the method of connection to E.M.F.s of a certain unique frequency than to E.M.F.s of any other frequency. It is this phenomenon of "resonance" which lies at the root of all selection and tuning.

WHAT IT SHOULD DO—



What we need is a circuit giving square-shouldered response and letting in only a limited band of frequencies.

If you look at Fig. 1 you will see a diagram giving the ideal response curve of a receiver. This ideal square-shouldered curve shows that the ideal receiver lets in only a defined limited band of frequencies. This, depending upon conditions, should be able to be varied in width from 5,000 to 10,000 cycles per second.

A *single* tuned circuit, however, has response curves as shown in Fig. 2. As certain of the relative values of resistance, capacity and inductance are changed, the shape of the curve varies as shown in Fig. 2.

The particular point to notice is that the response, as represented by the vertical distances from the line of origin O——X in the figure, falls off more or less rapidly but always continuously. There is no abrupt "cut off" with any ratio of inductance resistance and capacity, and the ideal of Fig. 1 is in no case realised.

If we have a flat top response curve for example (A), the skirts of the response curve go sailing on outwards, and are not tucked in sharply over the hips according to the more modern cut.

If you are flat topped your frills flow out as a crinoline, tight-fitting skirts are only possible if the waist too is terribly pulled in. Thus the ideal top makes for a superfluous skirt, and narrow skirt sacrifices the flat top.

The Cascade Connection.

If you have a wide-skirted resonance curve, you pick up unwanted transmissions outside the spectrum of the desired station; if you get great selectivity you sacrifice the pick-up of the spectrum you want to receive. All the above arguments apply if you are trying to make only a single circuit selective.

If, however, you take several flat-topped circuits in cascade and these several flat-topped circuits have each wide skirts, a little consideration will show that the effect of cascade connection is to diminish the width of the skirt while preserving the flat top.

Because each ordinate has to be multiplied by itself as each cascade circuit is added, the maximum response is say, unity. Then the maximum response remains unity, since $1 \times 1 \times 1 \times 1 \times 1$. But at 5,000 cycles the response of one circuit is say 0·95.

Then $0{\cdot}95 \times 0{\cdot}95 \times 0{\cdot}95 \times 0{\cdot}95 = 0{\cdot}8$ (about). At 10,000 cycles the response of one circuit may be 0·8, but with four circuits $0{\cdot}8 \times 0{\cdot}8 \times 0{\cdot}8 \times 0{\cdot}8$ is 0·4 (about).

One Circuit or Several?

Now we have the four circuits giving

1 at the carrier-wave frequency.

1·0 very nearly at the carrier-wave frequency — 2,000.

0·8 at the carrier-wave frequency — 5,000.

0·4 at the carrier-wave frequency — 10,000.

But to get a reduction to 0·4 at 10,000 cycles with 1 circuit we should have something like:

1 at the carrier-wave frequency.

0·7 at the carrier-wave frequency — 2,000.

0·5 at the carrier-wave frequency — 5,000.

0·4 at the carrier-wave frequency — 10,000.

Thus the cascade connection of many rather flat circuits gives us a nearer approach to the ideal of Fig. 1 than if we try to cut down at the outer limit of frequency band by making *one* circuit very selective.

There is, further, the possibility of getting better quality reproduction by using high-frequency cascade connection, even though sensitivity is not the object of using high-frequency connection.

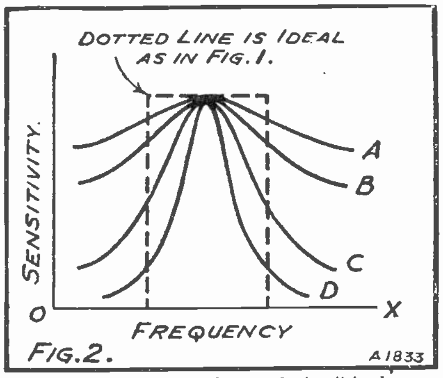
Phase Distortion, Too!

Most people think of high-frequency magnification as only useful in being selective and sensitive.

I insist that I can in one sense of the term make a highly selective receiver using only one high-frequency circuit, for reasons now to be explained, sacrifice quality.

You must take it from me that when a high-frequency tuned circuit has a response curve such as that in Fig. 2 (D) (very selective, inasmuch as the outer-frequency response is small) there is, besides an amplitude distortion, inasmuch as every part of the spectrum is not equally reproduced, a phase distortion.

—WHAT IT DOES!



Actually the response of a tuned circuit is always wide-skirted to some degree.

If you play a note of 3,000 say, this has a certain phase relation to the carrier-wave in the original disturbance. But the tuned circuit will increase this phase difference the greater the difference of frequency between side-band and carrier.

Thus the phases in the receiver disturbance will be different from those in the

(Continued on page 527)

LATEST BROADCASTING NEWS.

PLANS FOR THIS YEAR'S "PROMS."

A ST. PAUL'S RELAY—THE TIDWORTH TATTOO—"SKYLARKS" & "SOB STUFF," ETC.

THE 1930 season of Promenade concerts at Queen's Hall, the fourth arranged under the auspices of the B.B.C. and the thirty-sixth of the series, is framed on the orthodox lines.

It could not be otherwise. Accordingly, Mondays will be Wagner nights; Wednesdays will be devoted to Brahms and Bach, and Fridays to Beethoven.

On Tuesdays miscellaneous works will be given, and British composers will have their own evenings on Thursdays. Saturdays will, of course, be given over to popular programmes.

A St. Paul's Relay.

Evensong will be relayed from St. Paul's Cathedral at 3.15 p.m. on Sunday, July 27th. Everyone will hope that broadcasts from our London Mother Church will now be a regular feature of the programmes. We shall make a further announcement on the subject in the near future.

The Tidworth Tattoo.

Although most people will argue that military tattoos can be much more enjoyable when seen than when heard over the wireless, there are large numbers of listeners who like the relays each summer from Aldershot and Tidworth.

The Aldershot Tattoo has come and gone, but the Tidworth Tattoo is yet to be. It will be broadcast on the National wavelength.

Two Sunday Features.

Two religious broadcasts of outstanding interest are in the National programmes for Sunday afternoon, August 3rd and Wednesday afternoon, August 13th.

The first is an Old Contemptibles Service which is to be relayed from the Church of St. Martin-in-the-Fields, and the second a service from Norwich Cathedral, marking the 1,300th anniversary of the founding of the cathedral. (We hope to give further details of these broadcasts in our next issue.)

"Skylarks" and "Sob Stuff."

Charles Brewer's latest rèvue for Midland Regional listeners is due on Wednesday, July 30th, the humorous side of aviation being the theme. Mr. Brewer has called this show "Skylarks," and relies upon Alma Vane, Mary Wyndham, James Prodger, Alfred Butler and Charles Herbert with the Aerovue Chorus and a couple of pianists to keep it going. It should be an enjoyable item.

Gordon McConnel, who devises a similar type of programme for London listeners, is producing "Sob Stuff" on Monday, July 28th (National) and again the following evening (London Regional).

"Doon the Water."

Every year Scottish stations include a light programme feature entitled "Doon the Water," based on a trip in one of the pleasure boats from Glasgow down the Clyde.

This year the programme will be heard on Saturday, August 2nd, and will, as usual, be arranged by Tom Mailey, the cast including Meg Buchanan, Jean Taylor Smith, and Tom K. Uquhart of the Scottish National Players, and Helen M. Wallace and Harold M. Whiteman of the Ardrossan and Saltcoats Players.

Miss Gwendoline Mason.

A spot of harp music is down for Midland Regional listeners on Sunday afternoon, July 27th, when Miss Gwendoline Mason who, of course, is Welsh and who is recognised as a leading harpist at many important concerts in London and big provincial towns, will play a number of airs, including a Fantasia specially written for her by Herbert Bedford, and based on well-known old Welsh folk songs. We should add, perhaps, that Mr. Bedford is partly of Welsh extraction, although he does not seriously claim to have more than a quarter of Welsh blood in his veins.

THE PORTABLE AT THE PICNIC.

This holiday party is anxiously awaiting the weather forecast to know whether they ought to catch the steamer back home, or have another glorious day by the water.

TECHNICAL NOTES.

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

Curing Howling.

A READER wants to know why it is that howling, which occurs in an amplifier, may sometimes be overcome by the very simple process of reversing the leads to the low-frequency transformer. This is a very well-known effect, and for that reason some experimenters are rather apt to place too much reliance upon it.

I should mention that where the howling is really serious, you will probably find that the mere reversal of the L.F. transformer leads will not be sufficient to cure the trouble. The howling is often caused by reaction, and the reason the change-over of the leads has the effect of stopping the howling is because it removes the instability in the circuit by cutting out the reaction or feed-back.

Receiver Design.

I was talking a week or two ago about improvements in the design of radio receivers, and in this connection you will be interested to know that the question of tone-control is now receiving more and more attention from set makers. Although we have long had different simple methods of volume control, tone control has not been so common, although it is quite as important.

Attempts have been made for years to provide some simple method of controlling the tone from an ordinary gramophone. For instance, little gadgets have been put on the market adapted to be fitted to the soundbox, so that when a record is being played the shrill tones can be softened down whilst the lower tones are reproduced with their proper "roundness," the whole thing being continually under the control of the operator.

Local Interference.

I often receive letters from listeners who have changed over from batteries to mains units and who then find that they suffer from local interference whereas they were quite free from this before the change-over.

I have a letter before me at present from a reader who complains that since he put in an H.T. mains unit he has been incessantly bothered by interference from a flashing electric sign near by.

He says he is quite unable to cut out this interference, and he wants to know why he should be troubled with it now when he never noticed it before.

It is not always possible to say exactly what is the explanation in these cases, but there is no doubt that in the majority of cases the interference is actually transmitted over the electric supply wires and gets into the receiver via the mains unit leads.

When you are using an H.T. unit the high-tension part of your circuit is indirectly connected to the mains, and although regular hum is cut out by the smoothing circuits in the unit, any serious interference, such as that produced by the switching on and off of powerful electric signs, is bound to get through.

Sometimes, of course, you will get this kind of interference even when using batteries, the interference in this case being picked up by the aerial and other parts of the receiver direct.

It is very annoying; it is also, unfortunately, very difficult to cure, and in very serious cases there is sometimes, nothing for it but to go back to batteries or to use batteries when the interference is "on," and the mains unit when it is "off."

Double-Range Meters.

Most experimenters possess some sort of voltmeter—I mean a low-reading voltmeter up to, say, 6 or 10 volts, but comparatively few seem to feel the need for an instrument reading up to 100 or 150 volts, or for a milliammeter.

(Continued on page 528.)

"PHILEMON" GOES ABROAD

Our well-known contributor, who was long famous for his broadcast talks "Through My Window" tells of his adventures with "Belinda," a portable set, during a journey to Italy. Belinda is a talkative "young lady" who attracts a considerable amount of attention to herself and her guardian.

I AM writing this on the shore of Lake Maggiore waiting for the boat. The journey has had its excitements. Belinda started to talk as soon as we left Dover. It was amusing to see the disgusted looks on the faces of our fellow-passengers. "These wretched gramophone people!"—you know the kind of thing they say. But to take Belinda for a gramophone was too much, so I continued to annoy them. At 6.15: "Here is the first news," they edged a little nearer. At 6.30: "We are now going straight over to Lord's Cricket Ground," they gathered round. The first-class came from the upper deck and gathered round.

"Only One Belinda."

The whole ship gathered round. The captain forgot his wheel. The engine-room men came out like rabbits from a warren. The boat, with a heavy list to our side, was left to steer herself, like an old horse going home to the farm from market. Belinda was the centre of attraction. I could have had an O.B.E. for the asking. "That's a fine set you've got there," said a belted earl to me. "Yes," I replied, "it's Belinda." "Never heard of the make." "There is only one Belinda," I said, as proud as his lordship's butler.

Most of the crowd were going to Paris. They were all smiles as they bid Belinda good-bye. Our train was not crowded. As there were no "thirds," we went "second." Red plush! Fancy! I put Belinda on the seat, told her to be quiet, and went for some dinner.

A Little Difficulty.

I found it difficult to get Belinda to talk in the train. On the seat, on the floor—not a sound. I took her on my knee! She whimpered a little. I held her suspended out of the window. That was better, but inconvenient. How to get topside of the train's vibration? It was about nine o'clock. A small boy with adenoids and a long neck kept looking round the corner into our compartment. I enticed him in, gave him some chocolates, and stood him on his head between the seats. His long rubber-neck took the vibration famously. I stood Belinda on his upturned soles, and got the Fat Stock Prices splendidly. I stoked the "shock-absorber" with more chocolates.

Two "Conferences."

He was getting an ugly colour. But just when the Archbishop of Canterbury was being announced to speak on the Lambeth Conference, the youngster's mother spotted him by his feet! A different kind of conference followed. I trust the Lambeth Conference will be as lively! Exit mother and child! He came several times again in the morning, offering himself to be Belinda's footstool, but one such interview with his mother was enough for me. She was awful—what they call a virago! She was the first virago I have seen!

Having had the adenoids removed, I was at a loss. I then bethought me of the large coloured ball which we are going to throw at each other when we are bathing in the lake. I blew it up, not too tight. I put it between two valises, and sat Belinda on it, like a pouffé. Nothing could have been better. It was then about 10 p.m. I began to calibrate. It seemed the thing to do. What is the use of being abroad with Belinda unless you calibrate? I got on to the familiar mark of the National Programme, but Paris was chattering right on the top of it. I couldn't get clear. I could just hear some faint music which sounded like Tchaikovsky, but it was no go. Paris held Belinda's heart. But there were rivals in the offing. Just a little down the dial scale, somebody was "damning" something. When I got it more clearly, it was a gentleman in Berlin saying "Herren und Damen" at intervals in his address. Just a little above Radio Paris on the scale there was music which might have come from anywhere; the announcer spoke what sounded like Dutch. It was probably Huizen. Belinda was behaving like a perfect lady. We got Langenburg, and Oslo, without difficulty. And then, suddenly, two men in uniform stood in the doorway!

A Spot of Bother.

I switched off Belinda modestly castdown her eyes. The officials asked me something. I replied with one of the two French sentences I know, to the effect: "The hat of my aunt is blue and is cheap." They seemed angry, but then French officials always seem to me to be angry. They said something else, to which I replied with the second of my two sentences: "May I bring my doll to breakfast?" They pointed at Belinda. It was the finger of judgment. She had no licence in France. She had no licence anywhere in Europe, dear soul; and was "defendu," "vietato,"

(*Continued on page 532.*)

THE PORTABLE DOES A LITTLE ENTERTAINING.

A group of guests at a garden party given in the South of France welcome a "spot" of radio entertainment.

CORRESPONDENCE.

CURING FADING

SOUTH AFRICAN RECEPTION — THE "NEUTYPE" FOUR—THE "TINY" TWO.

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.

CURING FADING.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having benefited on many occasions by my weekly investment of 3d. I feel bound to write and point out an experience of mine, which I have not seen in print. It may be useful to your readers.

Recently I took down my set to rewire, etc. Having very carefully re-assembled, I have, since rewiring, been troubled with fading, preceded by a "muzziness" of notes. Certainly reaction. etc. was not so good as before rewiring, but until the fading occurred, the set performed well. This fading has troubled me a lot, and although every part was tested, the trouble was not located until yesterday. Possibly the solution would be obvious to you, but I think it would puzzle many an amateur.

I have a 2-mfd. condenser across the H.T., and when I re-assembled the set I forgot that on the transformer used in this set, I had, owing to the often occurring transformer whistle, reversed the secondary connections. When I re-assembled I omitted to do this, and as the condenser was used no squeal was heard, but the fading occurred. It is simple, but it is the last thing to look for.

Had I tested the set without the condenser, the squeal would have been heard, but it seems quite possible that there may be others troubled in the same way. My set is a "straight 3" but the same trouble could exist in any set. In last week's issue I notice the usual enquiry regarding transformer whistle, and as this develops with use in some transformers, it would be a useful point for those employing condensers across H.T.. for no whistle would be heard, while the set might deteriorate even without the fading I experienced.

Having reversed the secondary connections the set is now nearly the desired 100 per cent mentioned in one of your articles. I have an output filter circuit, and Ultra Air Chrome Speaker fitted in a large cabinet. With a pentode in last stage it is good.

I seldom use earphones, but could get America on ultra short waves at loud-speaker strength, given favourable conditions, prior to rewiring. I hope this still maintains.

Yours faithfully,

Deal. J. T.

SOUTH AFRICAN RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—As I have been a keen reader of your excellent publication for the past few years, I think the following may be of interest to you.

For the past two months I have been consistently logging Rome on the loud speaker at audibility ranging from R4 to R6. My set is a home-constructed screen-grid, detector, and two stages of radio amplification. Thinking you may care to publish the H.F. side circuit diagram in "P.W.," I am sending on same.

That this is not freak reception is proved by the fact that any evening after our local Johannesburg has closed down I tune them in. My nearest stations are Cape Town and Durban, both 500 miles away, and Johannesburg 1,100 miles. Thus it can be seen that this outfit is pretty efficient as there is not a night in the year that I have not one or other of these stations on the loud speaker.

The distance from Rome to here is about 5,200 miles and I believe there the power used is 3 k.watts.

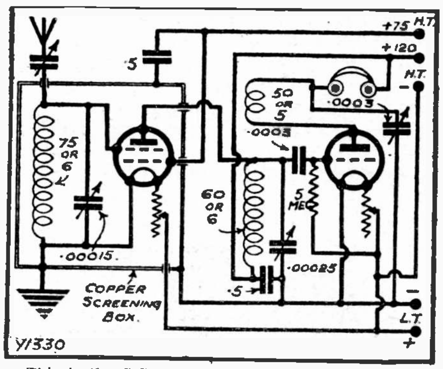
Yours faithfully,

D. C. SHANKS.
(Radio Z T 2 A.)

Coils		
H.F. coil 75		
Grid coil 60	}	300—550 metres.
Reaction 50		
H.F. coil 6		
Grid coil 6	}	19—50 metres.
Reaction 5		

P.O. Box 43, Humansdorp, S. Africa.

BRINGS IN THE WORLD!



This is the S.G. and Detector portion of the set used by Mr. Shanks in South Africa.

THE "NEUTYPE" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—Allow me to thank you and your technical staff for a remarkable set, the "Neutype" Four. I completed this circuit in two evenings and when the time came for a test out, I was greatly surprised and pleased at the results obtained.

I have been a regular reader of "P.W." for some years, and have hooked up many of your circuits, but the "Neutype" tops the bill for ease of operation, clarity, volume, and in fact everything that can be desired in a modern set (even to the elimination of the "B.P.s" in a degree or two!). I am using specified components with the exception of the transformer, which is a Ferranti A.F.3. I will not trouble you with a list of stations logged, but it will suffice to say that there were not a great number of European stations which I did not tune in on the speaker.

Thanking you again for a really good circuit.

Yours faithfully,

L. H. HOOPER.

Essex.

The Editor, POPULAR WIRELESS.

Dear Sir,—Perhaps the following hint will be useful to some of your readers who have made the "Neutype" Four. I found that a Brookmans Condenser, in series with the aerial terminal and the X coil, makes the best volume control and does not affect tone in the slightest degree. Wishing your paper and experts every success.

Yours faithfully,

W. G. GEORGE.

London, N.22.

THE "TINY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—The results obtained from this set are little short of remarkable. My brother and I got it up together during Easter, and the test out on an ordinary aerial gave every confidence of good results on a "tree aerial."

We packed same and went off for a trial in the country, to be precise the trial took place on Sneedhams Green, which is almost within the shadow of the Cotswold Hills. Using 100 ft. "tree aerial," 2 ft. iron rod for earth, Marconi H.L.210, and Lissen pentode with 100 volts on plate, the National (1554·4 metres) and Regional (479·2 metres) programmes were received at excellent loud-speaker strength, speech being readable at a distance of 14 yards. The pentode will work on 60 volts for plate, but the quality suffers slightly.

Radio Paris and Eiffel Tower were also received at fair strength.

Tests on my ordinary aerial after dark has shown that the set is not backward in DX, as Oslo, Langenburg, Milan, Rome, Dublin, Katowice, Glasgow, Frankfurt and Toulouse have all been received at loud-speaker strength.

Yours faithfully,

Gloucester. W. R.

SHORT-WAVE NOTES.

By W. L. S.

As we are now in the thick of the season during which a great number of Canadians and Americans pour into this country, the London "hams" in particular have been receiving a fair crowd of visitors.

One of the greatest thrills connected with amateur radio is the meeting of a brother amateur who has previously been only a signal "on the air" to one, although he may be a close friend before the meeting.

I have had the opportunity of talking over matters with three or four visitors to this country just lately, although they have not all come from the States, and their views are rather interesting.

The Britisher Scores.

The one point on which all the Americans are unanimous is that the average Britisher is far more technically minded than his counterpart in the States, and although he has less money to spare on radio gear he makes better use of it.

We are apparently to be sympathised with on account of our particular location on the globe (which, I am afraid, cannot be altered at the moment!) compared with that of the States, for, while we are having our long spells of bad conditions here, there is hardly ever a time over there when some part of the world is not coming through well. This rather confirms my theory that I put up a fortnight or so ago.

Incidentally, things are still just as bad as ever here, and I am quite resigned to the fact that 1930 will go down in history as the "Black Year of Radio."

Short-wave supersonics still seem to be a controversial subject. After my recent work on the subject I am inclined to the view that, as a telephony receiver, the superhet. is unsurpassable. For amateur Morse work its advantages are very doubtful on account of the duplication of stations through receiving each one in the two positions, as the oscillator beats on the upper and lower side of their carriers.

I believe that the intermediate-frequency amplifier that follows the detector is capable of giving a greater amplification on signals and less on "mush" than a low-frequency amplifier giving the same overall "mag.," but otherwise there is nothing in it for C.W. work.

Another point I have noticed just recently is the effect of a screened-grid stage before the detector on the length of aerial necessary. Results are just what one would expect; with the screened-grid stage working well there is very little diminution in signal strength when one shortens the aerial, although with the same aerial coupled closely to the detector there is an enormous effect. The fact that practice follows theory is sufficiently unusual to warrant a mention of this effect.

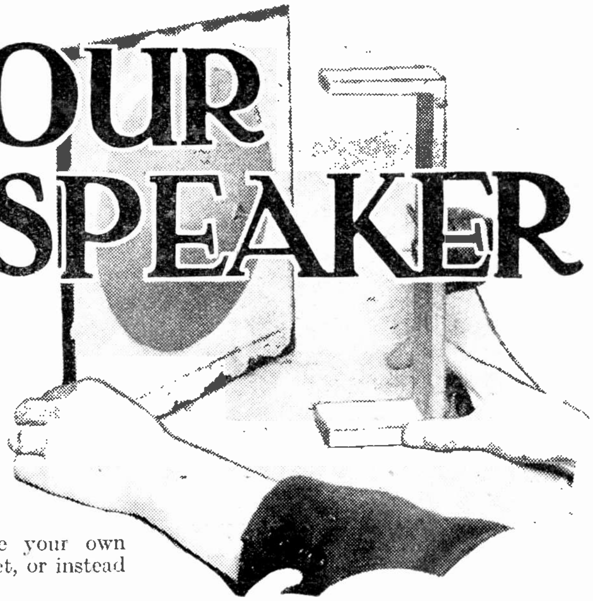
Incidentally, this might form a good test of whether a screened-grid stage is working properly.

Transatlantic Telephony.

The queer, unintelligible noises that are sometimes heard on the transatlantic 'phones are not due to single side-band telephony or any modification thereof, if my deductions are correct. I believe that, when secrecy is desired, they modulate the carrier-wave with a supersonic frequency, and that the modulation we hear is the difference between the speech frequencies and this supersonic frequency.

It should be possible to make it intelligible again, but I am not giving any hints in case I make myself unpopular with the authorities who desire secrecy.

MAKING YOUR OWN LOUDSPEAKER

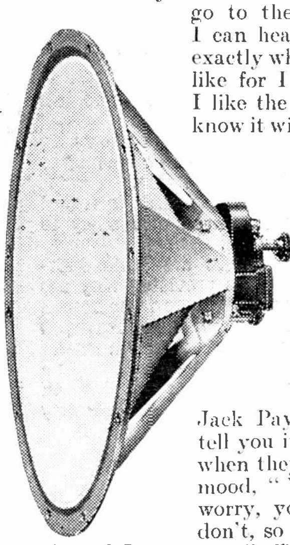


A practical article about a fascinating occupation at which every "P.W." reader should "have a go."

By ROBERT BLACK.

HAVE you ever seriously considered making your own loud speaker? Perhaps you have already weighed up the pros and cons and thought to yourself something on the following lines.

"If I buy a complete loud speaker I *do* know exactly what I am getting. I go to the dealer's and I can hear it. I know exactly what it will look like for I have seen it. I like the appearance, I know it will tone beautifully with the furniture in the rest of the room, I have got the maker's name behind it, and, finally, I don't have to worry."



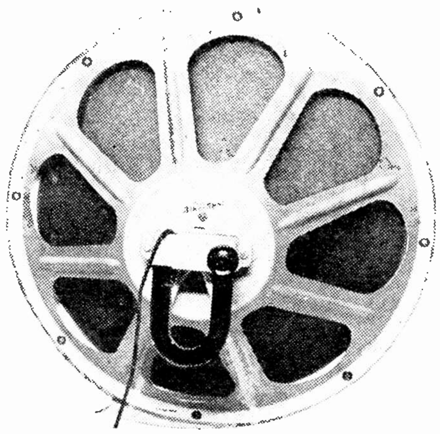
The Ormond Large Cone Chassis, with its adjustable unit.

Now as Jack Payne's lads will tell you if you listen in when they are in lively mood, "You die if you worry, you die if you don't, so why worry at all?" This idea that the making of a loud speaker is a worrying business ought to be nailed down once and for all, for on the contrary it is an interesting and profitable job. Think of the other side of the question for a moment.

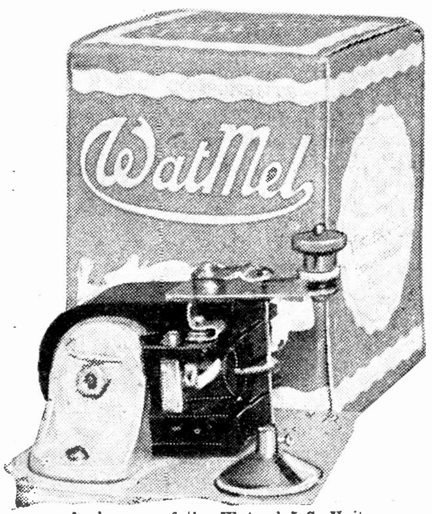
If instead of buying a complete loud speaker you buy a loud speaker unit and "make you own" all sorts of interesting possibilities are opened up. You can make your own cabinet, adapt, or buy a cabinet, or instead use a baffle-board.

You can try different cones with it, different methods of mounting the cone, and you can try different *sizes* of cone. The beauty of all these stunts is that they are accompanied by subtle differences of tone which if you are a musician, or have a musical ear, will be a constant source of satisfaction and pleasure.

If you are not particularly interested in the experimental side at present, the fact you will be saving money should be attractive. The unit is the heart and soul of the loud speaker and this you purchase ready-made. Having the unit, what else remains before you can listen to it?



Here is the famous "Blue Spot" L.S. Unit mounted on its chassis and ready for placing inside your own cabinet.



A close-up of the Watmel L.S. Unit.

Easily-Tried Improvements.

Well, it is provided with a little driving rod, and that driving rod has to be fixed to a cone, and that cone must be supported in some way, attention being paid to the effect of the support on the reproduction.

As no doubt you are aware, the unit and cone can be held in their correct relative positives on a proper "chassis."

If you have plenty of time and are moderately handy with tools you could make a wooden chassis or framework that will be absolutely satisfactory in use.

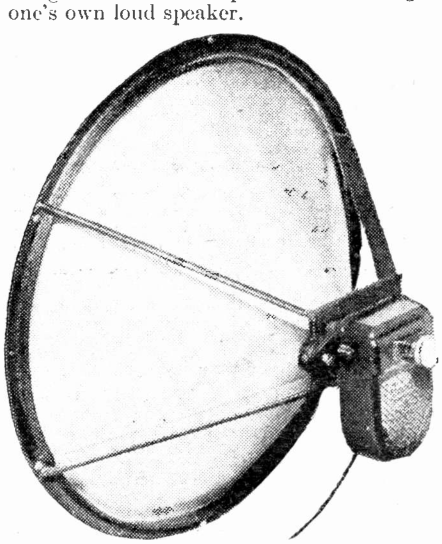
Various kinds of stiff paper, such as "kraft" can be tried for the cone, many of them being marked ready for cutting, and all of them being easily tried. If you like clean, crisp reproduction of the top stuff and high notes you will probably choose a stiffish paper, and there is plenty of room for experiment in doping and "loading" a paper cone.

There is a wide and interesting field of experiment in using thin wooden partitions, etc., for a diaphragm instead of a cone. One of the most natural effects I have ever heard was obtained by an ingenious householder who had a "serving-hatch" or trapdoor between his kitchen and dining-room, and who fitted up this as a "diaphragm."

Diaphragm Diversity.

Thin wood was used, fitting exactly into the hole in the wall, and an ordinary L.S. unit was fitted direct to the centre of the trap-door which thus became a wooden "diaphragm."

Worked from a three-valve set, the volume was ample for both rooms. The quality was unusually good, as the whole wall between the rooms was acting as a baffle. Anyone who has tried such a stunt will admit that one of the most interesting things about radio reception is the making of one's own loud speaker.



The "Vee" Unit shown here is a product of those pioneers of loud-speaker manufacture, S. G. Brown, Ltd.

FROM THE TECHNICAL EDITOR'S NOTE-BOOK.

Tested and Found—?

GECOPHONE MOVING-COIL SPEAKER.

THE moving-coil type of speaker is rapidly gaining popularity, and the latest people to commence manufacturing this type are the G.E.C.

I do not think that there has ever been any doubt as to the superiority of the moving-coil system in the minds of amateurs, but there must naturally have been a certain amount of—well, suspicion, against a speaker costing so much more than the simple cones and being built on relatively heavy lines.

Perhaps it was thought that even if fine results could be obtained it would only be so if a very powerful set were employed. This is not, of course, strictly the case. You want a *good* set because a moving-coil speaker can always show up faults.

Of the G.E.C. moving-coil speaker the makers say:

"... The suspension device and the speech coil former are machined from one piece of duralumin, and as the number of separate parts to be secured to the cone is reduced to a minimum, the most potent source of chatter in a moving-coil speaker is thereby eliminated.

"The machining throughout is to fine limits, and this enables an extremely small gap to be employed between the field magnets and the coil, with its attendant high efficiency and great sensitivity. Only 10 watts are required to energise the field magnets at very high magnetic flux density.

"The framework of the diaphragm is of aluminium, so that while it is comparatively light it is rigid, and it is firmly clamped to the pot to support the cone at its periphery. This cone is of impregnated paper, and it is suspended by very flexible calf skin, with a generous rim of felt at the diaphragm edge where it makes contact with a baffle.

