

CAPT. ECKERSLEY ON RADIO OPERA (See Page 715)

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December 20th, 1930.

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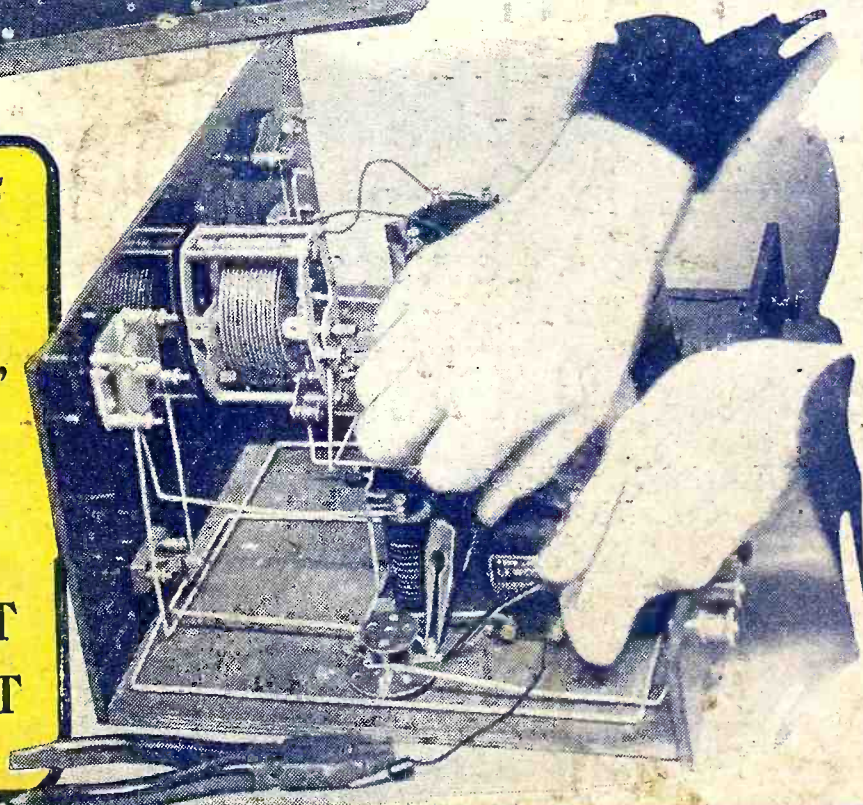
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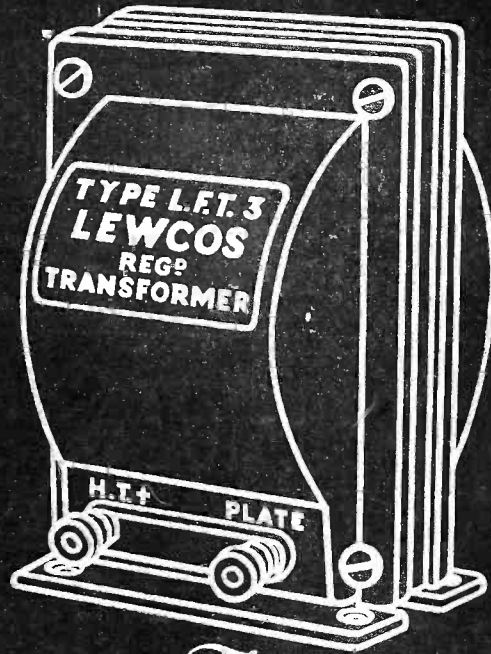
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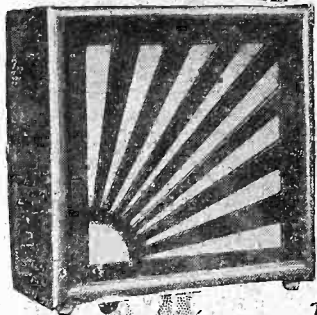
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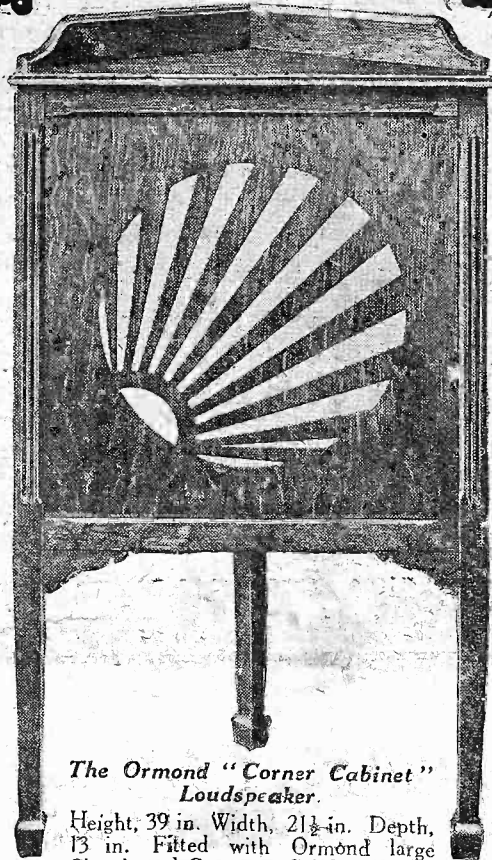


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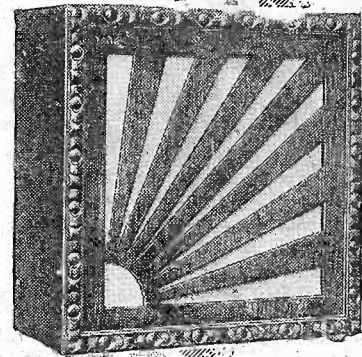


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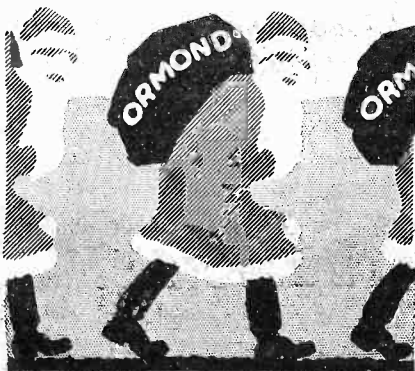
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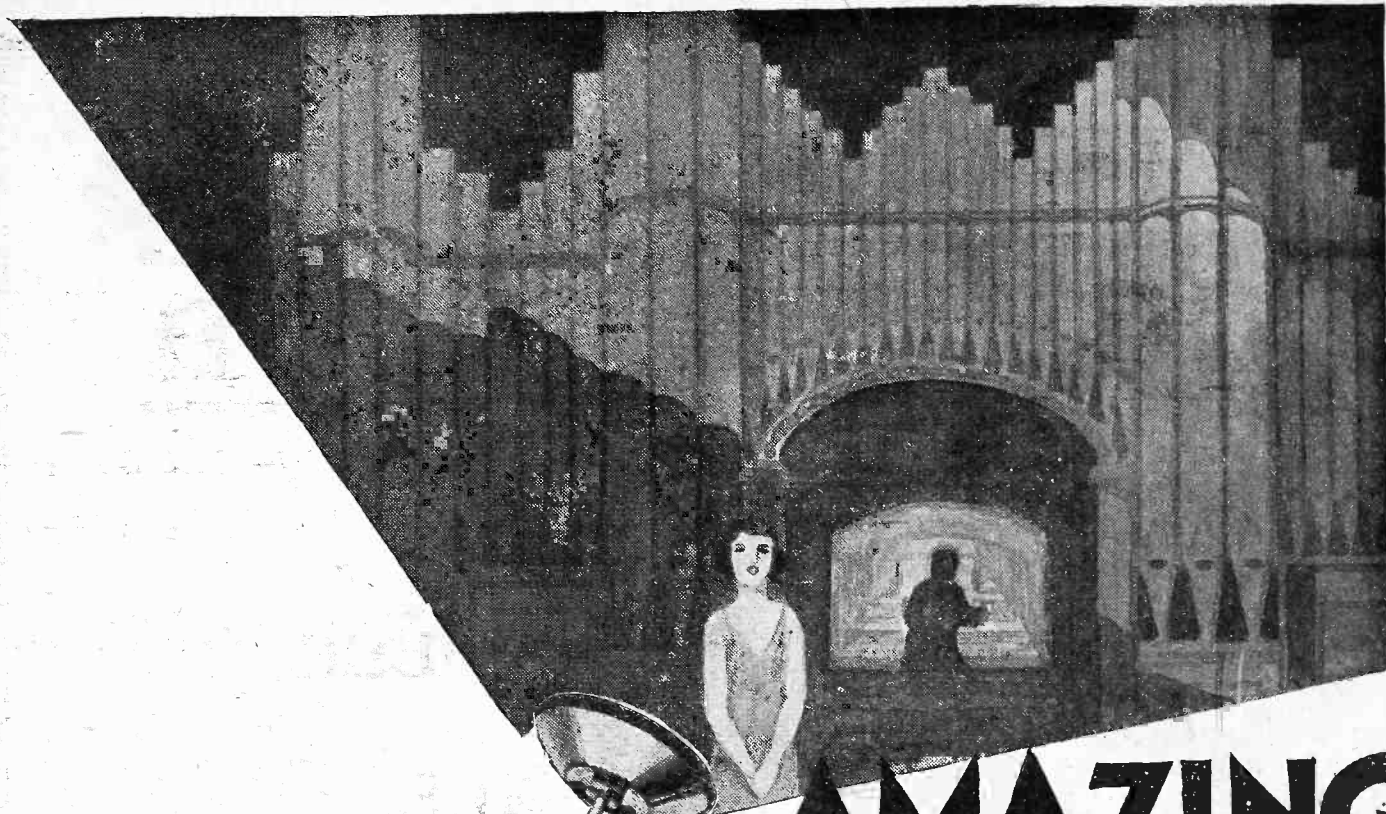
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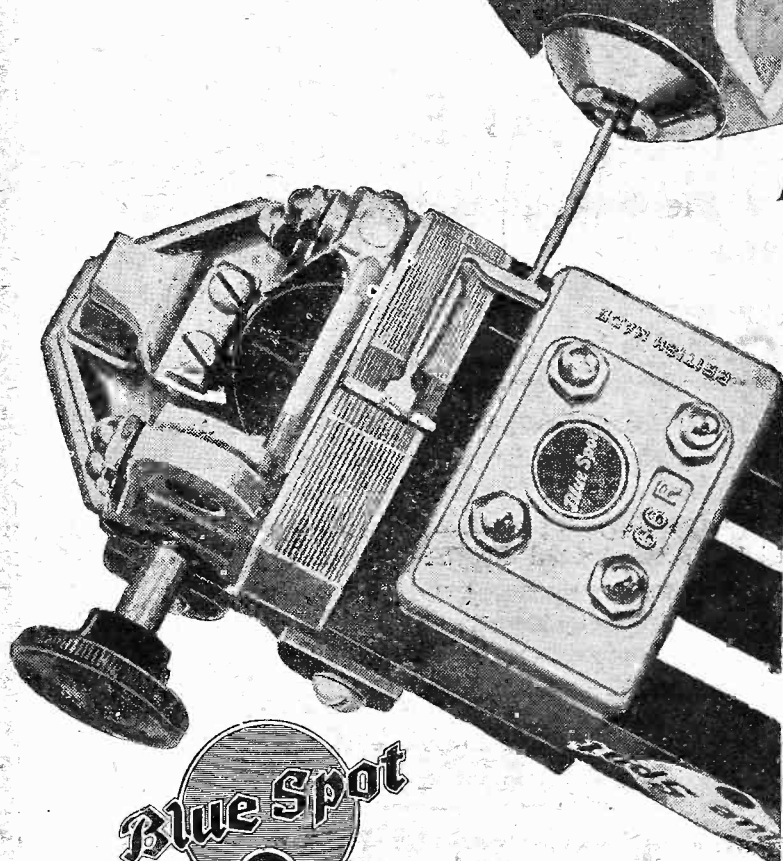
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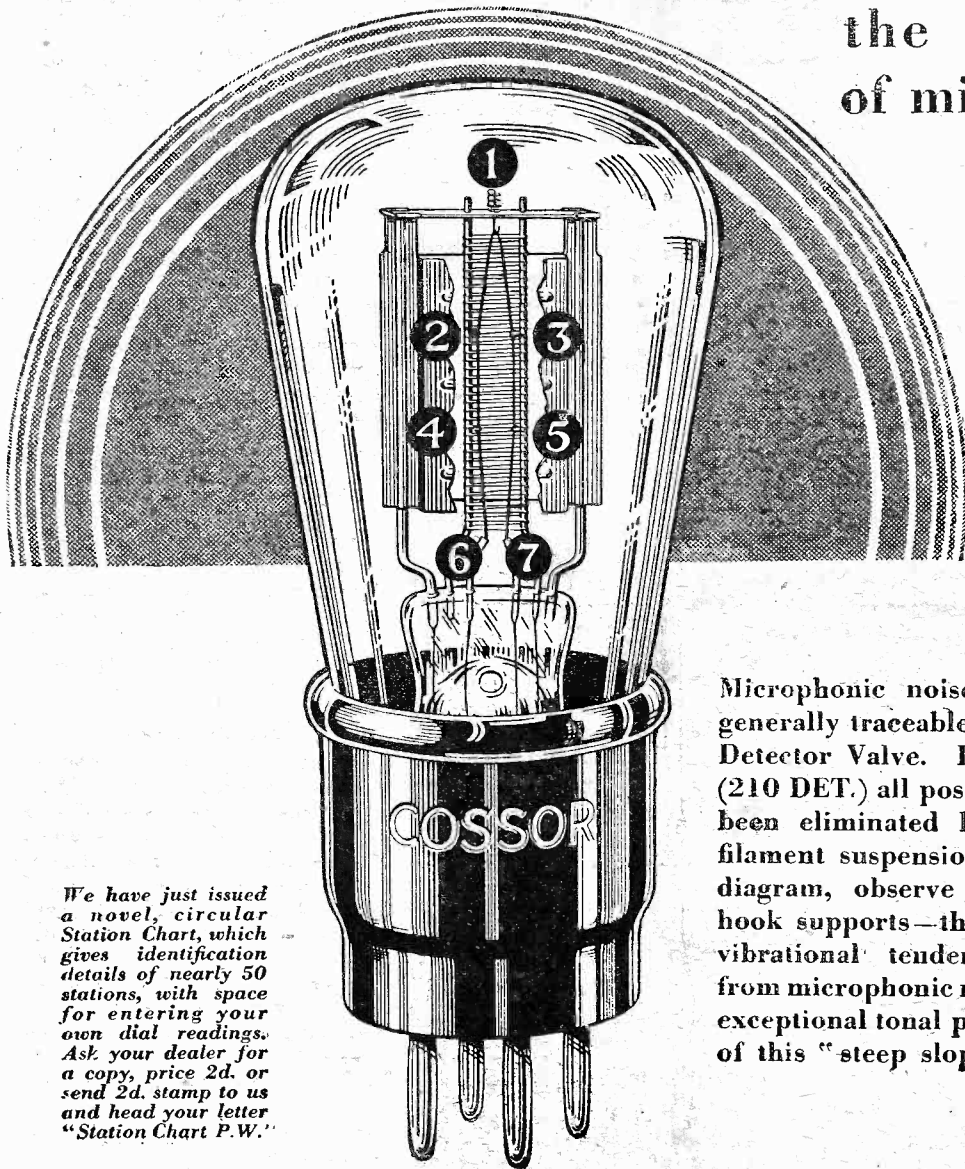
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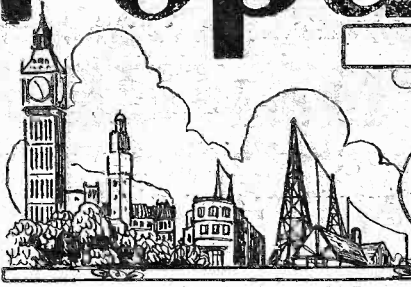
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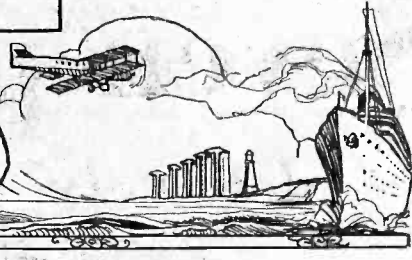
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**FOUR MORE DAYS.
 THESE NEWSBOYS!
 MILLIONS OF 'EM.
 PROGRAMMES FIRST.**

RADIO NOTES & NEWS

**LISTENING TO LEEDS.
 FREAK CONNECTIONS.
 BUCK UP, BRITAIN!
 ANY OLD LEAD?**

Four More Days.

JUST four more days and the great Festival will begin. The foundations of romances, and also of ruined digestions, will be laid, and shop assistants will compose advertisements for "sitting down" jobs. May you all spend your Christmas wisely, kindly and happily—and the same to me! May the turkey be a veritable Sultan of a Turkey, and may the pudding "come out" as clean as a whistle and be of that classic dark hue which brings a smile of pride to the little pudding-maker. Them's my sentiments, chaps!