"The Gecophone moving-coil loud speaker is designed both for A.C. and D.C. main supplies.

"In the case of the A.C. model a rectifying unit forms part of the speaker chassis, and is surmounted by a valve holder carrying an Osram U5 full-wave rectifier. Valve rectification has been adopted because of the advantages it offers in the simplification of the smoothing system, and the uniformity of the output voltage.

"This A.C. model is suitable for use on mains having a pressure of 200/260 volts, with a frequency between 50 and 80 cycles, and clearly marked terminals, with an ebonite safety cover, conduce to correct connection to these mains.

"An input transformer is incorporated in this model, and as it is centre-tapped, it permits a choice to be made of two impedances to match up with the output valve of the set to which it is connected. This transformer, because of its centre-tapping in its primary winding renders the use of an extra intermediary transformer unnecessary when employed in conjunction with a pull-push amplifier.

"Furthermore, in view of this transformer, the loud speaker can be used direct in the anode circuit of the output valve in any type of set, or with a choke condenser output filter, a provision which makes for safety as well as contributing to general efficiency.

"The D.C. model incorporate all the features of the A.C. model with the exception of the rectifying unit. An adequate smoothing device copes with the mains input in such a way that a remarkable background silence is secured.

"Like the A.C. Model, an input transformer forms an integral part of the unit, thereby offering just the same facilities for connection. Ample safeguards are employed, so that it can be connected with impunity on any mains within a 200/260-volt range. Its sensitivity and quality of volume are a revelation.

"One of the fundamental factors in the successful performance of a moving-coil loud speaker is the inclusion of a baffle. While both the Gecophone moving-coil loud speakers dealt with above are available in chassis form only, and therefore require the provision of a baffle for full efficiency, they can also be obtained mounted in a baffle.

"The baffle adopted as a standard is a singularly attractive one in the shape of a small easel. The loud-speaker chassis is firmly affixed to this in such a way that there is no undue tension at the point of amalgamation, and no possibility of the centre pole-piece in the magnet pot failing to maintain its essential right angle to the face of the diaphragm frame."

So, as you can see, this G.E.C. product is very far from being a haphazard design. And as you also will have gathered it does not work as such. Actually its results are very fine. Its sensitivity is of an exceptionally high character, indeed, I think it is by far the most sensitive moving-coil speaker I have ever come across.

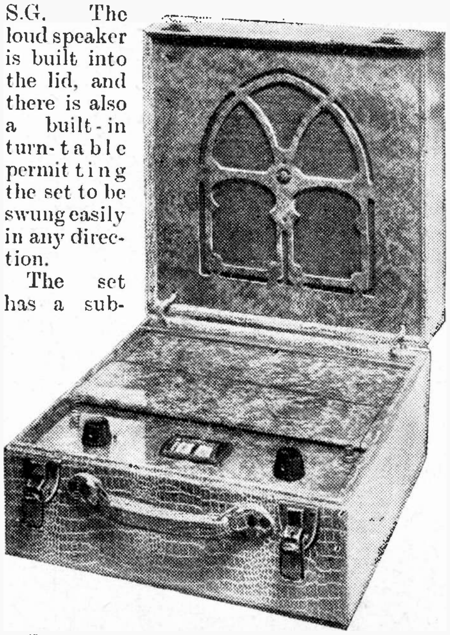
It is more sensitive than the average cone speaker, so you will agree that in this respect it is rather wonderful.

And it gives you full bass together with a brilliant upper register. It can be successfully operated with quite an ordinary kind of set, such as a Det. 2 L.F. three.

I think it deserves 100 points out of 100 for its all-round efficiency as judged by present-day standards, which are a lot superior to those of only a year or two ago.

BURNDEPT PORTABLE SET.

We have had an opportunity of testing the Burndept Super Screened Portable Set. This receiver employs four valves, one of which is an S.G. The loud speaker is built into the lid, and there is also a built-in turn-table permitting the set to be swung easily in any direction.



The Burndept super-screened portable receiver.

The set has a substantial and handsome leather case with a walnut finish. Wavechange is available with one simple switch.

It is not an unduly heavy outfit, more particularly when it is remembered that, unlike some portables which have been offered to the public, it has an adequate battery equipment.

The results it gives are well above the average. The quality of reproduction compares favourably with that of any set of any type, and it is completely stable in operation.

There is not the slightest tendency towards instability on either wave-band and this, in a portable having an out-of-the-ordinary degree of sensitivity, is quite surprising. The controls are perfectly straightforward and are simple in character and pleasant to handle.

Station-searching is facilitated by the provision of accessible and smooth-running controls.

On test we had no difficulty whatever in locating half a dozen stations in daylight, and these were received at full loud-speaker strength. At night, of course, the range of the instrument is considerably extended.

Should an even greater number of distant stations be required, aerial and earth terminals are provided so that an extraordinary antenna can be used.

The Burndept Super Screened Portable, complete with valves and including royalties, costs £23 10s. in either a walnut or mahogany finish.

When you are Buying—

23.—A MILLIAMMETER.

A milliammeter should have a low resistance—the lower the better. Some of the cheap ones have higher resistances than is advisable for such instruments if they are to be used for checking anode currents in valve sets.

Always see that the scale adequately covers the ranges you are likely to work over—but don't have too great a margin or your readings will tend to be less easily readable.

If you want to deal with currents up to 20 milliamperes a meter reading to 25 would prove quite suitable.

Many of the remarks made in regard to voltmeters last week also apply to milliammeters.

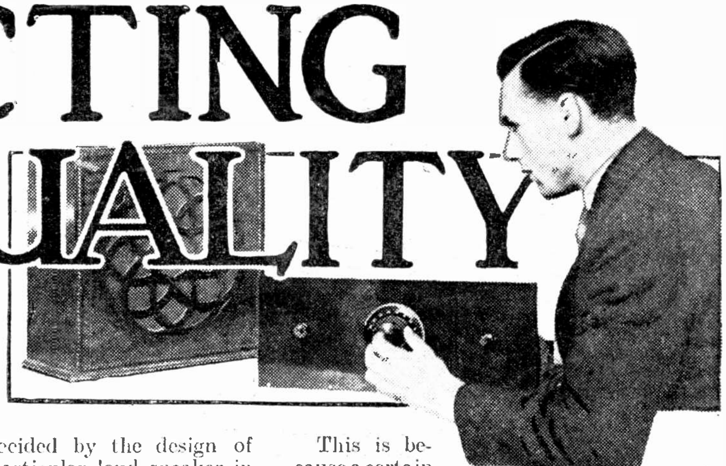
Multi-range meters are quite satisfactory propositions providing they are of reputable make. There is no reason at all why a meter should not show you several ranges, for it is merely a matter of resistance shunts—there is no mechanical "wangle" about it. Of course, the shunts must be accurately arranged.

A GRID-LEAK HOLDER.

A neat device which will doubtless find its way into the gadget boxes of many constructors is the new Burne-Jones grid-leak holder. It is a very simple but very useful little article.

There are two clips, which will accommodate any ordinary grid leak easily and securely, and two terminals fixed on a bakelite base drilled for baseboard mounting. The article is completely satisfactory, and costs only 6d.

CORRECTING YOUR QUALITY



Some practical hints on overcoming those little faults in the set which prevent you from getting the best results from your loud speaker.

By A. S. CLARK.

No matter how good your loud speaker—no matter how large your aerial—no matter how many valves you have—and no matter how superior your set is, unless it is being worked properly you cannot even hope to get passable quality! You can go on tuning-in all night, or adjusting your loud speaker for hours on end, and avail yourself nothing.

The Bullphone "Nightingale" Unit.

It is a great pity that sets capable of giving good quality should be allowed to go on pouring out "noise": because the adjustments necessary to correct the quality are so easily carried out.

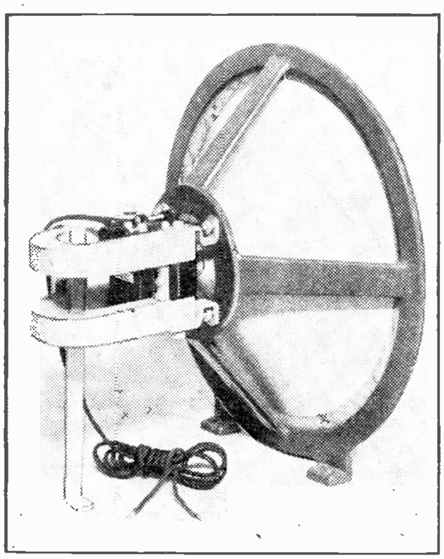
Avoid Overloading.

Strictly speaking an uneven overall response curve is distortion in itself, but this is not the distortion which gets on one's nerves. The shape of the response curve really only determines the tone or pitch of the results.

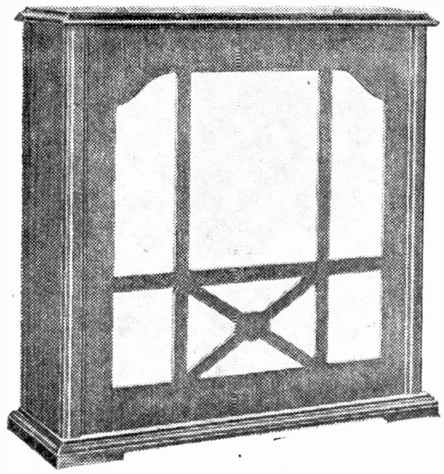
Also the question of what is the best pitch is a matter of personal opinion entirely. It is decided by the design of the set and the particular loud speaker in use.

The distortion we are really concerned with is of the "horrid" type, which produces tinny, screechy, boomy or rattly reproduction, and is generally caused by overloading, incorrect grid bias, or a poor H.T. supply.

Probably the first of these, namely overloading the last valve in the set, is the most common cause of bad quality. It is literally impossible to get good quality without a power valve of some sort in the last position (referring to working a loud-speaker, of course).



This is the N. & K. "Inductor."



The Type "K" Mullard Loud Speaker.

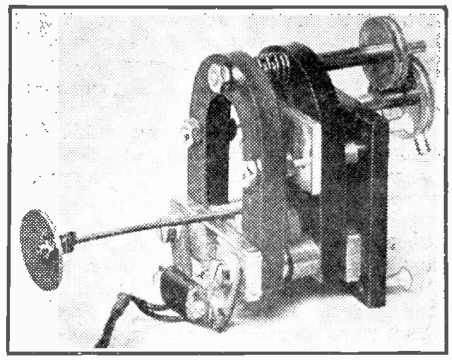
Yet in spite of this, many sets are working or trying to work a loud speaker, after an ordinary L.F. valve. Give your speaker a fair chance and use a power valve, and don't try to get more volume out of it than it can handle.

G.B. and H.T. Voltages.

You will find that most makers give a table with their power valves showing the correct values of grid bias for various H.T. voltages. The plate voltages given apply to the voltage at the plate of the valve, and not the actual voltage of the H.T. battery.

If, however, you are using an output choke of good quality these two voltages will be near enough the same. When your loud speaker is connected directly into the plate circuit of the last valve you should allow about 20 volts off the H.T. value before looking up the right grid bias voltage.

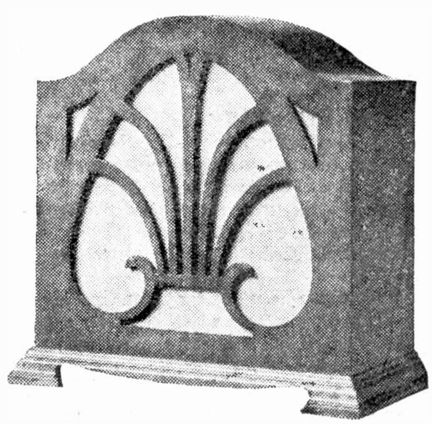
This is because a certain drop in voltage is bound to take place across the loud speaker winding. If you know the D.C. resistance of the speaker and the current being passed by the last valve you can of course work out the exact voltage drop by Ohm's Law.



The well-known Wates "Star" L.S. Unit.

When a dry battery is running down, its internal resistance goes up, and may produce L.F. instability by causing back-coupling between valves. Such instability does not always show up in the form of a howl or whistle. It may simply cause distortion to take place.

The way to prevent such battery coupling is by inserting decoupling resistances (with shunting condensers) in the H.T. leads. The detector H.T. supply lead is usually the most effective point.



This Falk Stadelmann Speaker employs a "Spider" diaphragm.

CAPT. ECKERSLEY'S QUERY CORNER

SHORT-WAVE STATIONS HEARD ON LONG-WAVES—SHALL I GET A HYDROMETER? — GRID-LEAK VALUES — A SHOCK FROM THE AERIAL.

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, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Short-Wave Stations Heard on Long-Waves.

W. S. (Cambridge).—" I am using a perfectly straightforward set consisting of a detector and two L.F. stages, the aerial circuit being of the tapped coil type. This receiver is quite selective and I have no difficulty in cutting out or separating the Brookmans Park transmission on the medium wave-band.

" When, however, I switch over to 5 X X, I find that the Regional transmitter at Brookmans Park tends to cause interference. I cannot understand this. What is the explanation ? "

" A straightforward circuit " consists in an inductance tuned by a condenser. On switching to long waves a new inductance (sixteen or more times the value of the medium wave range inductance) is switched into circuit.

An untuned inductance has an impedance which remains very much the same value over the range of frequencies as between say 200 and 500 metres wave-length. This constant impedance, as apart from a tuned circuit impedance, is enough to offer a high resistance to the passage of all high-frequency currents.

Thus the local Brookmans Park emissions of relatively high frequency simply pile up a voltage across the long-wave inductance regardless of the " tuning " effect by which we normally select programmes. A smaller inductance and a larger condenser to select 5 X X gets over the trouble, but in essence one wants to make the tuning effect apart from the fine impedance effect of the inductance predominant. Anything then for more *selectivity*.

Try a smaller inductance, try a weaker coupling or fine coupled circuit of H.F. tuned stages, all of which should cure the trouble.

* * *

Shall I Get a Hydrometer ?

T. R. (Birmingham).—" I have just bought a new accumulator, and I want to keep it in first-class condition. I have been told that the colour of the plates is an indication of the state of charge, and I have also been informed that a hydrometer is essential.

" Is it possible for me to tell from the colour of the plates exactly what condition the battery is in, or must I buy a hydrometer ?

It is practically impossible to tell the amount of charge in a battery by judging the colour of the plates. The colour of the plates is a general indication of the condition of the battery rather than a quantitative measure of its existing charge.

The hydrometer is an infallible method, as it measures a perfectly definite quantity. Buy a hydrometer, then, and see that the specific gravity of the acid is kept right relatively to charge and absolutely as regards evaporation.

If the specific gravity is changed absolutely through evaporation, always add distilled water. The relative specific gravity of the liquid gives a measure of the charge.

TRANSMITTER TECHNIQUE

This is a Marconi valve transmitter, which can be used for continuous wave work, or for I.C.W. Note the " all-in " simplicity as compared with earlier apparatus.

Grid-Leak Values.

B. N. M. (Hendon).—" I have a one-valve receiver, and I find that if I replace the 2-meg. grid leak with one having a value of 5 megs. I get much letter reception. Why should this higher value give me increased sensitivity ?

" I notice that in practically every published design the value of the grid leak is 2 megohms."

The grid-leak method of detection depends upon the positive excursions of grid voltage collecting electrons (i.e. a negative charge) on the grid, which, since there is a high-resistance path to earth in the grid leak, take time to leak away and to produce a non-proportionate effect as between positive and negative grid excursions.

In other words the negative grid voltage excursions are ineffective in producing anode current and so give rectification by eliminating one half of the charges of the total H.F. grid voltage charge.

Obviously the greater the value of grid leak the more pronounced this effect. But what of linearity of response ?

As too high value of leak produces distortion, so it is always a balance between quantity and quality. The 2-meg. leak maybe is high enough for good quality; given other constants, the 5-meg. grid leak is more sensitive but does not give such good quality.

* * *

A Shock from the Aerial.

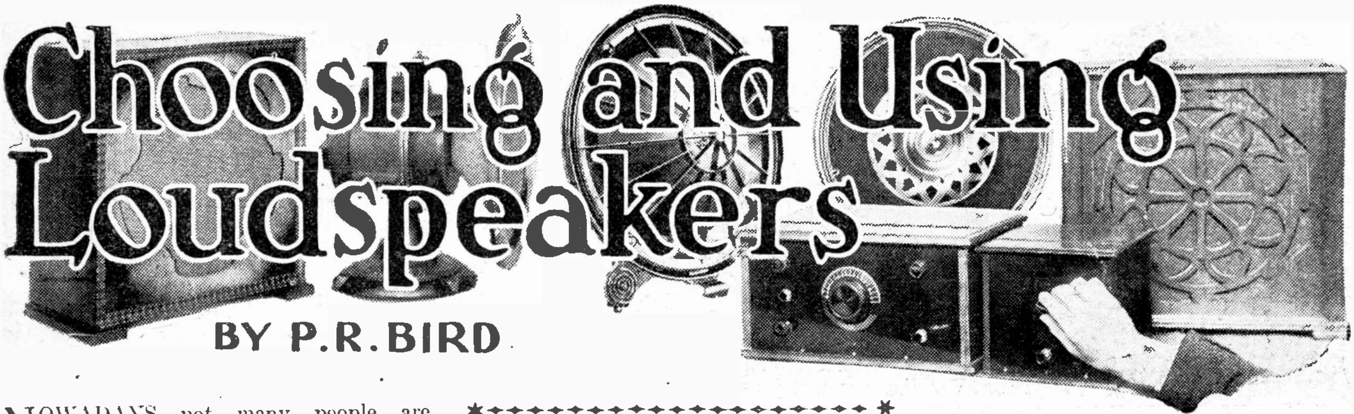
" Perplexed " (South Shields).—" Recently, fearing that my aerial might get struck by lightning, I disconnected this during a storm. Later on, after the storm had ceased, I attempted to connect this to the set, and received a violent shock. Why did I get this shock ? "

You got this shock because the aerial got charged up as an insulated conductor. The celebrated Franklin (the first one, not " C. M.," who designed the beam station transmitters) flew a kite on a conducting wire and he insulated the wire from earth and drew considerable sparks from his kite-carried conductor.

As you go up and up into the air the electric potential of earth increases with increasing height. In a thunderstorm this potential increases more rapidly than when the electric state of the atmosphere is more stable.

So if you put a wire into the air it collects a charge, and this charge, since the wire is a conductor, spreads itself evenly over the wire. But when you, an earthed body, touch the wire, the charge passes in you to earth and you give a jump !

Moral, if, as you should, you disconnect your aerial during a thunderstorm, earth it as well. Use a switch which in the off position earths the aerial; in the " on " position connects the aerial to the set.

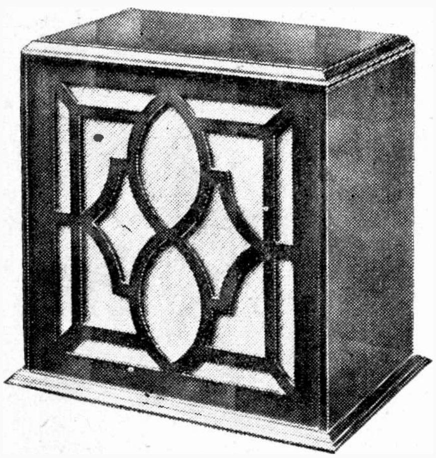


Choosing and Using Loudspeakers

BY P. R. BIRD

A practical talk about the various types, the ways in which they work, and the methods of getting best results.

NOWADAYS not many people are hardy enough to buy a loud speaker by its appearance alone, or on the strength of what the first salesman says about it. Usually a few enquiries are made among friends, but the results from this method are apt to be rather puzzling.



The "Marconiphone Moving Coil," which can be obtained for A.C. or D.C. mains drive, or for battery operation.

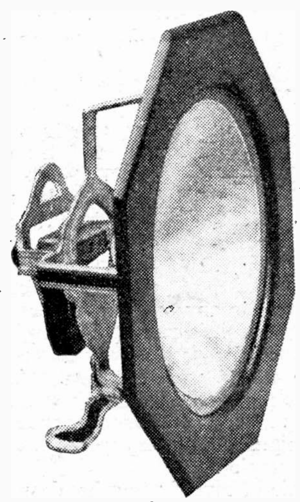
You find that different people have different ideas, the only similarity being that each considers his own fundamentally right and everyone else's idea fundamentally wrong. You speak to Jones for instance, and you find that he is superbly certain.

Other People's Ideas.

"I've got a so-and-so," he says. "It's simply wonderful! You ought to get one. You ought to hear mine. You ought to come round and listen to it."

You do, and very likely you wish you had not! Jones may be a good fellow—but his idea of music is not your idea of it.

Or perhaps you speak to Smith—a quiet, knowing chap in whose radio judgment you have faith. But Smith—himself a quiet man—likes a really *loud* speaker.



This Squire aluminium cone cradle for use with any standard unit retails at 15/-.

You do not have to go to his house to hear it, you can listen to it in the road. The power is phenomenal and the likeness to a band unmistakable.

You could hear the drums, you could hear the flutes, but your ear drums ached for days! And when Smith tells you how much it costs him for that outfit you shake your head and sadly fade away. (Wonderful it certainly was, and probably worth its cost, but *where's the money to come from?*)

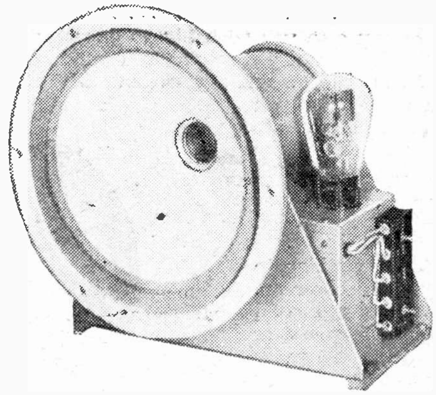
So you try again and this time you ask the acknowledged local radio expert. You immediately release a flood! He'll talk to you earnestly about a falling characteristic, and he will carry on about cut-off for hours. From him you will hear all about peaking and middle-range-resonance, and you will come away from him with thousands of technical terms ringing in your ears and dull despair in your heart.

Then you call on a dealer. He reverses the whole business once again. He shows you this, he shows you that, he shows you the other. Sometimes you get a world of help from him. Sometimes you don't.

Get it Demonstrated.

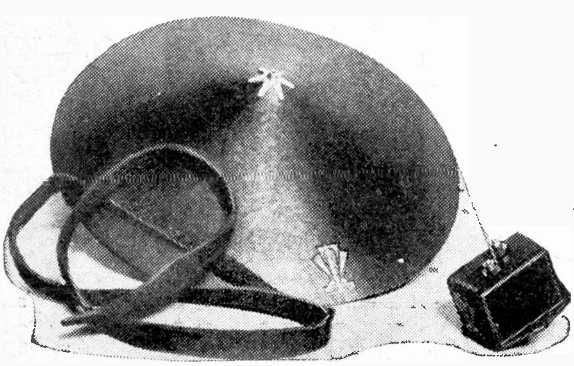
Sometimes you get the impression that he does not care a hang what he sells you, so long as he does sell it. While on the other hand he may be an obliging and efficient salesman who will willingly demonstrate any model in which you are interested.

(Continued on next page.)

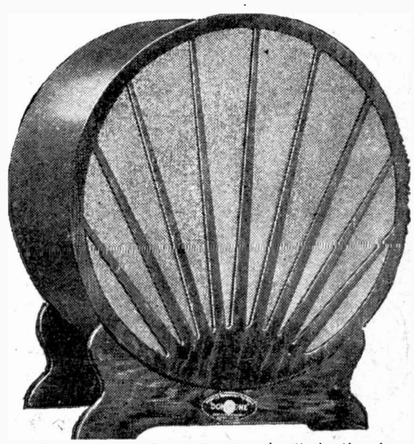


This Gecophone Moving Coil Speaker is for use with A.C. mains, the valve shown being the necessary rectifier.

READY TO BUILD YOUR OWN.

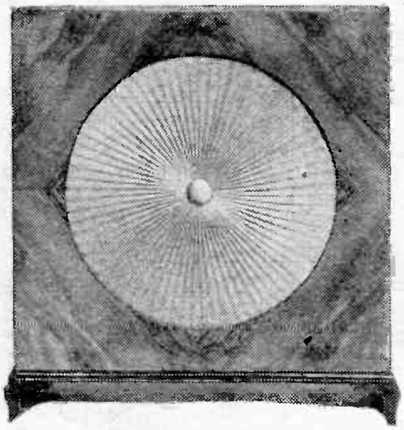


Here are the parts for the Six-Sixty Cone Assembly.



The Donotone Loud Speaker is distinctive in both principle and appearance.

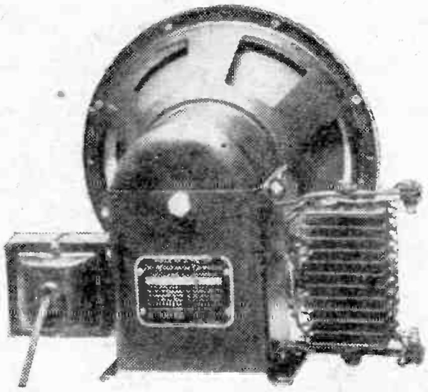
LET "P.W." HELP YOU T



This attractively-finished instrument is the Loewe Cone Type Loud Speaker.

In any case you probably go home and think it all over, you recall all the prons and cons, balance for and against, and after all your trouble you find that you are very much in the position from which you started. So what are you going to do now ?

The first thing to do is to cheer up. The sure and solid truth of the matter is this. There is an enormous variety of loud speakers from which to choose, every type has its own enthusiastic adherents, and nearly every enthusiast believes so firmly in his own favourite that he cannot help thinking that all the others are poor in comparison.



The dry rectifier shown attached to the framework is used in this A.C. version of the "Magnavox" X-core Moving-Coil instrument.

The Search for Perfection.

Actually and as a matter of technical interest there is no really *perfect* loud speaker at all. That does not matter very much because not one person in five thousand could recognise perfection if they heard it !

The point to remember is that the modern loud speaker is a very good instrument indeed. There are several different types, and these types have their different advantages and limitations. From the point of view of programme-enjoyment they have one thing in common—they are all good !

All this talk about the excellence of one type of loud speaker, or the still greater excellence of another type, is a sure proof of one fact—a proof that there is a steady search for perfection. There is a keen desire for realistic reproduction. There is an enormous and very critical audience concentrating upon every different detail of the loud speaker's performance.

Unwanted Resonances.

The fact that we are still progressing and finality has not been reached should not blind us from seeing that we have gone a very long way in our quest for quality. Let us see where the modern loud speaker, which you can buy at the shop round the corner, really stands when compared with its predecessor.

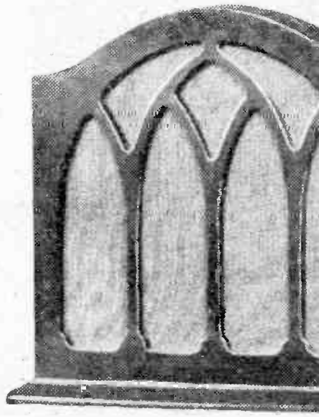
The loud speaker of a few years ago was simply a glorified telephone earpiece. There is no necessity for me to enter into the action of it here, as this has often been dealt with in articles in "P.W.," and in any case most readers will have an idea of the action of the diaphragm.

In the earlier types very pronounced resonance effects were common. That is to say, the peculiarities of its construction tended to make the loud speaker exaggerate certain frequencies at the expense of certain other frequencies.

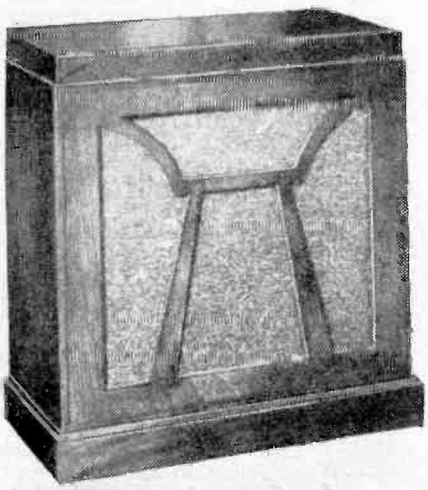
Incapable of reproducing the deep notes of the organ or the boom of drums, nevertheless these old-fashioned small-horn loud speakers were sometimes very good when reproducing speech, and their sensitivity was frequently phenomenal.

Experiments with the size and shape of the horn of loud speakers soon began, and are still going on, but public attention was largely directed away from these by the advent of the cone speaker. Breaking right away from the older type, this class of loud speaker uses a large conical diaphragm, driven by a unit to which it is joined by a short driving rod. The prospective purchaser will find many points of real interest in this class of instrument.

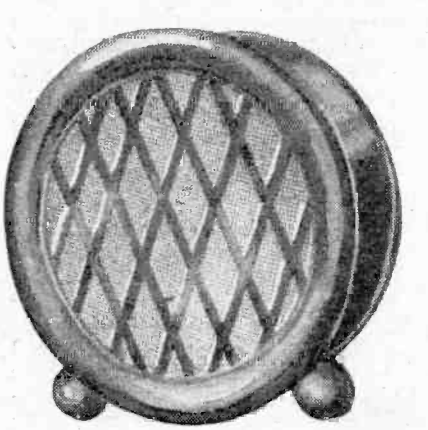
A great deal of attention has been paid to the driving unit itself and every detail of its action has been overhauled with a view to improvement. For instance, the air gap between the armature and

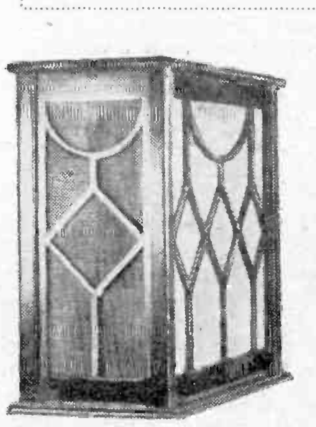


Of the five loud speakers in the c
diaphragm speaker, made by Mo
model, standing beside it, is an



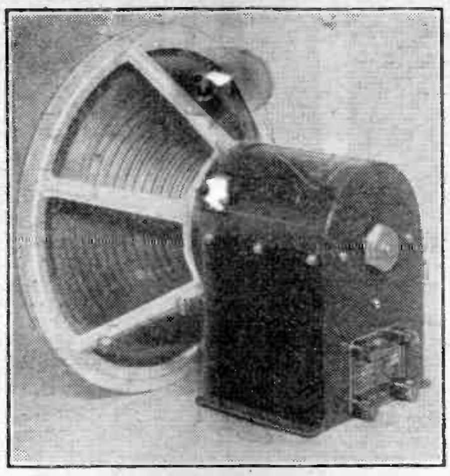
The famous Lissen Moving-Coil Speaker is available in both permanent magnet and electro-magnetic types, or without this handsome cabinet if cost is a first consideration.





—WHATEVER YOUR NE

O CHOOSE YOUR NEW LOUD SPEAKER—



Above is an up-to-date D.C. version of the B.T.H. "R.K.," forerunner of all the moving-coil loud speakers. Below (to the left) is shown a Burndept Cabinet Cone (price £2 10s. in oak or mahogany). Beside it is the Ferranti D.C. chassis, of which Cabinet and Pedestal models are obtainable.

the magnet, across which the magnetic action takes place, early came in for attention.

The methods of applying the magnetic force across this were greatly improved by the "balanced armature," and not only was the sensitivity of the instrument increased but its evenness of response and ability to reproduce different musical frequencies without showing marked preferences for certain notes on the audibility scale were greatly enhanced.

Cone and Coil.

Side by side with these improvements in the magnetic action many other equally important improvements were being effected. A very wide variety of materials has been experimented with in the search for the perfect cone diaphragm, and all sorts of likely and unlikely substances have shared popular favour at different times.

A stiffened paper or "cardboard" foundation is still commonly used, and among other substances adopted have been various skins, parchment, doped linen and so forth.

Development along these lines was in itself sufficiently promising when the whole situation was once again altered fundamentally by the arrival of another type altogether—the moving-coil loud speaker. Using a large conical diaphragm similar to that of the ordinary cone loud speaker, its principle of action is entirely different from that of the other types.

The result is that there are now in common use three different main types of loud speaker—viz. those in which a horn is employed; those in which a large diaphragm is driven by an electro-magnetic L.S. unit; and those in which the driving force is a moving coil.

In the latter type of speaker no sensitively-trembling armature is used, but affixed to the centre of the diaphragm is a light coil of fine wire, through which the set's output is passed. The coil, centred on the diaphragm, is placed in an intensely powerful magnetic field, and every variation of current through it causes it to alter its position. It thus moves the diaphragm to and fro in accordance with the received currents.

A New Departure.

There were some very remarkable differences between this and the preceding methods of reproduction. One outstanding fact was that the moving coil itself was its own driving and restoring force, not dependent on springs and similar resonance-producing mechanism. Another feature of great importance was its robust construction and generous size, allowing it to handle enormous volume.

Long Life.

So much for the main characteristics of the types at present on the market. How do these fundamental differences affect the purchaser?

"How long will it last?" is one question that crops up immediately, and in this respect all modern loud speakers are really satisfactory. Used properly they will "carry on" year after year—in fact, most disused loud speakers have been "improved away," supplanted by better instruments, long before they were worn out. A silent

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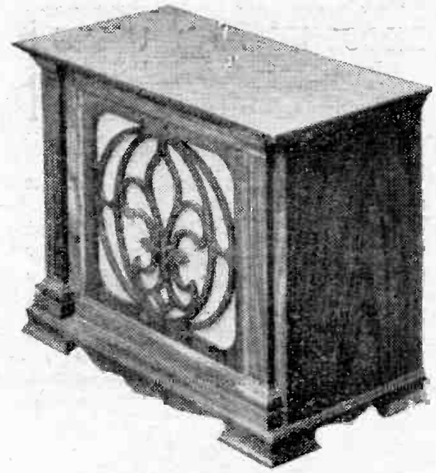
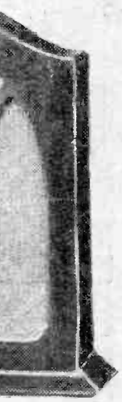
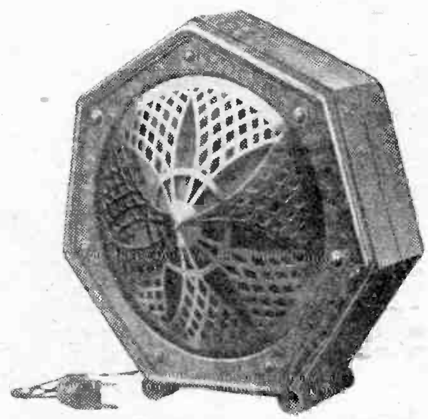


This attractive Kolster Brandes model employs a balanced armature.

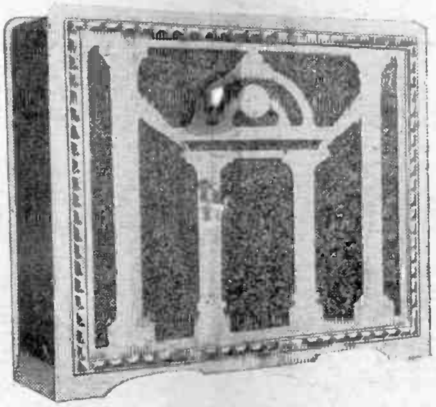


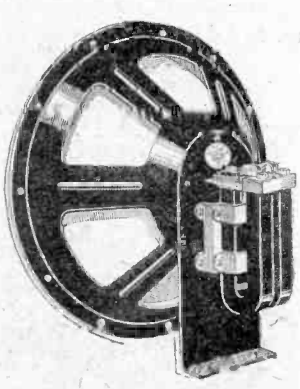
Look at the Wonderful Variety of Modern Loud Speakers now Available!

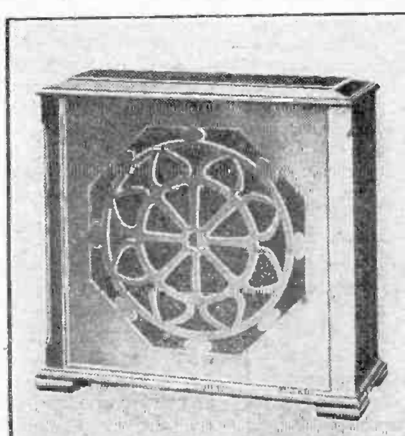


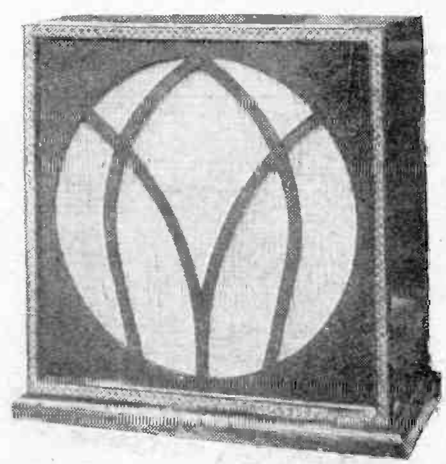
This Philips Loud Speaker is fitted in a moulded bakelite cabinet, and an ingenious lead-switch gives three different impedance values.

entre below, the first is a Triotron, employing a balanced-armature unit. Next comes a linen-
ores. of Liverpool, and in the centre is one of the Ultra Electric Ltd. models. The chassis
"Undy" product, and last of the centre five is the famous Z20, made by Celestion, Ltd.









Above is the Amplion Standard Cabinet-Cone, which employs a sensitive balanced-armature unit. It can be obtained in oak, mahogany, or walnut, and alternative values of impedance are available.

EDS THERE IS ONE MADE TO SUIT *YOU!*

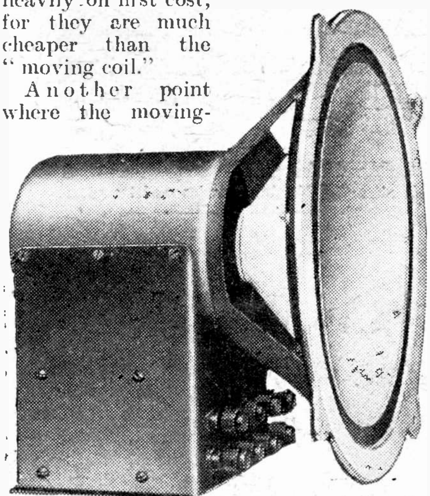
CHOOSING AND USING LOUD SPEAKERS.

(*Continued from previous page.*)

tribute to the great progress made in the last few years!

Assuming long life for all types, what about first cost, running cost, and quality of service rendered? Cone types score heavily on first cost, for they are much cheaper than the "moving coil."

Another point where the moving-coil loud speaker compares unfavourably is in running cost. The "cone," once purchased, has merely to be fed from the set's loud-speaker terminals, and will go on giving splendid service without further expense. The "moving coil" needs "feeding."



Bakers, of Selhurst, Croydon, are the makers of this moving-coil, which, like all such assemblies, is used in conjunction with a baffle-board or cabinet.

(It is true that some moving-coil speakers *do* get their field-magnetism from permanent magnets, and so, like the cone types, have no running costs. But the mains-driven or the battery-fed types are far more commonly used.)

Comparative Costs.

If you have electric light in the house you can drive a moving-coil speaker from the mains and hardly notice its upkeep cost, for the power consumption is quite low, and is usually less than that of an ordinary lamp. With D.C. mains the field winding simply goes straight across the mains, but with A.C. mains some form of rectifier is needed, and this usually puts up the first cost of the instrument.

As an alternative to driving from the mains there is the moving-coil speaker that is battery-driven, a very large 6-volt accumulator being commonly employed for the purpose. This battery, of course, has to be recharged, so the method has no advantage in running cost as compared with the direct-mains-driven type.

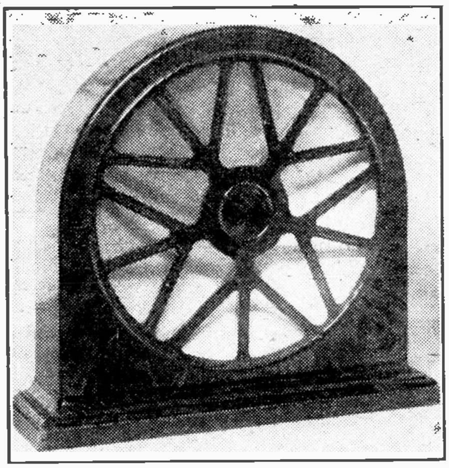
Apart from this question of running cost, there is quality.

How does the moving-coil *quality* compare with the "cone"?

Theoretically the "moving coil" should be better, and most people having heard a good M.C. speaker operating properly will claim that for quality it stands supreme. (Nevertheless not *all* M.C. speakers can beat *all* the cone types, and personally I would much prefer a good "cone" to a poor "moving coil.")

The Question of Quality.

This question of quality is one on which many rash statements have been made. You will sometimes hear it said that moving coils are too "boomy"; but whilst this was true of earlier models, it certainly is not an inherent fault in later types, which are marvellously bright and crisp in their rendering of "the top stuff."

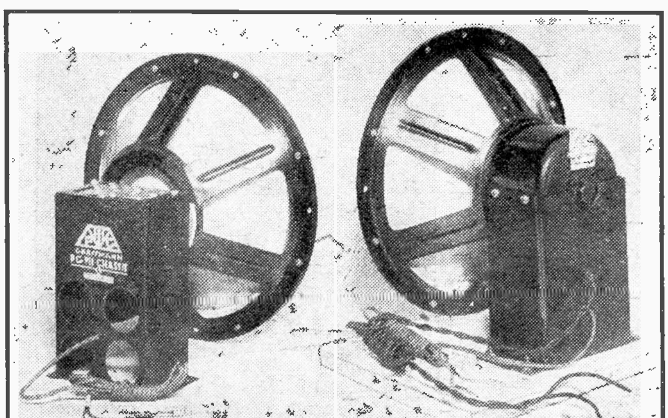


In this Whiteley Boneham instrument the cone is placed behind the driving unit.

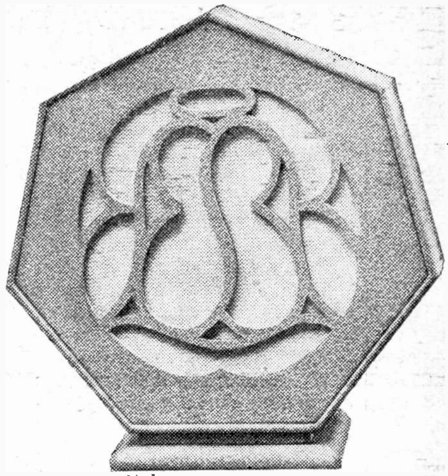
In general, if you can afford a good price for a loud speaker, it will pay you to do so, but the questions of cost are too involved to dogmatise over. If you fancy one of the "moving coils," don't forget to ascertain its running costs. (These can be worked out accurately by the dealer.)

Remember, too, that your results will not depend for quality upon the loud speaker alone. That is merely one end of a chain, every link of which is important.

The set itself, the valves, the proper maintenance of the batteries—all these are important. And so also is the method of connecting the loud speaker to the set.



Two Rotor-Electric Models, that on the right being the "Peter Grassman" Moving-Coil.



This seven-sided speaker is the Edison-Bell Perfectone.

The ideal method (especially where several rooms are to be "wired" for radio reception, and where large volume is required) is to use an "output filter." This takes the form of a choke-condenser circuit or of an output transformer, and has many advantages.

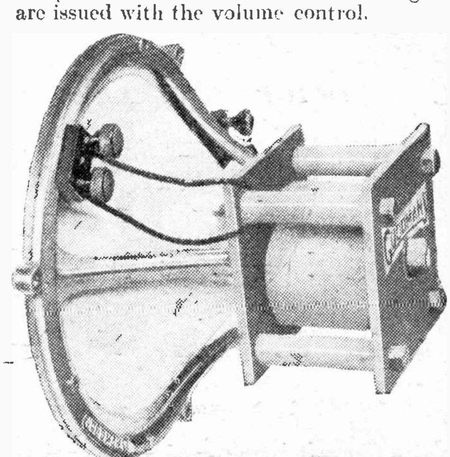
The more expensive moving-coil speakers not only contain their own "filters," but are recommended for use with certain valves, H.T. voltages, etc., and all such makers' hints should be studied beforehand. With less expensive speakers and less ambitious output requirements, the question of filters is less important, but it is always well worth considering.

Some Final Hints.

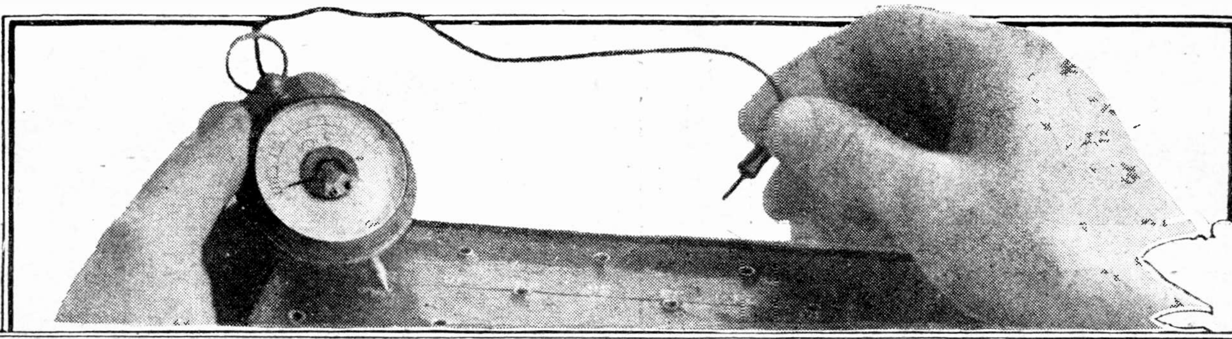
The leads to other rooms, etc., should be permanently wired, as trailing flex is very unsatisfactory. Where extensions are to be used a filter circuit becomes essential, for otherwise the extensions must be treated as "live" wiring and this is obviously inadvisable.

Standing near a bare wall, a loud speaker seems "brighter," and placed before a curtain it may lose a tendency to "ring" a little on certain notes, so be sure to find which position in the room seems to suit it best.

Another factor that makes a great deal of difference to the enjoyment obtainable from a loud speaker is the method of volume control. Gadgets for this are obtainable everywhere, and full details for fitting it are issued with the volume control.



The ends of the leads going to the moving coil are clearly shown in this Goodman M.C. Speaker.



CAN THE VOLTMETER LIE?

Invaluable as the voltmeter is to the experimenter, there are many little points about the use of it which are worth knowing and are clearly set forth below.

By R. W. HALLOWS, M.A.

THERE used to be a saying that the camera could not lie, which was more or less taken for granted until the first producer of faked photographs appeared with pictures showing all kinds of incredible subjects. So with the voltmeter.

Most of us are content to take it, so long as the instrument is of known accuracy, that the readings which it shows are correct. Actually it can lie as hard and as effectively as the camera!

Principle of a Voltmeter.

Let us see what electromagnetic voltmeters really do. Their action depends upon the basic fact that a magnetised needle suspended in the field of a coil is deflected in one direction or the other when current passes through the windings, the amount of the deflection depending upon the strength of the current.

This is the principle of the moving-iron voltmeter; the moving-coil voltmeter is a development of it. Here we have a coil, carrying a pointer, suspended in the field of a permanent magnet. The coil moves, carrying the pointer with it, when current is passed into the windings.

Suppose that we take a milliammeter reading from 0 to 100 and place in series with it enough resistance to bring the total of the outside resistance *plus* that of the windings to 1,000 ohms. Then by Ohm's Law each volt will drive one milliampere through 1,000 ohms, and we can make a scale reading from 0 to 100 volts.

So far so good, but remember that for a full-scale deflection, or in other words a reading of 100 volts, a current of 100 milliamperes is necessary. This we should call a low-resistance voltmeter; its resistance is actually 10 ohms per volt.

High-Resistance Meter.

We can make a high-resistance instrument by taking a milliammeter reading from 0 to 1 milliampere and obtaining a total resistance of 100,000 ohms with it. Since 100 volts drive 1 milliampere through 100,000 ohms, the instrument can be calibrated to read from 0 to 100, only 1 milliampere being required for a full-scale deflection. Such an instrument is said to have a resistance of 1,000 ohms per volt.

Let us see how each of these instruments can lie when used to measure voltages in the wireless set. A high-tension battery with an original E.M.F. of 108 volts has been in use for some months.

We wonder whether it is still in good condition. We apply to it first of all the low-resistance voltmeter, and are rather surprised to find that the reading obtained is only 22 volts.

We are still more surprised when on using the high-resistance instrument we note a reading of 99 volts. Both instruments are known to be accurate. Clearly one has lied. Which is it?

The answer, strange as it may seem, is both! From the practical point of view, considering, that is, whether the battery is up to the work of supplying the plates of the valves, the low-resistance instrument has given the truer reading.

But it has not measured the real E.M.F. of the battery. Neither has the high-resistance instrument, for it is actually something rather higher than the 99 volts that it shows. "How the? Why the? What the?"

Exactly; it is very perplexing, is it not? When a dry-cell battery has been in use for some time, its internal resistance, which was at first not more than a small fraction of an ohm per cell, rises enormously.

Internal Resistance of Battery.

The E.M.F., when a battery is old, has to drive current through the considerable resistance not only of the voltmeter, but also of the battery itself. Hence with a battery that has seen much service, the low-resistance instrument gives a reading which is far below the real one.

If we were to short circuit an old battery through a milliammeter, we might find that it could not supply so much as 25 milliamperes.

As the receiving set will draw from 5 to 35 milliamperes in the ordinary way the low-resistance voltmeter does give us a fairly good indication of the fitness or otherwise of the battery to undertake the work in hand.

The high-resistance meter does not. Even when it is on its last legs the battery can provide the fraction of a milliampere needed for a big movement of the needle, and if we take a reading with the battery not under load we obtain a completely erroneous idea of its state.

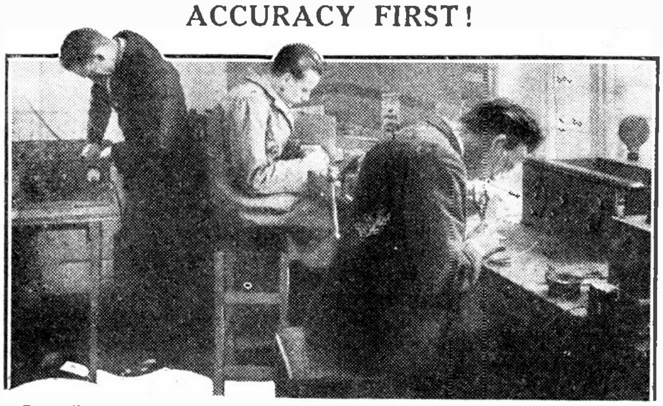
With what kind of filament voltage are the valves in the receiving set operating? Muggs pulls out one of them and connects the voltmeter across the low-tension terminals of its holder.

The Correct Method.

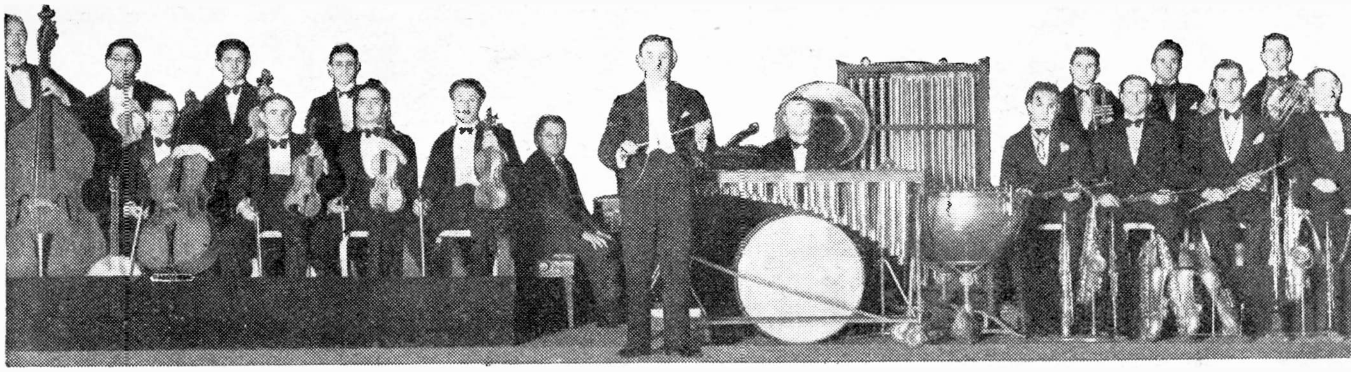
He is surprised to find first of all that though a good deal of resistance is in use the filament voltage is surprisingly high, and secondly that his manipulation of the rheostat produces only the tiniest changes in the voltmeter readings.

Has this rheostat broken down? Not a bit of it! Let Muggs replace the valve in its holder, keeping the voltmeter connected up, and he will find that the rheostat has a big effect. With the valve out of its holder the instrument lies; withthe valve in place it gives a fairly accurate reading.

ACCURACY FIRST!



Perfectly accurate measurements are the basis of all real research work. This illustration shows a section of the research laboratory in which the Robinson Stenode Radiostat was evolved.



IF I CONTROLLED THE B.B.C.

by CECILY COURTNEIDGE

THE hard, sane, practical man of affairs will tell you that day-dreaming is a waste of time. If that is the case, I must find some excuse for doing so in this article. And that is easy! Why, day-dreaming is one of the most important things in the world.

Wireless itself would not exist but for the day-dreams of Lodge, Marconi, and others. The whole of civilisation is founded upon the fantastic visions of primitive peoples. So that's that. Day-dreaming is henceforth permissible.

This popular artiste has some very revolutionary ideas about broadcasting, and we leave it to "P.W." readers to decide for themselves just how seriously she wants her remarks to be taken!

A Little "Supposing."

But let's do a little "supposing." Suppose that I controlled the B.B.C.! What should I do with it? How should I control it? What alterations would I make in the programmes? Or in and amongst the official machinery and workers of Savoy Hill? What would be my justification for controlling the B.B.C. at all?

That's also easy. The wireless programme is similar to a huge revue in that there is a little bit of everything, and each separate item must be good. And I am accustomed to revue. Although I know little or nothing of the inside working of the B.B.C., I flatter myself that I know something about my own sphere of action.

So I think that I should endeavour to run all the weekly programmes on the lines of a tremendous and comprehensive revue. Everything would be worth while, everything would suit somebody, each separate item would be an integral part of the whole.

You may say that that is how the B.B.C. is forming its programmes to-day. Too true! Perhaps my day-dreams are a little too close to reality. So let's go farther afield and suggest improvements and alterations that have never been thought of or carried out before.

The First Step.

First, then, I would make it compulsory for the Press to publish in series above the printed broadcast programmes, the photographs of the announcers.

In this way, the languishing heart of a maiden in Oswaldtwistle would be satisfied, and the said maiden might even wonder why she had ever loved the announcer's "golden voice" at all, and would go straight away to marry that nice young man who takes her to the pictures.

For similar reasons, I would make marriage compulsory for Jack Payne, who is too eligible a bachelor to sing such stirring love ditties into the microphone night after night. Should he dare to defy me and refuse to marry, an equally good solution would soon present itself.

I should marshal all his listeners, and compel them to sing the songs to him until the padding in the studio became necessary for more reasons than one.

DIRECTOR GENERAL?

Miss Cecily Courtneidge, the famous radio and revue artiste, who is scoring such a tremendous success in "The House That Jack Built," at the Winter Garden, says she would run broadcasting as a "tremendous and comprehensive revue" if she controlled it.

The wireless licence would next present itself to me for amendment, and I think that I should either halve its cost, or abolish it entirely. The deficit could be made up by a small tax on all tremulous tenors and wobbling sopranos, and a very large tax indeed on comedians who failed to be funny.

Listeners also could be reformed. The writers of letters of complaint would each receive six months hard labour in the studios—this would easily wipe out my salary list!—and all others would be forced to say what they really thought of the programmes.

In this way I should learn what the public really wanted. But perhaps these frightful schemes would be a little too revolutionary. We should soon have no listening public whatever.

Seriously, though, what reforms could be carried out by the B.B.C.? At one time, the charge of too much "sameness" in the programmes and failure to suit all tastes could easily be levelled, but with the new scheme of alternative programmes, all programme reforms go by the board.

There will be something to suit everyone part of the time. And who wants to listen-in all the time, anyway? Only those who are sick or bed-ridden, and such listeners, curiously enough, are the last to complain. On the contrary, they usually praise the programmes and seem to think them of superlative excellence. No, any reforms I make at Savoy Hill must be on the administrative side.

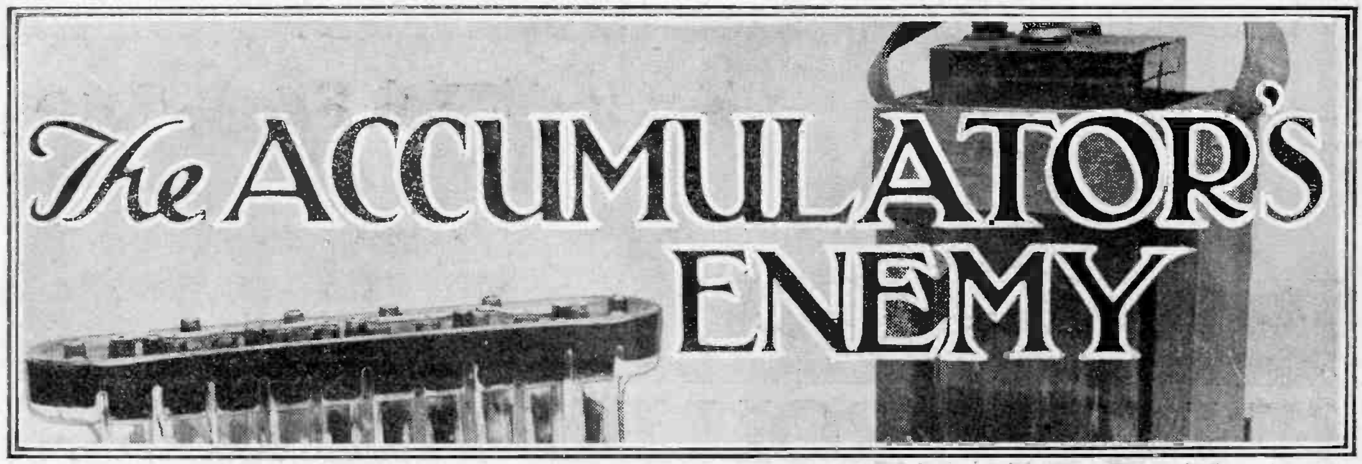
An Official Act.

For some time there have been movements afoot for providing the blind and bedridden with sets and licences. I should make this an official act. A doctor's certificate would be sufficient in either case for me to order licence-free sets to be sent and installed.

Also, I would see that the B.B.C. did more than transmit programmes; I would institute a special department that would attend to the reception side as well. It is obviously absurd to try to make wireless transmission more and more perfect when the receiving set still remains at fault.

It is true that some manufacturers give an "After care" service, but I would do more. B.B.C. engineers would ensure that listeners obtained the fullest possible enjoyment and service out of their sets by visiting their homes and examining the apparatus.

(Continued on page 531.)



In spite of the fact that the modern accumulator has been enormously improved it still requires fairly careful looking after if it is to remain in first-rate working order. In this article the dreaded "sulphate" is dealt with.

By J. F. CORRIGAN, M.Sc., A.I.C.

As every amateur of experience knows, sulphating is the great bugbear of all accumulator work. Even the best cell will succumb to the insidious attacks of the lead sulphate enemy if it is carelessly used for any length of time, whilst cheap and inefficient accumulators are quickly rendered more or less totally inactive by it.

DON'T LET YOUR BATTERY GO LIKE THIS!

The appearance of a sulphated positive accumulator plate.

Yet, surprising as it may seem, lead sulphate, which is so often the cause of an accumulator's ruin, is absolutely essential to the normal working of the cell. When an accumulator is properly discharged, both the spongy lead on the negative plate and the lead peroxide on the positive plate are converted into lead sulphate: but, during the subsequent re-charging of the cell, the latter substance is reconverted into spongy lead and lead peroxide on the negative and positive plates respectively.

Two Forms of Sulphate.

There is a great deal of difference, however, between the lead sulphate which is formed during the normal course of chemical actions taking place within the accumulator, and the lead sulphate which appears as a patchy white mass on the plates when the cell has been improperly used.

The former substance (which is generally termed the "normal" lead sulphate) is not a simple lead sulphate at all. In reality, it has a complex composition, consisting of true lead sulphate chemically combined with sulphuric acid, and, owing to this fact, it is less stable than ordinary lead sulphate; it is readily changed back again into spongy lead and lead peroxide during the normal process of re-charging the cell. It is the presence of this convertible form of lead sulphate which imparts the greyish-whiteness to the plates of an accumulator when it is nearing its run-down condition.

Over Discharging.

When, however, an accumulator is discharged too much, or when it is allowed to remain for any great length of time in a normally discharged condition, a portion of the convertible lead sulphate changes into true lead sulphate. This process goes on at both plates, but more particularly at the positive plate of the cell.

At first the change from the convertible form of lead sulphate to the ordinary form of that substance does not proceed evenly all over the plates. Therefore, the pure white masses of ordinary lead sulphate appear on the plates in patches, which "grow" until eventually they cover the plates entirely.

Many samples of ordinary water contain iron and sulphates as impurities. These, too, set up little chemical actions in the cells when an accumulator becomes "sulphated."

Thus it will be seen that the manufacturers' exhortation to use only the purest acid, together with distilled water, is no fad, for the employment of such materials are vitally necessary to the continued health of the accumulator.

Simple Explanation.