The Stenode Radiostat.

CONGRATULATIONS to Dr. Robinson on the reported success of his trip to the U.S.A. in order to demonstrate his invention, the "Stenode Radiostat." I hear that great interest in this receiver was shown by all the leading manufacturers of radio equipment, and that an "American Radiostat Corporation" is to be organised for the purpose of granting licences to manufacture under the British company's patents. If the Radiostat is badly needed anywhere, it must be in America, and we wish it the very best of luck.

These Newsboys!

DAVID SARNOFF, President of the great Radio Corporation of America, landed in New York as a poor Russian emigrant boy not so many years ago. He has now presented the equivalent of £2,000 to St. Lawrence University, Canton, New York, to commemorate a loan of £45 which was made to him in his youth, with which he bought a newspaper stall. The money is to form a fund for loans to needy students. By the way, Edison was formerly a newsboy—and so was Edgar Wallace.

"Mass" versus "Lone" Listening.

LO, a coincidence! I was alone in the house one Sunday afternoon and turned on the new toy, the remarkable S.G. set without a name. A goodish pro-

gramme, yet it seemed to fall flat; it was as exhilarating as a cocktail that has stood overnight in the rain. Pondering the possible cause of this I got no farther than the notion that listening alone is like drinking alone, when I happened to pick up an October number of the "Musical Standard," where I read, "The effect of music is enormously increased by mass excitement." "To listen alone, or almost alone, is almost to listen coldly." It's a true blue fact! You try it! Hear Beethoven's

on November 1st. This gentleman's father kindly writes to say that the trial tests gave "complete elimination of all disturbances" and that the Italian Government is to test it again, this month.

Improvement in Transmission?

AFTER having read the newspaper article sent by Mr. Bruni, senior, I begin to suspect that what his son has invented is not an apparatus for cutting out "X's" or "atmospherics," but a method of improving transmission. Else, why does Mr. Bruni say: "The apparatus used in this test was for continuous current, but another trial test is to take place . . . with an apparatus for alternating current"? Perhaps my courteous correspondent would explain further.

Millions of 'Em.

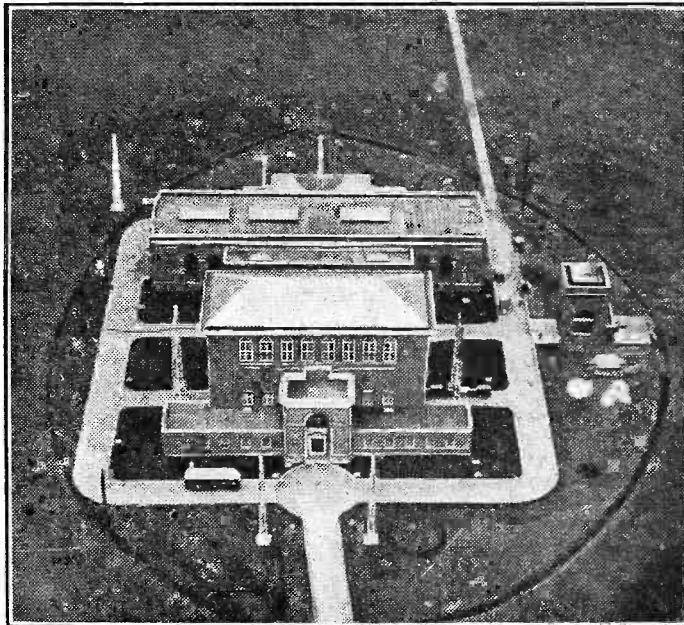
THEY say that about every tenth person in the U.S.A. has a wireless set, which makes the total number about 13,500,000! New York alone is said to have 1,752,000 sets. California being next with 1,470,000. Heavens! What a country! But they are not satisfied, for a report from Illinois states that all prisons and reformatories are to be equipped with wireless. One wonders what the total would be if they began to imprison "bootleggers"—why, they would have to import receivers! And build more gaols, too!

Distinguished Listeners.

SURELY that was a triumph of persuasion to get together at Sir Landon and Lady Ronald's house the Marchese and Marchesa Marconi, Mr. G. Bernard Shaw, Sir Hugh Allen, Director of the Royal College of Music, Dr. McEwen, Principal of the Royal Academy of Music, and Mr. Ernest Newman, the well-known music critic, all to listen to a demonstration of a new radio receiver—a Marconiphone Model 560, in fact. I should like to know what Mr. Newman thinks of present-day radio, for I recollect that he used to be very

(Continued on next page.)

THE BIGGEST STATION IN THE WORLD



This is a view of the Rugby wireless station, taken from the top of one of the 820-ft. high masts. It is in telegraphic touch with ships the world over, and it forms the telephonic link between all Europe and the U.S.A.

Seventh Symphony at a Queen's Hall "prom," and then at home by yourself. The one is a sort of white-hot experience; the other only a nice red glow.

Those Atmospherics.

TO change the subject we are all glad to hear of attacks on radio's oldest and most obstinate problem, and I must, therefore, refer once again to the apparatus devised by Mr. Riccardo Bruni of Genoa, about which I had a Note

Ronald's house the Marchese and Marchesa Marconi, Mr. G. Bernard Shaw, Sir Hugh Allen, Director of the Royal College of Music, Dr. McEwen, Principal of the Royal Academy of Music, and Mr. Ernest Newman, the well-known music critic, all to listen to a demonstration of a new radio receiver—a Marconiphone Model 560, in fact. I should like to know what Mr. Newman thinks of present-day radio, for I recollect that he used to be very

RADIO NOTES AND NEWS

(Continued from previous page.)

pessimistic about broadcasting not so very long ago.

The "Whiff of Audacity."

A WHIFF? By my halidom, 'twas an outrageous blast when Mr. H. Granville-Barker, a play-writing gentleman, coolly proposed that a portion of the B.B.C. surplus should be handed over for the establishment of a "national" theatre—whatever that may be! I am glad to note that Lieut.-Commander Kenworthy lost no time in getting up in the House of Commons and asking the Postmaster General "What about it?" So far no scheme for robbing the B.B.C. has been submitted to the Post Office, but the danger is by no means past. We know that Mr. Clynes has a weakness for the "fine arts," and that "national" anything sounds good to him and his colleagues. So, as eternal vigilance is the price of safety, let listeners ensure the safety of their B.B.C. funds by keeping an eye on subsidy-hunting gentry connected with the theatre.

Programmes First.

IF the B.B.C. would spend more on programmes—and more such expenditure is badly required—their cashbox would not cause the mouths of subsidy-hunters to water so freely. There is enough money available to provide at least two alternate programmes for every B.B.C. station. The present arrangement is a mere pretence at alternatives and the repetition of certain long items on the day following their first broadcasting is very annoying, especially if the other station is giving programmes which one would rather escape. Why should the B.B.C. make a profit? Let it balance its budget and no more, putting its would-be surplus "back into the business" after providing for the necessary reserves—which should be earmarked indelibly for the B.B.C.'s own consumption.

Listening to Leeds.

YOU can now listen your way to Leeds, for after a deal of experimentation a train in England is actually fitted up for the reception of broadcasting. Namely, the L. and N.E. 10.10 a.m. from King's Cross to Leeds. You pay your shilling, plug your 'phones in, and receive 5 X X—and anything there is to listen to until 1 p.m., when you want to go to your lunch! The receiver is a three-valver kept in the guard's van. The aerial is about 30 feet long, a single wire, and is run along the roof of the van. The credit for this innovation, from the technical side, is due to Messrs. McMichael.

A "Friendly Follower."

OF the "friendly following," about which I gloated in a recent issue, no reader better qualifies as a member than a Scot who is at present exiled in Newcastle-on-Tyne. To wit, J. McL, who offers us the first refusal of a new name for a set. The matter will be referred to our Nomenclature Department, Jock, as also will your offer to act as our unofficial representative in the North. As Jock is a professional radio man his appreciations of "P.W." make a warm glow pass through

our shrunken forms. Any time you are near Tallis, "come ben the hoose."

A Fine Bit of Reception.

IVE had a note from a Public Works official in Kuala Lumpur, Malaya, about his reception of the international broadcasting experiment, when Messrs. MacDonald and Hoover, and the Japanese Ambassador spoke. He received 5 S W, K E L (S. Frisco), J I A A (Tokio), K P K (Manila), and either Sydney or Nairobi, all at L.S. strength except 5 S W, the best being K E L, a 7,000 miles jump. "It will be noted," says J. B. B., "that the complete circle of the globe was successfully covered, Chelmsford, for instance, being received either W to E at 7,000 miles, or E. to W. via New York and S. Francisco, at some 17,000 miles, and if only Bandoeng, Java, had also taken part, listeners in

SHORT WAVES.

SUICIDE IN COMMERCE.

"—Portable Radio. We should like to demonstrate this model to you. Its tone and volume have nothing to be desired."—Natal paper.

According to reports, the police superintendent of the town of Arles-en-Provence, in France, has issued a by-law that all loud speakers must be switched off at sunset.

Does this apply to mothers-in-law? asks a correspondent.

THE JUDGMENT OF PARIS.

Referring to the Sunday evening programmes from Toulouse, which are specially provided for England, a Paris newspaper writes:

"Something now on the western front. Everyone who has been in England must have noticed how bored the poor English are on Sundays."

"A Radio Kidnapped," runs a headline in the "Glasgow Evening Times."
We wish the one next-door had been.

THIS WEEK'S MARTYR.

The man who, having with super-human efforts got 2 F G, was asked by his mother-in-law to change the record, because she preferred a nice song to that silly "whistling solo"!

"Wireless keeps even the cow contented," we read in the "Sunday Chronicle."
Yes, we humans must be very hard to please.

Henceforth, or so I read,
Grand Opera's destined to be grand indeed;
Born at the B.B.C.'s Olympic nod,
Nursed by its genius, nourished by its wad;
While Tommy Beecham—ay, and H.M.V.—
Join in the gay but high-class harmonice.
"Evening News."

There's one thing to be said for radio:
even if you do have to listen to some of those
bad sopranos, you don't have to look at them
as well.

England could quite successfully have received London either direct or after passing right round the world."

The "Drum" Accumulator.

I HAVE previously called attention to the new type of storage battery invented by Dr. James Drumm, a master at University College, Dublin, who has presented his invention to the Irish Free State. It is reported that a battery of Drumm cells can store enough power to run a train for 60 miles, and that its recharging takes a few minutes only. The Dail has voted the Ministry of Industry and Commerce £13,000 for this battery, which, by the way, has been patented in twenty-four countries.

"Freak" Connections.

EVER since I ventured into the open with a squeak of surprise because a man said that he received with his aerial "earthed" from a point near the lead-in, I have been the target of letters from practically everybody in the British Isles who connects his set in an unorthodox and inefficient way. The foreign mail is now breaking out into this complaint, and I refer now to a letter from G. K. M. (S. Africa) who tells of a set in King William's Town which receives Jo'burg without an aerial and with the "earth" plugged into the aerial terminal, better and freer from X's, than when connected à la mode! There is no limit to the vagaries of radio receivers.

Buck-up Britain!

THERE is that in G. K. M.'s letter which strikes a more serious note. He states that he could not find a British set for sale in the country. German, Dutch and American sets are available, but when he wrote to a well-known firm in England, asking for lists, he got no reply. Dutch "all-mains" sets are being sold there for £32 10s., and German ones for about £40. Naturally, he asks whether British firms really want any South African business. If they do they must invade the market with sets in which sensitivity is placed before selectivity. There are only three stations (442, 405 and 378 metres); Jo'burg is 15 kw., Durban 1.5 kw., and Capetown 1.5 kw. "All-mains" sets are popular, even on isolated farms, for many of these have electric light plant; but some battery sets are required.

An Unobtrusive Aerial.

A READER who signs himself "Helpful"—may his tribe increase!—describes how for an indoor aerial to be used with the "Magic" Three, he covered the back of a picture measuring two feet by eighteen inches with tinfoil from cigarette wrappers, connected the foil to a wire and the wire to the set via the back of an almanac. The result, he says, is very satisfactory—and so it ought to be, for it is an old and well-tried device, though not quite so efficient as forty feet of the best strung up on a nice pole in the garden.

"Our Conservative Navy."

I AM glad to learn from my ex-naval correspondent, H.A.C. (Leicester), that although he found the grub to be "rotten"—which, he says, would make a story by itself—he does not consider that the W.T. Department of the Navy is conservative. Well, perhaps he is right. The Navy was slow to take up wireless—slow as a Service, I mean—but when it did I think it went ahead as fast as all the rules and red-tape would permit.

Any Old Lead?

MAY I be permitted to call attention just once more to the fact that even when your accumulator has buckled and sulphated beyond possibility of redemption it may yet be of use because of the lead in its plates. If you have any such "duds" a postcard to Mr. S. C. Knott, at Middlesex Hospital, Mortimer Street, London, W.1, apprising him of the news that he is welcome to them, would be gratefully received by him.

ARIEL.



WHAT I THINK OF RADIO OPERA.

By Capt. P. P. ECKERSLEY, M.I.E.E.

PERSONALLY I like opera. Wagner has a robustness seldom associated with sensibility. Also I like garlic, snails and Port Salut cheese. I do not like Gilbert and Sullivan. Puccini is lovely slop for a summer's night and reproduces wonderfully on a gramophone. Lots of people will disagree with my likes and dislikes.

These are my *personal* likes and dislikes, and I'm hanged if anyone is going to tell me what I *ought* to like (or dislike). But bureaucracy has decreed that we all *ought* to like opera (when the majority of us do not), and it's going to be broadcast whatever it costs; private enterprise knows that most of us love Gilbert and Sullivan opera so they won't on any account have it broadcast. This is all somewhat confusing to a logically minded person, and rights and wrongs get very muddled.

It is the avowed policy of the B.B.C. to give the public programmes which the Board of Governors considers the public ought to like, and not what the public think they want to have.

Go-ahead Influences.

The Board of Directors would seem to be eminently qualified to implement the policy so firmly expounded by the Director-General. It is a question whether the decision to give us opera is part of that policy or whether it is considered that for once they are coming near to satisfying public need.

Are they consistent or not? Obviously, in regard to this decision to subsidise opera, they have been persuaded by the go-ahead influences in the B.B.C. directorate, and any arguments with our no-saying Chancellor have had an influential supporter towards a yes-saying result. But was "yes" the right answer?

I am not dogmatic on the question, but I certainly feel that the decision was most unwise, particularly at the present time.

The fact that opera does not pay is not necessarily an argument against it. The fact that it requires subsidy in all foreign countries where it is continuously presented, and that so far England has refrained from official support, is not in itself a condemnation.

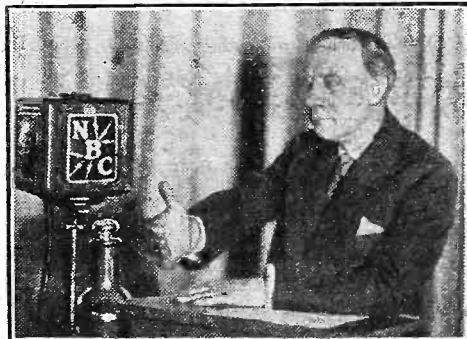
The fact that Sir Thomas Beecham's enthusiastic support for the League of Opera failed to raise enough money to start opera, or that when his object of having opera, at popular prices, is achieved in another way makes him burst into rage, is still no fundamental bar to opera as

Here are some very novel and refreshing comments on a subject that has recently aroused much discussion among listeners.

such. It may, of course, be a condemnation of Beecham opera, but not opera. And that may be no particular evil.

In my view, the debatable point is whether broadcasting or opera have much in common, and whether, if they have, such a large sum of money is truly available for this purpose, above all others, and whether, indeed, in these times the money

VERY DEMOCRATIC!



This is Al Smith, former Governor of New York, speaking on behalf of the Democratic candidate for that position. His voice was broadcast all over America.

is available for any purpose to do with opera or broadcasting. Also, whether the money available is going to give us good opera.

Let me be clearer. Broadcasting is surely an art concerned with sound, and sound only. Opera when well done combines sight and sound for its full effect. Therefore opera is to that extent emasculated when one of the supposed essentials is completely missing.

A Great Difficulty.

Such artificial aids as telling us the story are merely admissions of essential failure to present the opera as an opera. Of course, as music, opera is very well. And hearing the music may make us want to go to see and to hear. This widens our opportunities of enjoyment and is all to the good.

And so we come to this: by having the opera presented in emasculated form we are to be intrigued into going and seeing

and hearing it. So then, of course, opera would pay.

But it does not. See subsidy! And the B.B.C. has been broadcasting opera for years. But it has not had the effect of making people go any more. Perhaps the subsidy will make broadcasting of opera so much better that people will go.

But here is a great difficulty. The broadcasting from the studio is much better. You can place artistes so that they can really be understood (words and all), so that balance is right for broadcasting. You cannot do that in Covent Garden, so opera is broadcast worse—thanks to the subsidy. It is difficult to get the rights and wrongs of it all.