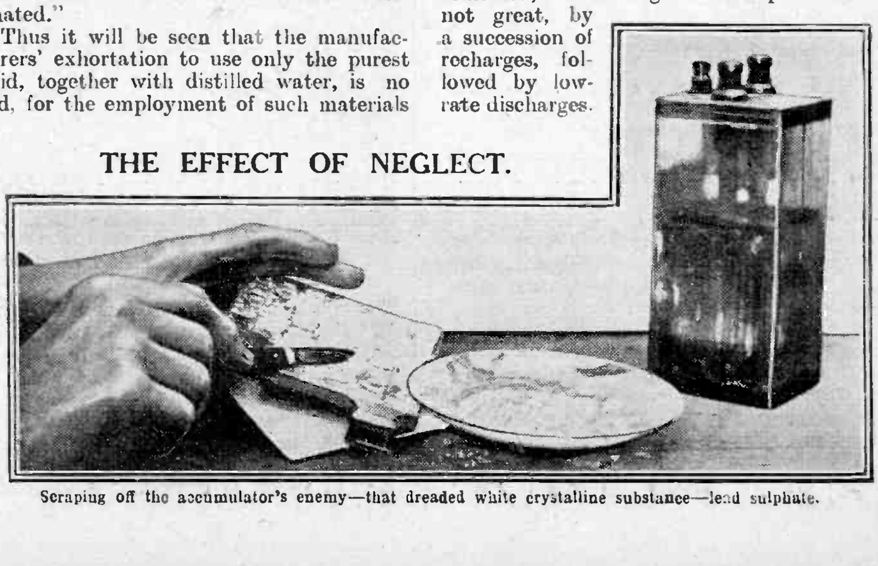
You may, perhaps, ask why the formation of insoluble lead sulphate ruins an accumulator. The explanation, however, is very simple. For one thing, the insoluble form of lead sulphate is *not* reconvertible into spongy lead or lead peroxide as is the normally-formed complex sulphate.

Hence, the insoluble sulphate, by covering up the active material of the accumulator plates, more or less completely prevents the necessary interchange of the latter substance during the discharging and recharging of the cell. Insoluble lead sulphate is a slight conductor. Hence, leakages and short-circuits are liable to occur between the plates of a sulphated cell. Finally, the formation of insoluble sulphate causes the material of the plates to shred and flake away.

Curing Slight Sulphation.

A badly sulphated accumulator is fit only for the scrap heap. Slight and medium cases can generally be cured either by removing the plates and immersing them in an ammonium acetate solution in order to dissolve away the sulphate, or else by emptying out the acid from the cell, and filling up with ammonium acetate solution, and so dissolving out the sulphate. Or, on the other hand, such accumulators may be remedied, if the degree of sulphation is not great, by a succession of recharges, followed by low-rate discharges.

THE EFFECT OF NEGLECT.



Scraping off the accumulator's enemy—that dreaded white crystalline substance—lead sulphate.

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

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

QUESTIONS AND ANSWERS.

CONE QUALITY THAT "FELL OFF."

F. J. L. (Sheerness, Kent).—"Using a —— cone loud speaker, I got such beautiful tone and quality that I decided I would put the whole affair into a bigger and better cabinet (my job is cabinet-making), and, knowing nothing about the wireless part of it, I was careful to shift it en bloc, simply building the new cabinet round the old one.

"At first it went fine, but somehow it seemed to fall off later, and all the 'truth' and sharpness went from the music and speech. Looking for the cause of this, I could see nothing wrong except one screw a bit loose, and that seemed to be a 'fixer' and nothing to do with the working parts. I tightened it, but no better.

"Please give me advice as to how to find the cause? I am tempted to put it back again into its old position but for the fact that at first it *did* work well in the new. Why should it go off like this? (I am enclosing sketch showing position of screw that was loose.)"

Your little sketch has solved the mystery for it indicates that the entire loud-speaker unit is held in position by this loosened screw. When the screw became loose the unit moved slightly on its frame, and though you have now tightened the screw matters are not improved because the unit is not placed "square" with the cone.

What you must do is to undo that screw again and find the old setting (or position) of the unit relative to the cone. Probably when the screw got loose the unit *dropped* a little, so try raising it a little higher than its present setting, at the same time looking carefully to see if it appears out of line to the right or left.

If the cone has a soft material (such as "kid") for a surrounding support, see that this "sets" evenly and is not strained to one side or the other.

By using care you could try it whilst signals are coming through quite safely, the essential part of the test being *slight* movements of the unit on its support to find the position in which it drives the cone squarely to and fro, without any side-pressure.

When satisfied with the position, tighten up the screw and the job is done.

THE L.S. ADJUSTING SCREW.

"CONE" (Buntingford).—"What does the adjusting screw on a cone loud speaker actually do? I have been surprised to find how much depends on getting this adjustment 'just right' for volume and tone."

The adjusting screw enables the position of the permanent magnets to be varied relative to the armature that is actuated by them.

Normally, the armature is still, but when current "strengthens" the magnet the armature is attracted, thus pulling the diaphagm to which it is attached by the driving rod. The closer the magnet is to the armature the greater the pull for a given current.

But if the armature is too close it will touch the magnets when a loud signal comes along, and this causes a most unpleasant rattle.

The best way to set the speaker is to listen carefully whilst slowly adjusting, and bring the strength up and up till the magnet touches, immediately slackening off just a little to give the necessary clearance but retaining as much of the volume as possible.

IMPROVING SELECTIVITY.

K. T. (Falmouth).—"I am holidaymaking and touring in this district with a couple of friends and to liven up evenings I brought my 'Magic' Three along. It goes splendidly here; in fact, I get so many extra foreigners now that Daventry (5 G B) doesn't 'butt in,' that I should like to get better selectivity when I return home.

"I had been told before that my 'Magic' was not as sharp-tuned as others of exactly the same kind. Is it likely to be the fault of the set, or of something in the position, or what?"

Your selectivity may be affected by several factors the chief of which are outlined below:

First of all, there is the question of coils. Cheap and inefficient coils are one of the most fruitful causes of poor selectivity. They are really very false economy, if your conditions are such as to require a high degree of selectivity. The really good ones, such as the Lissen, Lewcos, etc., are well worth while and have a great influence on the general efficiency of your receiver.

The cause of poor selectivity with a "Magic" set is sometimes to be found in the coil holders. There are a certain number of specimens on the market made of very low-grade moulded material which introduce very considerable H.F. losses into the circuit.

These, we have found, are definitely quite capable of reducing the overall selectivity very considerably, and a little care should be exercised here. See that your coil sockets are of really good quality and by some reputable maker, and then you can dismiss this particular detail.

The aerial and earth are also very potent factors in deciding the degree of selectivity which you will obtain, and it cannot be emphasised too much that a very large aerial is really a hopeless proposition under modern conditions of crowded wavelengths. It is far better to use an aerial of only moderate size, and depend upon the great power and sensitivity of your "Magic" receiver to give you the range and volume you desire.

THE AERIAL AND EARTH.

Do not forget, too, that an inefficient aerial can spoil your selectivity just as effectively as a very large one, so if you have any cause to think that something is preventing you from getting the results you expect, take a look at your aerial and ask yourself whether its efficiency is being spoiled by being run too close to walls, iron fall pipes or gutters, and so on.

Above all, remember that it is a most undesirable practice to take your aerial lead-in for any very considerable distance indoors, particularly if that means taking it along walls, and on no account yield to the temptation to use twisted flex for the aerial and earth lead indoors. Always keep them well separated from one another, and if you use any form of earthing switch, be sure that it is satisfactory from the H.F. point of view.

A good earth is a pretty obvious requirement in the interests of selectivity and general efficiency, but nevertheless, it is a point which many people seem to forget. A poor, high-resistance earth, a long earth lead, or an earth lead of too thin a gauge of wire is one of those things which you can depend upon to spoil your results with complete certainty, and this is one of the first questions you should go into if you feel that your selectivity is not up to scratch.

A connection to a doubtful sort of gas-pipe, a single small earth-pin in dry earth, and so on, is definitely not good enough if you desire to get the best possible selectivity of which your receiver is capable. What you want is a short and direct lead to a water-pipe, with a good sound connection thereto, a good-sized earth-pin in damp soil, or one or other of the well-known schemes for obtaining a really low-resistance earth connection.

MILLIAMMETER FOR DETECTING DISTORTION.

G. S. (Gateshead).—"When running normally my last valve takes about 15 or 16 milliamps, and I want to watch variations in this current to check distortion. For this purpose I have a choice of two milliammeters, one reading up to twenty milliamps, and the other reading up to fifty milliamps. Which would be better?"

(*Continued on page* 528.)

TECHNICAL TWISTERS

No. 19. THE EARTHING SWITCH

CAN YOU FILL IN THE MISSING LETTERS?

The aerial should always be . . . . . when not in use.

The correct place for the earthing switch is out of doors, immediately . . . . . . the aerial.

If the earth plate is directly beneath the lead-in, the wires to the earthing switch can be . . . . . which is the ideal arrangement.

To maintain good contact, the earthing switch should be provided with a . . . . . to protect it from the . . . . . . and a wooden box is quite suitable for this.

Last week's missing words (in order) were: Insulated, Earth; Condenser; Short; Aerial, Joint.

TONE AND TUNING.

(Continued from page 509.)

transmitter, and this will militate against the true reproduction of transients.

All this may seem rather trying and difficult, but the practical point is that cascade connection (i.e., H.F. magnification), where each circuit is rather highly damped, should give better *quality* for a given selectivity than if the same selectivity is obtained by forcing one circuit.

The perfect quality receiver then uses, say, two or three rather highly damped high-frequency circuits, push-pull grid-leak rectification with up to 300 volts high tension and push-pull low-frequency amplification and no transformers.

The receiver is made ubiquitous by making the damping of the tuned circuits variable by including ganged variable resistances in each tuned circuit which, when reduced to a minimum introduces a large measure of sensitivity and selectivity for picking up distant stations.

There must be, lastly, a volume control in the low-frequency end so as to reproduce speech and music at the correct relative volume without leaving one's chair.

With such a receiver, where every component has resulted from calculation and not guess-work, and where these main principles have been followed, one might definitely criticise transmission. Until then we must wait for various things to happen in connection with true transient transmission.

RADIOTORIAL QUESTIONS AND ANSWERS.

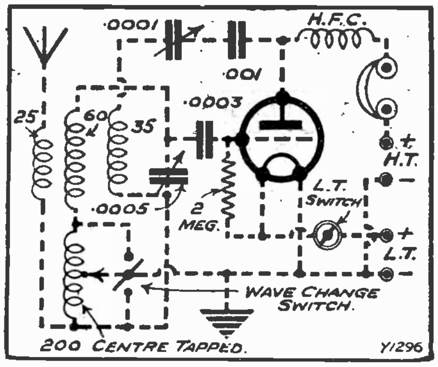
(*Continued from page 526.*)

"I should be inclined to take the twenty milliamp one except for the fact that when the output valve is not biassed it takes well over thirty milliamps which, of course, is far too much for the smaller range instrument, but well within the scale of the bigger one."

"As your main purpose is to check distortion we certainly recommend you to get the twenty-milliamp instrument in preference to that with the higher range, on account of its wider scale.

The needle kicks given by even a good milliammeter are not very big, and it is, therefore, advisable to use an instrument which is nearly "all out" when reading the anode current which is to be checked. When this is the case small variations in average anode current are shown quite plainly, but even so the needle will have to be watched carefully.

POPULAR "WIRELETS" No. 14



The dotted lines show the connections for a plug-in coil one-valver, with easy switching for long waves, the "components" for which were given last week.

On the other hand an instrument capable of taking a much higher maximum reading shows the average anode variations proportionally to this greater figure, which means that your actual needle movements will be smaller than before. So for your purpose the 20 milliammeter scale reading will be better than the 50 milliammeter scale.

The fact that you will not be able to take direct readings of the anode current when no grid bias is being used should not worry you at all, for this is a measurement that need never be taken under ordinary working conditions.

IS THE VALVE "GOING"?

E. J. D. (Exeter).—"Reception seemed to be falling off in strength, and in tone to a lesser degree, so I got a friend to bring his milliammeter round to check the last valve's output current. Instead of the usual 16 it had dropped to 11 milliamps, all H.T. and G.B. battery voltages being right. Do you think the valve's filament emission is going? (I've used it constantly since Christmas, 1927.)"

Probably it is a failure of the filament emission that is causing your symptoms, and you will find it rapidly getting worse till the set is not worth listening to. You have had good service from the valve, but now you need a new one.

H.F. COUPLING.

T. C. H. (Guernsey, C.I.).—"I have become very interested in the 'Magic' H.F. Unit, which I am thinking of adding to my own 'Magic' Two. But the one I have seen working uses a resistance and H.F. choke for coupling. Is this the usual arrangement, as choke and resistance don't seem ideal for an S.G. valve? I always understood tuned anode was better, yet this set gave wonderful distance when the H.F unit was added."

The "Magic" H.F. Unit employs a form of "parallel-feed," in which the detector's grid circuit acts like a tuned anode circuit. The H.F. choke in the unit is, of course, necessary to supply the path from H.T. + to plate, and the resistance with its large condenser is not for H.F. coupling, but actually for battery de-coupling purposes.

FINAL ADJUSTMENTS OF THE POTENTIOMETER.

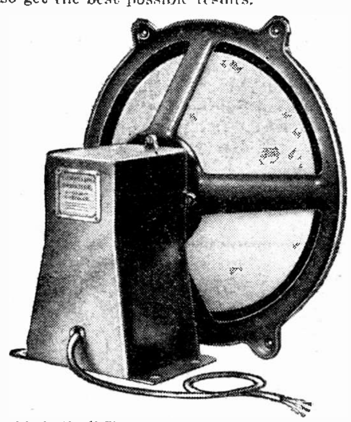
E. S. (West Hartlepool).—"I get fine reception but do not understand the potentiometer on the baseboard (Magic Four), nor how it should be operated. What is the best position?"

You will find that if you place the slider right along at the positive end (the end nearest the 25,000 ohm anti-motor-boating resistance) volume is good, but reaction tends to be a little ploppy. With the slider at the opposite end, on the other hand, reaction becomes exceedingly smooth, but volume on weak distant stations is not, as a rule, quite so good. Evidently something in the nature of a compromise adjustment is needed, and this is how you should set about finding it.

Start off with, say, 60 volts applied to terminal H.T. + 3, and then turn to the potentiometer. Start with the slider right along at the positive end and test the reaction control. You will probably find that the set goes into oscillation with a slight plop (care first having been taken to see that the two dials are in step, and that you are not tuned to the local station.) Now take the slider gradually along towards the negative end of the potentiometer, testing the reaction as you do so.

You will presently find that reaction becomes smooth and you should stop your adjustment at this point. Now tune-in a weak distant station and note the strength you obtain. Next reduce the voltage on H.T. + 3 to, say, 50 volts, and readjust the potentiometer. Now observe what signal strength you get, and you will quite likely find that it is slightly better because you are now able to set the slider of the potentiometer a little further towards the positive end without making the reaction become ploppy.

A little testing on these lines will soon find an H.T. voltage which will enable you to get the potentiometer slider well along towards the positive end, and so get the best possible results.



This is the "Silver Ghost" Inductor Dynamic Chassis, a new Lamplugh product that retails at £3 10s.

WHAT DO *YOU* THINK ABOUT THIS?

A Yeovil reader of "P.W." who had a quality set (Det. and 2 L.F., with choke-filtered output to M.C. speaker) was really *satisfied* with various minor improvements to tone, etc., when suddenly the set's quality went "all to pieces," volume dropped considerably, and the last valve's milliammeter showed pronounced kicks, though grid bias, H.T., and super-power valve itself were proved to be O.K.

Everything else looked all right. Can you guess

WHAT WAS WRONG?

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 solution to above next week.)

If you have ever had trouble with lacquer you guessed last week's problem easily enough, for all that had happened was that the re-lacquering of terminals, etc. was carried out irrespective of contact surfaces, and the lacquer was acting as an insulator.

TECHNICAL NOTES.

(*Continued from page 510*)

Low-reading ammeters are fairly common, but milliammeters, probably owing to their greater cost, are not so commonly used by amateurs.

As a matter of fact, it is a good investment to have an instrument which will enable you to test the voltage output of high-tension batteries, H.T. mains units, and so on, and also one by which you can determine the milliamperes which are passing in the anode circuit of a receiver.

There are, as you know, combined instruments on the market which will read volts, ohms, and amperes over a considerable range, and these are very useful. Naturally, they involve the outlay of a certain amount of money, and also I always think that some of these combined instruments are apt to be a little inaccurate.

Combined Instruments.

I have before me a letter from a reader who has what he calls a "double voltmeter," reading on one scale from 0 to 6 volts, and on the other scale from 0 to 120 volts. He gives the resistances of these two circuits, and wants to know whether it will be possible to graduate the scales to read milliamperes.

The resistances which he gives are 160 ohms for the 0 to 6-volt scale, and 3,200 ohms for the 0 to 120-volt scale. This means that if 6 volts be applied to the 6-volt terminals the instrument will give a full scale reading, and, since the resistance of that circuit is 160 ohms, the current passing through the instrument will be 37·5 milliamps.

In the same way, if 120 volts be applied to the 120-volt terminals the instrument will give a full scale reading, and, since the resistance of that circuit is 3,200 ohms, the current passing through the instrument will be again 37·5 milliamps.

My correspondent wants to know whether he would be in order in graduating the scale to a maximum of 37·5 milliamps and then using the instrument as a milliammeter, and, if the answer is in the negative, what are the objections to the scheme?

Changing Conditions.

The answer is not entirely in the negative, although there are certain objections to the use of this instrument in the way suggested. It is perfectly true that when 37·5 milliamps. are passing through the instrument the needle moves over a full scale deflection, and therefore it will obviously serve as a milliammeter.

The objection lies in the fact that the winding—more particularly the high-resistance winding—will introduce a resistance into the circuit which may have the effect of altering very materially the conditions in the circuit from what they were before the instrument was introduced.

For example, in order to use the instrument on the 0 to 120-volt terminals we have to introduce the resistance of 3,200 ohms into the circuit which is being tested, and, unless the resistance of that circuit is already large compared to 3,200 ohms, the introduction of this resistance will alter the circuit conditions materially.

(*Continued on page 530.*)

"POPULAR WIRELESS" ADVERTISEMENT RATES

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TECHNICAL NOTES.

(*Continued from page 528.*)

The result will be that the current indicated in milliamps will be materially less than it was before the milliammeter was introduced into the circuit. This objection will not be so serious when the low-resistance winding is used, but it may still be an important objection.

Internal Resistance.

It is essential that an ammeter (including the milliammeter) should have an internal resistance so low that it does not seriously alter the total resistance in the circuit in which it is used; if it does, and unless the resistance of the rest of the circuit is known, its readings are obviously useless.

In the same way, a voltmeter should have a resistance so *high* that the current it draws from the circuit which is tested is too small to upset appreciably the conditions obtaining before the instrument was connected to the circuit.

Altering the Circuit.

I should remark that this voltmeter in question strikes me as having too low a resistance (I mean for use as a voltmeter), particularly on the high-voltage scale. If the voltmeter is used for testing a 6-volt

accumulator, obviously a current of 37·5 milliamps will not appreciably upset the voltage of the accumulator.

But if the instrument is being used for testing the voltage of a high-tension dry battery or H.T. mains unit of around 120 volts, the current of 37·5 milliamps will almost certainly bring down the output voltage very considerably; or, to be more accurate, an ordinary dry battery having a voltage of 120 volts will give an apparent reading of much less than this amount when connected to this particular voltmeter.

Strength of Reception.

A very interesting question is raised by the following letter, in which a reader of these notes says:

"I imagine that only a limited amount of energy is radiated from the aerial of a transmitter and that receivers tuned to the wave-length of the transmitter only function by virtue of absorbing a small proportion of that energy.

"Has it ever been ascertained what number of receiving aerials can be energised by a transmitter? And is it possible for so many receivers to be tuned to a transmitter so that complete absorption of all the available energy occurs?"

It has never been ascertained, so far as I am aware, how many receiving aerials can be energised by a transmitter and it would, in any case, be impossible to arrive at such a figure without defining what is the minimum

(*Continued on next page*)

TECHNICAL NOTES.

(Continued from previous page.)

energy to be received by each receiving aerial. The only thing you can say is that the total energy received by the various aerials in the aggregate cannot exceed the energy radiated by the transmitter.

Shielding.

You have to remember that the electro-magnetic energy passing in the "field" of the transmitter (which field includes all the various receiving aerials) is being dissipated or absorbed by every conductor in the field, whether it be a receiving aerial or a steel girder building or any other object which has the slightest electrical conductivity.

Many amateurs are rather apt to suppose that the electro-magnetic energy goes around, so to speak, picking out receiving aerials and carefully avoiding any object which is not ostensibly an aerial. This is very far from the case, and there is no difference (so far as the electro-magnetic energy running itself to ground is concerned) between a receiving aerial and the steel girder work of a modern building; indeed, the latter is infinitely more effective as a "sink" of radio energy than any receiving aerial; and that is why reception is usually comparatively poor at any point within the interior of a steel girder building. This, indeed, is the principle of "shielding."

Question of Selectivity.

The question as to how many receiving aerials can be adequately energised by a given station is practically the same as the question as to the maximum distance from a transmitter at which a receiver may pick up the signals. The answer is that it depends upon the sensitivity of the receiver in question.

IF I CONTROLLED THE B.B.C.

(Continued from page 523.)

carrying out repairs where necessary for small and reasonable fees, or for nothing where hardship rendered payment impossible.

"Fantastic!" you say? Perhaps, but what else is there to suggest? Very little. The B.B.C. knows what it is about. Mistakes here and there are naturally made; an institution that never made mistakes would be inhuman. Besides, it is admitted on every hand that British broadcasting is the best in the world.

And I agree. Few countries have so regular a service, or such a comprehensive one. Many have to put up with advertisements for Somebody's Soap being inserted here and there; others cannot even get a programme at all.

No, gentlemen of the B.B.C., on second thoughts I would not accept the post of Lady High Controller even if you offered it to me. I should probably make a mess of things, and you seem to be quite all right as you are. Eight years of broadcasting has taught you many things of which I remain ignorant.

So carry on with the good work. The way in which new and different programmes appear night after night, and the way in which fresh talent is always being discovered is a source of perpetual amazement to me. The B.B.C. supplies entertainment, education, uplift and enjoyment all rolled into one. Could anyone do better? I think not. Anyhow, I don't intend to try!

"PHILEMON" GOES ABROAD.

(*Continued from page 511.*)

and "verboten" to boot! Still the fingers pointed. I broke into an understanding smile: "But certainly!" I said, and switched on. As luck would have it, it was dance music from somewhere. Their faces softened. Their hearts melted. They embraced each other. They fox-trotted up and down the corridor. They smiled with black moustaches and white teeth! They saluted and left me in peace.

Radio Toulouse.

I had heard of Toulouse. What I had heard, indeed, made me shy of turning Belinda southward to face the music. The train was now roaring through the night. It was getting late. "Toulouse or not Toulouse?" I debated with myself. In a weak moment I wished to hear Toulouse. I began to search the Universe for Toulouse. I came slowly down the dial from Vienna to Oslo and Langenburg; all faint, because Belinda was giving them the cold shoulder.

Then, suddenly, a blast! Toulouse! Belinda fell on her side. A panel of the compartment was blown out. The toupée of the virago was blown through. It fell on Belinda. I seized it and ran with it into the next compartment. The virago was attired for a bad night. "Madam has lost her knitting, perhaps?" I said, and retreated.

Belinda "Let's the Cat Out."

You know what a morning is like after a night in the train. I felt like that. At 10.15 a.m. the "Daily Service" would have been a relief. I was trying to get into touch with England, when I heard down the corridor the sounds of the approaching Customs Officers. I had been warned that I might have trouble there with Belinda. I had just time to put her mackintosh on, and place her among the suitcases, when the officers appeared. Belinda looked just like a suitcase. I felt she would pass in the crowd.

Had I anything to declare? I waved my hands over the suitcases and Belinda, and said I thought not. Then, horrors, Belinda began to talk! I hadn't switched her off! She was speaking an awful language, but she was distinctly speaking. I was debating in my mind whether I should say she was a pet canary, or an unborn child, when I caught the smile on the official face. "Now I'm in for it!" I thought.

The smile became a beam. "Ah!" said the officer, "that is Huizen. You have a fine set, signor. May I see?" I uncovered Belinda. She shone radiantly. The officer looked at her, opened her, shut her, looked again, listened to Huizen, smiled more and more broadly. "I am," he said in broken English, "how do you say?—a fan!" And he shook my hand. "I like your English programmes," he said; "I like your—Jack Payne!" And we shook hands again, and he saluted and went away smiling seraphically! I kissed Belinda!

Here at Last!

So here we are on the shore of the lake. I shall soon be across, with Belinda, in the wilds on the other side. There is a blue sky. It is piping hot. Addio!

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Popular Wireless

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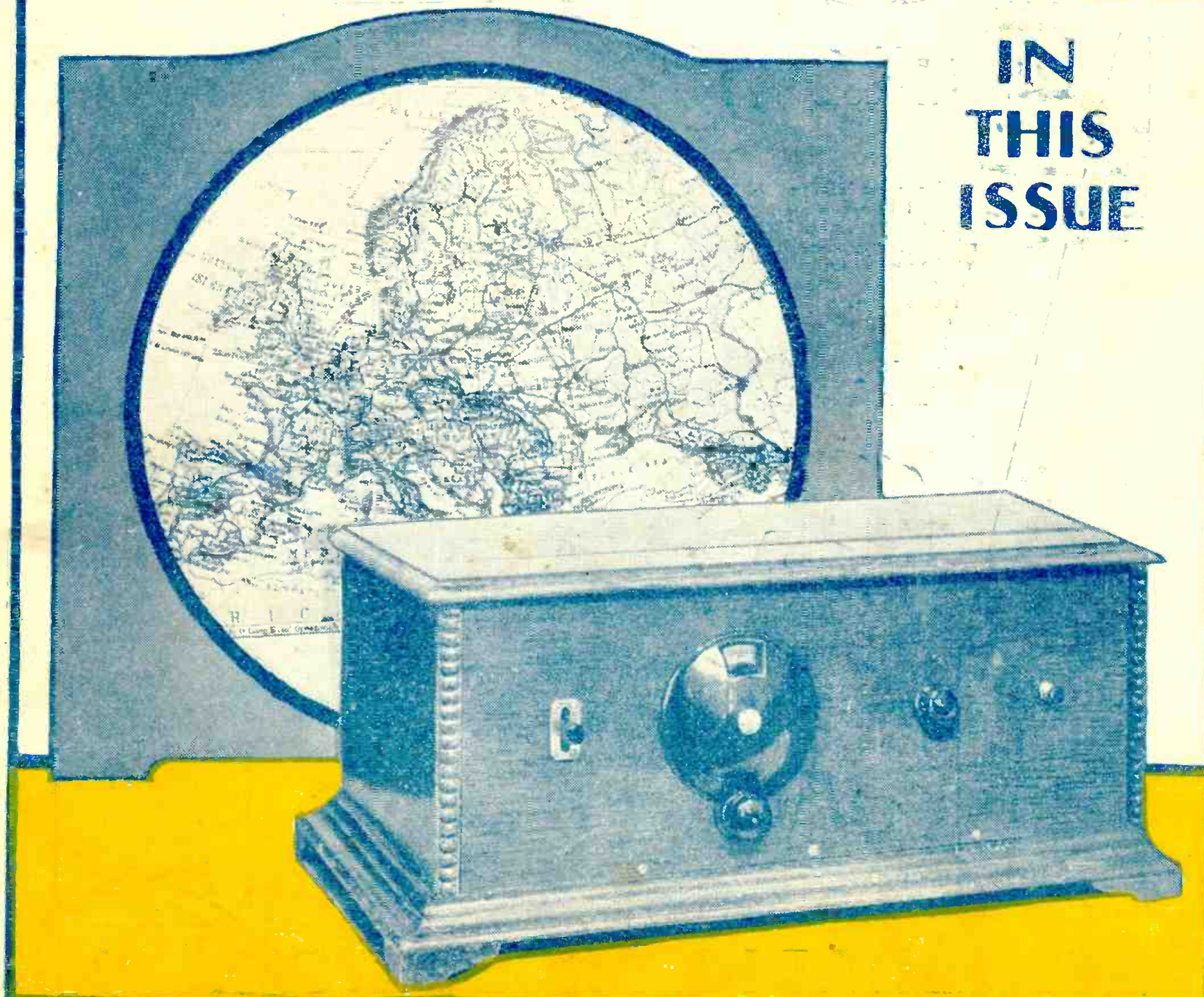
No. 425. Vol. XVII. INCORPORATING "WIRELESS" July 26th, 1930.

The "EUROPEAN" THREE

IN THIS ISSUE



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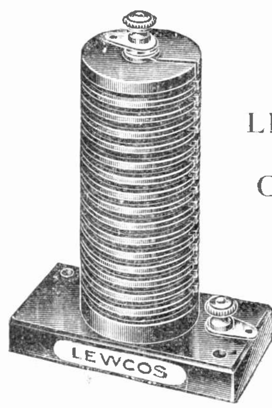

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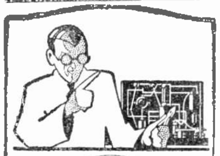

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HARKING BACK—MASS PRODUCTION—FOR THE BLIND—THE LONELIEST JOB?—

RADIO NOTES & NEWS

"BELINDA"—WIRELESS WARNINGS—"P.W." IN PALESTINE—SIT UP FOR THIS.

Now!

NOW is the time when the keen "fan" thinks that the "earth" is much too dry. Now is the time when visiting Americans, sweet pea fanciers and most ordinary folk agree with him. Now the owners of portables boast like blazes, that being the sole compensation for their perspiration. Now is the time when the B.B.C. Talks Department has to fall back upon faith in its destiny: nobody loves the blamed outfit except the printer—and what is the love of a printer? Now loud-speakers blare on lawns, and suburban wives find in the designs new material for competition with "next door." Now—no, not just now, please! Pass me another block of ice, and heaven send the weather change not to cold and rain ere this note gets itself printed.

Harking Back to Winter.

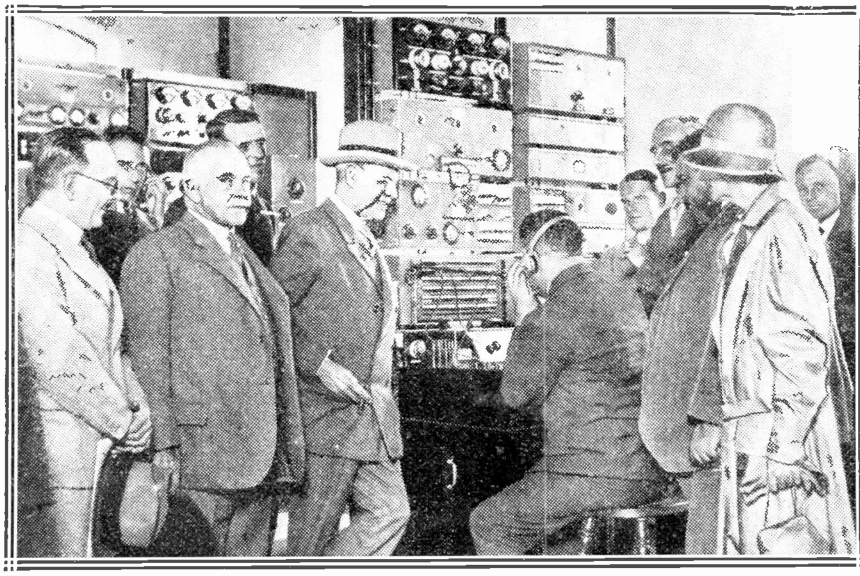
QUITE providentially, at this very moment who should walk in (*I see*) but Horace the Demon Tipster, engaged at the present time in being our office boy, but destined to fail brilliantly in the City in years to come. He produces a letter, which. (*ses* 'e) has been found archived by mischance between the radiator and Mr. Bird's life-saving outfit, which he keeps handy because at any moment may come the cry, "Mr. Rogers has fallen down the vacuum again, sir!" This letter bears a January date! Positively refrigerating to contemplate the Arctic relic, my dear boy. Help yourself to a nib!

Mass Production.

M. C. J. is the target of my apologies and this frivolous persiflage. His was the lost letter which now turns up like Rip van Winkle—very old and whiskery, but perfectly good inside. Many thanks, brother! You want standardised aluminium cabinets! But, imagine standardised furniture! And s. dinners! Or s. clothes! Oh, my friend, shall we not leave a little scope, even in cabinet design, for the quaint, the beautiful and the new?

You leave the "mass producer" to standardise! Go now, on the instant, and make a cabinet crawling with knobs, gargoyles and little cherubs: devise a secret drawer and a trick handle, which when turned letteth loose a cuckoo or a snake. Flee from the yardstick as from the wrath of Olympus! Standardisation is halfway to petrifaction! Well, cheerio!

PRESS DELEGATES TALK TO THE "ELETTRA"



Visiting the Dorchester Beam Station, these delegates to the Empire Press Conference called up the "Elettra" at Genoa and had a few minutes' talk with Marquis Marconi.

Wireless for the Blind.

THE Radio Manufacturers' Association began their campaign seven months ago and the result so far has been magnificent. Contracts for thousands of sets have been placed, but it is computed that there are still between 15,000 and 20,000 blind persons in Great Britain without receivers. Anyone who would like to help should send money or equipment to the Secretary, Wireless for the Blind Fund, 224, Gt. Portland Street, London, W.1.

A Royal Portable.

ALTHOUGH, no doubt, the portable is a goodly thing, it has always aroused in me a faint sense of the comic which some day I'll have to explain at length. Just now, however, I see that such japing would be out of place, for I read that H.M. the King has just bought one of McMichael's models, which is mighty fine business. Whether they sell 'em or have 'em stolen, McM's keep their stock of portables well on the move, and either method is a compliment to the makers!

Broadcasting Feeling.

I UNDERSTAND that the B.B.C. at Savoy Hill are going to try the effect upon broadcasters of allowing them to dress in their stage clothes. The reason for this is that artists have on many occasions complained that the stiff formality of standing before the microphone, dressed in "store clothes and boiled shirts" drives away inspiration, takes the sparkle from the performance, etc., I take their word for it, but all the same I consider it a feeble confession, savouring of the "temperament," which is a favourite pose of entertainers, artists, poets, and such. If a comedian has sufficient strength of mind he can say his piece well, whether his nose be reddened or not.

The New Gardening.

BY the Great Hoe! this is what I must try on my asters, which have this year entered into a conspiracy against me. A German scientist named Hildebrandt is said to have zipped up the growth of various plants so that only half the usual time was required for them to mature. His tomatoes ripened in three months; radishes matured in two weeks, and so forth. All this was the result of subjecting

(*Continued on next page.*)

RADIO NOTES AND NEWS.

(*Continued from previous page.*)

the seeds to very short radio waves (1-50th of an inch) for periods of fifteen minutes. Number of such periods not reported. Very interesting! How much did the radishes finally cost, I wonder!

The Loneliest Job?

WITH the exception of lighthouse-keepers, I should think that radio operators must have to take some of the loneliest jobs on earth. What about Willis Island, for an example? A strip of sand 250 miles east of Cooktown, Australia. On the edge of the Coral Sea and the breeding place of cyclones! There three people stay for six months at a time, advising the mainland by radio of the approach of storms. No ships, except the relief boat, ever come near, and most of the inhabitants of the islands are turtles. Quite suitable for rejected lovers, penniless persons, and students of turtles!

"Sulphating."

THINKING that it might help in the controversy about accumulators, a Hornsey reader is good enough to transcribe an extract from a text book describing the effect of impure zinc in setting up "local action" in a battery, whereby zinc sulphate is formed and hydrogen generated. This, however, probably refers to the Leclanche type, a primary cell, not an accumulator. The elements in a storage battery of the commonest kind are lead compounds and the "sulphate" is that of lead.

"Belinda."

I ALWAYS thought that Philemon was a nice lad, but I don't like the way in which he writes of his "Belinda" at all. I wouldn't give away all the little personal secrets of my Grammy! And he says, "Meet Belinda" and then hustles her off to Italy the very next day. After his unkind remarks about Bel's conversational (one-sided?) abilities, he will be well served if she shuts tight up and sulks throughout the trip. These "femmels," as an old farmer friend calls them, are like that. Now, my Gramelia is—— (*Snuffed out!*—ED. "P.W.")

Wireless Warnings.

UNLESS one saw it in the annual report of the Admiralty surveys one would not realise that during 1929 no less than 668 radio warnings or notices to mariners were sent out by the Admiralty. By the way, I noticed that the survey people found 67 new rocks last year, the highest number for any year since the war. I wonder how one finds a rock without striking it! But doesn't this sort of report make one wonder how on earth we ever managed in pre-radio days? Life had its compensations, I suppose, for in any age it is an adaptation to environment, and therefore a balanced affair.

A B.B.C. Beecham's Bill?

WHAT'S this we hear about a possibility of the B.B.C. presenting Sir Thomas Beecham with a "chit" for £5,000 in respect of his share of the loss on last year's symphony concerts? Far be it from me to stick my foot into someone else's elementary book-keeping! What engages my attention is the fact, if it be such, that the concerts made a huge loss. Why do they, and why should they? Didn't they get "full houses" or are the costs overloaded or the prices too low?

Data from Java.

H. H. (Leamington Spa) is good enough to send us a letter received by him from Bandoeng, Java, addressed to him by the Manager of the International Telephone Office. The following data may be of use. The most important transmitters at Bandoeng are P L E (15·9 metres), P M B (14·55 metres), P L F (16·81 metres), and P L R (27·8 metres). Every Tuesday from 13.40 to 15·40, G.M.T., P L E broadcasts music.

"P.W." in Palestine.

AN enthusiastic reader in Palestine gives his results with Brookmans on 261 metres, using a "straight" three-valver (Det. and 2 L.F.). The signals supplied three pairs of 'phones at strength R8, and were very free from fading. Very difficult to get a good "earth" there owing to the dryness of the soil, and he has to rely on a well. Seems funny, when you think over history, to hear from a Britisher about "Det. and 2 L.F." in the Holy City, the goal of the Crusaders.

SHORT WAVES.

A musician says that for wireless transmission the most soothing instruments are the violin 'cello and flute. The intervals that occur when a battery runs down are also very restful.—"Humorist."

* * *

"The average American's vocabulary is much more extensive to-day than it was a few years ago," we read.

It is unfair, however, to say that the construction of wireless sets is greatly to blame.

* * *

AN UNSOLICITED TESTIMONIAL.

"Although I have no wireless outfit myself, I have a brace of lavishly-equipped meighbours whose enthusiasm and batteries are so strong that I have heard almost every word emitted by 2 L O since March, 1925."—"London Opinion."

* * *

"There had been oscillation for over two hours, so in a fit of mad temper I went and chopped down the aerial," said a police-court defendent recently.

This method of cutting out oscillation is not included in those recommended by our Queries Department.

* * *

"Oh, but for a little music
That makes the highbrow wilt.
To place the 'phones upon my head
And hear a cheery lilt;
For only one short hour
To hear what we used to hear.
Before recitals and bulletins came
With talk that lasts the whole year."
—"Daily Record and Mail."

* * *

IN THAT WIRELESS AGE.

Mr. Robot: "What's wrong with the youngster—teething?"
Mrs. Robot: "No; only a howling valve."
—"Wireless Weekly."

* * *

UPLIFT.

A wireless expert remarks that "a good earth is essential." The B.B.C. thinks so, too—hence the Sunday programmes.

Correspondents Wanted.

MR. BOB CONINGSBY, Van Ness Avenue, Maribquong (W3), Melbourne, Australia, would like to correspond with "P.W." readers interested in short-wave reception. Mr. A. W. Mason finds him to be an interesting and helpful correspondent.

Corks on the Aerial.

IN reference to my comment on the conscientious Cotswold cottager who had strung corks on his aerial, a Rotherham reader suggests, apparently seriously, that the intention probably was the protection of young game birds belonging to the lord of the manor. "If his aerial killed one young partridge, down comes the aerial!" Does that sort of thing really happen? Feudalism must be sat on severely, and if an actual instance were found I should think that "P.W." would be glad to have the fullest possible particulars.

The Latest Columbus.

HAS anybody picked up signals from the frail barque of the Frenchman who recently sailed from Morocco for New York in a boat less than 20 feet long? It is understood that this adventurer's call-sign is X C N P, and that he transmits on 41·5 metres round about 9.30 p.m. and on 36·5 metres an hour later. There's a fine chance for discriminating short-wavers. Has Alf of Middlesbro' got this in his log yet? The contemporary from whom I derived this information does not state whether the transmissions are telephonic or morse, but I expect the latter.

Sit Up For This Item!

WHEN in reply to criticisms of the programmes Sir John Reith said—and with reason on his side—that one cannot play trumps every round, "Punch" set the seal of its approval upon the *mot* by adding: "Nevertheless, it is understood that arrangements for broadcasting the Last Trump are already well in hand." Yes, and the B.B.C. will offer to give £100 to a charity for the right to broadcast it!

The Campaign Against Noise.

THIS steadily increases in intensity. Council follows council, with short intervals, in prohibiting loud speaker- and gramophone-playing in the street or at doors and windows in such a manner as to annoy or disturb people. Mr. Abraham Finklestein, of Islington, was recently stung for £1 plus £1 costs for playing a gramophone in his shop. One complainant alleged that he was annoyed in his house 40 yards away. The manager of the shop said that he was using a soft-playing gramophone. Another witness said that he was *inside* the shop at the time and heard no gramophone at all. The quickest way out was to extract £1 from Mr. Finklestein!

What Is One to Do?

INSTANCES like that render me extremely nervous about using my own grammy. I feel that I ought to ask my nearest neighbour before I pass a pensive needle over a bit of Beethoven. "Is the baby asleep? Has your wife a headache? Do I disturb or annoy your bees, cockatoo, tortoise or grandmother?" But, gentlemen, there are other noises! Trains blow off steam nearby till one is deafened. Why can't they do it half a mile up the line? Music lessons ooze out of the school over the way; an infernal *tum tum*. Milk floats and trucks rattle like anything, and new-fangled parents allow babies to yell for hours at a stretch, instead of plugging them with "comforters."

ARIEL.

THE B.B.C. TODAY

BY THE EDITOR

THE most important and significant event in B.B.C. history in the past twelve months was the resignation of Captain Peter Eckersley from the position of Chief Engineer, which he had held since the beginning of broadcasting in this country. Captain Eckersley stood for enterprise, adventure, unremitting activity; he was very much more than Chief Engineer: he was *facile princeps* energiser and stimulator.

"P.W." again investigates the organisation and policies of the B.B.C. In this first article of a short series the main tendencies and changes are discussed and authentic information of an exclusive nature is given.

Last Year's Big Loss.

He had divided with Sir John Reith the outstanding personal contributions to broadcasting; he was, if anything, more devoted to broadcasting than even Sir John. The withdrawing of his personality from the counsels at Savoy Hill was a serious blow, the results of which are only now becoming apparent.

This does not involve any reflection on Mr. Noel Ashbridge, the new Chief Engineer. On engineering matters Mr. Ashbridge is pre-eminently sound and able, but it was not to Peter Eckersley, engineer, that the B.B.C. was beholden; it was to Peter Eckersley, iconoclast and restless rebel against mediocrity and dullness.

Captain P. P. Eckersley—" Iconoclast and restless rebel against mediocrity and dullness."

From the time Captain Eckersley ceased to attend B.B.C. Control Board meetings, and Programme Committee meetings, all those tendencies against which he valiantly and successfully struggled till then began to appear. There was decreasing attention paid to "peaks"; novelties diminished; experiments declined; showmanship waned; and the dead-level came into its own at last.

When I last reviewed the affairs of the B.B.C. I expressed the hope that the Corporation would bring Captain Eckersley back at all costs, and before the end of 1929. But my hope has been frustrated, to the considerable disadvantage of broadcasting.

In the past year I daresay the B.B.C. has become more efficient; there have been fewer and fewer mistakes and lapses. The announcers approximate more and more to the common anonymous standard; music is better balanced and controlled; plays run more smoothly; noise effects are more uniformly realistic, and so on.

The Points of View.

But the old time spirit of high adventure is sadly lacking. Some say it is because the B.B.C. is getting more like a Government Department and less like it was in the days of the Company. There is possibly something in this explanation, but I believe the main cause has been the departure of Captain Eckersley.

Let us consider the tendency as applied to some other parts of the work. Take the talks, for instance. Miss Matheson, the Talks Director, had a firm friend and supporter in Captain Eckersley.

A year ago now was being planned the first Point of View series, including Wells and Bernard Shaw. This was excellently contrived, full of interest, and of real "peak" material. Late in the autumn, after the resignation of Captain Eckersley had become effective, a new series of "Points of View" was considered and launched.

This time the policy was strikingly different. Instead of going for the original and challenging thinkers of the younger generation (which probably would have been Miss Matheson's line if unhampered), the B.B.C. got a group of solid respectable pillars of established society who, with the exception of Sir Oliver Lodge, had no message comparable with those of the first series.

Too Many Cooks?

The policy of the second series was obviously different. What of the procedure? I believe I am right in saying that practically the whole of the arrangements were taken out of the hands of the Talks Director and put into Committee including Governors, Director General, Director of Programmes, and Assistant Director of Programmes. These being translated were: Lord Clarendon, Lord Gainsford, Dr.

(*Continued on next page.*)

" Even Sir John Reith consults his board far more than he should."

THE B.B.C. TODAY.

(Continued from previous page.)

Rendall, Mrs. Philip Snowden, Sir Gordon Nairne, Sir John Reith, Mr. R. H. Eckersley, and Mr. Cecil Graves.

It was a foregone conclusion that the combined efforts of all these excellent people would err on the side of caution and "safety." And so the event proved. The Points of View have now degenerated into the ordinary talks rut; the glamour of the first series has been eclipsed.

If one series of "Points of View" were the only thing affected by the new tendency, it would not be so bad. But the infection has spread both in policy and procedure.

Quick and bold decisions based on personal knowledge and true instinct are no longer the order of the day.

Music the Bright Spot.

Not that Mr. Graves is deficient in qualities of decision or judgment. His hands likewise are tied. He, like Miss Matheson, appears to be caught in the machine. And so it runs right up the hierarchy. Even Sir John Reith consults his Board far more than he should. Is this a symptom of the creeping paralysis of state bureaucracy? I sincerely hope not, but I am not sure.

Meanwhile there is no move to brighten Sundays by providing the alternative programmes during religious transmissions, for which the whole country has been waiting for years. On the contrary, the impression I get is that there is a stiffening of attitude on religious subjects; there is less toleration of views, more insistence on orthodoxy, longer and more frequent religious services, which are certainly no brighter than they were.

I have said the B.B.C. is paradoxically more efficient and less satisfactory. It has lost the genius of Peter Eckersley and so far there is no sign of adequate replacement. On the other hand the really bright spot is music.

Here, anyway, efficiency has made for improvement. The coming to broadcasting of Adrian Boult is of first-class importance. He has already done a good deal and the next few months will see much more. The National Orchestra is at last nearing completion.

With Adrian Boult behind it, this new aggregation will seriously rival the New York Symphony conducted by the great Toscannini himself. There is also less of the deciduous modern music, so distasteful to the bulk of listeners.

Walton O'Donnell's military band is far and away the best in the world. In Stanford Robinson the B.B.C. have a pre-eminent choral-master. And so this bright side of the picture unfolds itself.

But I am not done grousing yet. The past year has seen an alarming and dangerous growth of the movement for centralisation. Of course a considerable demobilisation and retrenchment in the Provinces was inevitable as a result of the regional scheme.

The Whittling Process.

Yet the firm maintenance of programme-building centres at Birmingham, Manchester, Edinburgh, Belfast and Cardiff was always represented to be part and parcel of the regional plan.

But the whittling process seems to have proved very ineffective at Savoy Hill. Once the host of relay stations were safely out of the way, the temptation to cut down the regional centres was irresistible. First it was Scotland; the orchestra at Glasgow and all the staff in Scotland except a bare nucleus. Then it was the turn of the Birmingham orchestra, than which no other feature in recent years has done more to add to licence revenue.

But there was such a row about the Birmingham cut that the B.B.C. is marking time in connection with the abolition of the Northern Wireless Orchestra at Manchester. I hope they do more than mark time about it. This whole centralisation policy needs overhauling. There should be a readjustment of perspective. Here is a chance for the fresh mind of the new chairman, himself a Provincial in origin.

Let Mr. Whitley, Mrs. Snowden, and Sir John Reith go round the Provinces together and get to grips with the situation; let them realise the dangers, and then revise policy accordingly.

Strengthen the Provinces.

It is not safe to go on with the parrot-cry of the box-office argument, translated in licence-increase statistics. The only course acceptable to public opinion and consistent with pledges and policy is to sustain and strengthen the regional centres, orchestras and all.

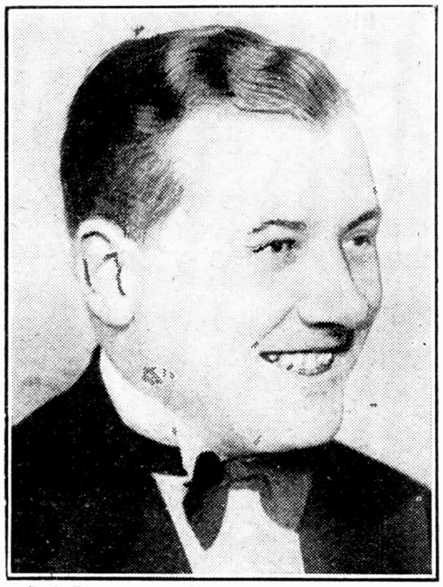
If there is a scarcity of money, then let the Broadcasting Palace in Portland Place suffer or wait. What matters is what gets into the homes of the million. Real alternatives can be given only by different minds working from different centres, with only a synchronising control.

Halt centralisation, get back to the Peter Eckersley spirit of high endeavour, reform Sunday programmes, and give alternatives on 99 per cent of radiating time, dissolve committees; do these simple, reasonable things and the B.B.C. will take a new lease of life.

Room for Improvement.

It is still easily the best broadcasting service in the world; but I want to see it very much better than it is. Hence the frank commentary on what I regard as the faults that have come to light in the past year or so. How long will it be, I wonder, before Sir John Reith and Mrs. Philip Snowden combine their great talents and ability in the common cause?

A RADIO FAVOURITE



Jack Payne has achieved a notable success with his B.B.C. Dance Orchestra.

THE WORLD'S BEST

Captain O'Donnell whose B.B.C. Military Band is "the best in the world."

SOME HELPFUL HINTS.

One of the great advantages of a loud-speaker filter-output circuit is the fact that it confines the H.T. voltage to the set itself, and thus any long loud-speaker leads to other rooms are not at high voltage, and there is no chance of shock or leakage.

* * *

If your 'phones are left permanently connected to your set they should be kept in a perfectly dry place free from dampness which is certain to affect them adversely.

* * *

If you use high-tension of 150 volts or more an on-off switch in your H.T. lead may prove to be a good investment.

* * *

When a set is switched off the by-pass condensers, etc., are not subjected to the full pressure of the H.T.B. if the H.T. negative lead is fitted with a break switch.

* * *

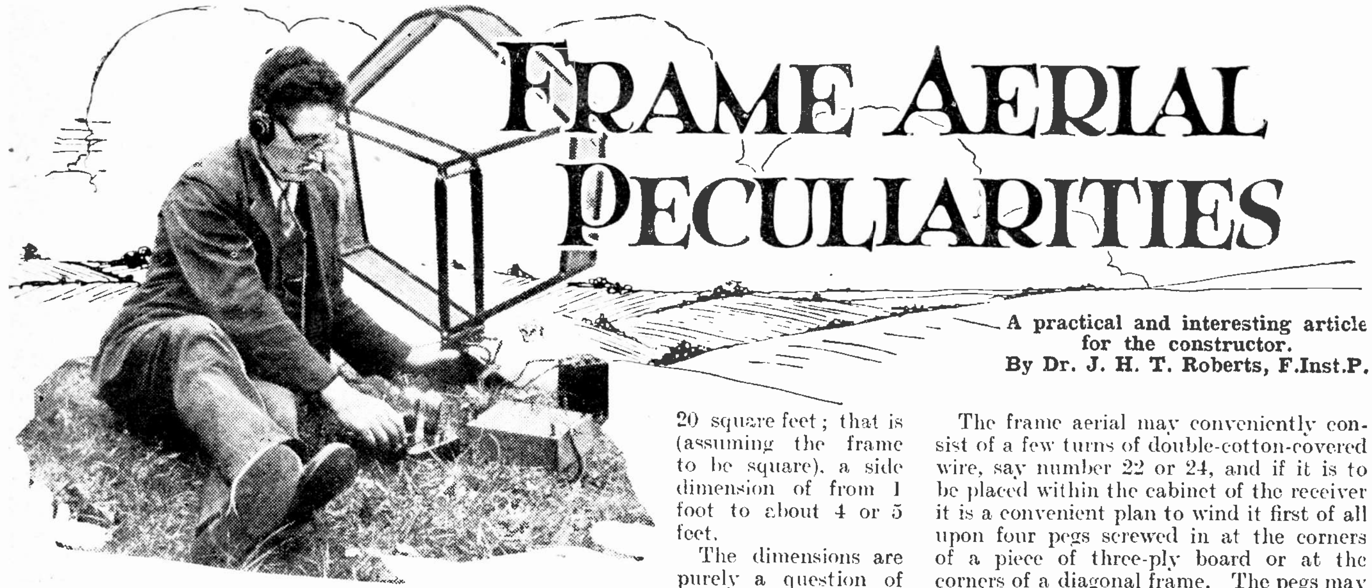
In an emergency a good substitute for a drill is a bradawl of the same size, but pressure must be exercised carefully.

* * *

When two circuits are connected together by capacity coupling the smaller the capacity in question the looser will be the coupling.

* * *

When the aerial is not in use it should be connected direct to earth outside the house by means of an earthing switch.



FRAME AERIAL PECULIARITIES

A practical and interesting article for the constructor.
By Dr. J. H. T. Roberts, F.Inst.P.

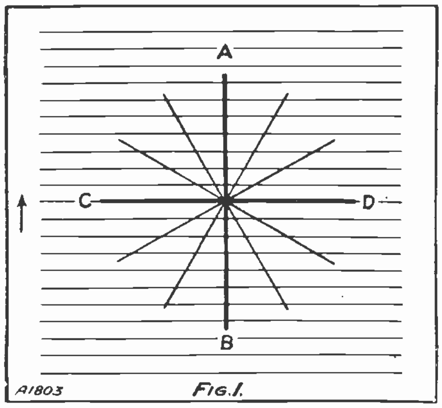
THE current produced in a frame aerial depends on the difference between the effect of the wave upon one vertical side of the frame and that upon the other vertical side of the frame at the same moment. It will be clear from this that if the frame is placed "broadside on" to the waves, the effect on the two vertical sides of the frame at any instant will be the same, that is, the *difference* will be zero, and therefore there will not be any electro-motive force induced in the frame.

Directional Effects.

On the other hand, if the frame is "edge on" to the direction of travel of the waves, the time-interval between the striking of one vertical side and the striking of the opposite vertical side will be at maximum; and the current induced in the aerial by the wireless waves will be at maximum.

This explains the simple and well-known fact that reception on a frame aerial is at a minimum (never actually zero) when the frame is broadside-on to the direction of the waves and at a maximum when the frame is edge-on to the waves.

DIRECTIONAL EFFECT



The horizontal lines represent the radio energy.

The frame aerial consists, as you know, of a few turns of wire wound upon a frame having an area which may be anything from, say, one square foot to perhaps 20 square feet; that is (assuming the frame to be square), a side dimension of from 1 foot to about 4 or 5 feet.

The dimensions are purely a question of convenience. In the case where the frame aerial is enclosed within the cabinet or lid of a portable set, it is usually of very small size, not more than 12 to 18 in. sides.

In Fig. 1 the horizontal lines represent magnetic lines of force due to the waves which are travelling in the direction of the arrow or parallel to the line AB. You will see that in the position AB the number of magnetic lines linking with the frame is at a maximum, that is, when the frame is edge-on to the direction of the waves.

If the frame is rotated through 90 degrees to the position CD, no magnetic lines are linked and no electro-motive force is induced into the frame.

If we measure the signal-strength produced in the frame when it is in various positions we can plot the diagram shown in Fig. 2, in which the signal strength is proportional to the length of the line drawn (parallel to the frame) from the centre or "origin" and cutting the curve. An important point emerges from this diagram.

You will notice that if you shift the frame through a small angle from the position CD, the length of the chord rapidly increases. If, however, you start from the position AB, and shift through a similar angle, the length of the chord varies very little.

This means that slight shift of the frame aerial when in the region of the *maximum* signal strength produces very little difference, that is, the exact maximum position is not well defined.

Minimum Position Well Defined.

On the other hand, a very slight shift from the *minimum* position causes a pronounced increase in signal strength, and therefore the minimum position is much more sharply defined than the maximum position. For this reason, when the frame aerial is being used for direction-finding purposes, it is customary to take readings of the position of minimum signal-strength.

As a matter of fact, in practice the sharpness of the minimum position is also interfered with owing to certain accidental causes. One of these causes is the fact that the frame aerial, even in the minimum position, acts also to a slight extent as an ordinary line-aerial, and still picks up signals, although very weakly. Also if the windings are not correctly balanced the minimum strength will be raised.

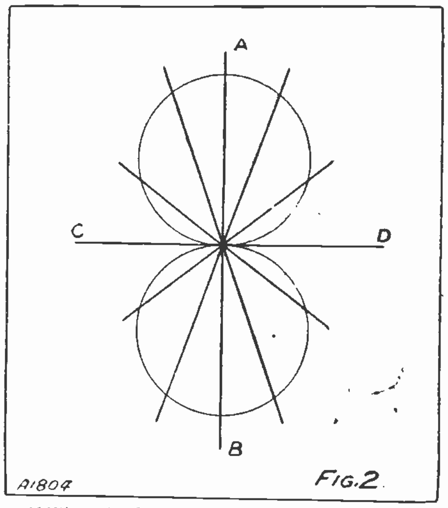
The frame aerial may conveniently consist of a few turns of double-cotton-covered wire, say number 22 or 24, and if it is to be placed within the cabinet of the receiver it is a convenient plan to wind it first of all upon four pegs screwed in at the corners of a piece of three-ply board or at the corners of a diagonal frame. The pegs may consist of ordinary wood-screws carrying ebonite sleeves, and holding these firmly against the wood so that they will not rotate.

Advantages of the Frame.

A series of sawcuts may be made in the ebonite, spaced at about one-eighth of an inch apart, the successive turns of wire being laid in the sawcuts. Some constructors put the pegs into the cabinet itself and then wind the turns of the frame aerial in that position, but I think it is much more convenient to wind on a separate frame which can be inserted into or removed from the cabinet.

The frame aerial has the great advantage that no outside aerial is required, nor is an earth connection necessary. Moreover, a receiver with a frame aerial is much more portable than one which has connections to an outside aerial and to earth. At the same time, against these advantages must be set the fact that the frame aerial has only a small fraction of the sensitivity of a good outside aerial with an earth system.

CRITICAL POSITIONS



Shifting the frame from the C—D position has a more rapid effect than from A—B.

By rotating the receiver as a whole (including the frame), the best position for the reception of any particular station can be found, and this is a distinct aid to cutting out unwanted stations.

LATEST BROADCASTING NEWS.

EISTEDDFOD BROADCASTS

NATIONAL ORCHESTRA OF WALES—GROUP LISTENING IN SCOTLAND—HERE AND THERE—LANCS. V. YORKS. AT MANCHESTER.

IT goes almost without saying that several relays from the Royal National Eisteddfod, which opens at Llanelly on Monday, August 4th, are to be included in the broadcast programmes.

Perhaps the most important is the speech by the Rt. Hon. David Lloyd George, M.P., which will be followed by a commentary on the ceremony of the Chairing of the Bard. These relays will be heard by National as well as West Regional listeners.

On Tuesday evening, August 5th, Mr. Caradog Pritchard, the Crown Bard, is to give a talk on "The Eisteddfod, Past and Present." Mr. Pritchard is well-known to listeners for his readings from his own works.

National Orchestra of Wales.

This year's Festival will be memorable in the annals of broadcasting inasmuch as the National Orchestra of Wales has been engaged to play during the week. Listeners, both in the West and to the National transmitters, will hear them on Wednesday evening, August 6th, in a concert, during which items will also be contributed by Francis Russell (tenor), Arthur Fear (baritone), and the Eisteddfod Choir of nearly six hundred voices. Part of the orchestral programme will consist of Sir Hubert Parry's cantata, "The Pied Piper of Hamelin," which will be conducted by Mr. Edgar Thomas.

Group Listening in Scotland.

An important experiment, financed by a grant of £300 from the Carnegie-Trust, to discover what scope exists for the extension of group listening in Scotland on the lines developed in England will take place between September and the end of 1931.

The money will be used for the purchase of receiving sets, which will be loaned to listening groups in the counties of Dumfrieshire and Lanark, which have been selected because they are representative of town, industrial and rural life.

The organising committee has been formed by representatives of bodies interested in adult education under the chairmanship of Professor Rait of the Glasgow University.

Enthusiasts for broadcast education are confident that the experiment will lead to the formation of numerous groups, so that within a short time those responsible for this side of broadcast work in England will have to look to their laurels.

Here and There.

The August Bank Holiday programme for National listeners will include the next edition of Gordon McConnel's "Suitable Songs"—mainly those of the late Albert Chevalier, King of Cockney comedians. The songs will be sung by Edgar Lane, who was one of Chevalier's greatest friends, and who, it will be remembered, has already given several recitals of a similar nature from the Birmingham studio.