Then, again, this money supposedly comes from the entertainment tax on broadcasting. Is it best spent on opera? When I was in the B.B.C. I was very keen to raise the power of 5 X X now, at once. But no! We had not the "resources." Money is "resources." We could double the effectiveness of 5 X X for £20,000; but opera, culture! And boxes for the elite!—ugh!

The Most Pathetic Fact.

Perhaps the most pathetic fact is that the money seems still insufficient to give really good opera continuously. I reckon there is available some two hundred pounds a performance. Is this enough, even with box office receipts?

Up to now broadcasting is said to spoil opera as far as box office receipts are concerned. Therefore, we shall be allowed only isolated acts, we who listen and pay! By ruining the box office receipts we get our money's worth then!

And, lastly, is the money available even for increasing the effectiveness of 5 X X, for giving more alternative programmes, for engaging better and better artistes, for research, experiments, rewards to the deserving, for the myriad ways it could be effectively spent on *broadcasting*?

To my view, it is not. The licences and the unemployed increase their numbers apparently proportionately. Our Chancellor might see a constructive policy in further taxation on wireless, increasing licences to help pay for the increasing unemployed. This surely would be more constructive than subsidising opera?

What a pity it is that people do not see essentials more clearly, and that because of a failure to grasp such essentials continually "bolster an inefficiency"—a phrase I learnt at Savoy Hill!

THE B.B.C. IS HARD UP.

By THE EDITOR.

Despite the millions of ten-shilling licence fees paid by listeners there is not a superfluity of cash left when the Post Office, the Income Tax Collectors and the Treasury have each had its "rake-off."

IT will probably come as something of a shock to many readers to learn that the B.B.C. is "hard up."

Being hard up is not a very unusual phenomenon these days, but it seems to have surprised many people that even with an income of £944,301 (for last year) the following words should appear in the B.B.C. Year Book for 1931: "Entering on a phase of development in which its needs in the way of revenue and capital expenditure are bound to exceed greatly its present financial resources."

Enormous Expenses.

The fact is, of course, that the B.B.C. is committed to at least two costly ventures—the Regional Scheme, and the new Broadcasting House.

The latter item is what may be colloquially termed a mere fleabite when compared, from the expense point of view, with the Regional Scheme. Each Regional station costs something like £150,000.

readers that the B.B.C. gets less than six shillings from every ten shillings paid by listeners. Last year the Treasury took £341,949.

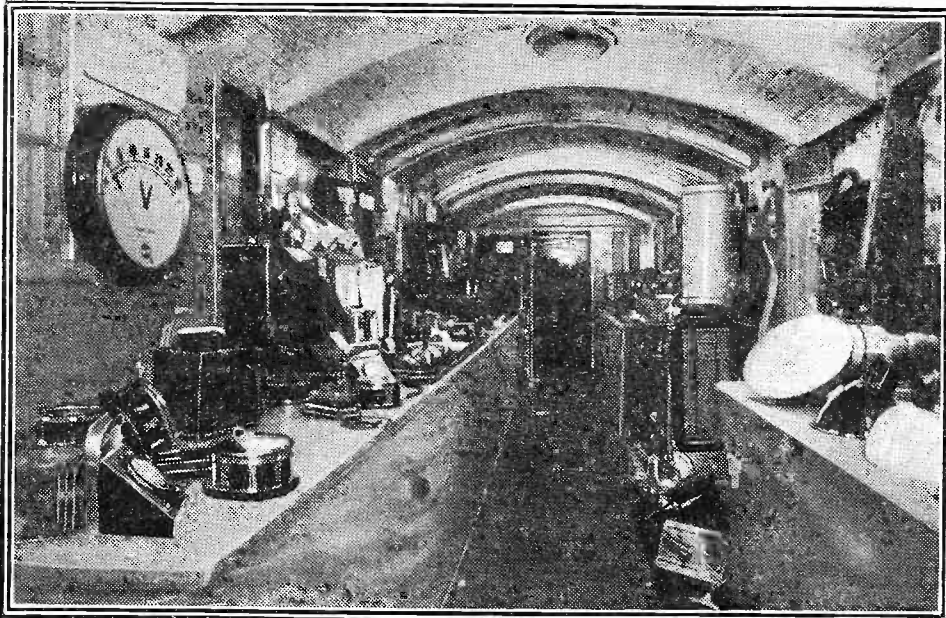
The B.B.C.'s income from all sources for 1929—including profits from publications, etc.—was, as a matter of fact, over a million—but after taxes, etc., the amount available was found to be inadequate.

It seems pretty clear that force of circumstances will eventually make the Treasury disgorge. It would be a fine scandal if the B.B.C. got into really serious financial difficulties and the Treasury refused to help by returning some of the money deducted from licence fees.

The whole business is really amazing, and it is a singularly striking example of how the public meekly accepts a situation which, to say the least of it, has never been legally authorised.

To cap it all, when Mr. Snowden announced the other week that a small portion of this Treasury hoard, built up

A RADIO EXHIBITION ON A TRAIN



A group of large French Industrial firms have formed an exhibition which is displayed in a railway train. The train is travelling all over France and stops at all the big towns. Above you see the radio section of this novel show.

Add to this the enormous programme and administration expenses, and the fact that the B.B.C. pays income tax on the money received from the Treasury, and it will be seen that a gross income of nearly a million a year is not so marvellous, after all.

There is no doubt that the B.B.C. is very seriously hampered by the present scandalous arrangement whereby listeners' licence fees are "milked" by the Post Office and the Treasury—and then again by the income tax authorities.

At the risk of repetition, we again remind

from pickings from licence fees, was to be returned to the B.B.C. for the purpose of assisting opera, and incidentally the broadcast programmes, there was a terrific yell of protest from all quarters of the land.

The Listener Pays.

Misuse of taxpayers' money was alleged, and a dozen other distorted versions of the whole business. It could have been argued that the so-called subsidy was a misuse of listeners' money, for it was the listener, and no one else but the listener, who found the

money. Those who did not possess wireless licences would have done better to keep quiet. They were not concerned. Their money was not being used.

But with amazing indifference to the real facts people all over the country have jumped into the fray and letters numbering thousands have for weeks past appeared daily in the press condemning the Chancellor's action.

A Very Great Truth.

A few enlightened critics have pointed out the real facts, but their voices have been drowned in the general clamour roused by

B.B.C. FINANCE:

In a written reply to Sir William Mitchell-Thomson, the Postmaster-General gives the following figures of the total receipts from wireless receiving licences during the year ended March 31, 1930, and their distribution, with the corresponding figures estimated for the year ending March 31, 1931:—

	1930	1931
	£	£
Total receipts	1,537,377	1,725,000
Deduct 12½ per cent (for P.O. expenses of management)	192,172	215,625
Deduct contribution to cost of conversion of "spark" stations &c.	6,686	3,150
	1,338,519	1,506,225
Paid to B.B.C. (based on licence receipts for previous year)	963,171	1,069,648
Balance to Exchequer	£375,348	£436,577

Mr. Lees Smith adds that he is not in a position to furnish particulars of the total income of the British Broadcasting Corporation from all sources during the same two periods; but its total income during the year ended December 31, 1929, is shown in its Third Annual Report (Cmd. 3599 of 1930) as £1,097,337 7s. 3d.

the ignorant, the prejudiced, and the political wingers who jump at any opportunity to raise a political dust. Altogether a rather sickening business.

Hazlitt once wrote that "Prejudice is the Child of Ignorance." Anyone who has studied the financial facts of broadcasting, and condensed them in the light of the Opera Scheme, will realise the very great truth of Hazlitt's dictum.

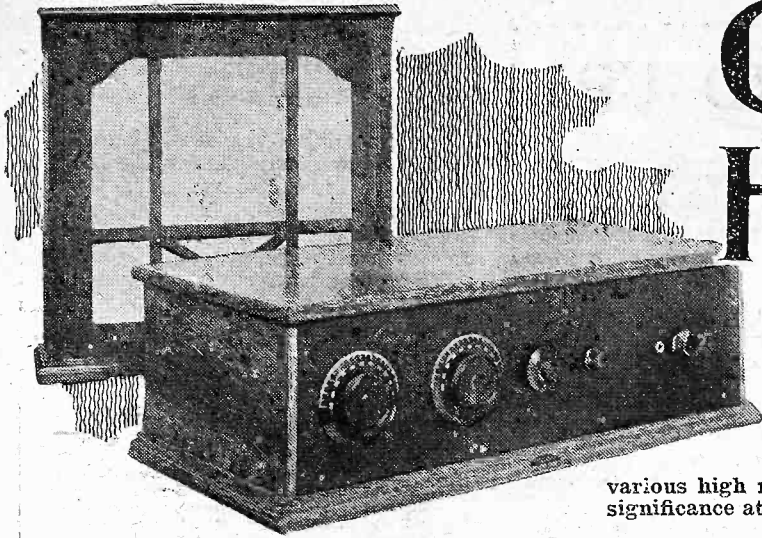
Well, let us hope the B.B.C. won't be too seriously handicapped by lack of money. If it is, and the Regional Scheme is again held up, or British broadcasting is in any way set back, then there will be absolutely no excuse for the Treasury to withhold its accumulated deductions from listeners' licence money.

PROGRAMME CABLES

Although the buried cable has the advantage that it is less liable to breakdown, the overhead line for S.B. work scores in quality.

A new high-quality type of Post Office cable is now being laid between certain important towns in the British Isles, and will eventually be available for S.B. work.

With the new Post Office buried cable an almost straight response characteristic from 50 to 7,000 cycles is obtainable.



ON THE HIGH "C's"

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

Another of those fascinating "music and the ordinary amateur" articles, which we are sure will be enjoyed by all readers. It shows you how to correlate the various high musical notes with their respective frequencies, and the vital significance attached to the harmonics that accompany all musical sounds.

ONE of the minor tragedies of radio is this: many listeners do not realise that dozens of notes are lost during every few seconds of a musical broadcast. The range of the average radio receiver is remarkably restricted, although, unfortunately, a vast number of people seem to find it adequate.

However, it is very apparent that listeners are, on the whole, developing their critical faculties. Of course, at one time the romance of radio completely smothered criticism—it was regarded as so wonderful that anything at all could be received that criticism of the noise emitted by the phones or loud speaker was out of the question.

Coming to the immediate present, I have an important question to ask "P.W." readers. It is this: Are you able to criticise the output quality of a radio set?

Obviously you cannot do this with scientific precision if you haven't got a proper testing outfit enabling you to measure the response of your gear at every frequency in the "audio" range.

Timbre.

But can you give a rough approximation of the general failings of a radio outfit?

I don't suppose you can do even that, unless you are a trained musician and are in a position to know exactly what the various musical combinations that broadcast should really sound like, and can identify the various instruments and are familiar with their natural "timbre."

Perhaps you are glad you are not able to do these things, and count yourself lucky that you can take broadcasts as you hear them—as agreeable noises!

On the whole, I think that very critical listeners get

far less real enjoyment out of their listening than do those that can forget their sets and such things as frequencies while a band or an artiste is broadcasting.

Nevertheless, it is very interesting on occasions to try and correlate musical notes with their respective frequencies. It is certainly very instructive.

Dissatisfaction—But, Progress.

It may make you a trifle dissatisfied with your present apparatus, but a little dissatisfaction is a good thing—it makes you progress. It makes you want to improve your reception, and in the long run, you get a fuller satisfaction from broadcasting. It is true that "what you don't have you don't miss", but on the other hand, when you get those things your horizon assuredly widens.

For instance, if you have never heard a brass band broadcast via a powerful receiver working a first-class moving-coil

loud speaker, you do not realise what a stirring, thrilling thing it is, with its full-blooded "om-pom-om-pom" effect that makes you want to get up and march along the room in time with the music!

It is quite wrong to suppose that you must have a set giving a straight line output from about twenty to ten thousand cycles before "realistic results" can be obtained. Anyway, such an affair would be quite useless, for the simple reason that the B.B.C. does not broadcast such a range of frequencies. They are lucky when they can keep fairly straight from forty to four thousand.

Nevertheless, such a range is often quite adequate from the point of view of many listeners, and maybe that is a pity!

You know how far down the scale the various instruments go in terms of frequencies (that is if you read a recent article of mine), but the upper end is not so clear-cut in its limitations.

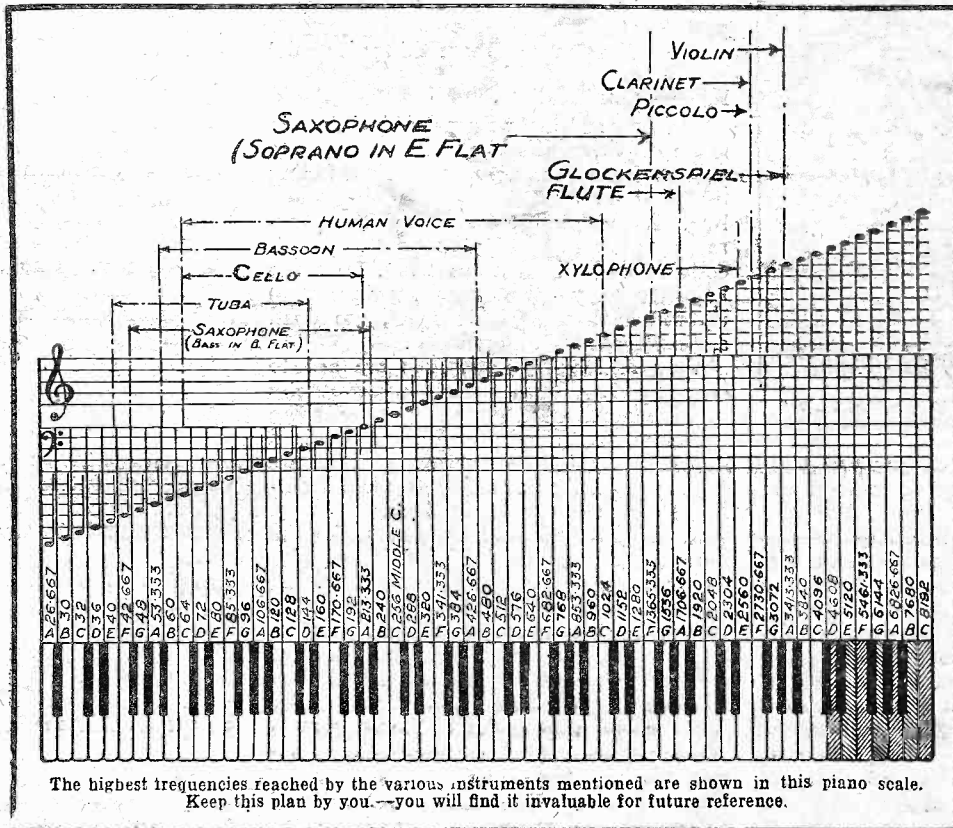
When an instrument emits a note having a fundamental frequency of sixty or thereabouts, realism is well served if the receiving outfit cuts right off just below sixty, but deals fairly well with frequencies a thousand or two above. You see, no musical note comprises just the one frequency—its main or fundamental frequency is always accompanied by a number of subsidiary higher frequencies, and these are known as harmonics.

Fundamentals.

Now you see where lies the "nigger in the woodpile." The higher the note the higher its harmonics, and the more widely spread they will be in view of the fact that a fundamental is always the highest common factor of its harmonics,

(Continued on next page.)

THOSE HIGH NOTES—AT A GLANCE



ON THE HIGH "C's."

(Continued from previous page.)

A note of 60 cycles will have harmonics of 120, 180, etc., but a note of 3,000 cycles will have harmonics twittering away at 6,000, 9,000, 12,000, etc. That is, they will be trying to twitter, but the average radio receiver will not let them, and so the note loses something of its characteristic tone. A violin note tends to sound like a flute note—a proper violin note sounds so beautiful simply because it is rich in harmonics.

One of the instruments that suffers worst in radio processes is the clarinet. It is true that its notes run up to only 2,500 cycles or so, but it is an instrument that depends for its success very much upon harmonics, and a falling off at the usual two or three thousand hits it badly.

That Shri!l Squeal.

As the clarinet tootles up the scale there comes a patch where the harmonics of the notes it emits actually predominate over the fundamental frequencies after that; it then runs into a very shri!l tone that is absolutely lost in the ordinary loud speaker.

HE HITS THEM!



Teddy Brown ventures well into the "High C's" with his xylophone.

It is rather otherwise with the piccolo, for although this little flute can range up to the middle of the third octave above the piano's middle C—about 3,000 cycles—its notes are not so rich in harmonics. A little, or even a lot, of harmonic snipping leaves it comparatively unaffected in tone.

Very different, however, is the case of the glockenspiel, which is something like the xylophone in construction, except that it has metal resonators. You hear it in some dance bands; it has a very high and rather penetrating note not unlike a tuned triangle.

Its fundamentals go well above 3,000 cycles, and no radio set in existence can take in more than a mere handful of its harmonics. And being a percussion instru-

ment, that is an instrument that has its notes generated by blows, it has other characteristics than those contributed by harmonics which inevitably suffer in any of the various radio processes.