* * *

Frank Westfield's Orchestra, at the Prince of Wales' Playhouse, Lewisham, which has not been heard for more than a year because of the talkie boom, is to be heard regularly on Tuesday afternoons, beginning on July 29th.

* * *

It is an open secret that the programmes of "Diversions," arranged at Savoy Hill, did not come up to expectations, with the result that the authorities decided to drop them, at any rate for the time being.

Undeterred by the set-back to their London colleagues, the Studio officials at Birmingham are determined to try their luck even if they fail to provide more than one show. Naturally, details are being kept secret, but it is understood that the Midland engineers have been making some tests with an aeroplane.

The date chosen for the programme is Friday, July 25th.

* * *

More than usual interest is contained in the announcement that the London and National programmes on Thursday and Friday, July 31st and August 1st respectively, will contain a play by Dulcima Glasby called "Obsession." Miss Glasby, who for many years has been on the staff at Savoy Hill, has prepared many plays for broadcasting.

* * *

National listeners will have to wait until Thursday, August 7th, for a relay from the seaside, when the Coldstream Guards will be heard playing at Brighton.

* * *

Millions of listeners will look forward to hearing a broadcast of Miss Amy Johnson's arrival at Croydon on Tuesday, August 5th. It is hoped that the broadcast will go out from all stations.

* * *

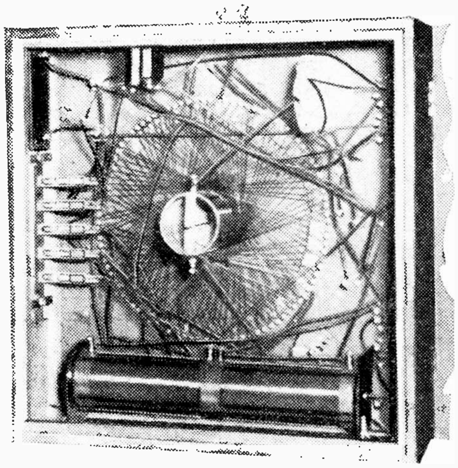
Lancs. v. Yorks. at Manchester.

Provided the weather is fine, listeners throughout the North on August Bank Holiday afternoon will have no grouse against the programme to be provided. It is one of the days devoted to the County Cricket Match between Lancashire and Yorkshire at Old Trafford, Manchester, and several eye-witness accounts of the game will be given by Mr. A. E. Lawton, the former captain of Derbyshire.

Later the same day there is to be a humorous debate on cricket in the Manchester studio between George Cartwright and Levi Shaw, the title of their discussion being "Ashes of Roses."

Subsequently the Northern Wireless Orchestra and the Clitheroe Wesley Male Voice Choir will give a programme of examples of the music of England, Scotland, Ireland and Wales, which has been strung together under the title of the "Royal Standard." This part of the Northern programme will also constitute the programme for National listeners.

AN OLD-TIMER



This interesting photograph shows the back view of an old crystal set made originally to receive the Eiffel Tower broadcasts and time signal. It measured about twenty inches square—the size of a modern portable!

FOR THE LISTENER.

A Specially-contributed Criticism of Current Broadcasting Events. By "PHILEMON"

This week our popular contributor, who is holiday-making on the Continent, tells how British broadcasting is received there.

A Sensation.

WELL, here we are, Belinda and I at the farm. Belinda's reception was immense.

It is not being reported in the local papers, partly for fear that Mussolini might be jealous, partly because there are no local papers. On previous occasions I myself have been the centre of attraction; but from the moment I said, "This is my Radio. Please meet Belinda!" she has been the centre of attraction.

Nobody in these parts has seen anything like her before. The farm-boy who carried my luggage into the cottage stood staring at her, open-mouthed. I took off her mackintosh—her travelling cloak, I should say. She stood on the table before him, her polished wood gleaming, and all her little gadgets pricking him with eye-bulging curiosity.

"E bella!" he cried, smiling with his white teeth. "Bellissima!"

The Aerial.

The farm emptied itself around her. The farmer left his reaping-hook, the farm-hand came off the midden, the farm-wife abandoned her washtub, even Lulu, a fat liver-coloured mongrel, left her bone, and they all came around. I took advantage of this enthusiasm to get the aerial put up.

Belinda, of course, carries her aerial inside her, but I thought that an extra

(Continued on page 552.)

CAPT. ECKERSLEY'S QUERY CORNER

A SHOCK FROM A CHARGER—THE NORTH REGIONAL—TROUBLE WITH AN S.G. STAGE—ADJUSTING DETECTOR BIAS.

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, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

A Shock from a Charger.

"CHARGER" (Seven Kings).—"When charging an accumulator from D.C. mains with the positive main earthed, is it possible to obtain a shock from the accumulator by merely touching the negative terminal? The above is assuming that I am standing on an earthed object."

Yes, rather! and you bet! and I have done it! and it's not pleasant! You see if a conductor is either positive or negative compared to earth, and if a person is earthed, and if he touches that positively or negatively charged thing, current is bound to flow from that thing through him to earth, thereby giving him an electric shock.

It doesn't matter if the current flows one way or the other, it's a shock just the same.

* * *

The North Regional.

G. B. A. (Huddersfield).—"I am situated within a few miles of the new Northern regional station, and am thinking of constructing another receiver. Is it safe to assume that conditions within ten miles of this station will be similar to conditions within a similar distance from Brookmans Park?"

Yes, practically speaking.

* * *

Trouble with an S.G. Stage.

J. M. (Muswell Hill).—"I am extremely dissatisfied with my screened grid H.F. valve. The H.F. amplifier gives me good amplification but no selectivity, and if I reduce the number of turns on the primary of my H.F. transformer (which is interchangeable), the selectivity is improved but a loss of amplification results.

"Do you consider an efficient H.F. transformer (Litz wire, etc.) used with an ordinary neutralised H.F. valve would give me a higher degree of selectivity and an amplification comparable to an S.G. valve, the latter employing a small primary?"

No. The S.G. valve properly treated ought to give both better selectivity *and* sensitivity than an ordinary H.F. valve. *But* the screened-grid valve has a very much greater sensitivity as selectivity is sacrificed because sensitivity and selectivity are actually inversely proportional and an increase of sensitivity gives an apparent decrease in selectivity.

But on balance, and designing things properly, both sensitivity and selectivity can be increased in the case of the S.G. valve provided proper precautions are taken. Thus do not force sensitivity beyond the limits dictated by selectivity. Make your inductances of low resistance and make them to have high impedance.

Adjusting Detector Bias.

B. H. (Southgate).—"I have constructed a four-valve receiver incorporating indirectly-heated A.C. valves and am experiencing some difficulty in arriving at a value of grid bias for the detector, which, while allowing me to obtain good quality of reproduction from Brookmans Park, also enables me to bring in distant stations.

"A positive bias of $1\frac{1}{2}$ to 3 volts allows me to fully tune in the local station, but I have to reduce the bias to zero in order to obtain maximum signal strength from other stations. A negative bias (anode bend rectification) appears to be useless, since it reduces volume considerably from all radio sources.

"I should be grateful for some suggestions. Incidentally, an S.G. A.C. valve precedes the detector."

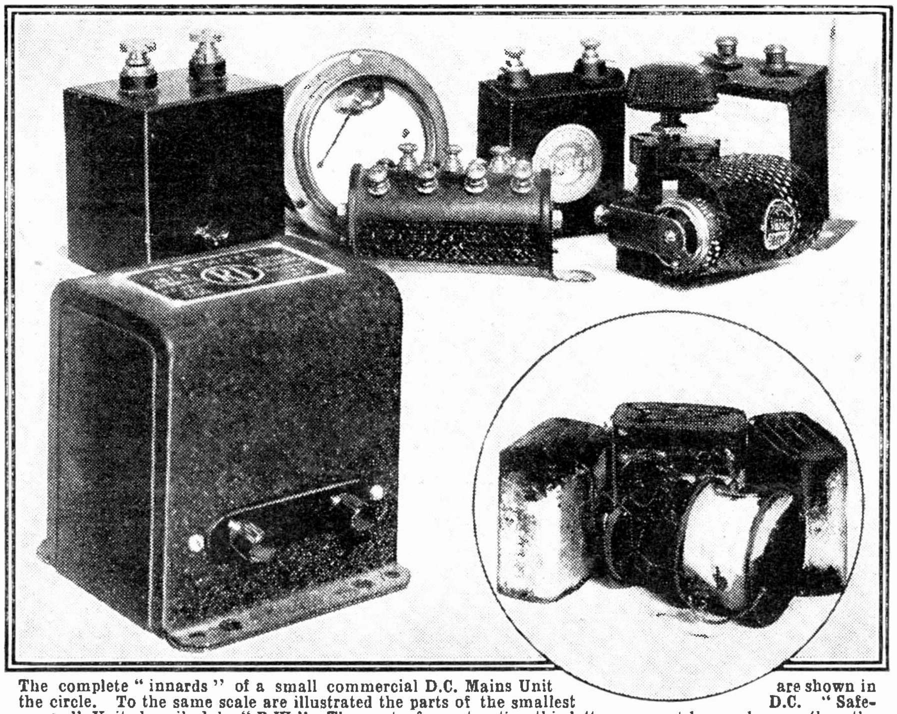
I do not know the characteristics of the valve you are using. You have two things to consider—quality and quantity. They are not necessarily proportional.

If you get on the straight part of the characteristic you have the nearer approach to distortionless rectification; if, however, you are on other parts of the characteristic you may get better volume but worse quality.

Frankly it is for you to decide. If you get good quality and good volume, why worry? If the volume is good but the quality poor with one adjustment, but vice versa with another you must decide what you want yourself.

Since distant stations are normally pretty poor quality, you want to get volume, but in the local station your volume is there, so get the best quality.

TWO MAINS UNITS



The complete "innards" of a small commercial D.C. Mains Unit are shown in the circle. To the same scale are illustrated the parts of the smallest D.C. "Safe-power" Unit described by "P.W." The cost of constructing this latter may not be much more than the price of the commercial unit, nevertheless, it is obvious that the constructor must score heavily in, at least, this particular case.

SHORT-WAVE NOTES.

News about short-wave stations and short-wave reception, including some very useful advice on working short-wavers from H.T. mains eliminators.

By W. L. S.

THE Editor has asked me to say a few words on the subject of mains units and short wavers, as apparently a number of readers seem to be having all sorts of troubles with them.

I have at several times made scrappy remarks on this somewhat wide subject, chiefly consisting of practical tips gleaned from my own experience. I must therefore ask those who know all about the subject and are liable to become bored either to forgive me or to pass on quickly.

I have no hesitation in saying that the source of nearly all the troubles that crop up when a mains unit is used with a short-waver is the detector. It is child's play to make the "note-mags." work from the cheapest eliminator, but when we get to the detector we generally run right into a nest of troubles.

The Source of the Trouble.

Unfortunate though it may seem, the trouble generally comes from the detector and not the mains unit. If the H.F. choke is doubtful, if the by-pass condenser is not above reproach, and particularly if no trouble has been taken at all to provide a really efficient by-pass for H.F. before it gets too far round the detector anode circuit, then it stands to reason that the slightest modulation in the H.T. supply, whether ripple from D.C. mains or 50-cycle stuff from imperfectly-smoothed A.C. mains, will cause plenty of trouble.

Therefore see that your by-passing scheme is efficient. This means not only that its physical position on the baseboard is correct. Remember, above all things, that in the region of 20 metres one good long loop in the wiring may have half the inductance of the tuning coil!

Thus, if you are using an ordinary series-fed circuit you should be able to trace the following short, direct wires: from detector anode to one side of the reaction coil; from the other side to an H.F. choke and also to one side of the reaction condenser (the other side of which goes to L.T.—); from the other side of the choke to one end of the transformer primary: from the other end of the primary straight down through a 2 mfd. condenser to L.T.—, and also through 10,000 or 20,000 ohm resistance to H.T. positive.

Using Extra Smoothing.

If you can find all this there should not be much wrong with the "set" part of the business. Now for the eliminator.

If it is a really good mains unit it should work straight away with one of the appropriate H.T. tappings taken to the detector H.T. terminal mentioned above. If it is of the cheap kind without enough smoothing, take the detector H.T. lead out through an externally-connected 20 or 30 henry choke, and connect the "set" side of this choke straight down to earth through a 2 mfd. or 4 mfd. condenser.

If there is still a trace of hum, don't be afraid of using 8 mfd. It is cheaper than buying high-tension batteries anyway!

Need for a Good Earth.

I honestly fail to see how anyone can be troubled with hum now, providing he has a moderately good earth on the set. That, too, is a point missed by a number of people who have found that they can work a short-waver quite well off batteries without an earth.

The next trouble that may arise is that the set will continually be slithering in and out of oscillation (at least, we hope it slithers—some of them will go in and out with ear-shattering explosions.) This is, of course, due to slight but persistent variations in the mains voltage, and is, unfortunately, common to a great number of supplies, including mine.

This phenomenon is capable of causing much annoyance, but, luckily, there is a simple remedy. Simply connect a neon lamp across the detector positive and negative H.T.

The ordinary 200-volt night-light that can be bought at any electrician's is suitable. It takes 5 watts (which means about 20 or 25 m.a.) and is very efficacious, provided that your mains unit is designed to stand an output of that order.

If it is not, a resistance of about 10,000 or 20,000 ohms across that tapping will often put things right. A large condenser across the resistance will also help.

And now I must leave it for readers to make their own particular problems known to me, since I can think of no other troubles that the average man is likely to meet.

A Welsh reader has been kind enough to forward me a schedule from Radio Bandoeng, P L E, which runs as follows: Monday, Wednesday, Thursday and Saturday with P M B on 14·55 metres from 1140–1600 G.M.T. Also one or both of the two stations, P L F on 16·8 metres or P L R on 28·2 metres.

On Tuesday and Friday there is one or more of the above and P L E on 15·93 metres. The weekly concert is given by P L E every Tuesday from 1340 to 1540 G.M.T.

Telephony Working.

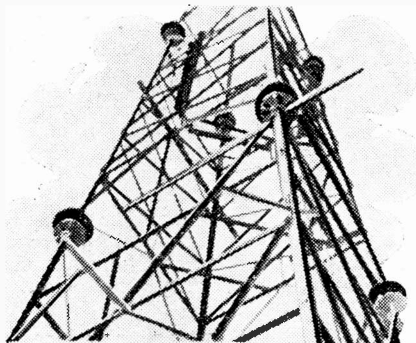
The Transatlantic 'phone is often the only inmate of the entire 20-metre band these days. Very seldom are distant amateur signals heard at all in the evenings, and the other short-wave broadcasting stations in this region are particularly weak.

This record spell of poor reception extends from the end of March!

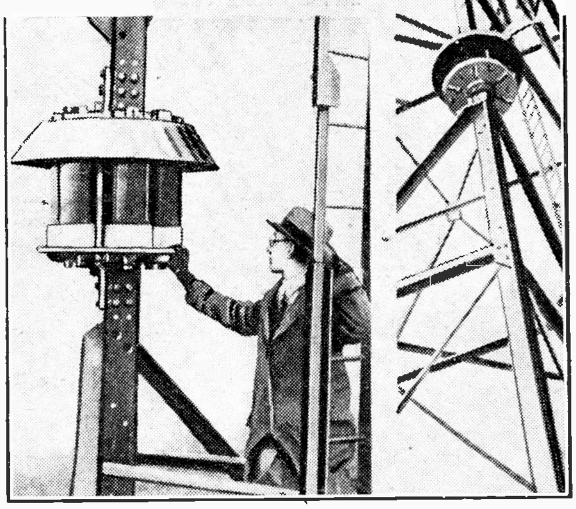
Amateur telephony seems to be going strong on 40 metres these days. I have heard some really excellent "fone" from round about London, but particularly from stations further distant and as far North as Aberdeen.

I have hopes that the 80-metre band, now re-opened for amateur work, will prove of use for telephony work at week-ends. At all events it should be more useful for "local" work up to about 100 miles than either the 150-metre or the 40-metre waves.

INSULATING THE AERIAL MAST.



To avoid losses in the metal masts of high-power transmitting stations it is often necessary to insulate them in sections in the manner illustrated in this photograph.



POINTS ABOUT AERIALS.

Indoor aerials are not very good from the pick-up point of view, but the coming of better H.F. valves and the higher-powered stations is resulting in a considerable increase in their use.

* * *

From a high-frequency point of view an aerial is not insulated properly unless it is spaced well away from all adjacent conductors.

* * *

If you run an insulated aerial wire close to a metal gutter pipe you are forming a small condenser with the insulation of the wire acting as the dielectric, and your signals are likely to "leak" to earth via this.

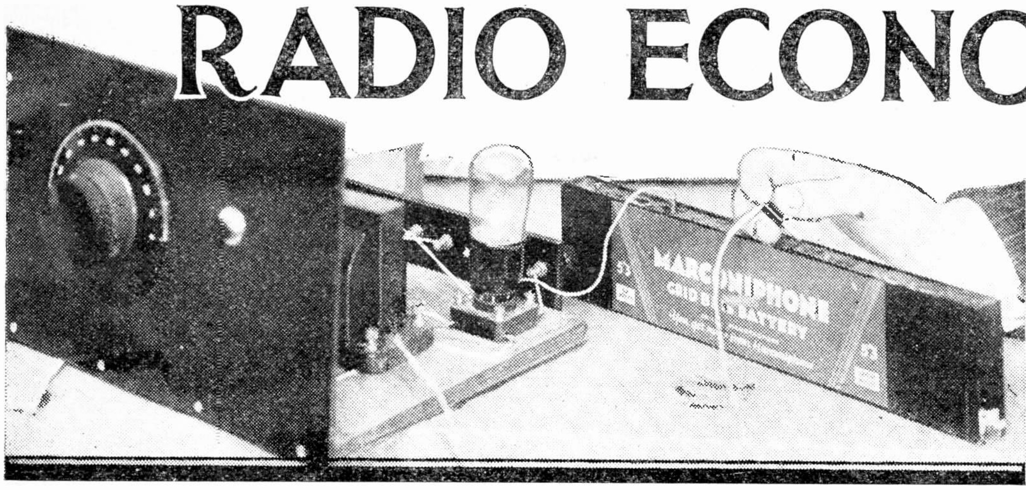
* * *

A big aerial often causes more trouble by its lack of selectivity than is gained from its large energy pick-up.

RADIO ECONOMIES

by

VICTOR KING



Sound advice on set selection and assembly by one of radio's most outstanding personalities.

I THINK I must have received more letters about one of my recent articles than any other that I have ever written. The article was entitled "How Much Does Radio Cost You?" and many of my correspondents appear to consider that I did not fulfil the promise of that title.

But really, you know, the complete economics of radio is too big a subject to be coverable by one page of "P.W." However, the editor has kindly given me this opportunity of going further into the question.

It has been pointed out that many of the sets described in "P.W." and "M.W." cost some pounds to construct if the recommended components and parts are used, whereas satisfactory versions are possible at fractions of the outlays. I did think that I had adequately covered at least that point, and shown you that it is possible to narrow things down in many instances by an intelligent selection of parts, but it appears that there are many enthusiasts who go to surprising limits.

Dangerous Extremes.

"I have been able to build a so-and-so two-valver for 15s." is the kind of thing that is said. Now that sort of business is all very well, but extremes have their dangers. I think I can go right to the heart of that matter by repeating a very clever sub-title that I spotted in a recent "P.W."

This ran: "the set is no better than its loud speaker," or words to that effect.

The average small loud-speaker is the greatest stumbling block in the progress of home-constructor radio. It is an undeniable fact that all sets are reduced to a very low level of overall efficiency when they are used with mediocre loud-speakers. And unfortunately there are all too few loud-speakers that rise above the *very* mediocre.

If you are for ever going to confine your attentions to a nasty little loud-speaker having no bass, and capable of handling nothing above a thousand in the way of high notes, then you need look no further than the cheapest of everything in the way of component parts.

Another Viewpoint.

What is the use of building a receiver capable of getting frequencies of 75 or 5,000 to its output terminals in fair measure, if a loud-speaker is tacked on which is quite incapable of dealing with them?

But look at the other side of the picture. What is the advantage in having a first-class loud-speaker that has the power to reproduce quite respectable low frequencies with a quite decent percentage of the upper register, if you never have a set that can deliver a respectable output.

Rather Unfortunate Word.

It seems to me that the constructor too often fails to remember that a radio set is one complete entity and that its accessories, that is, batteries, loud-speaker, etc. are far from being unimportant incidentals.

Maybe the word accessory is unfortunate in that it might tend to indicate that these vital items play "second fiddle" to the set itself.

But you should always think of the whole outfit, batteries, valves, loud-speaker, aerial—everything, every component part, every accessory as playing important rôles in an important whole.

I have mentioned batteries, and what vital things these are! You can get results from your set whatever it is with an H.T. probably as low as 60 volts. But that is not a matter for congratulation; it is not an achievement.

Victor King (left) describes one of his own set designs for the benefit of some interested friends.

If a loud-speaker outfit cannot give better results with more H.T. than that, then there surely must be something wrong with it. It is a false economy indeed to cut down your battery power to such absurd limits. That is, if you have a decent set and a moderately decent loud-speaker to take its output.

You see, all these things are so inter-dependent; drop the level of the one and the level of the whole outfit correspondingly falls. The practical value of a £100 outfit can be entirely invalidated by the presence of one cheap and nasty little component.

Expensive Components.

As you are all by now no doubt aware, I am no lover of the expensive component or accessory for its mere expensiveness, but I would not attempt to drive a fifteen guinea moving-coil loud speaker (if I had one) with a fifteen shilling set.

Unfortunately for constructors in general, I have to admit that there is no justification for the high prices of a few of the components and accessories of first-class grade. But gradually prices are coming down, and the discriminating constructor has no difficulty whatever in getting real value for money.

There is very keen competition in the radio trade.

Although there may not be much stuff sold these days that is as hopelessly bad as some of those earlier components and accessories, there is an extremely wide gap between the component or loud-speaker with a passable performance, and the one that is labelled by the expert as first-class.

Sound Advice.

And it depends upon your selection of parts for your set and the selection of its accessories, whether the results of the whole outfit are going to be at the one end or other of the scale.

Real skill is needed to steer a middle course, knowing that your financial resources will not permit you to strike the highest levels.

I should advise you to spend all you can on those radio parts having definite frequency or amplitude characteristics, particularly loud speakers, L.F. chokes and transformers, valves (and H.T.), if you want really high quality results.

THE CRITICS OF THE B.B.C.

Readers will enjoy this article about criticisms of the B.B.C., especially in view of the new series of well informed and constructive articles which begin in this issue.

By N. F. E.

IT is sometimes amusing, though seldom instructive, to go through a pile of newspaper cuttings and note the space devoted to criticisms of the B.B.C.

Where the criticism is not definitely destructive it is usually carping, and where, in rare cases, it is not carping, it is misinformed.

Now we have had many a word of adverse criticism to make against the B.B.C., and unless a miracle happens and all things suddenly attain to a state of blissful perfection, we shall have many a word of similar criticism to make in the future. But, we hope, with some definite constructive basis.

Criticism which consists in the main of fault-finding is similar in effect to a nagging, grumbling wife: it becomes a habit to be disregarded by the object of the criticism. And there is nothing quite so valueless, so sterile, and so abysmally futile, as criticism which is contemptuously disregarded.

Those Constant Attacks.

A dramatic critic who inspires theatre managers to say "Oh, it doesn't matter a tinker's cuss what so-and-so says about a play," should throw up his job and try something else.

Oscar Wilde once said that it was better to be attacked than to be ignored—but like most of the so-called smart sayings of that King of Poseurs, there was only a superficial truth in his *bon mot*.

Constant attack—especially when it is obviously destructive and biassed—is harmful to those who attack. The attacked needn't worry—much.

And so, when the B.B.C. is picked upon—as it often is—as the object for all the ink-slingers who suffer from indigestion, liver, and what-not, and who seem to find some relief in castigating the B.B.C. in and out of season, the B.B.C. need not worry.

As a matter of fact they don't. They used to—very much. We remember days when one little piece of adverse criticism would set Savoy Hill in an uproar. We ourselves have had some experience of the fluttering in the B.B.C. dove-cote caused by editorials in this journal.

Two Classes of Critics.

But those days, happily, are passed. The B.B.C. is now well able to face criticism, because it realises that intelligent and constructive comment on its affairs is definitely valuable.

Criticisms levelled against the B.B.C. may not always be regarded at Savoy Hill as pearls of wisdom. The advice offered—gratuitously, of course!—may not always be accepted; but there can be no doubt that Savoy Hill does not find it unwelcome. As Sir John Reith would say, "By taking heed of differences of opinion, we gain ground."

Critics of the B.B.C. may be split into two classes—those who criticise the programmes, and those who criticise the administrative policy.

The programme critics seem reasonably unanimous about the need for more cheerful Sunday programmes, but like their brethren, the dramatic critics of the theatre, they seldom agree when criticising individual programmes. Which shows, of course, the truth of the old adage that what is one man's meat is another's poison, and incidentally lends force to the argument that you can't please everybody.

The Out-and-Outers.

The critics of policy are equally divided. Some are against the "uplift" policy: some maintain there should be a basis of entertainment in everything broadcast—especially in connection with the "educational" activities of the B.B.C. (With this view we agree.) And there are the out-and-out highbrows, and the out-and-out lowbrows: and then a vague body generally known as middlebrows.

And lastly, the "can't-be-pleased-at-any-price" gang—the critics who simply cannot find an ounce of good in the B.B.C.—from programmes to administrative policy. These of course, can be ignored. They are of no value.

The Brick-Heavers.

They contribute nothing to the progress of broadcasting, and they merely weary the listener who is interested in B.B.C. crititism, by the monotony of their diatribes and the malice of their rhetoric.

Still, they probably get some fun out of writing stuff and nonsense, and we all know that, at times, there is a smug satisfaction to be had in "breaking things."

Your jaundiced critic gets the same feeling as a small boy does when he heaves a brick through a window and runs away. The only difference being that hard words break no bones, while hard bricks *do* break windows.

But there it is. It takes all sorts to make a world and perhaps the B.B.C. and the average listener would miss the fulminations and the desperate campaigns of those who regard the B.B.C. as a sort of permanent Aunt Sally.

The only danger is this: some people find this sort of froth convincing because of its very superficiality.

What Really Counts.

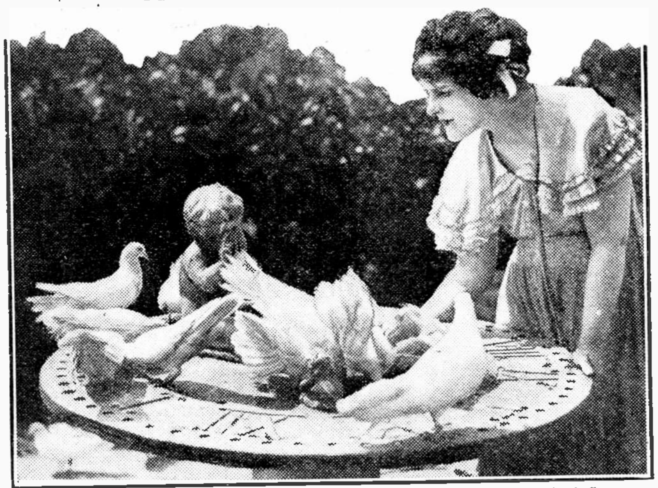
But the man who likes a tankard of beer knows, by experience, that the froth at the top, although effective in appearance, doesn't count for much. So then, we hope listeners will not be gulled by the froth of the "out-and-outers" who can find no sign of grace in the activity of Savoy Hill, but will blow them aside and pay heed to the unprejudiced critics who know their subject, and who realise that although there may be much which is (relatively) bad about the B.B.C., so there is much that is (relatively) good.

After all, who wants a perfect B.B.C.? Nothing is perfect on this earth—and probably never will be. And if we could honestly say British Broadcasting were perfect we should have realised something absolute.

And that would be almost supernatural. Certainly it would be super-human: and super-human in the broadcasting sense would probably result in something super-mechanical.

But there's no fear of that so long as intelligent criticism, backed by goodwill and a desire to *help forward*, is understood and appreciated—*not so much for what it is intrinsically worth, but for the motives which underlie it.*

A RADIO PERSONALITY



This is Miss Beatrice Harrison feeding the birds in her beautiful Surrey garden after a successful American tour. She is well known to listeners for her 'cello recitals and in connection with the nightingale broadcasts.

RADIO WRINKLES

When soldering, both the iron itself and the working surfaces must be kept perfectly clean.

* * *

The old-fashioned idea of a small loud speaker necessarily giving small volume and a large loud speaker giving large volume is still occasionally cropping up, although it has been disproved long ago.

* * *

An ordinary on-off switch fitted across the terminals of one loud speaker wired in series with another will enable it to be switched into circuit without affecting the other speaker.

* * *

For "family" use one of the permanent types of crystal detector is generally more satisfactory than the "cat's-whisker" which easily gets out of adjustment.

DOUBLE-DUTY LOUDSPEAKERS

A novel plan for connecting extension leads to a set.
By L. C. MUNN.

THE advantages of an output choke are well known to readers and there is no need to repeat them here.

One of the advantages is that it is easy with a choke output to take an extension to any room of the house (or to the garden). A single wire can be employed. the return going to the nearest earthed object such as a water- or gas-pipe.

We thus have no high-voltage wires running round the place, and quite a small-gauge wire will suffice without elaborate precautions as to insulation.

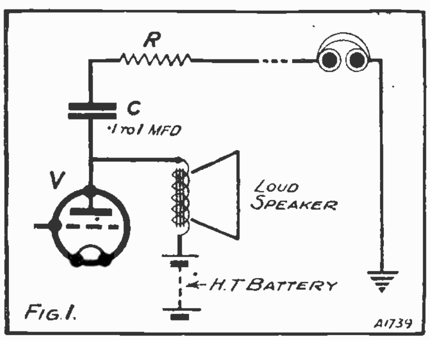
Simple and Cheap.

Many sets have not an output choke or transformer, consequently often when a 'phone or speaker extension to another room would be useful, one is not inclined to go to the trouble of putting it up.

Such an extension requires double-stranded flex (which looks untidy), careful insulation, and produces a general complication of the output wiring, besides tending to upset the working of the set.

There is, however, a very simple, neat, and cheap way of running a 'phone extension to another room or several rooms from an ordinary direct-output set by using the loudspeaker as a choke. It is also quite safe even with a mains unit.

SIMPLE CONNECTIONS



One fixed condenser and a home-made resistance are all you want to put the plan into practice.

Fig. 1 will make the general scheme plain. The windings of the loudspeaker are represented in the conventional manner as a low-frequency choke, and the single-wire extension is taken to a fixed condenser C via a resistance R.

The other side of the condenser is wired to the anode of the last valve. Alternatively, of course, it may be taken to that terminal on the loudspeaker which is connected to the anode.

The resistance R will probably be needed unless several pairs of 'phones are wired in series. Particulars of this resistance are given later.

The fixed condenser can have any value from about 0·1 mfd. upwards for 'phone work, but a 1-mfd. condenser is better, since it passes more of the low notes than a smaller condenser.

There is no need whatever to use heavy-gauge insulated wire. Just take a ¼ lb. reel of No. 26 or No. 28 D.C.C. wire, soak it in some melted paraffin wax (a candle can be used), and you have a neat, cheap, efficient extension wire that will serve your purpose.

The fixing of this wire is easy. A length of rubber-covered flex is taken from the set to the nearest convenient point on the wooden skirting-board and anchored there with a small staple.

To it you join one end of your waxed D.C.C. wire.

Then this wire is carried via the top edge of the wooden skirting-board—or under the carpet—to the door.

It can be held in place with an ordinary drawing pin every few feet, the wire being given one turn round each pin as it is pushed in.

This is a much better plan than using staples or special insulating pins, which are not necessary in this case. It is easier and neater. It does not damage the woodwork, and you would not notice the extension wire unless it was pointed out.

The Extension Leads.

Continue on to the room where the lead is to end by following any convenient woodwork on the way, along the side of the stairs, or up the sides of door frames.

Finish off at the other end with a short length of flex, anchored as before, to take the strain of any movement of the 'phone leads, or use a wall 'phone plug.

The "return" lead is also of D.C.C. wire, and no precautions regarding insulation are necessary. It is taken to the nearest or most convenient "earth," such as a gas- or water-pipe, and good contact is made with a clip or spot of solder. Solder is best for a permanent job.

As already mentioned, it will probably be found necessary to cut down the 'phone strength with a series resistance when using a 1-mfd. bypass condenser and a normal loudspeaker.

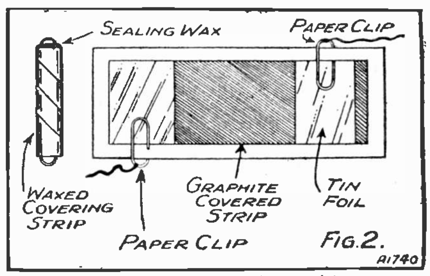
It is impossible to give the value of this resistance. It depends on too many factors. If you have a variable resistance by you, you can try it.

If not, you can easily make a resistance (see Fig. 2) with the following simple materials: Some notepaper and tin foil, several wire paper clips, and a soft lead pencil.

Cut out a strip of the notepaper (which should have a rough surface) 4 in. long and 1½ in. wide, and another of the same length 2 in. wide. The latter is for wrapping.

Cover one side of the 1½ in. strip evenly with the "blacklead" finely scraped from the "soft" lead pencil (B.B.). This is your resistance.

EASILY-MADE RESISTANCE



Here are the details of the resistance.

Connection at one end is made with the bared end of the D.C.C. wire bent over a slip of tin foil (from a cigarette packet). A wire paper clip holds it in place.

For the other end a similar slip of tin foil is provided, and is moved along the black-leaded strip towards the other tin foil until, by audible means, you have found the right resistance.

You should determine this at the 'phone end where the speaker will not interfere with your judgment; but, having found the correct adjustment, the resistance is finished off and wired-in at the set end.

Finishing off.

You finish it off by clipping the second foil connection in place with another clip, but before doing so, put the 2 in. paper under the 1½ in. strip, leaving a ¼ in. margin each side of the conducting strip.

The one clip and wire is on the right and the other on the left of the strip. It is then rolled up lengthwise, a little sealing-wax put on each end, and a strip of warm, waxed paper wrapped round it.

The "EURO THREE

This remarkable set gives you the efficiency of a single-r

Designed and Descri

HAVE you ever seen a receiver of the detector and L.F. type with wave-change switching arranged with plug-in coils? Can you remember how many coils there were? Somewhere about five or six, wasn't it? That is what generally happens when an attempt is made to arrange a set including switching for going over from the ordinary band to long waves, and yet retaining the advantages of standard plug-in coils.

Efficient Switching.

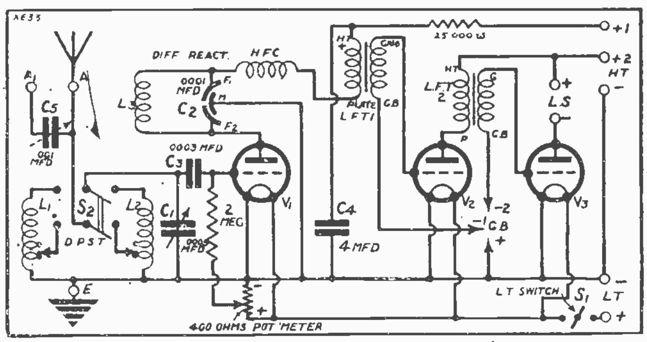
The complication and waste of space which results in the case of a set assembled on these lines has been sufficient to cause designers to avoid this otherwise satisfactory method of wave changing. It really is an attractive method, of course, remembering that plug-in coils are not expensive and that a very large number of constructors already possess them, and further, that provided the switch itself is a good one, the efficiency obtainable from any scheme giving a complete change-over from one set of coils to another is usually quite high.

Evidently if the one drawback of complication introduced by so large a number of separate coils could be removed, we should have then a very excellent method of wave changing. We have been led recently to look into this question, with a view to seeing whether we could not reduce the total number of coils required and so effect the necessary simplification. It all started because certain readers wanted to introduce wave-change switching into the famous "Magic" Three receiver, which was originally of the interchangeable coil type, in order that it might be used successfully on the short waves.

We have now devised a form of wave-change circuit with plug-in coils which we think our readers will agree fills the bill admirably. A glance at the photographs of the receiver we are presenting this week will show you that it contains only *three* plug-in coils, and calls for nothing more complicated than an ordinary double-pole change-over switch. What a contrast it presents to many designs using this type of coil! The actual extra complication as compared with an ordinary non-wave-change receiver is really only slight and does not entail any loss of efficiency.

You will appreciate this point better when we tell you that the circuit used for this receiver is fundamentally the same as that in the famous "Magic" Three, and that the present set when on test came well up to the very high standard set by its predecessor. Those who have had experience of the "Magic" Three will understand that this is high praise indeed: this remarkable wave-change receiver possesses to the full the extraordinary power and sensitivity of the "Magic" and handles just as pleasantly.

SIMPLIFIED SWITCHING AND A STRAIGHTFORWARD CIRCUIT



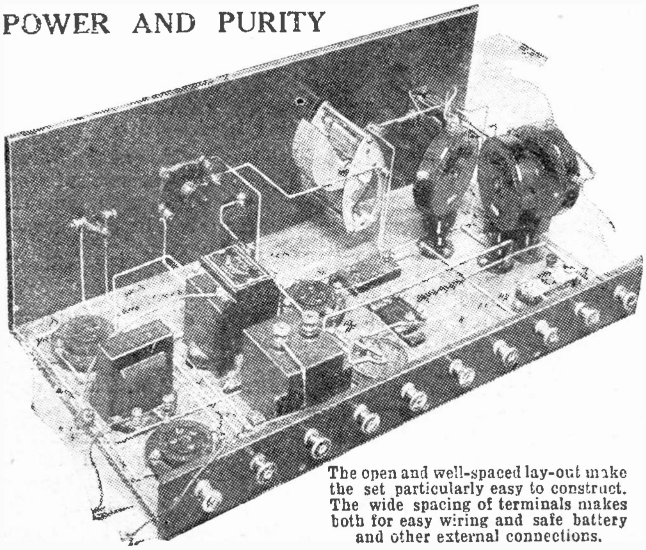
Have you ever seen such a simple wave-change circuit as this? Remember that it uses plug-in coils and absolutely standard parts.

Selective.

An examination of the circuit diagram will show you the main features of the set, because the switching arrangement is so simple that it is quite easy to follow in this form. First, you will notice that the aerial can be connected to either of two different terminals, one connecting it straight through to the tappings on the tuning coil via the switch, and the other bringing in a series condenser of the adjustable type, which enables you to obtain higher degrees of selectivity.

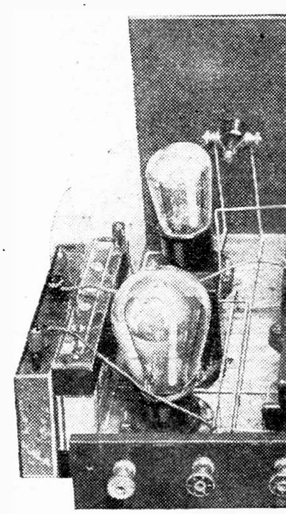
Now take a look at the switch S_2, and you will see that it gives you a complete change-over from the coil L_1 to the coil L_2. These are both "X" coils and serve for both aerial coupling and tuning purposes. Coil L_1 is the short-wave one, while L_2 is for long waves and you will observe that the switch gives you what is in effect a complete change-over from one band to the other, with no possibility of dead end or other losses. this point you will begin to see w the simplicity of our scheme comes in. using "X" coils in this way we have able to achieve our end with only two

POWER AND PURITY



The open and well-spaced lay-out make the set particularly easy to construct. The wide spacing of terminals makes both for easy wiring and safe battery and other external connections.

READY

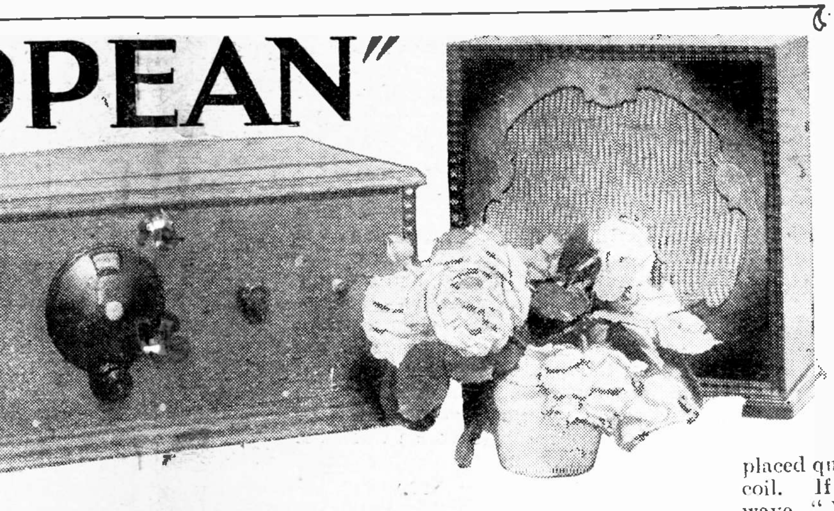


Here you can see how the open

HERE ARE

1 Panel, 18 × 7 ins. (Paxolin or Lissen, Trolite, Goltone, etc.).
1 Cabinet to fit, with baseboard 9 or 10 ins. deep. (Cameo or Osborne, Pickett, Kay, etc.).
1 ·0005 - mfd. variable condenser (Lissen or Lotus, J. B., Ready Radio, Dubilier, Ormond, etc.).
1 Vernier dial if condenser not of slow - motion type (Lissen or Igranic, J.B., Lotus, etc.).
1 ·0001, ·00013, or ·00015-mfd. differential reaction condenser (Ready Radio or Lotus, Lissen, Ormond, Dubilier, Formo, Bulgin, Wearite, Polar, etc.).
1 Lever type double-pole change-over switch (Wearite, etc.).

…OPEAN"



…convenience of wave-change switching in combination with all the …ange instrument, with amazing power and sensitivity.

…bed by the "P.W." RESEARCH DEPARTMENT.

…At …here …By …been …nits

instead of the more customary four which are required when a separate aerial primary winding is employed on each wave band. The second great simplification results from the fact that we have found it possible to dispense altogether with any sort of wave-change switching in the reaction circuit. Instead, we have so arranged matters that a single reaction coil serves our purpose on both the medium and long wave bands, this coil being the one marked L_3.

Coil Economy.

How this is done is really very simple, for it is only a matter of suitably placing the three coils in relation to one another. Briefly the scheme is this. The reaction coil is of the usual type for long-wave work, in other words, a No. 100 or 150, and it is placed quite close to the long-wave "X" coil. If it were also close to the low-wave "X" coil naturally the reaction effects on the ordinary wave band would be far too violent, so the low-wave "X" coil is put out at something of an angle, the distance being adjusted by test in a matter of a few moments until satisfactory results are obtained. We will tell you how to carry out this adjustment when we have finished the constructional side of the set, and then you will see how easy it is.

The reaction circuit is of the improved differential type which we used in the "Magic" Three, and which is now so well-known for the special sensitivity which it confers and its very valuable property of absence of any effect upon the tuning adjustment. A further device which helps you to get the very last ounce from your detector valve when working on distant stations is the potentiometer which controls the grid voltage, another point with which we will deal more in detail when we come to the operating instructions.

Ensuring Stability.

The remainder of the set consists of the now familiar extra-powerful two L.F. stages, which do so much to give it its tremendous volume and range. In the detector stage you will see the customary anti-motor-boating filter consisting of the 25,000 ohm resistance and the 4-mfd. condenser marked C_1. By the way, a 2-mfd. unit will also serve the purpose here quite well, but in view of the ever-increasing use of mains H.T. units we have thought it advisable to increase the capacity somewhat as a further precaution.

The larger this condenser the more completely is motor-boating prevented, and so a 4-mfd. unit was thought desirable when it was remembered that many of the mains units now in use are a little prone to produce motor-boating troubles with really powerful receivers.

Now let us take a look at the constructional work. The general details of drilling the panel, layout of the components thereon and upon the baseboard, and wiring-up are carried out just as usual, as we do not think that any special instructions will be needed here. No special order need be followed, since everything is nicely spaced out and the various connections are quite easy to get at. We would only just give you the usual hint that it is a good scheme to keep the wiring diagram in front of you while you do the wiring and to cross out each connection thereon as you solder the corresponding wire into your set.

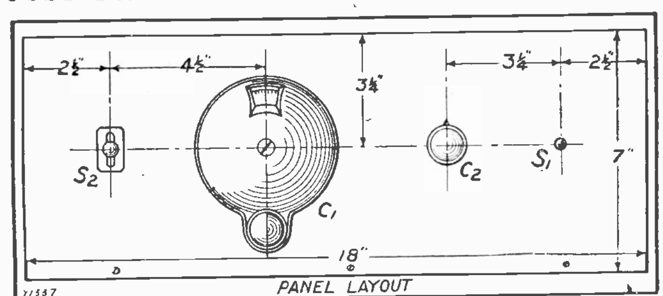
The Switch Wiring.

The only constructional point we think we need go into with any detail concerns the wave-change switch. There are several suitable types upon the market, but if you use one of those other than the one shown in the original set, you will just have to be a little careful in working out your connections to suit. The connection points of the other makes of switches are usually placed somewhat differently, so just look out for this point when you reach it.

The original switch was of the lever-controlled type, and this requires a small slot to be cut in the front of the panel. This is much easier than it sounds, because

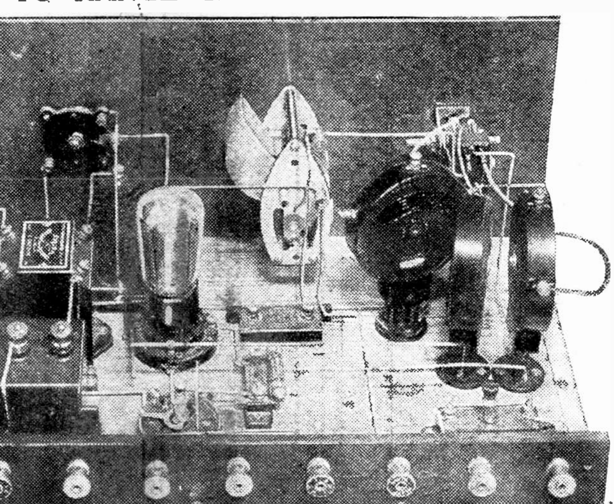
(Continued on next page.)

JUST TWO CONDENSERS & TWO SWITCHES



The panel lay-out indicates how remarkably the design of the set has been simplified. Note how few are the controls.

…TO RANGE THE CONTINENT

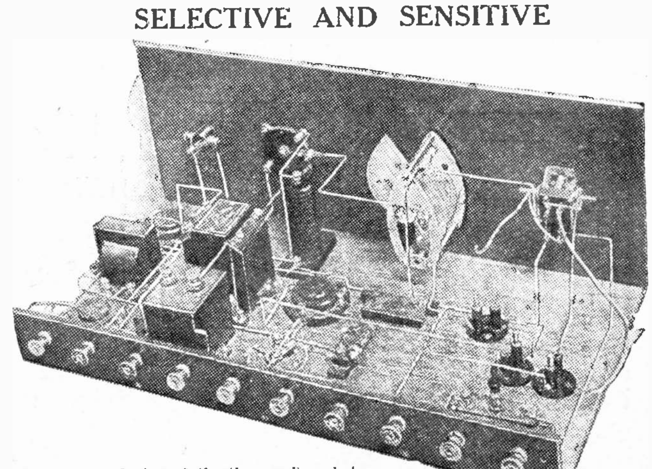


…nature of the lay-out, and the care with which it was planned, combine to give particularly simple wiring.

THE COMPONENTS THAT YOU WILL NEED.

- 1 L.T. switch (Red Diamond or Benjamin, Lotus, Igranic, Lissen, Bulgin, Wearite, Ready Radio, Junit, Ormond, etc.).
- 3 Single coil holders (Red Diamond or Lotus, Lissen, Igranic, Ready Radio, Wearite, etc.).
- 1 ·001-mfd. (max.) compression type adjustable condenser (Formo type G or R.I., Lissen, Lewcos, etc.).
- 1 ·0003-mfd. fixed condenser (Lissen or T.C.C., Dubilier, Ediswan, Igranic, Ferranti, Mullard, etc.).
- 1 4-mfd. condenser (T.C.C. or Lissen, Hydra, Dubilier, Mullard, etc.).
- 1 2-megs grid leak and holder (Dubilier or Igranic, Lissen, Ediswan, Mullard, etc.).
- 1 H.F. choke (Lewcos or R.I., Ready Radio, Lissen, Varley, Dubilier, Lotus, Watmel, Wearite, Magnum, Bulgin, Ormond, etc.).
- 2 Low ratio L.F. transformers (Varley and Lotus, or Lissen, R.I., Igranic, Ferranti, Telsen, Lewcos, Mullard, etc.).
- 1 25,000 or 30,000-ohm resistance and holder (Ready Radio, or Ferranti, Lissen, etc.).
- 1 400 or 200-ohm potentiometer (Lissen or Igranic, Wearite, etc.).
- 3 Sprung valve holders (W.B., Lotus, etc.).
- 10 Terminals (Eelex or Igranic, Belling & Lee. etc.).
- 1 Terminal strip, 18 × 2 ins.

SELECTIVE AND SENSITIVE



Note the placing of the three coil sockets
The reaction coil goes in the middle one.

THE "EUROPEAN" THREE.

(Continued from previous page.)

you need not make a particularly neat job of it, for the reason that the front plate of the switch covers up any irregularities in your cut. An easy way of doing it is to drill a series of small holes on the outline of the required slot, break out the piece of ebonite so isolated, and then finish off the edges with a suitable file. A better method still, of course, is to drill four small holes at the corners of the piece to be removed, and then join them up with a fret-saw.

You will find that this particular type of switch has eight connection points to which wires must be soldered, and you will observe, on reference to the wiring diagram, that the four middle connection points are to be joined together in pairs with two short pieces of wire, as a preliminary to the attachment of the various other leads. The remainder of the connections you will find quite easy to follow out from the wiring diagram, just taking care to identify them correctly by their positions.

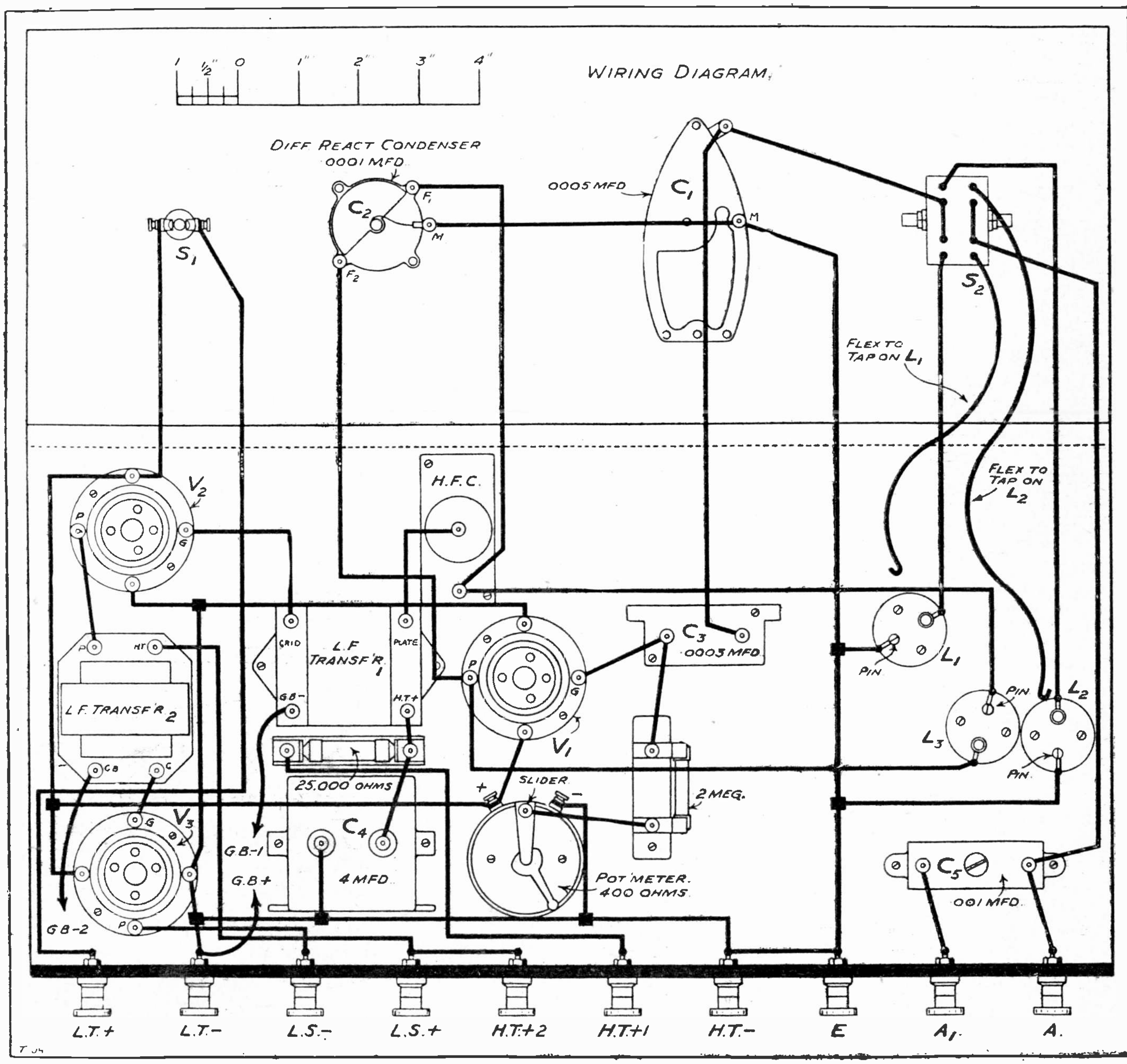
Making Certain!

Now we will suppose that you have got the last wire soldered into position, and you feel that the set is finished. Before you put it on test, let us give you a hint which we ourselves find saves lots of trouble later on in some cases. It is this: go over all your screwed-down connections and give them an extra twist with a pair of pliers, to make sure they are really tight. Then turn your attention to the various soldered joints and give them a sharp pull, so making sure that you have no dry joints anywhere, but, on the contrary, that every joint is a really good, sound one.

Now, assuming that the set is really finished, and that you are satisfied that every constructional point has been given the attention it deserves, let us see about getting the receiver into working adjustment. First of all you want a valve of the H.F. type for the detector, one of the L.F. type in the V_2 socket, and a power or super-power type in the V_3 socket. The grid bias will be 1½ or 3 volts negative on the G.B.—1 plug, and somewhere about 6 to 9 on G.B.—2, if you are using an ordinary power valve. A super-power type will naturally require a good deal more grid bias, and you should decide this from the maker's data slip.

(Continued on page 552.)

HOW A GOOD LAY-OUT IMPROVES THE WIRING



The design of this receiver has been worked out so carefully that the wiring is as easy to do as that of an ordinary non-wave-change set.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

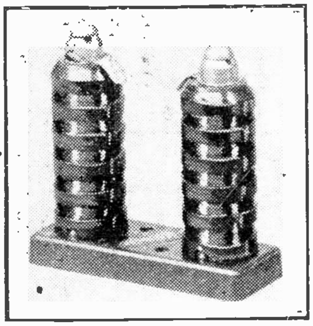
FERRANTI LITERATURE.

NEW leaflets published by the Ferranti people deal with their Radio Meters, Fixed Condensers and Valve Tester, while there are two constructional charts giving details of H.T. units. Any of the lists or charts are available free to "P.W." readers on application.

WATMEL H.F. CHOKE.

Watmel Wireless Co., Ltd., have placed two new types of H.F. chokes on the market, the D X 2, which retails at 1s., and the D X 3, which retails at 6s. The first is designed as a reaction choke, while the D X 3 has a higher efficiency and can be used for H.F. choke coupling.

Both types are similar in general construction and appearance. They are wound in binocular form and each includes two sectionalised formers. Both types cover the normal broadcasting band efficiently, and I regard them as meritorious productions.



The Watmel D X 2 H.F. Choke.

A WONDERFUL TWO-VOLTER.

Some years ago most of us held the opinion that two-volters would always be some long way behind the six-volt valve in efficiency.

It was a fairly general impression, but there has been so much intensive research accompanied by successful results in the development of the two-volter that to-day it is miles in front of the six-volter of two or three years ago.

Of course, the six-volter still leads, but you can do practically everything you want to, in the way of ordinary reception, with two-volters up to and including the operation of moving-coil loud speakers with satisfactory results. There is now even a super-power two-volter, having the extraordinary characteristic of 2,300 ohms. impedance and an amplification factor of 6·5. These you see, give you a mutual conductance of 2·8, which is about 500 per cent better than anything to be found in the two-volt line a year ago.

But this P.2 valve, which is one of the latest additions to the Marconi range, takes only ·2 amperes at two volts. It is, therefore, a particularly economical valve. Indeed, in view of such filament economy one cannot but marvel at the characteristics achieved.

In actual operation I find it a most excellent valve, and its performance is absolutely in line with what one would expect from it. Those who are forced to economise in the way of L.T. need no longer look with such longing eyes at the six-volt range.

LIGHTNING PROTECTION.

The Melbourne Radio Supply of High Street, Walthamstow, recently sent us a sample of their combined lightning arrester, earth switch and lead-in tube. This device retails at 3s. 6d.

It consists of an insulating tube, through which runs the rod actuating the switch. The arrester, switch and terminals are grouped beneath a protective cowl.

The aerial connection is via the switch rod from which it can be taken away by a soldering tag.

It is, of course, very nice to earth the aerial outside the house, but I am not quite sure of the weather-resisting properties of this particular article, and I am going to carry out some rather extended tests. I hope readers will not get tired awaiting the results of them! However, in the meantime, I must point out that I consider the price very reasonable, even should the device need to be renewed every two or three years.

NEW IGRANIC LITERATURE.

Recently published leaflets received from Igranic, Ltd., deal with the A.C. Filament Transformer and the Igranic Response Corrector.

ELECTRIC TESTING SIMPLIFIED.

This is the title of a book by Harold H. Cross, published at 5s. by Crosby Lockwood & Sons, Ltd. It is copiously illustrated, and describes in simple language how to use electrical measuring apparatus, more particularly in the diagnosing of troubles concerned with domestic electrical appliances, motor-car electrical equipment, and various other things.

BLUE SPOT LOUD-SPEAKER UNITS.

The merits of the Blue Spot loud-speaker unit will be far too well-known to need more than but a brief reference on this occasion. There must be a million or more speakers embodying Blue Spot Units in satisfactory service.

In these circumstances, the introduction of two new Blue Spot loud-speaker units must be a matter of some importance. These two units are known as Blue Spot 66P and 66R, and we have received test samples mounted on their respective chassis. The 66R is the larger, and will appeal to those constructors who deal in outsizes in the way of volume. Large magnets figure in these new units, and they are provided with scientifically designed laminated pole pieces.

The movements are first-class in every respect, and the results given are just as good as would be expected. There is all that brightness long associated with Blue Spot loud-speaker devices together with a really commendable bass free from boominess.

WHEN YOU ARE BUYING—

(24) AERIAL EQUIPMENT.

An aerial insulator needs to have mechanical strength as well as good electrical properties in order to stand up against the pull of the wire.

It should be made of a very smooth, weather-resisting material such as glazed porcelain or high-quality glass.

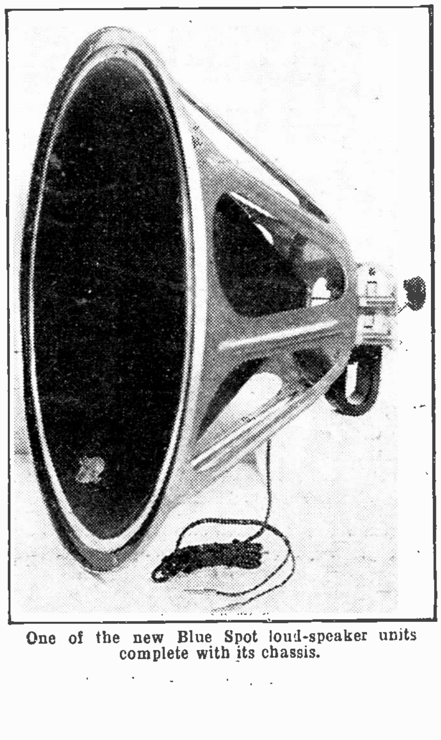
There should be a fairly long surface on the insulator between the wire and the securing halyard or rope.

Halyards need to be of pliable, reliable material, and ordinary rope is seldom satisfactory. Special cord materials are freely available.

The actual wire must be strong, and phosphor-bronze stranded wire is to be recommended. An aerial wire does not have to be insulated throughout its length, though an insulating covering will not prevent it working.

ATLAS MAINS UNIT.

Messrs. H. Clarke & Co. inform us that the Mullard people are recommending the use of their A.C. 38 Atlas Battery Eliminator for use with the Mullard Orgola Senior Receiver. That is a compliment which we are sure Messrs. Clarke appreciate and which will be accompanied by material benefit of a definite character.



One of the new Blue Spot loud-speaker units complete with its chassis.

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

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

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the 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.

HILVERSUM'S WAVE-LENGTH.

E. T. (Sheringham, Norfolk).—" During the week I often get Hilversum on about 300 metres, but never on Sundays except on his long wave-length. Is this the rule of the station, or have I been unlucky when searching for him on 300 metres on Sundays ? "

Hilversum works only on 1,071 metres on Sundays, but during the week and before 5.40 p.m. the transmissions are made on a wave-length of 298 metres. All the evening transmissions from 5.40 p.m. onwards are on 1,071 metres.