The ordinary piano goes higher than anything we have yet mentioned, for its top note is above 4,000 cycles. But those top notes are seldom used. Even Mendelssohn's Spring Song, which I referred to in my previous article as "light and airy," does not take in any note above 1,700 cycles, and that only at the very end of the score.

The Wonderful Piano.

If you look through a book of music you will see that very few composers for the piano use notes above the third C above middle C, and that has a frequency of a mere 2,000.

By the way, it is rather wonderful that the piano should go above and below practically everything else, isn't it? However, when you strike the very high notes on a piano you find that they have little individual tone—they sound flat and expressionless against the rich fullness of the notes nearer the centre.

Why should that be? The reason is fairly obvious when you think it over. The ear has a limited range, so that it cannot take in harmonics of frequencies above a certain maximum. Many people cannot hear notes of seven or eight thousand cycles. Therefore, the lower the note the more chance it has of getting away with a big proportion of its collection of harmonics.

This indicates that we need not concern ourselves too much with the very, very high frequencies, for even if we were able to get them through our radio we should not be able to hear them! I am of the opinion that ten thousand represents the highest point at which we need aim—at least until we develop our aural faculties a great deal more than they are developed so far by critically listening to those B.B.C. programmes!

After all, we must get something of a limit!

Practical Considerations.

But I am writing in terms of ideals, not in those of practical radio! In the average present-day set there is a very serious falling off at about two thousand, so that those high fundamentals, let alone their harmonics, get very shabby treatment. Practically everything in a radio set, from the high-frequency stages (where these are used) up to the loud speaker itself, are dead against those high frequencies.

Very misleading resonances are apt to occur in many loud speakers at frequencies in the neighbourhood of two or three thousand, and these are liable to lead listeners to think that their high notes are getting not only their fair share of treatment, but more than their share.

Further, a lack of bass may make the reproduction sound high pitched and lead to the same sort of wrong conclusion. In such circumstances, far from the high notes being given undue amplification, it is actually that they want to "stay put," or have even more proper magnification and then have an adequate bass added.

There are people who throw away most of their already poor measure of high-frequencies by placing fixed condensers across the terminals of their loud speakers in order to make the results "mellow." Fancy making a clarinet "mellow"!

It is the high-frequencies that distinguish between the sounds made by a xylophone and a vibraphone, or a miramba and a glockenspiel.

The whole object of a band, whether it be a dance band or a symphony orchestra, is to get over a medley of musical notes of a carefully chosen kind. The brass band does not have instruments made of brass just because brightly polished brass looks smart, and a "silver" band does not spend hundreds of pounds on silver instruments simply because silver looks "posh."

ABOVE THREE THOUSAND!



Tom Jones, of the Eastbourne Grand Hotel Orchestra, can play notes of over three thousand cycles frequency with his violin.

The reasons underlying such choices are of a purely technical character—an instrument derives its tone from its structure. A brass instrument will have a different tone from one made of wood, and a silver instrument will sound different from either. You can distinguish the difference between a "middle C" played on an organ and a similar note played on a piano, for they will each have their own individual tones.

And they owe their characteristics, as I have said before, to their harmonics. Take away those harmonics and you take away individuality. One tuning fork or valve oscillator emitting a pure note free from incidentals will sound like any other similar device.

A Complicated System.

A big symphony orchestra such as the new B.B.C. outfit has scores of instruments of different kinds, and they all overlap to a very great extent. In cases, groups of instruments must be playing exactly the same notes, but they are not all merely piling up the powers of fundamental frequencies. Each instrument, brass, wood, string, percussion, contributes its own harmonics, little families different from all those due to any other instruments even of similar nature.

But listen to your set very critically the next time Adrian Boult and his boys are on the air, and ask yourself whether you are getting as much as you should of the thousand and one incidentals in the way of partials, that one hundred odd instruments are able to generate.

THOSE MAINS UNIT CIRCUITS

THEY ARE QUITE EASY TO UNDERSTAND AND EXTREMELY INTERESTING IF YOU READ THEM THE RIGHT WAY.

SOME HELPFUL HINTS.
By J. ENGLISH.

JUDGING by the questions I am frequently asked about mains units, there must be a good many constructors who are much puzzled by the theoretical diagrams of these devices, especially those of the A.C. type. You, yourself, may not perhaps have very clear ideas on this subject, and the purpose of this article is to help you to follow diagrams of simple A.C. units and what goes on inside them.

With so many people now going over to mains operation it is nice to remember that if you have a working knowledge of simple mains units and can follow their diagrams, your less well-informed friends will look upon you as a real live expert!

There are Three Sections.

After all, mains units, or eliminators as some call them, are not nearly so complicated as you may imagine, and the recipe for getting quite familiar with them is first of all to grasp a few fundamental principles underlying their make-up, and then add commonsense and a little simple arithmetic. Thereafter you will find that you can follow designs which previously seemed hopelessly complicated.

Now it is a great help if you look upon an A.C. mains unit as being made up of three sections—the *rectifier* for changing alternating current into direct current, the *smoother* for removing roughness and hum from this D.C., and finally the *distributor*, which breaks down the voltage supply from the smoother and distributes it to the H.T. terminals on the unit at the right values for each valve in the receiver.

Suppose we now follow out in some detail the make-up of each of these sections in a simple mains unit, as this will bring to light the fundamental principles common to all A.C. units and, at the same time, give you a clearer idea of the working of each section and the purpose of each component. The mains unit I have chosen as a basis for examination here is the first of the excellent A.C. "Safe-Power" series, the circuit diagram of which is reproduced in Fig. 4.

We will commence with the rectifier section which has been cut off and re-drawn

may be. S_1 supplies alternating current at a fairly high voltage to the "half-wave" rectifier which converts it into raw D.C., S_2 supplies raw A.C. at a low voltage, 4 volts in this case, to heat the rectifier filament; and S_3 also raw A.C. at the regulation 4 volts, ready for the heaters of A.C. valves, which you will use when you want to make your receiver entirely mains-operated.

The valve is called a "half-wave" rectifier because it only passes current when its single anode is made positive, which happens at each half cycle, or alternate pulsation of the A.C. supplied by S_1 .

In some mains unit diagrams you will come across a valve with two anodes. This is a "full-wave" rectifier giving about double the D.C. output, as each anode rectifies alternate cycles, a slightly different connection of S_1 then being necessary, as shown in Fig. 1a.

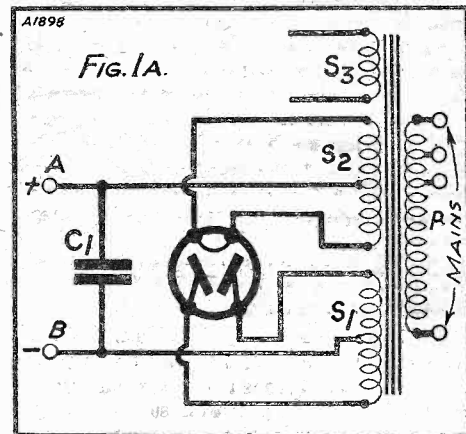
How to Follow the Circuit.

Notice in Fig. 1 that one end of S_1 is connected to the rectifier anode, and the other end eventually goes to H.T. —, whence the circuit is completed through the valves of your receiver to the H.T. + terminals and back through the smoothing chokes and the centre tap on S_2 to the rectifier filament. You can follow this rather tortuous circuit better if you ignore the other two sections of the unit, and imagine your valves as a high resistance connected across A and B in Fig. 1.

When looking at a mains-unit diagram always try to trace out in full this circuit from rectifier anode to rectifier filament, as this is the actual path taken by the H.T. current. It must now be obvious to you that the filament is the positive or high potential side of the rectifier valve, quite the

(Continued on next page.)

DOUBLE WAVE



And here you have the connections relevant to a double-wave rectifier.

in Fig. 1. This section comprises a specially designed iron-cored transformer linking the mains to the actual rectifier.

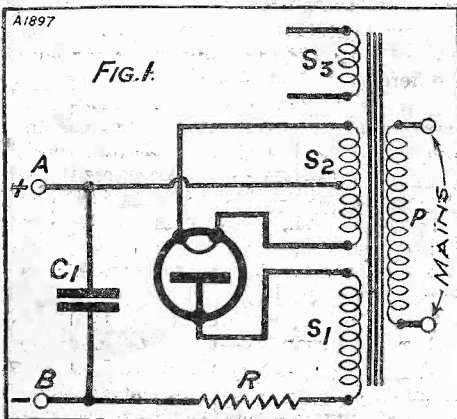
For the latter we can use one of several devices, in this case a special valve without a grid. Another popular type is the metal-oxide rectifier with which you may already be acquainted.

The Rectifier Portion.

You will see in Fig. 1 that the rectifier valve is fed from A.C. from one of the secondaries of the "power" transformer, the primary of which is either specially wound to suit the voltage of your mains or provided with windings to suit various voltages. Incidentally, the frequency of your mains supply, usually 25 or 50 cycles, must also be specified when buying a power transformer. (Look for this on the meter.)

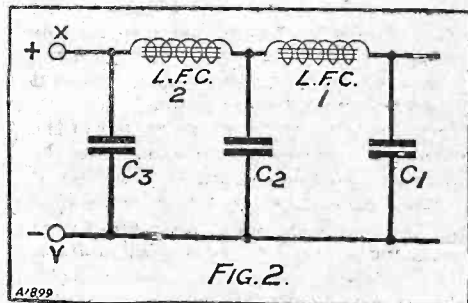
In the transformer of Fig. 1 there are three secondaries specially wound to step-down or step-up the mains voltage, as the case

SINGLE WAVE



The connections, shown theoretically, of a single wave rectifier valve.

THE SMOOTHING SECTION



The smoothing section of the "P.W." A.C. "Safe-Power" Unit.

THOSE MAINS UNIT CIRCUITS.

(Continued from previous page.)

opposite of the valves in your receiver, and explains why you cannot make one 4-volt secondary for both rectifier filament and A.C. heaters.

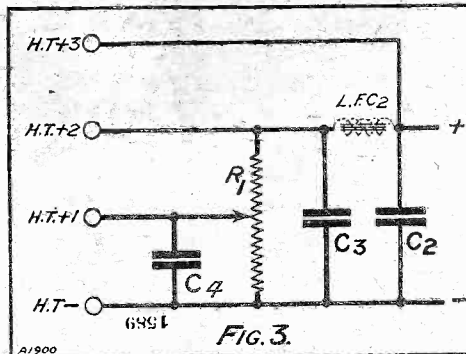
Another important point about the valve rectifier is that the voltage of the D.C. output varies according to the amount of current you take from it. If you use a Mullard D.U.10 in this particular unit, and S_2 supplies 150 volts, the D.C. voltage across A and B will be about 175 at 10 m.a., and 150 at 25 m.a. approx., ignoring the effect of R.

The latter is a resistance specially included as a voltage regulator, as you can see when you trace out the H.T. circuit and find that the total output current flows through it. The fixed condenser across A and B also deserves special mention, as it is absolutely essential if the rectifier valve is to do its job properly.

It helps to smooth the rectified current, as you can imagine it as a large reservoir into which D.C. is pumped in jerks by the

The D.C. resistance of the choke in ohms multiplied by the H.T. current flowing through it in *amps.* gives you the voltage wasted, which we naturally want to be as small as possible. It is also important to make sure that your by-pass condensers are rated to stand at least twice the D.C. voltage of the rectifier output, in this case about 150 volts.

HANDING OUT THE VOLTS



How the voltages are distributed by the "P.W." A.C. "Safe-Power."

The smoother section of the A.C. "Safe-Power" unit shown in Figs. 2 and 4 is rather ingenious, as you will see that the H.T. current for the earlier valves is smoothed more than that for the output valve, which is not quite so particular in this respect.

We now have left only the distributor section, which is a vital part of any mains unit as it controls the voltages.

The distributor of the unit we have under discussion here is quite a simple affair, as you will see from Fig. 3.

Output Scheme.

Notice that the lead coming from the junction of the chokes is essentially a part of this section, although it seems to be mixed up with the smoother.

You will remember that in the original unit a voltage of approximately 130 volts is available at H.T. + 2 and 3 under normal load, the difference between this voltage and that supplied by the rectifier being accounted for by the voltage drop across R, and the chokes.

The resistance R_1 wired across the output from the smoother is called a potential divider, because a wide range of voltages up to nearly that of H.T. + 2 can be obtained by moving the tapping connected to H.T. + 1 along R_1 , just like a potentiometer, which it actually is. The voltage of H.T. + 1 increases as we move the tapping towards H.T. + 2. This potential divider itself naturally takes some H.T. current from the smoother, 6 or 7 milliamperes in

this case. Before finishing with the distributor I want you to notice in Fig. 3 that there is a fixed condenser connected from the receiver side of each H.T. terminal to H.T. negative, and that each terminal is separated from the other either by a resistance or a choke. This wiring of condensers and impedances results in a complete decoupling device for each output terminal, and thus for each valve in your receiver.

Consequently, with this unit, back-coupling and L.F. howling is a very remote possibility. In all well-designed mains units the distributor resistances are always arranged to separate each H.T. terminal, which in turn possesses its own large by-pass condenser.

Now that we have dissected a simple mains unit, turn once more to the complete diagram of Fig. 4, which should now tell you a great deal more than it did before. Similarly when you come across other diagrams, even complicated ones, just split each one up into its three sections in your mind's eyes, and then all its apparent complications will vanish.

RANDOM NOTES.

TECHNICAL AND OTHERWISE.

An accumulation of dust on a valve holder or between the legs of a valve will often give rise to a high resistance and leakage, and cause intermittent "frying."

The creeping of the acid of an H.T. wet battery is often caused because the cells are placed in a damp container, by failure to see that the cells are perfectly dry before filling, or by allowing the liquid poured into the cells to splash.

When placing one L.F. transformer near to another, or near to an L.F. choke, remember that the position for minimum interaction is when the cores are at right angles.

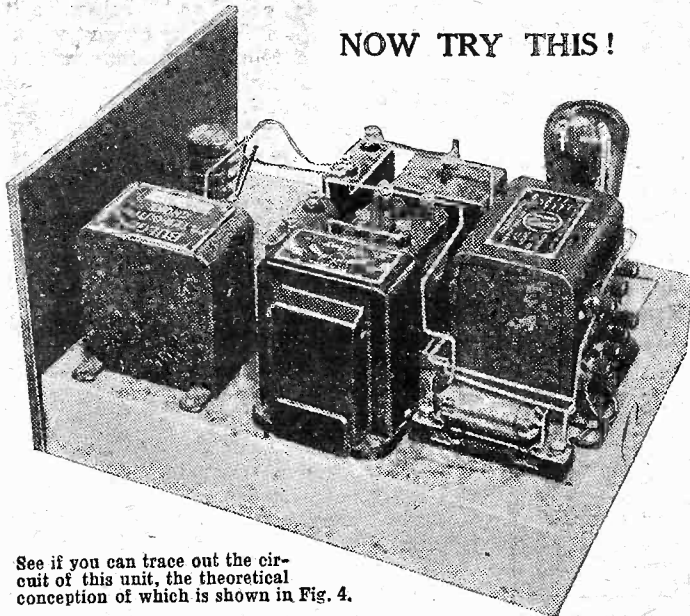
Germany is to follow Britain's lead and is inaugurating a regional scheme by means of which the whole country will be covered by only three stations.

Pick-up enthusiasts should remember that a gramophone motor should not be wound up and left overnight, but should always be unwound when idle.

If a set fails to work after the service man has recently changed the L.T. battery, the probability is that the trouble is due to a dirty contact on this.

Never keep your batteries a long way from the set, as long leads between them are not only wasteful but are unnecessarily dangerous.

NOW TRY THIS!



See if you can trace out the circuit of this unit, the theoretical conception of which is shown in Fig. 4.

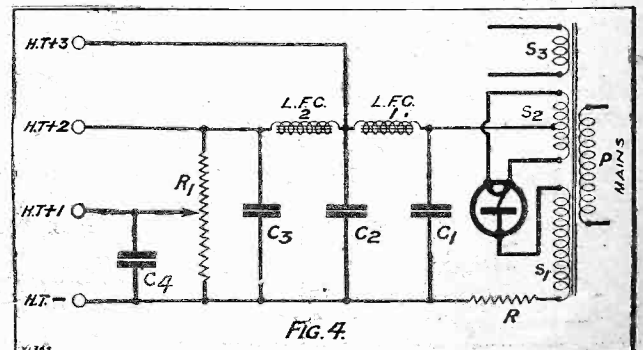
rectifier, and then drawn out again at A and B at a steadier rate. The section to follow the rectifier is the smoother, invariably a collection of chokes and condensers, without which your loud speaker would "hum" rather alarmingly.

Removing the Ripple.

The pulsations in the current drawn from A and B are "ironed" out by passing it through the smoother, shown in Fig. 2. The iron-cored chokes are an effective barrier to the A.C. ripple riding on the back of the D.C. current, coming from the rectifier, and this unwanted component is then short-circuited away to H.T. negative through the comparatively easy path of the large fixed condensers.

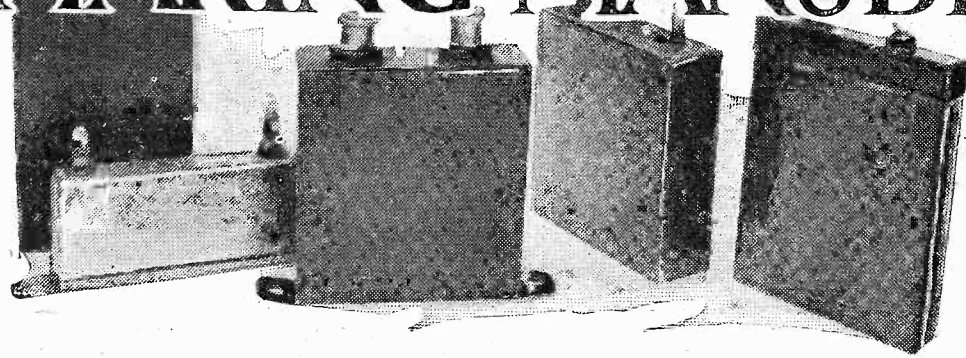
If you compare Figs. 1 to 3 you will see that condensers C_1 and C_3 are each common to two sections. For the most effective smoothing you must have generous sized chokes of low D.C. resistance and high inductance. High resistance chokes mean a loss of voltage at X and Y.

SAFE, SILENT, AND CERTAIN



The full circuit of the A.C. "Safe-Power," one of a series of specially designed H.T. mains units produced by the "P.W." Research Dept.

MAKING MANSBRIDGES



BY

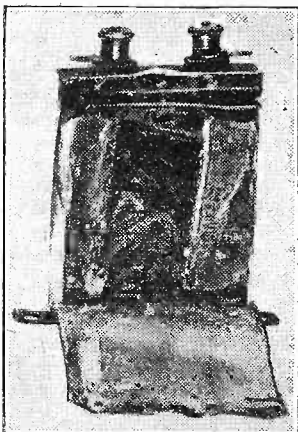
J.F. CORRIGAN M.Sc. A.I.C.

Have you ever examined the "innards" of a large fixed condenser? One of those 1- or 2-mfd. fellows? It's a wonderful sight, as you will realise from the fascinating description and illustrations below.

To judge from external appearances only, there is hardly a more thoroughly uninteresting instrument in the whole galaxy of radio gear than the average Mansbridge condenser.

A small metal case of fairly standardised pattern, two terminals or connecting tags growing from the top of it, and sometimes a moulded base; that is all. Nevertheless, despite its far from thrilling appearance, the Mansbridge condenser embodies constructional features of the greatest interest.

REMOVING THE JACKET



The first glimpse inside a 1-mfd. condenser.

An ordinary fixed condenser, as you are aware, consists simply of alternate layers of tinfoil and waxed paper or mica. Now, one of the disadvantages of this type of condenser lies in the fact that it cannot be made in comparatively large capacities without

of the metallic particles are forced right through to the other side of the roll.

Owing to this fact a further operation is necessary before the metallised paper becomes suitable for the manufacture of Mansbridge condensers.

In this latter process the particles of tin which have been forced through the paper by the calendering rollers, and which, of course, if they were allowed to remain, would render the paper conductable on both sides, are actually burnt away.

The metallised paper is passed through rollers across which is connected a high-voltage supply (about 2,000 volts), a bank of condensers being placed in parallel with the circuit.

Full of Holes.

The result of this operation is that the particles of tin which protrude through the back of the paper are burnt away, thus leaving a roll of metallised paper which is conductable on one side only, and which is therefore suitable for Mansbridge construction.

If you happen to have handy a piece of this metallised paper taken from an old Mansbridge condenser, you can very readily see the results of this electrical burning process. Hold the paper up to a strong

light and examine it through a powerful hand lens. The paper will be seen to be covered with innumerable pin-holes, and to be quite different in appearance from an ordinary strip of tinfoil when examined under the same conditions.

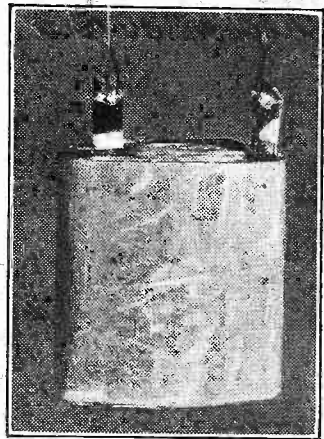
Viewed under the microscope the effect is even more startling, the entire body of the paper being seen to be riddled with gaping holes of irregular size and pattern.

Strange as it may seem, the presence of these pin-holes in the metallised paper in no appreciable way affects the efficiency of the material for use in condensers.

The paper is cut up into suitable lengths for use in the construction of Mansbridge condensers.

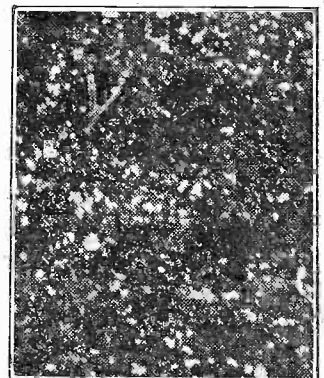
Two lengths of the metallised paper are taken, together with two plain paper strips. The interleaved strips are then rolled up together—the necessary condenser connecting tags, of course, being slipped in at suitable places—the roll subjected to high pressure, embedded in wax, and finally placed in the now familiar Mansbridge casing. And there we are!

BEFORE UNWINDING



The metallised paper before unwinding, as in the centre photograph.

NOT THE MILKY WAY—



—But a highly magnified photo of the pinholes in a Mansbridge condenser's paper. The light is seen through the holes, and the blurred effect is due to refraction by the pinholes.

YARDS, AND YARDS, AND YARDS!



A small section of the gigantic strip of metallised paper used in Mansbridge condensers. There are many yards in a 2-mfd. condenser of this type.

unduly increasing the bulk of the instrument.

Hence the inception of the Mansbridge type of condenser, which was the invention, in 1900, of a Mr. G. F. Mansbridge, a Post Office engineer, and which, up to very recent times, was manufactured under licence by four firms only.

An Ingenious Scheme.

The Mansbridge condenser depends for its functioning upon the use of "metallised" paper. A roll of tough paper is taken and pure metallic tin is deposited on it by means of a special process. In this state, however, the thin layer of metallic tin is hardly conductive enough for any electrical use. The roll of metallised paper, therefore, is subjected to a calendering operation in which the paper is heavily pressed between rollers moving at different speeds.

The consequence of this treatment is that the metallic particles are more or less forced into the body of the paper, and are brought into permanent electrical contact with one another. So great is the pressure to which the paper is subjected that many

LATEST BROADCASTING NEWS.

THE GRAND OPERA MUDDLE
THE CHRISTMAS SPIRIT AT SAVOY HILL—CHRISTMAS AT BELFAST—“THE LAD FRAE INVERSNECKY,” etc.

THE situation about the subsidy to opera gets more and more intricate. It now emerges that the B.B.C. has agreed to go on for at least two years whether or not the Government is able to carry out its intention. In other words, the B.B.C. is committed to a possible expenditure of £50,000 in two years on opera alone.

As the B.B.C. has announced its considered view that opera for broadcasting is not worth a penny more than £7,500 a year, there is a risk of the expenditure of £35,000 not represented in programme values. Members of Parliament who have been making difficulties for the Government on the subsidy are now turning their attention to the B.B.C. aspect.

The Christmas Spirit at Savoy Hill.

It appears that the general “atmosphere” at Savoy Hill is very much happier and healthier than it was a year ago. The intense rivalries, struggles, and intrigues of that troubled time have disappeared.

Harmony prevails among the higher grades, and is reflected by happier conditions generally. The only outstanding cause of friction is the talks, but even this will be allowed to stand over for the period of festivity and Christmas worship.

Christmas at Belfast.

Belfast has no intention of letting the festive season pass without putting on one of those bright feature entertainments for which the Ulster Station has now become famous.

It is called “The December Review,” and is described by Alan Campbell, who has written and devised it, as a “Christmas Entertainment.” Listeners will hear it on Tuesday, December 23rd. Philip White-way and Clifton Helliwell have composed and arranged the music, and listeners will be asked to imagine they are suddenly transplanted from the queue outside a theatre to the other side of the footlights. It will be unusual to mix with the people

“POPULAR WIRELESS”

has an unparalleled radio news service, and has earned world wide renown for the accuracy and topicality of its information. The happenings in Savoy Hill are faithfully portrayed, and the various doings of the B.B.C. are reported with unflinching authenticity.

If you want to know how the world of radio is faring, at home or abroad

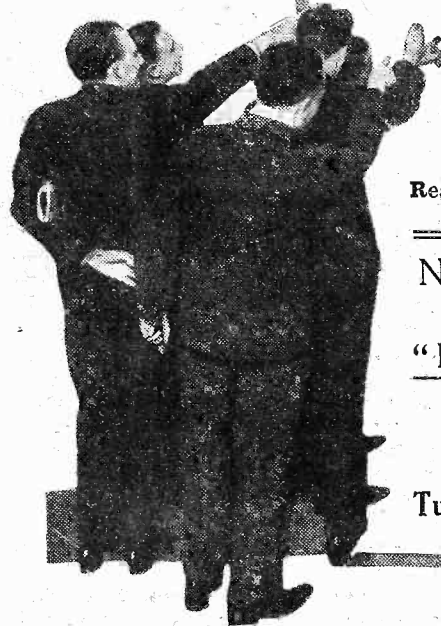
YOU'LL FIND IT IN P.W.

one never meets in the ordinary way, the call boy, the dresser, and many others whose work, though not seen, is as important to the success of the show as the principals.

“The Lad frae Inversnecky.”

Harry Gordon, the “Lad frae Inversnecky,” whose broadcasts with his own Concert Party from Aberdeen were a delightful feature of the Scottish summer programmes, will be heard again by Glasgow and Aberdeen listeners, on Friday, December 26th, during an hour's relay of the pantomime “Mother Goose,” from the King's Theatre, Edinburgh.

Also in the cast are Archie Glen, Nita Croft, and Betty Jumel. On the same evening a programme of Sea Shanties, arranged by Ian Whyte, will be sung in the Aberdeen Studio by



THE
Clear-cut Cone

A loud-speaker, designed on entirely novel principles, that anyone can assemble at home. Its special construction enables it to give unaccountably realistic results. It sets a completely new standard in radio reproduction.

Read about it! Build it!

Next Week's issue
 OF

**“POPULAR
 WIRELESS”**

will be on sale

Tuesday, Dec. 23rd.

FOR THE LISTENER.

By **“PHILEMON”**

A chat about broadcasting, persons and programmes, with frank comments on the fare provided and the way it is served up.

THE journey which Sir James Jeans took us in a rocket to the centre of the Sun where the temperature is several millions of degrees was very exciting. How either we or the rocket ever came back I don't know! I felt that I could do without a hot-water bottle in bed that night!

The Red Giants are stars which are big enough to contain a million suns inside them; and the White Dwarfs are stars on which a spadeful of “soil” weighs several tons. On the whole I'm glad I'm on the earth!

It is all very wonderful, and if you are missing any of these talks, well, you're missing something!

Good-looking Fellows.

In the B.B.C. Year Book, which has just been published, there is a record of the percentage of failure in the transmitting machinery. It works out to this: That for every 5,000-hours of your listening you are

Harry MacGillivray (baritone) and a male voice chorus.

Mr. Tyrone Guthrie in Canada.

For some time negotiations have been going on between the Canadian National Railways and certain officials at Savoy Hill with a view to the appointment of an official to take charge of radio play producing for the C.N.R. broadcasting system.

The post has now been accepted by Mr. Tyrone Guthrie, who, before he joined the productions staff at Savoy Hill some time ago, did excellent service at Belfast. He is the author of “Squirrel's Cage” and “The Flowers are not for you to Pick,” two fine plays which have drawn considerable appreciation from listeners.

A Welsh Christmas Programme.

The wind howls, the thunder crashes and lightning splits the sky over a remote part of the Welsh countryside where the only shelter for miles is an apparently deserted mansion.

To a deserted mansion travellers come, one by one, to await the passing of the storm and soon the time is being spent in relating strange experiences.

It is just the right sort of thing for a Christmas programme, and is being transmitted by the West Regional Stations at 9.30 p.m. on Friday, December 26th.

likely to get one hour of breakdown—and I suppose somebody will write to the papers and complain about that hour!

I like the photographs of the more renowned among the Broadcasters. What good-looking fellows they are!

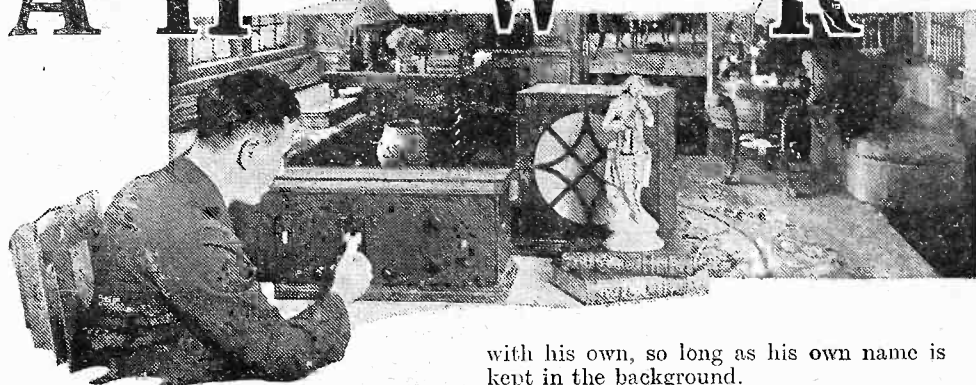
A Red-letter Night.

I suppose I am old-fashioned, but no music appeals to me quite so much as Beethoven, and I have rarely enjoyed a Symphony Concert so much as the one the other evening which was entirely devoted to his works.

“The Emperor” Concerto was a superb performance, which did the greatest possible credit to the conductor, Sir Landon Ronald, the orchestra, and Benno Moisevitch, who was at the piano. It was sheer delight; all so high-spirited and splendid. A red-letter night for me.

(Continued on page 746.)

AT HOME WITH RADIO STARS



Our representative discovers some new and unexpected side-lights on a famous pianist whose radio recitals have achieved great popularity.

(6.) SOLOMON.

IMAGINE a broad-shouldered, dark-haired young man of medium height. Imagine a large pair of horn-rim spectacles, and behind them flashing eyes of quick intelligence. Imagine the young man dressed quietly and unobtrusively, a trim lounge suit, plain white collar and shirt, and a tie of tasteful harmony.

That is Solomon.

He has no use for the black sombrero, the Victorian cravat, or the flowing cloak of the traditional genius of music. He does not draw continually of artistic temperaments, smoke endless chains of cigars, or turn pale at the blatant-squeaking of a motor-horn. In fact, he is a human being with very human tastes and habits—and a genius for the piano.

Ease and Harmony.

I was welcomed with a smile and a hearty handshake. Solomon took my hat and coat, motioned me towards the lounge, and a second or two later was seated beside me on the divan.

My first impression was one of delightful ease and harmony. Solomon's lounge is decorated in blues, so well matched and so quietly ordered that it is impossible not to realise that here indeed is a home of one who understands the true meaning of taste. A Steinway grand occupies one side, and on the other there is a desk, a bookshelf, and, tucked away in a corner, a number of music files.

"Have you lived here long, Mr. Solomon?" I asked.

"About two years," he said. "And it suits me splendidly—for the simple reason that I can practise here as long as I choose without disturbing my neighbours. In a flat I previously occupied I sometimes received a telephone call as early as ten in the morning from a neighbour who demanded to know 'when the darn row is going to cease.' It was very unsettling for both of us, so I had to find a place where I should be more or less unrestricted."

A Child Prodigy.

"Tell me something of your career," I said.

Solomon thoughtfully polished his glasses. "I am afraid you won't find it a very interesting story," he smiled. That, I thought, was a reply typical of Solomon.

There are a thousand and one subjects he likes to discuss, but Solomon is not one of them. He likes to absorb your own ideas on music, art, or literature, and compare them

with his own, so long as his own name is kept in the background.

By dint of hard questioning, however, I drew from him a few brief facts of his life.

He is a Londoner—in fact, almost a Cockney. He started his music lessons at five, and when he was eight gave his first recital at Queen's Hall. He has played in Ireland, Scotland, Wales, America, and throughout the Continent.

Weakness for Flowers.

He did not think to tell me, however, that he is one of the few child prodigies who have fulfilled their early promise, or that many competent critics consider him one of the greatest English pianists of all time. He will forgive me, I hope, for supplying this deficiency to my readers.

Solomon has a great weakness for flowers. In his lounge I saw no fewer than half a dozen huge vases packed with flowers of every hue and description. Whenever he has an hour or two to spare he slips away to the country in his car and picks the flowers himself.

I asked Solomon his general views on broadcasting.