IS THE SET OSCILLATING ?

B. S. S. (Ipswich).—" I am given to understand that even a one-valve set can cause interference, and I don't want that to happen. How can I tell if it is oscillating ? "

Different sets show oscillation in rather different ways. We will describe some of the effects, from which you will be able to tell whether you are oscillating.

First of all, what do the neighbours say ? Do they complain that when you switch on your set their reproduction is spoilt ? Do they notice that when you are out in the evenings their programmes are clear, but when you get home and switch on, their programmes become muffled and distorted ? Do they find that when you tune your set it sets up squeals in theirs ? If so, you are oscillating !

A great deal of helpful advice will be found in the B.B.C.'s book on " Oscillation," which is supplied free upon application at Savoy Hill, W.C.2, or to any broadcasting station. No new listener should be without this book if he wants to get maximum results from his set and not interfere with his neighbours.

You will never get much enjoyment from your set if it is allowed to oscillate, so it is worth going to the trouble of finding out just how to avoid this. To recognise oscillation, choose a time when there is no broadcasting on, such as early Sunday morning, and carefully listen-in, not to other stations, but to your own set.

Set the tuning dial about halfway round and then turn the reaction so as to increase it slowly, from minimum to maximum. You will notice that as you leave the minimum position and get towards the maximum (provided you do this slowly enough), the little " breathing " noises which at first are hardly audible become louder as the maximum reaction point is neared. The set gets more and more sensitive as more and more reaction is applied but at some position on the reaction dial (possibly halfway round, possibly three-quarters, or even right at the top), you will hear a soft " plop " and a kind of hissing or rushing sound, which indicates that the set is oscillating.

How to Know.

This sound is not very loud, but it is quite continuous and definite, and if you have been listening carefully to the noises which are caused by the gradual increasing of reaction up to this point, you will soon recognise the difference between the set's condition when it is nearly oscillating and when it has actually passed into oscillation.

Here is another tip. Wet the end of your finger and, opening the set, tap gently first of all on the moving, and then on the fixed, vanes of the tuning condenser. The reaction condenser should, for this test, be set at zero, and you will probably find that the clicks which you hear in the 'phones as a result of tapping your finger are louder on one set of vanes than on the other. The probability is that when you tap the moving vanes you will hardly hear anything, but when you tap the fixed vanes you get quite a distinct click every time you touch them.

If you increase reaction slightly, this effect becomes more marked. The further you increase reaction the louder become the clicks, but before reaction has been increased far, listen carefully to the type of click which you get. Supposing it is the fixed vanes of the tuning condenser which you have tapped, you will probably find that when the set has enough reaction to be really sensitive you hear before the finger touches the plates the little breathing sounds, followed by quite a loud click as your finger touches the plates.

Test by the Double Clicks.

If the finger is allowed to rest on the plates the noises disappear, but they appear again when the finger is removed. Increase reaction still a little further, and the effect is still more marked.

Increase the reaction a little further still, until you hear the soft plop which indicates that the set is oscillating, and then tap the finger on the fixed plates again. As the finger makes contact the click is a very loud one, and all noises cease immediately until the finger is removed, when there is an equally loud click, and the rushing sound denoting oscillation.

Notice that when the set is merely being made more sensitive by reaction and it is not oscillating, the finger clicks are fairly loud, and the intervals between are filled with a very gentle whispering breathing sound.

When the set is actually oscillating, the finger clicks are louder still, there is a definite *double* click as loud when the finger is removed from the condenser as when it touches, and instead of the whispering breathing sound there is a distinct rushing noise in the 'phones.

It is not easy to put into words the exact difference, but a little patience at a time when no broadcasting is on will teach the intelligent listener the difference between reaction properly applied, and reaction applied beyond the oscillation point. In the first case—that of the clicks and the very gentle whispering breathing noise—the set is sensitive, good for long-distance reception, and not interfering with neighbours. In the second case, when double clicks are noted on touching the condenser vanes, when the gentle breathing sounds give place to definite rushing noises (and when turning the condenser dial results in squeals or squeaks), the set is no good for long-distance reception and is causing interference with your neighbours.

JOINING 'PHONES " IN SERIES."

R. A. (Sheffield).—" The instructions say ' A second pair of 'phones can be joined in series.' What does ' in series ' mean ? "

There are two ways of connecting two pairs of 'phones together, viz., " in parallel " or " in series."

To join them in series undo both pairs and connect one of the 'phone tags of the first pair of 'phones to one of the tags of the second pair. That leaves you with two free tags, one on one pair and one on the other.

Place one of these free tags on one of the set's " telephone " terminals, and the other free tag on the other terminal, leaving the two which were joined together dangling free. The 'phones are then connected " in series."

" A HUM WITH THE SAME CONNECTIONS."

F. R. (Grimsby).—" I was going to use all old components and I mounted them for Det. and 2 L.F. (transformers), and first wired up with bits of 24 D.C.C., just to test results on that aerial and earth. Reception was first-class, really good in strength and tone, so I left all mounted as before, and changed the thin wires for good stuff, well soldered or screwed-down.

" Naturally, I expected results as good, if not better, for only the wire itself was different. Yet now I get a hum, with the same connections, components and batteries. What can be the cause ? "

We think that in re-wiring you must have reversed the two leads to one of the L.F. primaries, or to one of the secondaries. Try changing over and we expect you will get your good results again.

H.T. BATTERY LIFE.

L. S. S. (Manchester).—" Since getting a good outdoor aerial my set has been more than satisfactory. In fact, it is now so good that I am adding the extra valve I have always wanted to use, bringing it up to four valves for real loud-speaker reproduction.

" I suppose I shall need a large-size battery in this case ? Is there anything I can do to

(*Continued on page* 550.)

TECHNICAL TWISTERS

No. 20.

CARE OF THE L.T. BATTERY.

CAN YOU FILL IN THE MISSING LETTERS?

The liquid in an accumulator is liable to loss by . . . . especially in . . . .

Its level should always be kept just . . . . . the top of the plates.

It is not necessary to replenish with . . . . but . . . . water should be poured in.

The " strength " of the acid (or . . . .) should be checked from time to time by means of a . . . .

Last week's missing words (in order) were : Earthed ; Under (or Below) ; Short ; Cover ; Weather.

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 548.*)

improve the life of the battery, as to me the constant H.T. renewal is the one bugbear of wireless? (I use an output filter)"

When buying the new battery be sure that you get one of adequate size to supply the current required for the four-valve set. If you get too small a battery it is always being overrun, and consequently its life is invariably much shorter than it should be.

You can ascertain from the maker how many milliamps the battery will usefully give, and your valve curves will tell you exactly how much anode current is required, if you have no milliammeter in the negative lead to measure the current. The use of a filter output, and adequate capacity of the battery, are the main safeguards, but apart from these, important points to watch are to keep the battery cool, dust-free, and, of course, protected from metal, wires, etc., which can be carelessly laid upon it. Correct grid bias is *vital* to long H.T.B life.

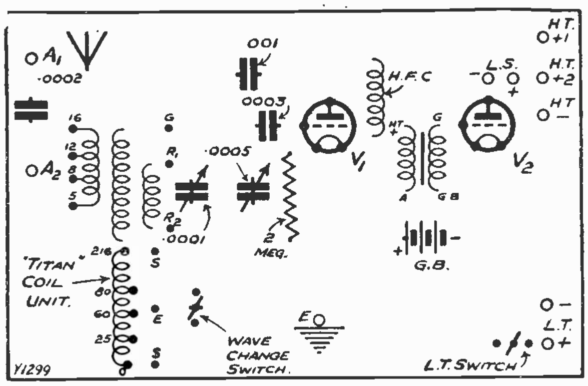
EARTH EFFICIENCY.

G. N. (Colindale, London, N.W.).—"After experimenting with several different kinds I have come to the conclusion that the best earth in my house is not outside, but is a water pipe.

"One thing I have proved, and this is that the earth connection makes an enormous difference to the strength of reception on a crystal set, and I want to make a really good connection and maintain it as perfectly as possible for a long time. Do you think it would be a good plan if, after I have done all I could in the way of tightening-up, etc., I were to cover the whole joint with petroleum jelly to protect it from the air?"

If you make a thoroughly good, clean job of the electrical connections and smear the whole of the joint with petroleum jelly to protect it from the atmosphere, you can be sure that the water-pipe connection will continue to give you an excellent earth. (It is sometimes thought that an outside earth is better than a water pipe, but very often the water-pipe is far more satisfactory.)

POPULAR "WIRELETS" No. 15



Here are all the necessary "components" for a two-valve set (Det. and L.F.) with a "Titan" tuner for wave-change. The ·0001 reaction condenser has a ·001 fixed condenser in series with it, to prevent shorting, and the circuit is otherwise perfectly straightforward. Could you wire it up?
(Look out for the answering diagram next week.)

RENEWING OLD H.T. BATTERIES.

M. F. (Pendleton, Manchester).—"Is there any way of 'gingering up' old H.T. batteries? I always hate to throw them away because it seems such a waste of money, and yet nobody seems to be able to find a use for them after they have become useless on the set.

"Is it worth while trying to evolve some method of renewing their voltage?"

A good many "P.W." readers have in various ways tackled this problem, and some very interesting letters on the subject have appeared in our correspondence columns (and no doubt many more of the same kind will appear, for most of us hate throwing batteries away).

Usually some form of acid rejuvenator is relied upon, and unfortunately such materials have to be bought, and as they are not always easily obtainable the methods have never found universal popularity. Generally the falling-off of the H.T. battery is accompanied by a tendency to instability, followed by pronounced distortion and a general lack of life and clarity in the set, and in this condition practically everybody discards batteries and gets new ones as the simplest way out of the difficulty.

WHICH H.T. BATTERY?

H. A. M. (Stratford-on-Avon).—"Knowing nothing about wireless I was quite content with the information that I should require 'a 100-volt battery for H.T.' To my surprise, when I inquired at the shop for one I was told there are several different sizes, some costing more than others and apparently being larger in size. Which do I need?"

Whilst a small battery is O.K. for small sets, the larger sets require the larger type of battery, owing to the extra current consumed by the greater number of valves.

The ordinary small H.T. battery is capable of supplying about 5 milliamps. If you look at the valve makers' figures for the plate current required by the valves you are using in the set you will find that the detector valve is taking say, one milliamp, and the power valve about 3 or 4 milliamps, so that *two* valves can be supplied from such a battery.

It is, however, generally being over-worked when called upon to supply the current for *three* valves, especially if the other valve is of the screened-grid type or of the super-power or pentode type.

If the total anode current of your receiver as measured by a milliammeter in the H.T.— lead or by reference to the valve makers' curves, is more than 5 milliamps, you require something more than the ordinary small H.T. battery; and it will be cheaper to buy a larger-capacity model, sometimes called a "double capacity" or "power" battery, for these are capable of supplying very much more than the small battery. (For very large sets *triple* capacity—or more—is required.) The point worth remembering is that if the battery is called upon to give more current than it is designed to give, it will deteriorate very rapidly indeed.

FOREIGN STATION RESULTS.

D. X. (Stepney).—"Why is it that a crystal set which normally can only receive signals from one station is sometimes able to receive a foreign station situated hundreds of miles away? And why is it that sometimes on a valve set on some nights plenty of stations can be received, whilst on other nights with just the same valve and everything else as before there are not so many stations?"

The energy from a broadcasting station is radiated in different ways. In the first place there are *direct* waves which, travelling along the ground, are strongest in the vicinity of the transmitter, and get weaker and weaker as the distance increases, becoming attenuated and too weak for crystal reception at distances of perhaps twenty miles from a main station.

These direct waves are very reliable, and are not much affected by atmospheric and external conditions, so they are used by the B.B.C. as the basis of their service areas. In addition to the direct rays, stations also send out *indirect* waves which are not "earth bound." These do not travel along the surface of the ground, but they travel off into space. After they have reached a height of sixty miles or so above the earth surface they are, owing to a peculiarity of the rarefied atmosphere, reflected or "bent back" to earth again, but they come to earth at a tremendous distance from where they originated.

It is this "indirect" radiation that is the cause of the extraordinarily long-distance results you hear about from time to time. The remarkable thing about it is that not only are the waves bent back, but sometimes they appear to be concentrated at certain points, so that reception is really loud and good whilst conditions are favourable.

But mysterious alterations in the reflecting properties of the upper layer of air may at any moment affect them, and then their wonderful long-distance properties are gone. Such indirect radiation is sufficient to affect a good crystal set only occasionally, but on a single-valver the skilful use of reaction will generally enable the set to pick up at least half a dozen different European stations at any time after sunset.

A two-valve set, of course, is better still; whilst three valves, if properly handled, can bring in quite a number of stations with regularity.

WAVE-LENGTHS COVERED BY SHORT-WAVE COILS.

R. A. A. (Peterborough).—"I am thinking of fitting short-wave coils, but have not much idea of the wave-lengths they cover. What are the usual sizes?"

As a rule, with a four-turn coil you can go down to about 18 or 20 metres, with a six-turn for the reaction. (The upper limits you will reach will, of course, depend upon the size of the condenser used for tuning.)

A six-turn coil will go down to about 25 or 28 metres, and an eight- or nine-turn coil will begin at about 30 or 32 metres.

There is one little group of broadcast stations in the region of 32 metres, and another roundabout 25 or 26 metres, so that these figures will help you to identify your approximate range when the set is in use.

WHAT DO *YOU* THINK ABOUT THIS?

Loss of volume was the trouble of a Stafford reader, the set being a three-valver which had given good loud-speaker results for a year with no trouble.

One day all the volume disappeared suddenly, the set sounded "dead," and tapping the grids of the valves gave no corresponding click. Even shifting the H.T. plug gave no click, though the accumulator was O.K. and all other connections, valves, etc., looked all right.

Could you have told

WHAT WAS WRONG?

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 solution to the above next week.)

Last week's trouble (experienced by a Yeovil reader) was traced to the output choke, the insulation of which had become defective, causing some of the turns to be short-circuited.

POSITION OF CONDENSER OF L.S. FILTER CIRCUIT.

M. J. (Yarmouth).—"Will the output filter circuit shown on the accompanying sketch completely take away the high tension from the loud-speaker lead which goes to the next room?"

When using a choke and single condenser in this way the *position* of the condenser is important. If the space is limited inside the set and an external filter is to be fitted, the filter-condenser must be placed close to the set's output terminals.

You will note that only one side of the condenser is connected to the loud speaker, the other side of the condenser being joined in circuit by a lead to the plate of the valve and L.F. choke (in practice this goes to the output terminal which is connected internally to these points).

For the filter circuit to be efficient you must place the condenser close to the set, as the lead between these points is "alive." The other side of the condenser and the remaining loud-speaker wiring can then be as long as necessary, no H.T. voltage being present there.

PHYSICAL JERKS BY RADIO.

"Boy Scout" (London, S.E.7.).—"As you will see by my nom de plume I am interested in other things besides radio, and one of my specialities is physical jerks. I understand that some of the Continental stations broadcast exercises in the early mornings, and I should like to listen to one of these if you can tell me which one, out of the list of stations I enclose, all of which I am able to get at good strength."

Your list shows Langenburg to be the best station, and you will find that such a course is given from there on most mornings (except Sundays) at 7.45 a.m.

REGENTONE D.C. or A.C.

COMBINED MAINS UNITS (H.T. with L.T. Charger)

A.C. MODEL—The First

This is the Model which has given such satisfaction in Portables of practically every make and every type.
MODEL W.5. *Incorporates Westinghouse Metal Rectifiers on both H.T. and L.T. Sides.*

SIZE: 9"×5"×3½". OUTPUT: 120 Volts at 15 m/a.
TAPPINGS: H.T. 2 continuously variable (1 S.G.) and 1 Power. L.T. Trickle Charger for 2-, 4- or 6-volt Accumulators.

Price **£5 : 17 : 6**

Model W.6. H.T. only, £4 : 5 : 0.
Either of the above models is available for 25 cycles at an increase in cost of 10/-.

Fit INSIDE all Portables

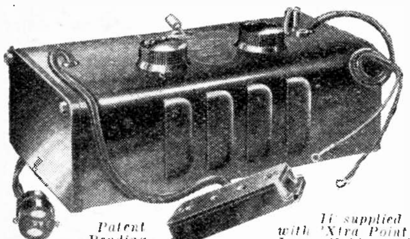
EQUALLY SUITABLE FOR ALL POPULAR 2, 3 & 4 VALVE RECEIVERS

D.C. MODEL—The Only

SIZE: 9" × 5" × 3½". INPUT VOLTAGE: 200-250 volts.
H.T. OUTPUT: 130 volts at 20 m/a.
H.T. TAPPINGS: 2 continuously variable (1 S.G.) and 1 Power.
L.T.: TRICKLE CHARGER for 2-, 4- or 6-volt accumulators, without any alteration whatever to existing wiring.

Price **£4 : 5 : 0**

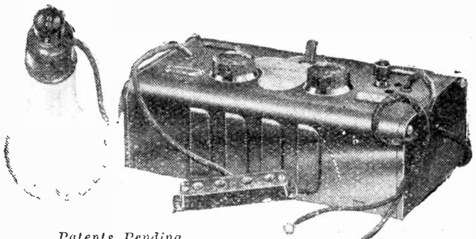
H.T. only, £2 : 15 : 0



Patent Pending Design Registered

If supplied with 'Xtra Point Lamp Holder and Plug 4/6 extra.

HAVE you read the opinions of leading Set Manufacturers and Radio Authorities in the REGENTONE NEW FREE BOOKLET?—from your dealer or direct from us.



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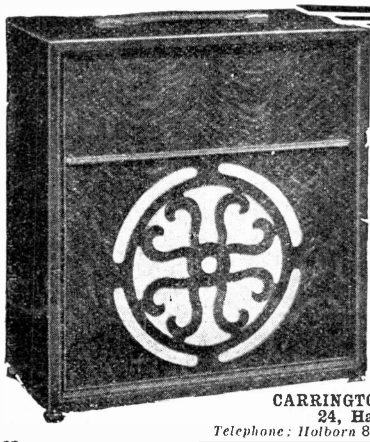

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THE "EUROPEAN" THREE.

(*Continued from page 546.*)

By the way, you will find space for a grid-bias battery at the end of the baseboard, between the grid leak and H.T. — and H.T. + terminals.

The H.T. voltages will be just the usual ones—namely, about 60 volts on H.T. + 1 and somewhere about 100 or 120 volts on H.T. + 2. A little adjustment on the H.T. + 1 terminal may be desirable later on to enable you to get the very best results and the smoothest reaction control, but these voltages will suit most valves.

To begin with, you should place the potentiometer slider somewhere near the middle of its travel. Later on, after you have made various other adjustments, you can return to this and try moving it towards either the positive or negative end until you find the point which gives you the best combination of good volume and really smooth reaction control. This adjustment is best made on a rather weak signal, such as that of a distant station.

Coil Adjustments.

Now we come to the important question of the choice of coil sizes, and the adjustment of their positions so as to obtain the desired satisfactory reaction effects on both wave-bands. Coils L_1 and L_2 are both of the "X" type, L_1 being a No. 60 and L_2 a No. 250. To the tapping points on these coils you should attach the flex leads from the switch S_2, remembering that you can obtain an adjustment of selectivity by the use of one or other of the two tappings on each coil.

The reaction coil L_3 will normally be a No. 100, but in some cases you may find that better effects are obtained with a No. 150. Start off, however, with a No. 100, and note that all you have to do is to find such positions for the three coils that satisfactory reaction is obtainable on both wave-bands.

In the constructional work it is advisable to fix the L_2 and L_3 coil sockets at the slight angle shown, and leave the fixing down of L_1 until later. Temporarily, you should make the connections to L_1 with short pieces of flex, leaving the holder loose upon the baseboard so that you can move it about. Start off with the coils roughly as shown in the photographs, and see whether you get suitable reaction on both wave-bands.

Getting The Reaction Right.

Possibly you will find that you are obtaining rather more reaction on the long waves than on the medium waveband, in which case you should move L_1 a little nearer to L_3, and then try varying its angle a little. A little experimenting in this way will soon show you exactly where this coil should be placed, whereupon it can be screwed down and its flex leads replaced with proper stiff ones.

A very few minutes' testing will settle these points, and thereafter you will have no further adjustments to make. All that you will need to do is to operate the switch S_2 to go over from one waveband to the other, and tuning and reaction will be carried out in just the usual way. The switch positions, by the way, are these: knob downwards for low waves, upwards for high waves.

FOR THE LISTENER.

(*Continued from page 538.*)

30 feet added to the length of her delicate little ears would help her. The farmer climbed the roof of the farm and fastened the guy-rope round his chimney.

The farm-hand, who has only one eye, but it is a good one, tethered the other end to an upstairs balcony outside the cottage. The women and children watched from below the mysterious line being slung from roof to roof.

Belinda Talks Italian.

I shouted to them that they might hang their washing on it, if they could reach; whereat they laughed excitedly, a little bit timidly, I thought, as if they were not quite sure what was going to happen.

It was time I showed Belinda off. It was 6.30 p.m. Continental stations do not wake up much before then. I put Belinda on a table in the open window, earthed her, plugged the outside aerial in, and in a jiffy she was talking Italian.

She spoke it perfectly, though I prefer her English. At the sound of her voice, my neighbours came stealthily across from the farm and stood among the bushes, listening. I think they were surprised to hear her talking Italian.

They probably imagined that, since she came from England, she would talk English.

"Italiano!" I heard them saying to each other. I asked them if they could understand. "Yes, yes!" they cried, laughing. "A meraviglia!" which, I suppose, meant "splendidly!"

So Belinda made her debut.

Barrage.

The reception from Rome, southward, proved so clear that, on the next night, I determined to try my luck on the long-wave. That would be northward towards Paris and Hilversum. I was doomed to disappointment.

Belinda sputtered and crackled and roared. She was like a thousand fishwives explaining a black eye. I thought she would burst. Nothing could live in that row except a few Morse signals which, like microbes, seem to be able to live anywhere. There was only one word for it—Donnerblitzen!

Jack Payne Again.

The storm brewed for two days. Northward I was cut off. It broke on Friday night.

The cauldron boiled over into a deluge. Saturday was clear. I guessed that there wouldn't be a single atmospheric left, and waited until night. Then I began to feel northward again, searching the ether for England.

I got a lot of Morse—a very annoying feller, Morse! Then I heard a voice chattering, and music behind it. It was about ten o'clock. The voice was speaking French, so I tried to cut it out and get English.

After infinite twiddlings of patience—for I really do not know very much about Belinda's innards—I succeeded fairly well. It was Jack Payne and his Band. So will you please present Belinda's compliments to Jack Payne, and tell him that he "was the first that ever burst" from England into this lovely wilderness on the shores of Maggiore! Addio!

TECHNICAL NOTES.

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

The Pentode.

THE fact that the screen-grid valve as well as the pentode have established themselves firmly in popularity in America is shown by the large number of sets exhibited at the recent Radio Exhibition at Atlantic City having screen-grid on the H.F side and a pentode on the output side. A particularly popular set employing these two types of valve is the three-valve set.

Battery Sets Still Sell.

Another interesting feature of this exhibition is the large number of battery-operated sets which are on view, showing that the all-mains receiver has not completely displaced the battery-operated set, even in cases where electric supply is available, and further, that there is a large market still to be found amongst homes where there is no electric supply.

Filters.

Talking about all-mains sets, particular attention is given in the exhibition referred to above to special filters incorporated in these sets for the purpose of cutting down landline interferences and noises produced by the switching of electric lights or electrical machinery, or local electrical disturbances such as those from electric railways, advertising signs, and so on. I mention this because it is a matter which was discussed in these Notes some little time back.

Tone Control

Naturally, these devices, since they were to be applied to an ordinary gramophone, were mechanical in their operation. When we come to electrical reproduction, either of gramophone or radio music, we have available to us electrical methods of tone control and very soon you will hear of some ingenious methods for regulating the relative values of high and low notes in the reproduction. Not only this, but actually the *quality* will also be to some extent under the control of the operator.

Should Control be Used?

It is always a question whether the listener should be put in a position to adjust the quality of the reproduction—at any rate, the relative intensities of, say, high and low notes. It comes back almost to the same question as to whether a piece of music should be played exactly as the composer intended, or whether modifications by the performer should be permitted.

At any rate, apart from questions of this kind, there is a large section of radio experimenters and listeners who will certainly welcome a simple device whereby they can modify the reproduction of their radio or gramophones to suit their own taste—and, after all, that is what really matters.

Getting Quality.

Low-frequency amplification often involves loss of quality, and this may be due to several causes. In the case of a transformer-coupled amplifier, the interference with the quality may be due to

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TECHNICAL NOTES.

(*Continued from page 552.*)

any one of a number of defects in the coupling transformer as well as to other causes which are not directly connected with the transformer itself.

I mention this matter because I have had several inquiries arising out of my remarks on low-frequency transformer ratio which I made in these Notes a few weeks back. Transformer coupling is still very greatly used by amateurs and constructors, and it is no exaggeration to say that the better types of present-day L.F. transformers have been improved out of all recognition as compared with those of four or five years ago.

Effect of Proper Impedance.

One of the most important properties of an efficient L.F. transformer for radio work is a high impedance, and the poor reproduction given by many cheaper transformers is due to stinting materials (the iron of the core and the copper wire of the windings) with the result that the impedance is insufficient.

The impedance, as you know, is not a constant quality of a transformer, but must be defined for each particular frequency. Everybody knows that the effective impedance increases with the frequency of the alternating current fed into the transformer, but perhaps you may not have realised how rapidly the impedance rises with the frequency.

For instance, in a particular case, whereas the impedance at 100 cycles may be, say, 40,000 ohms, at 500 cycles, it may be 350,000 ohms—that is, nearly nine times as much.

Question of Frequency.

This brings us to a very important point in the design and use of L.F. transformers. It is obvious from the figures just given that almost any transformer will have a high impedance at a high frequency, but the frequencies with which we commonly deal in the case of speech, and also in the case of many kinds of musical instruments, are not much higher, and frequently are actually lower, than 500 cycles.

Consequently, you must have a transformer which has a sufficiently high impedance, even at comparatively low frequencies; if it has not, then it cannot be relied upon to amplify these comparatively low frequencies without distortion.

Matching Impedances.

Another point which often arises in queries from readers is the question of the matching of the impedance of the transformer with the impedance of the valve with which it is used. According to some opinions, the best results are obtained when the impedance of the valve and the impedance of the transformer are equal.

But a note of warning is necessary here, for this theory is based upon the assumption that we want the best conditions for the transference of power, whilst obviously in the case of intervalve coupling we are not so much concerned with power as with voltage.

Now, it has been laid down as a general rule that, so far as quality is concerned, it is best to have the highest possible transformer impedance in each transformer-coupled

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stage, quite irrespective of whether the impedance of the transformer matches that of the valve.

Ratio and Amplification.

The remaining point, and the one which I really intended to mention more particularly, is the question of the transformer ratio, as several readers have again referred to the possibility of getting a higher amplification by using higher-ratio transformers. With the ratios of between 3 to 1 and 5 to 1 it has been found that the best all-round results are obtained without incurring unduly high losses at high frequencies.

As a matter of fact, this question of transformer ratio is often exaggerated, and you will find that in many cases you will get much better results by using a comparatively low-ratio transformer, say, even 3 to 1, than you will with a higher ratio, say, 5 to 1. When it comes to still higher ratios, such as 7 or 8 to 1, these may only be used in special circumstances, and for general purposes it is much better to stick to the lower ratios of 3 to 1 or 4 to 1.

Primary Inductance.

So far as getting good amplification at low frequencies is concerned, this depends largely on having plenty of magnetic material in the core of the transformer, a high value of primary inductance and a comparatively low step-up ratio. The question of the air gap in the transformer is one upon which opinions still differ, but it is generally conceded that a very small air gap is better for the amplification of low frequencies.

So far as the amplification of high frequencies is concerned, this is influenced by the design of the windings of the transformer, so that self-capacity and eddy current losses may be kept to a minimum.

It is a common practice to connect a condenser across the primary of the transformer, but in my opinion it is preferable that this condenser should be included in the transformer itself by the manufacturers, as then there is no danger of an unsuitable capacity of condenser being used.

The Perfect Curve.

As you know, the perfect transformer should have uniform amplification ratio throughout the whole of the range of frequencies with which it is intended to be used. Actually, of course, no transformer reaches this ideal, although the best types of transformer made to-day will give remarkably uniform amplification over a considerable portion of the desired frequency range.

Most of the second-rate transformers fail in the *lower* frequencies. They generally give a fair performance at frequencies between, say, 1,000 and 3,000 vibrations per second, but then fall very far short of the ideal at frequencies much below 500; this is almost invariably due to the transformer impedance being insufficient, for the reasons I mentioned above.

In the Future.

During the past few days there has been a good deal of newspaper talk about the possibility of television (accompanied by sound broadcast) becoming a serious rival

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to talking pictures in the cinematograph theatres.

This is largely based upon the fact that some experiments have been made in America, over a short distance, about a mile, in which television pictures have been received and projected upon a screen some 6 ft. square. Nothing is stated as to the "definition" of these pictures or as to the amount of subject-matter which is comprised within the picture.

As you know, I have always been averse to exaggerated and extravagant statements being made with regard to television and its "possibilities." No one, and least of all a scientific man, wishes to place any unreasonable limit upon what may be accomplished by scientific research, but at the same time one should be equally careful not to go to the opposite extreme.

In my opinion, any suggestion that television will ever be able to give us upon a full-size cinema screen a picture approaching in any way, for clearness and detail, the ordinary cinematograph pictures, is quite without foundation, and the excited newspaper accounts that one reads must be set down to the fact that the authors of the same, in the majority of cases, have little or no knowledge of the technical difficulties involved in television.

It is easy to bring up the old story that, twenty years ago, nobody ever thought the Atlantic would be flown by an aeroplane, that thirty years ago no one thought we would have cinematograph entertainments or talking pictures. Television is, in my opinion, in a totally different category from any of these, and it will not do to argue by analogy that because remarkable achievements have been made in one sphere they must necessarily be expected in another.

Remarkable Achievements.

I do not want to be misunderstood in any way. I think that the achievements which have already been made in television, particularly those of the General Electric Company in America, are very remarkable, almost as much so as the development of radio telephony, and I have no doubt that improvements will continue to be made.

What I object to, however, is the immediate publication of what I can only regard as wild-cat suggestions that within a comparatively short time we are going to see on the cinematograph screen televised pictures, comparable in any sense with an ordinary cinematograph show. As a matter of fact, I personally am of the opinion that television will *never* be able to give us anything comparable with the cinematograph, but that is only my own private opinion.

I am convinced that television will not in any practical sense rival the cinematograph during the lifetime of anyone at present living. One is getting a little weary of hearing everlasting predictions (by people with no technical knowledge whatever) about "sitting in an armchair at one's own fireside and seeing a Test Match played in Australia." It would be very nice if the non-technical prophets could think of something new.

Incidentally, I think exaggerated newspaper talk does more harm than good to the cause of television, by leading the public to expect too much.

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