"Considering the very great task which confronts the B.B.C.," he said, "everything is splendidly managed. I think, however, that too much broadcasting is done. There are three main stations which supply continual programmes—with a few breaks, of course—from ten in the morning until midnight, to say nothing of the provincial stations.

"I believe that if each programme were

two or three hours shorter, a higher average standard of entertainment would be gained. That is only a personal view, and you must take it as such."

"Then you don't care for dance music?"

"Certainly I do, but I must have it in small doses. I find it all so much alike that after a quarter of an hour or so I am glad to listen to something else."

Solomon has no special leaning towards any one of the great classical masters. There are times when his mood suits him to a Beethoven sonata, and he has no thought for the others. Anon he inclines to a Chopin nocturne or a fugue or concerto by another. Music to him is largely a matter of moods.

Real Sportsman.

His taste in literature is entirely cosmopolitan. He reads advanced works printed in French. He enjoys the works of the popular novelists, and, like another genius of our age—Sir Oliver Lodge—simply revels in the pure, unsophisticated humour of P. G. Wodehouse.

It was something of a shock to hear Solomon give an expert opinion on a big fight that was pending at the Albert Hall. I mentioned two contests that I had seen some five years ago. Solomon remembered them perfectly for he, too, had been a spectator.

He told me how he had endeavoured to see the Final Test Match at the Oval, but found the gates shut. So he jumped in a taxi and went straight off to Lord's. He gave me a very sound reason

for the decline of the Middlesex side, and went on to sing the praises of Bobby Jones, who has col-lared the four great golf championships of the world in a single season.

Solomon told me of the many occasions he had seen the Wimbledon Tennis Championships, and that he sometimes managed to snatch a game himself.

From all of which you may gather that he is something more than a great pianist. He is a great sportsman, too.

A GREAT SPORTSMAN



Solomon devotes much of his time to music—but, as our representative found during his visit, he has many other interests.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

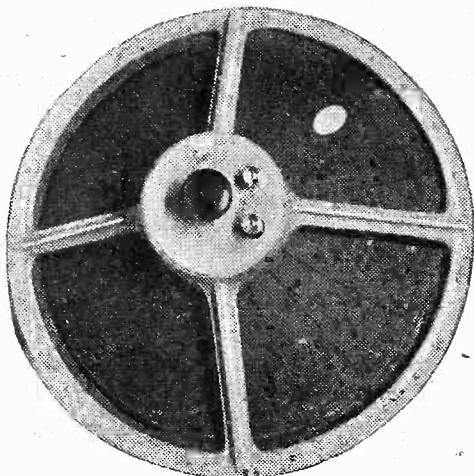
Tested and Found—?



A CELESTION CHASSIS.

I HAVE now had an opportunity of examining the Celestion D.20 chassis, the first chassis loud speaker ever made available to the public by Celestions. The price of this instrument is three guineas—a very moderate price, in view of its sturdy, scientific construction.

It never has been the policy of Celestion, Ltd., merely to fasten a unit to a cone and then encase the whole in a cabinet and call it a loud speaker. Right from the



The new Celestion Chassis model.

very beginning they have obviously realised the necessity for "sympathetic" assembly.

You have very good evidence of this in the new chassis model. It is clear that the framework, the mounting and the special cone construction have all been designed as parts of a whole, and not as individual items.

The result is that this chassis is first rate. It is very sensitive and will respond as excellently to the output of a small two-valver as to the output of a more ambitious outfit. Its freedom from peaks and the even balance between the high and low frequencies prove that Celestions are maintaining their very high standard.

NEW OSRAM VALVES.

Unless you have actually used them, it is hard to realise how superior A.C. valves are to the battery-operated types. It is no exaggeration to say that the A.C. valve is in comparison staggering in its effectiveness.

And properly constructed, a Det.-L.F. A.C. set will give results almost equal to the

best of battery-operated three-valvers. Unfortunately, we have not all got A.C. mains!

However, those who have will be greatly interested in three Osram mains valves, the characteristics of which have recently been improved.

These are the M.H.L.4, the M.H.4, and the M.L.4. They are all 4-volters taking

1 ampere filament current. The M.H.4 is a high-magnification valve suitable for detector, certain H.F., and L.F. positions. It has an impedance of 16,000 ohms, but its amplification factor is 35, thus you see it

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are therefore framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.

has a mutual inductance of over 2, which is astonishing for a valve of such a type.

The best equivalent battery-operated valves generally have mutual conductances of 5 or thereabouts.

The M.H.L.4 has an impedance of 8,000 ohms, and an amplification factor of 20, so this achieves a mutual conductance of 2.5. This M.H.L.4 is a valve suitable for detector and L.F. positions.

The M.L.4 is a power valve with an impedance of 3,000 ohms and a magnification factor of 9 (mutual conductance 3).

All three of these new Osram valves are designed for a maximum H.T. of 200 volts, so that they come well within the scope of the "medium power" man. They are most effective valves, and the results they give are, of course, up to the usual Osram standard. I have seen similar Osram valves in the process of making, so that I do not find it surprising!

EVERYTHING FOR WIRELESS.

This is the appropriate title of the 1930-31 catalogue issued by Will Day, Ltd., in over 104 pages, all kinds of radio products due to all the leading makers are listed.

POLAR CONDENSERS.

Wingrove & Rogers, Ltd., have now prepared for distribution a leaflet giving full

details of their fine range of Polar condensers.

MAINS UNIT LEADS.

The usual twin flex, especially that of the cheaper kind, is not suitable for mains unit wiring. It is seldom particularly robust and I, personally, would hesitate to use it as a direct extension of a power point.

A very strong and quite safe material is that known as "high tension cable," but this, on the other hand, is bulky, clumsy stuff, awkward to handle and far from being neat in appearance.

Realising this, those enterprising northerners, Ward & Goldstone, Ltd., have produced a special "shock-proof" flexible cord, which admirably fills the breach.

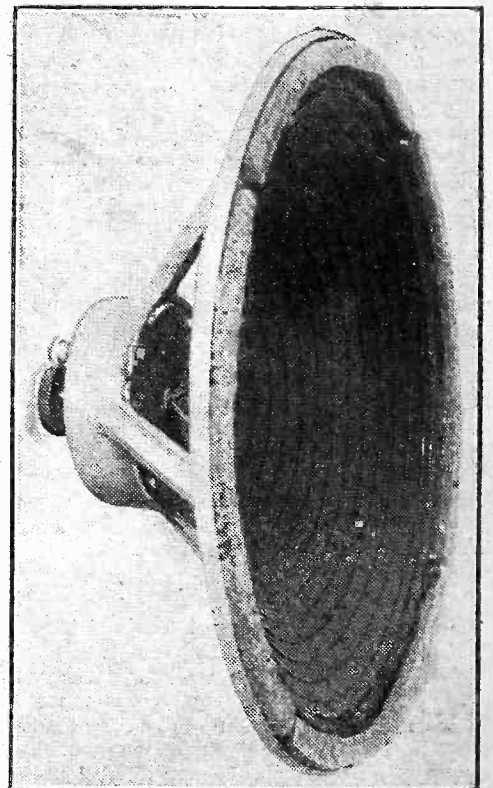
It comprises two leads, each consisting of 23 strands of 36-gauge wire encased in solid rubber. The whole makes a neat, easily-wired flexible of a most dependable nature and minus that fabric covering that so easily seems to fray and look untidy.

Another new Ward & Goldstone line is a "shock-proof" adapter—a very useful device. Fixed to the end of a mains unit connecting lead, it enables such an instrument to be plugged into either a lamp holder or a wall socket.

The adapter is in two sections, the one being a bayonet-type fitment, the other a two-pin plug; and it is to this latter that the lead is joined. There are two sockets in the bayonet portion into which the plug can be inserted. The two sections are linked by a strong silken cord so that they cannot be separated. The price is 1s. 6d.

ANOTHER FERRANTI H.T. UNIT.

Ferranti, Ltd., have issued a new constructional chart dealing with the building of an H.T. supply unit suitable for use with any receiver of good design employing up to five-valve stages. The maximum output of the unit is 50 milliamps at 200 volts. Ferranti, Ltd., will send a copy of this chart free on request to anyone interested.



Another view of the new Celestion Chassis.

PURE LISSEN CURRENT FROM YOUR MAINS!

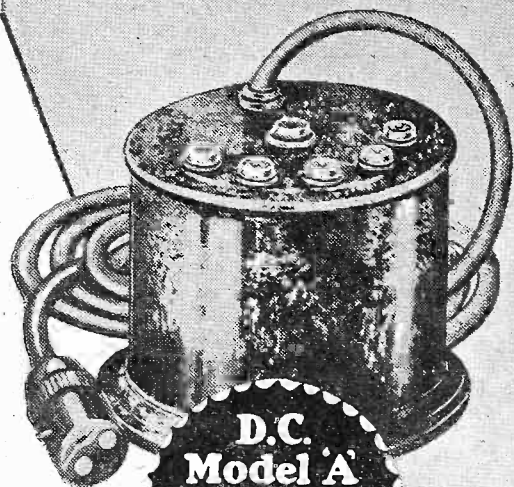
You cannot get purer current for radio than the pure D.C. current of a Lissen Battery—BUT IF YOU WANT TO USE AN ELIMINATOR USE A LISSEN ELIMINATOR.

Because no current from any eliminator is smoother or more silent than the current from a Lissen eliminator. No eliminator output is more constant, none is so free from hum.

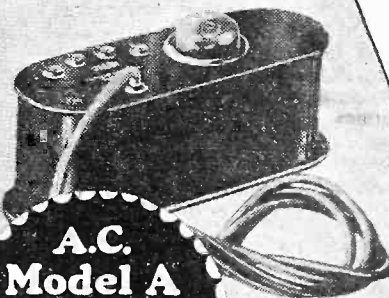
Lissen have made eliminators safe—notice that the neat moulded cases of these Lissen Eliminators are made entirely of insulating material—see also the thickly insulated "cab. tyre flex" that Lissen have used.

Lissen too have made it easy for you to choose the right eliminator—there are only four models and they satisfy the requirements of 90% of listeners. In producing these eliminators Lissen have compared their current with the purest form of current known, namely the Lissen Battery, and have got as near to that standard as it is humanly possible to do.

If you are buying an eliminator, be sure to see a Lissen Eliminator. Your Dealer will be pleased to show you one that will suit you.



D.C. Model A
27/6



A.C. Model A
60/6

TYPES AND PRICES.

D.C. MODEL "A"
(100-150 volts and 200-250 volts).

Employs 3 H.T.+ tappings: H.T.+1 giving 80 volts for S.G. valves; H.T.+2 giving 60 volts at approx. 2 mA. for detector valves; H.T.+3 giving *120/150 volts at 20 mA.

Price 27/6

D.C. MODEL "B"
(100-150 volts and 200-250 volts).

Employs 3 H.T.+ tappings: H.T.+1 and H.T.+2 are continuously variable (by means of two control knobs) and capable of giving any desired voltage up to *120/150 volts at approx. 2 mA.; H.T.+3 giving *120/150 volts at 20 mA. for power valves. Price 39/6

*(The output voltages given from D.C. models operating from 100/150 volt mains are approximately 75 per cent. of those quoted.)

A.C. MODEL "A"

Tappings as in D.C. Model "A" (100-125 volts and 200-250 volts). Price £3:0:0

A.C. MODEL "B"

Tappings as in D.C. Model "B" (100-125 volts and 200-250 volts). Price £3:15:0

LISSEN ELIMINATORS

LISSEN LTD, Worples Rd., Isleworth, Middlesex.

EVERYTHING



ELECTRICAL



TWO NEW STARS

For 2-volt users

OSRAM

L.P.2 and P.2

Power Valve Super Power

— with characteristics and performances unexcelled by any 2-volt valves in the world and designed for specific improvements in battery sets.

The OSRAM L.P.2 is a most efficient loud speaker valve for 2 valve sets, portable sets, and all cases where highest amplification is required with least possible H.T. consumption. The OSRAM L.P.2 will give you *more* amplification with *less* H.T. than other valves of similar type.

The OSRAM P.2 is a super-power valve particularly suitable for 4 valve sets (including portables) and all cases where a large undistorted volume is required. The P.2 will produce wonderful quality of reproduction with the least expenditure of current. **Note carefully the characteristics.**

Characteristics L.P.2:

Filament volts . . . 2
 ,, current .2 amps.
 Max. Anode volts . 150
 Amplification factor 15
 Impedance . 3900 ohms.
 Mutual conductance 3.85

10/6

Osram valves

MADE IN ENGLAND

Sold by all Wireless Dealers



Characteristics P.2.

Filament volts . . . 2
 ,, current .2 amps.
 Max. Anode volts . 150
 Amplification factor 7.5
 Impedance . 2150 ohms.
 Mutual conductance 3.5

13/6

EXTRA QUALITY — WITHOUT EXTRA COST

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2

CAPT. ECKERSLEY'S QUERY CORNER



"CLOUDY" VALVES—THE COST OF A POWER VALVE—H.F. ON SHORT WAVES—MAINS DRIVE OR "PERMANENT"—SHARING THE SUPPLY—IS IT REALLY SAFE?

Under the above title, week by week, our Chief Radio consultant comments upon radio queries submitted by "P.W." readers. Don't address your queries to Captain Eckersley, however, a selection of those received by the Query Department in the ordinary way will be answered by him.

"Cloudy" Valves.

G. C. (Southport).—"The valves in my receiver have the familiar internal bright coating of, I believe, magnesium, but I have noticed that, towards the bases of some of them, where the glass is normally clear, a grey clouding of the glass is becoming apparent.

"Is this circumstance normal, or does it indicate partial failure of the valve to maintain its initial good characteristics?"

"I fear I am not knowledgeable on this point. But the proof of the pudding is in the eating, and I expect you can soon prove whether the valve is in fact behaving properly, either by borrowing a similar valve and comparing, or by doing an emission test, because emission failure would be the only trouble, surely?"

The Cost of a Power Valve.

H. St. J. (Liverpool).—"Why should a power valve cost more money to purchase than a valve of medium or high impedance? I take it that the retail price of a valve affords indication of its relative production cost, and yet casual examination seems to me to reveal that a power valve is much more robustly constructed and that the assembly of the electrodes would require less care than in the case, for instance, of a valve of 30,000-ohms impedance.

"Of course, I realise that my inexpert opinion cannot be reliable, but I should like to know what difficulties in manufacture are peculiar to the power valve."

"I am not expert in this matter. True, the construction of a power valve is more robust but on a mass production job this does not count for much.

"A power valve has to use more material, and quite likely has to be pumped harder. Lastly, is it not true to say that there is a less quantity production of power valves, and that therefore they could not be economically mass produced?"

"This always puts up costs, and I am inclined to believe this is the chief reason that they are more expensive."

H.F. on Short Waves.

H. A. L. (Charlton).—"I want to build a very efficient short-wave receiver, and I notice that most of the published designs are of the Det. and L.F. variety.

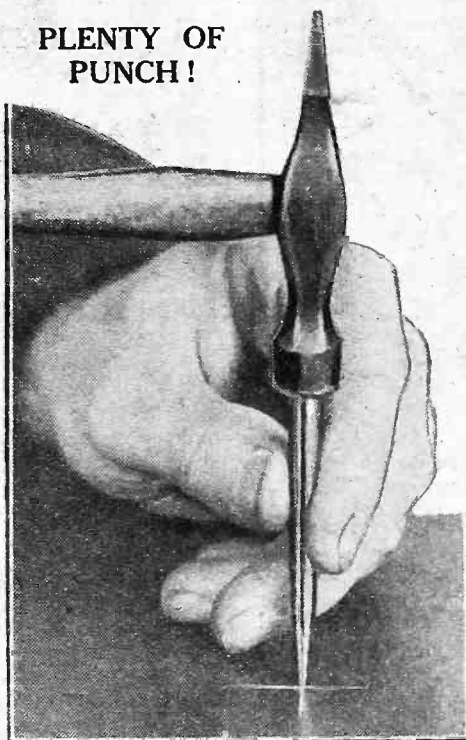
"I would like, if possible, to use two H.F. stages, but my friends tell me that this cannot be done, because on the ultra-short waves an ordinary H.F. stage becomes very

inefficient, and does not magnify at all. Will you please tell me whether this information is correct?"

"I am perplexed enough to build a sensible, stable, calculable, easily handled 2 H.F. set for frequencies of 1,000 kilocycles. I shudder at the thought of 15,000 kilocycles!"

"No! Leave it alone. You can't get anything out of it if you try. The best way for simplicity is, as your friends advise, Det. and 2 notes.

PLENTY OF PUNCH!



If you want a hole accurately in position it must be punched, or the drill will wander. If you haven't a proper centre punch, a nail will do quite as well; so there's no excuse for incorrect position.

But if you are ambitious, design a super-herodyne using 2 H.F. in the intermediate. That ought to be sensitive, although I should hate to pick up more of short-wave distortion than I do!

Mains Drive or "Permanent"?

J. W. H. (Yarmouth).—"I am thinking of purchasing a moving-coil loud speaker of the permanent-magnet type, but I noticed at the Radio Exhibition that the manufacturers of such speakers claimed no

more than 9,000 lines per square centimetre as the flux density of their magnets. This is considerably below similar data furnished by makers of the mains energised types.

"I appreciate that the permanent-magnet type of loud speaker must, therefore, be less sensitive than its current-operated counterpart, but I am uncertain if it also sacrifices any of the good frequency characteristics possessed by the current-driven speaker.

"Could you, therefore, tell me if the permanent-magnet type of loud speaker is capable of such good reproduction as the mains- or accumulator-driven type?"

"It's simply a question of convenience. The quality, other things being equal, is the same with a mains-energised as with a permanent-magnet type. Some people prefer to eliminate the necessity for separate magnetisation power and find the permanent-magnet type a convenience well worth the slight loss of sensitivity."

Sharing the Supply.

B. W. G. (Dundee).—"I have in use a three-valve receiver (Det. and 2 L.F.). After purchasing a super-power valve, I find that the H.T. eliminator in use is not capable of supplying the necessary current for all three valves.

"The output, however, is sufficient for the last valve only. Would it be satisfactory to obtain a second eliminator to feed the first and second valves, and use the original eliminator for the last valve only?"

"Yes, certainly. Or a high-tension battery, for that matter, if you think it a bit extravagant with two eliminators.

"Or if cost does not worry you, why not a redesign of the whole eliminator? But anyhow, that's not my business. A second eliminator is, of course, a perfectly feasible solution."

Is It Really Safe?

L. D. R. (Highgate).—"I am thinking of obtaining in the near future a set operated entirely from the A.C. mains. Before doing so, can I have your assurance that providing the set is of high quality and the makers' instructions are followed, there is no danger of damage being caused either to self or the mains?"

"You need fear nothing. If the maker is reputable, and if you follow his instructions, there can be no danger whatsoever.

"Indeed, a metal standard lamp is often more dangerous than a wireless set."

WIRING YOUR SET

By G. P. KENDALL, B.Sc.

You can take liberties with the wiring of "P.W." sets, because, as Mr. Kendall explains, they are so designed that they achieve their high degrees of efficiency without being critical in construction.

HOW fashions do change in the radio world! Only a little while ago every technical writer was urging the constructor to take all possible pains to make a perfect copy of the wiring of the original design from which he was working, to take no liberties anywhere, and so on.

And now what do you see? Nothing less than an article from your humble servant, deliberately inciting you to take liberties, and telling you how to do it without risk of regrettable consequences!

That is just what I am about to do, and I will tell you why: it seems that all the terrifying warnings which have been hurled at the poor home constructor have so filled him with forebodings that there is a general impression abroad that a wireless receiver is really a very tricky thing to make.

Set Construction is Really Easy.

It is only natural that such an impression should have got about, and I have seen unmistakable signs that it is quite widespread. It is no uncommon thing to come across a constructor who has built one set, got satisfactory results, and then been afraid to make a later and better one for fear he might not be as successful the second time.

All the fuss about "copying the run of the wires" has made him think that a set will only work properly if the connecting wires between the various components are arranged in one particular way. Quite reasonably, he concludes that he may not be lucky enough to puzzle out just how they run from the photos, and then there may be trouble, or so he thinks, and who can blame him?

Pardon me if I lapse into plain, homespun colloquialism, but the only (printable) expression I know which conveys my opinion of that idea is this: it's all my eye!

Critical Designs Barred.

If it were true it would mean that all our set designs were mighty bad ones! The designer who turned out sets which were as critical as all that would have just cause to be heartily ashamed of himself, and believe me he wouldn't have an earthly of doing it for long in the "P.W." Research Department!

It may have been true to some extent of the earlier receivers with the more primitive systems of H.F. amplification, but that is just another way of saying that they were really not good sets, or not so good as modern ones, at any rate.

Suppose that there is a risk of harmful interaction somewhere in a modern design, what do we do about it? Do we laboriously seek out the only run for the wires which will prevent it, and then try to frighten the constructor into copying it closely?

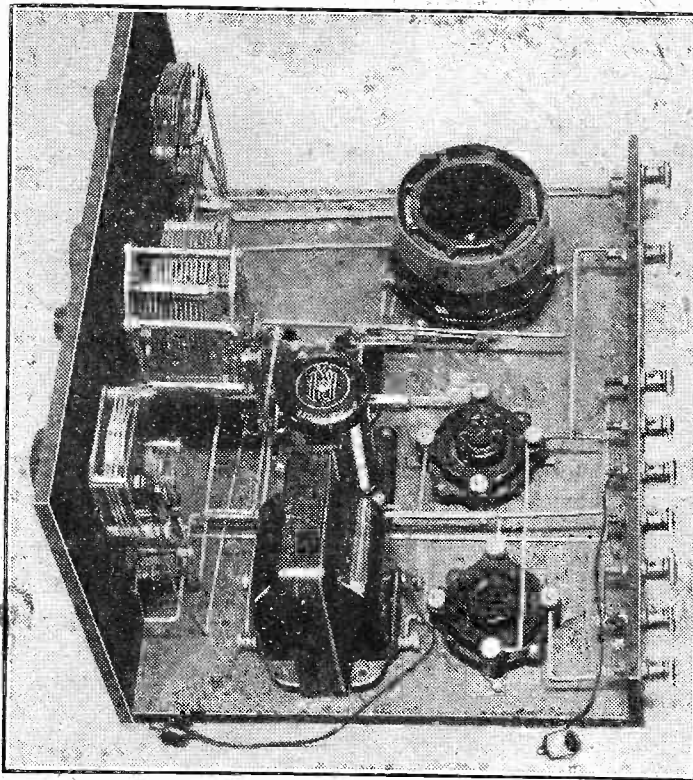
We do not: in goes some simple screening, and that is the end of that! We have a perfectly "safe" receiver thereby, and one which can be made up with the wiring run in all sorts of different ways so long as

the right points are joined, and a bit of common sense is exercised, with practically identical results.

The real fact of the matter is that in a modern design you have quite a lot of latitude in wiring, and there is no cause for alarm at all. Of course, it is a good idea to copy the original wiring, because it was done by a skilled worker, and you can be sure that it was carried out in one of the various good ways.

If, however, you can see another way of joining up the same points which also gives direct leads, by all means use it. It is sure to be just as good in the vast majority of

A VERY RECENT EXAMPLE



To match exactly the wiring in the original "P.W." "New-Coil" Two you would have to solder some of the leads. But you lose nothing if you make the minor alterations of wires necessary for a "no-soldering" hook-up.

circuits. (If we ever find, in some very special set, that certain wires are best run in a particular way we say so, but it hardly ever occurs.)

Simply Follow the Layout.

You can quite safely take it for granted that any normal "P.W." set can be wired up in all sorts of different ways, and work properly every time. You see, we arrange the layout of the parts so that all the different methods of joining up the correct points are good methods.

It's not difficult in the light of modern knowledge, and it is just one of the things which we do to make "P.W." designs safe to follow.

What it means is that if you lay your parts out carefully in the positions shown on the wiring diagram there is no need to worry about the exact method of wiring up the various points. So long as the right ones are joined and you use your common sense to avoid any needlessly long or wandering leads, all will be well.

So fully do we believe in this feature of our sets that the draughtsmen who prepare the wiring diagrams are allowed to use a little discretion in showing the run of the wires in the clearest possible way. You will sometimes see, in consequence, that certain leads may be placed a little differently in the diagram from the arrangement visible in the photos of the set

Soldering Not Necessary.

Do you realise that a further consequence of this feature of "P.W." designs is that they can be wired up without any soldering? If it is merely a matter of seeing that the right points get connected together, you can obviously run all your wires between terminals on the various parts themselves, and avoid all "T" joints in the wiring.

Suppose you have three points, A, B, and C, which are to be wired together. If you can solder it may look neatest to join B to C and solder the end of a lead from A to a point midway along the B-C wire. If you don't want to solder, you can just as well connect A straight to B or C, whichever is the nearest. If the set has been properly designed there will be no difference in efficiency.

For example, look at the photo on this page, and observe the wire coming away from the second terminal on the strip, counting down from the top. Midway along a wire is soldered to it in a "T" joint, and it ends in another "T" into a lead between a valve holder and the terminal strip.

Both those soldered joints could have been omitted. They are only there because the wire-man was seeking for neatness of appearance, and not for any reason connected with efficiency.

Now do you begin to get the idea? If you find a series of points in a wiring diagram which are so connected up that you can get from any one to any other by passing only along wires and never *through* components, you can join them in any order.

If the layout of the design has been properly done the result will be good wiring, however you do it, subject to the exercise of just a little discretion on your part.

That would have sounded like high trapeason a few years ago, but times change!

The New Marconi LP2 Masterpiece!

A HIGH AMPLIFICATION POWER VALVE— AMPLIFICATION FACTOR 15!



**NOTE
THESE
FIGURES**

Filament Volts— 2.0
 Filament Amps— 0.2
 Amplification factor 15
 Impedance— 3,900 ohms
 Mutual conductance
 3.85 MA/volt.
 Anode Volts— 150 (max.)

APPROX. OPERATING DATA
 Anode volts— 125
 Grid bias— 4½
 Anode current— 6 M.A.

STUDY THESE CONVINCING FACTS

- 1 A power valve with an amplification factor of 15—a hitherto unheard of figure.
- 2 Mutual conductance 3.85 milli-amps per volt—the highest valve efficiency yet achieved Irrespective of type.
- 3 Stage gain thus comparable under working conditions to that given by a pentode.
- 4 Impedance only 3,900 ohms—a figure perfectly matching the average speaker.
- 5 Provides reproduction of exceptional quality without the sacrifice of volume from distant stations.
- 6 It is the supreme output valve for portable and most battery operated sets.
- 7 Strictly economical in current consumption—H.T. current only 5-6 milli-amps under normal conditions.

10/6

And here are particulars of the **NEW P.2.** WITH OUTSTANDING CHARACTERISTICS.

- 1 A genuine super power valve with an amplification factor of 7.5—a figure previously considered impossible!
- 2 Combining the stage gain of the average SMALL power valve with an output which is adequate for a moving coil speaker.
- 3 Mutual conductance 3.5 milli-amps per volt.
- 4 Impedance only 2,150 ohms, ensuring reproduction of ample volume and perfect quality.
- 5 Ideal for the moving coil enthusiast who requires 6 volt results from 2 volt equipment.
- 6 Minimum current consumption compatible with highest efficiency—a most important point to the listener with battery equipment.

NOTE THESE FIGURES.

Filament volts— 2.0
 Filament amps— 0.2
 Amplification factor— 7.5
 Impedance— 2,150 Ohms
 Mutual conductance— 3.5 MA/volt.
 Anode volts— 150 (max.)

APPROX. OPERATING DATA:—

Anode volts— 125
 Grid Bias— 9
 Anode current— 12.5 M.A.

PRICE 13/6



USE THE VALVES THE EXPERTS USE!



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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

CHECKING FOR H.T. LEAKAGE.

H. G. (Parsons Green, S.W.).—"Recently I put a milliammeter on the panel, and arranged plugs to insert it in the last valve's plate circuit, or in negative H.T. to check total current flowing.

"I notice that when in the latter position it reads 17 m.a. when the set is switched on,

which is about right for H.F. detector and 2 L.F. according to valve-makers' slips. But even when the set is off there is a very small indication on the needle—about one-third milliamp, or less—unless the H.T. — plug is taken out of the mains unit.

"Is this anything to worry about, or can I take it that if reception remains good when in use, and I move the plug H.T. when switching off, a small leak doesn't matter?"

We should certainly not be inclined to leave the leak in peace, merely cutting it off when the set is out of action; you have all the necessary means of tracing it in a few minutes, and it would be far more satisfactory to do so.

One reason against leaving it is that it may get a lot worse, suddenly, and do no end of damage. Also, you may forget to remove the H.T. — lead, and it is not desirable that leakage may occur for hours on end, for obvious reasons.

A simple way of finding the leaky spot is to connect the milliammeter in turn in the different H.T. — leads, to discover the one in which it fails to go right "off" when the set is switched off.

When the leaking lead is found, test the effect of removing by-pass condensers, etc., in that part of the circuit until the erring component is found.

For instance, you may find that the m/a. goes right off when in the detector lead and in the power lead, but stays on slightly even when the set is off, if connected in the H.T. lead that supplies the S.G. plate and the first L.F. valve.

In such a case see if the needle still reads when the L.F. transformer primary is disconnected.

Yes? Then the leak is in the remaining part of the circuit.

(Continued on page 740.)

HOW IS THE SET GOING NOW?

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.



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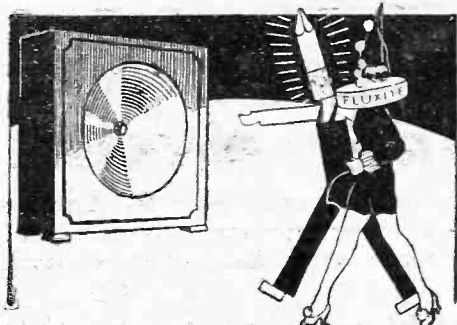
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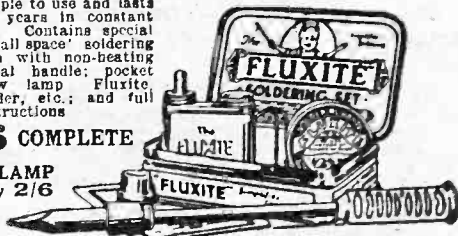
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ALL MECHANICS WILL HAVE

FLUXITE

—IT SIMPLIFIES ALL SOLDERING

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 738.)

First undo the plate terminal of the S.G. valve, and then "work back" to coil, choke, etc., towards the meter, until you find a disconnection that will stop the leak.

You can't miss the fault with a meter showing it up in this way, and in your shoes we should certainly not rest until we had replaced the dud component or connection. You won't be very long finding it if you go systematically to work.

A VERY SELECTIVE THREE.

"Wozzo" (Caterham, Surrey).—"Reception here on the 'Magic' Three is simply 'silky,' but in January we are moving to Hatfield, just near Brookmans Park. And I don't want to give up my roaming round the Continent, so I am looking for a real 'hum-dinger' in the selectivity line.

"It's got to be a 'Three,' because I have proved a 'Four' is unnecessarily expensive. And the annoying part is that a chap I met casually at a dinner told me of the very set, but like a fool I didn't write it down, and now I can't trace it (nor him!).

"He lived out St. Albans way, he said, and had just made up this 'Star' Three from a blue print (I think it was a 'Star' Three or an 'International-Star' Three—something like that). He said it was a real razor, and he certainly knew all the Continental stations like a book, so it can be done with a three-valver even at short distances from London's Twins.

"Can you tell me where I can get a blue print of a set of that name, or put me on to a real super in the selectivity line, capable of bringing in plenty of foreigners even with a twin Regional only three or four miles away."

Your elusive acquaintance was probably referring to the "Interstar" Three, which was specially designed to give exceptionally high selectivity. (It

incorporates one S.G. H.F. stage, with the famous "Star Turn" tuning arrangement.)

Full details of this set will be found on the "M.W." Blue Print No. 13. (This is one of eight blue prints given away with the November "Modern Wireless.")

ROME ON THE SHORT WAVES.

"MUSSOLINI" (Near High Wycombe).—"What has happened to Rome, which used

to be receivable at great strength on just over 25 metres?"

Since about the beginning of November the Rome short-wave transmissions have been sent out on the 80-metre wave-length instead of the 25.4 wave-length, the station authorities having decided after tests that the 80-metre wave-length gave the most favourable service conditions.

IRELAND'S NEW STATION.

"PAT" (Maryborough, Queen's County).—"The papers are saying the new Irish high-power station is to be erected near Athlone. Will I be able to work a loud speaker from a crystal set?"

It's doubtful, "Pat," but there is certainly a chance for you.

Generally a crystal set will not work a loud speaker because the latter requires a great deal of power to drive it, and this must normally be obtained from batteries, valves, etc., in the form of a more or less powerful valve set.

Nevertheless, in districts quite close to a high-power broadcasting station, and at ranges of say up to five miles, it is quite usual to find that lucky listeners living, as it were, "under the aerial" are able to work a small loud speaker because of their proximity to this high-power station.

So far as we know, the exact site of the Irish high-power station has not been settled, but as you are situated near the geographical centre of Ireland, it is quite possible that it will be in your vicinity, in which case you may be able to work a loud speaker without a valve set. But if the station goes up over five miles away, you will in all probability find that although reception is very powerful on a crystal it is really not quite powerful enough to work a loud speaker nicely.

GLASGOW'S POWER.

"PUZZLED" (N. B.).—"I see that the power of the Glasgow station 5SC has been increased and is now given as 1.2 kw., but I still get the programmes on exactly the same setting of my condenser. Is that O.K.? No louder."

The power employed has nothing to do with wave-length, and it is only an alteration in wave-length that would affect your tuning adjustment.

(Continued on page 742.)

TECHNICAL TWISTERS

No.40. Charging an L.T. Battery

CAN YOU FILL IN THE MISSING LETTERS?

The re-charging of a battery should always be done at the rate specified by the

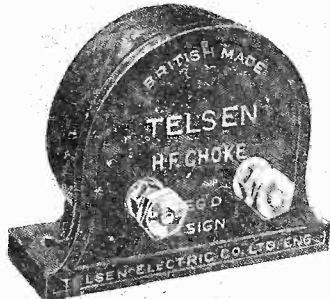
One good sign that a battery is properly charged is that each cell then freely.

Another sign of proper charging is that the fails to rise over several hours.

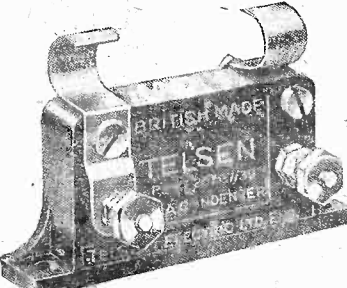
The vents in the plugs must never be allowed to become stopped up, because there is then no escape for the . . . given off during charging, and the battery may

Last week's missing words (in order) were: Cools. Copper. Flux. Flux.

SPARKLING REPRODUCTION!

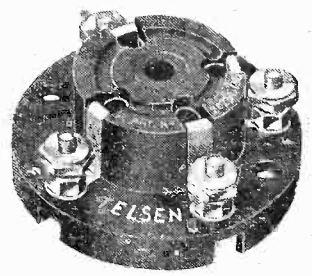


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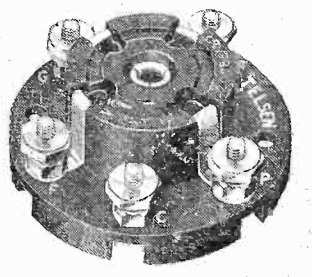


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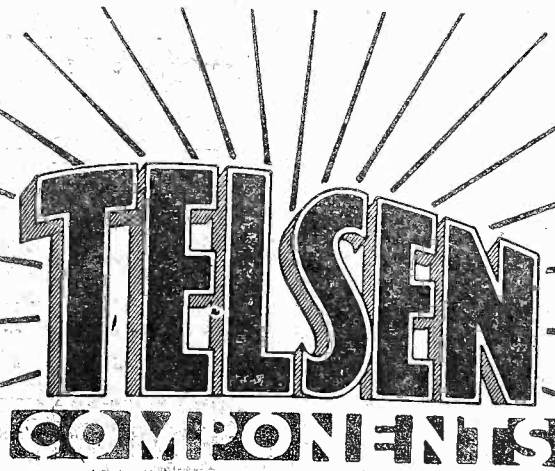
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TELSEN FIVE-PIN VALVE HOLDERS. Price 1/3 each.



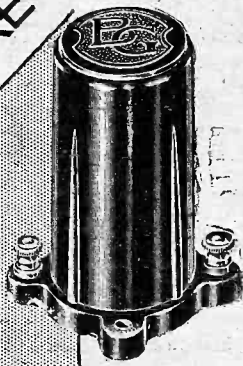
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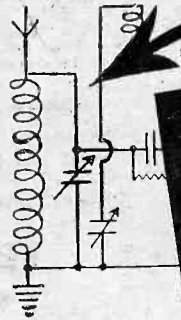
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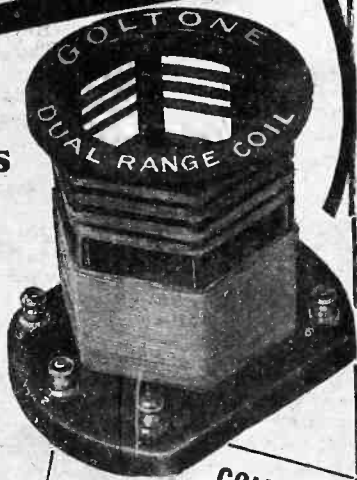
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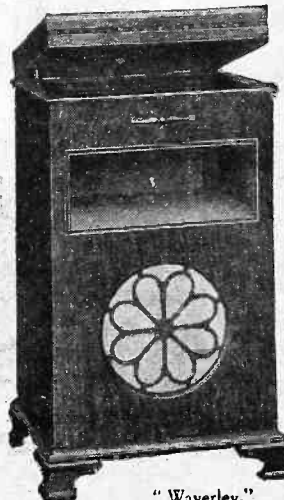
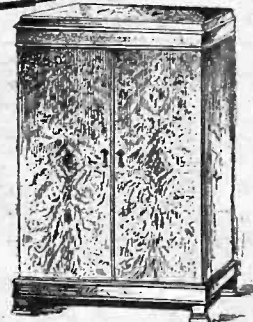
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7008

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 740.)

As a matter of fact even the power has not been altered, but is the same as it was previously, the only alteration being that a new method of reckoning power is now employed by the B.B.C. This gives all the B.B.C. stations higher figures than were previously used to indicate the power of these stations.

Actually there has been no alteration to Glasgow at all, either in wave-length or in power, so it is quite right that you should still be receiving the programme at the same setting on your receiver and at the same strength as formerly.

TWO-VALVE BLUE PRINTS.

R. W. L. (Wheatley, Oxon.)—"I want a blue print to build a two-valver. What kind of circuit can I get in blue-print form from 'P.W.'? I want the full constructional details, list of parts, etc."

The following is a list of the two-valve blue prints now available. Each contains a wiring diagram showing back of panel, and baseboard, a theoretical circuit, and also a list of the components necessary, with operating hints, etc. The price is 6d. per blue print, but it stamped, self-addressed envelope must be enclosed with the application.

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THE CHRISTMAS CRACKLE!

R. W. T. (Beckenham).—"Help, help! S.O.S.—S.O.S.!" I am sinking under the strain! Help! S.O.S. My 'Maxi-power' Four, which was the pride of my life, has developed a continuous crackle, crackle, crackle, and it will ruin my Christmas unless you can tell me how to stop it.

"For half an hour or so the programme goes perfectly, and then I get a sort of G-r-r-r-r-r-r-r-r, followed by two or three grunts and a crackle. After that I may go for half an hour without anything else happening, or I may be irritated beyond measure by repetition after repetition of this mysterious noise.

"I spent over a week looking for it, and I can stand it no longer. So if you want me to feel peace on earth, good-will to all men, tell me how I can stop this noise.

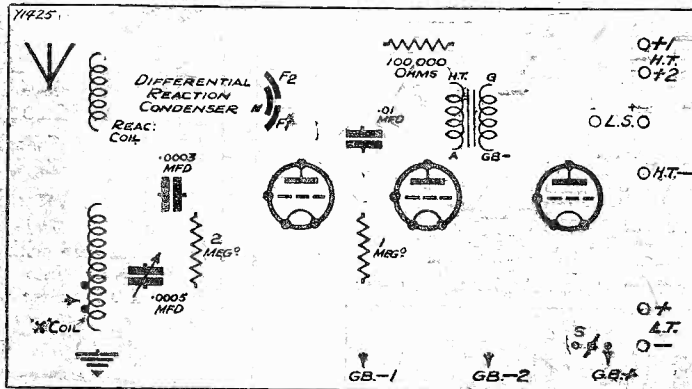
"I suppose I have asked for it partly, because I have used a lot of components from my previous set, but the S.G. valve is a new one, so are the switches, and so is the differential reaction condenser, as well as an odd fixed condenser or two, and a couple of the coils (long-wave).

"Most of the other stuff I have used before, and I have never been troubled with a crackle from it. The funny thing is that the 'Maxi-power' Four was the best set I have ever put up, and it is because I am particularly anxious not to take it down that I want your help.

"What hampers me in finding this crackle is the fact that it is not continuous, but comes and goes, so when I change a resistance and find it is cleared up, I then go happily on thinking it cured until it starts all over again. Several of my friends who know a thing or two about radio have had a go at it, but none of us can put his finger on the spot or suggest a method of finding exactly where it is.

"We have tested through with 'phones and dry cell, and substituted what we could (Continued on page 744.)

POPULAR "WIRELETS" No. 26 A STRAIGHT THREE-VALVER.



These are the "components" for a three-valve set comprising Detector and two L.F. Amplifiers (one resistance-capacity and one transformer stage). Plug-in-coils—one ordinary and one X-type—are used, and differential reaction. Can you "wire-up" this circuit?

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120 volt	10 m/a	- - -	14/6
60 volt	super power	20 m/a	15/6
120 volt	super power	20 m/a	31/6

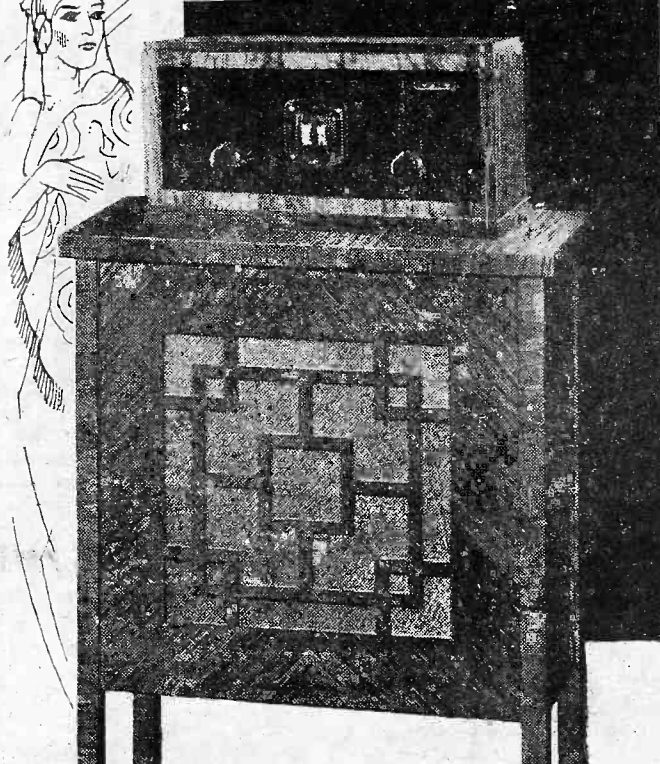
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M.B.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 742.)

for other components, but it did not cure the crackle.

"For instance, one man lent me his power valve and we tried the whole evening with that, and thought we had actually found the cause of the trouble, when a quarter of an hour before London closed down the crackle started again with his valve in! I have also tried an old transformer which I have by me, and it happened when that was in use."

"And another thing I notice is that the crackle is there even when I turn the filament rheostat of the S.G. valve right off. That cuts out the broadcasting, but it does not cut out the crackle."

"Can you tell me how, without buying testers, I can put my hand on the cause of the trouble, or otherwise I shall go mad."

It is certainly not going to be easy with a crackle that only comes and goes like this one, and we are afraid you are in for a long firing search. However, this is the way to set about it, and we have no doubt that if you follow this plan you will trace the crackle before the holidays, and thus ensure yourself a Happy Christmas.

We already have something to go on, and that is that the power valve, the L.F. transformer and the S.G. valve circuit have nothing to do with it. So you had better have a whip-round among your pals and try and borrow as many of the other components as possible to substitute for those in your set while you are trying it out.

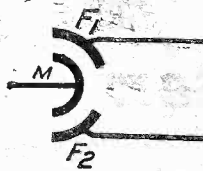
Try a new anode resistance, for instance, different H.F. choke, new grid leak, and, if possible, a new grid-bias battery, while if you can obtain a new L.T. and H.T. battery, so much the better.

The first thing to do is again to look carefully all over the set and make sure there are no bad connections, such as loose coils, half broken flex leads, dud pigtail connections to variable condenser, etc. If you can see nothing of this kind wrong at all, then connect up your new components in place of the old ones, and first of all switch on the set with the S.G. and all valves going so that you can ascertain if these are up to standard.

"INSIDE" INFORMATION.

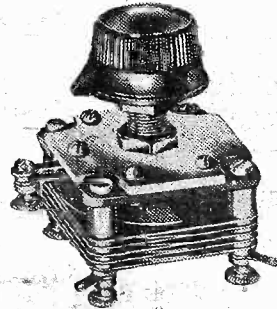
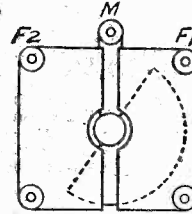
No. 10.

THE DIFFERENTIAL CONDENSER



This is the sign you see in the theoretical circuit diagram.

On the wiring diagram this, or some similar representation of a differential condenser will be found. (Usually the makers do not mark the terminals F₁, etc.)



Two separate sets of fixed vanes (here marked F₁ and F₂) are arranged so that moving vanes can interleave with either set, or partially interleave with both. (See the dotted moving vanes in centre picture.) The theoretical sign for a differential condenser (top) clearly illustrates this action.

"P.W." DIAGRAMS.

If it misbehaves as formerly on both long and ordinary waves, equip yourself with a sheet of paper and a pencil and look for the crackle. As soon as you hear it make a note of how the circuit is arranged, such as "all four valves, on long waves," etc.

As we are reasonably sure from what you say about turning off the S.G. valve that it cannot be in this (H.F.) circuit, you should then, without altering any of the other tuning adjustments, etc., or switches, disconnect the H.T. + 1 from the battery, disconnect the S.G. valve, and remove it altogether from the set. Take off aerial and earth also then switch on again and listen to the loud speaker.

There will be no sign of broadcasting, of course, but you should be able to detect the slightest appearance of the crackle when it comes along. As you have already done everything you know in the way of testing joints, etc., we should not attempt to touch the set any more, but simply sit down and read a book or something and note whether the set will continue to crackle without its S.G. valve and all that associated circuit.

If it does so you must thin down the circuit still further. Having taken the first valve off, the next thing to do is to work from the other end, and cut the whole of the loud speaker and power stage out of action.

In other words disconnect the primary of the low-frequency transformer from "P" and H.T. + 2, and join a pair of phones across the two leads, and then listen in on phones (if you have no phones, and cannot borrow a pair, try and borrow a different loud speaker).

The object is to refrain from using the same part over again, but to use different ones (as if your loud speaker were faulty it would show up as a crackle whatever improvements were made to the rest of the circuit).

At this stage you will be listening in to a detector valve without aerial and earth connected to an R.C.-coupled stage of L.F. There will be nothing else in circuit, so if the crackle continues you know it is one of the components now in use, and these consist only of the detector valve with its grid, plate, and reaction circuits, the L.F. valve with its resistance coupling in front of it, and the 1½-volts grid bias and H.T. feed.

Should the crackle disappear with this arrangement you can locate the faulty component by joining up again, listening in with your phones or loud speaker in the plate circuit of the power valve, and changing over the transformer or the grid-bias battery until the absence of the crackle proves that the faulty component or wiring has now been found.

Do not forget that the valves themselves are "components," and these must be tested by substitution to make the test complete.

(Continued on page 746.)

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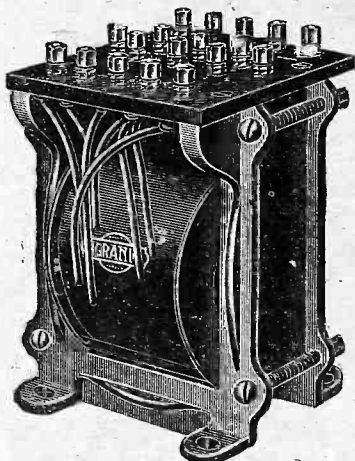
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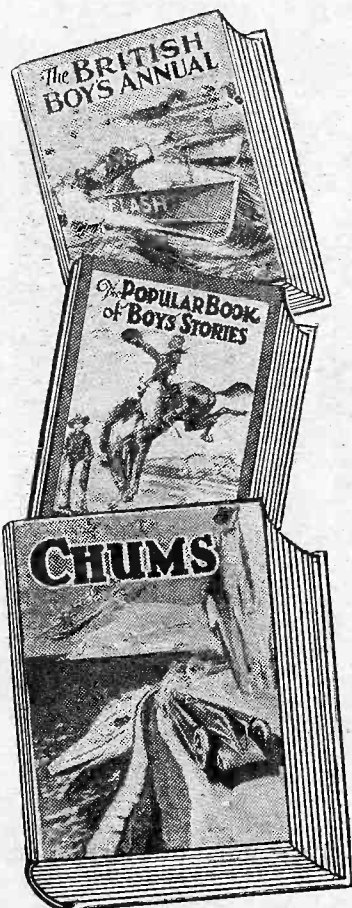
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 744.)

If, however, even with the detector and one L.F. stage and telephones you still get the crackle, you must go a step further to eliminate possible causes of the trouble by connecting your 'phones across the points now joined to the 100,000-ohm resistance. This will give you a detector circuit only, and by listening to this you will soon be able to say definitely whether the crackle is in this stage or in the following one.

Do not forget in all the tests that in order to show up any crackle as much as possible it is as well to advance the reaction a little way so that the set is somewhere near the oscillation point. And do not forget that when changing components and putting in new ones, or altering the valves, to make a note on the paper of the components which you have now definitely excluded as being possible causes of the trouble.

Finally remember that not only every component but every wire should be suspected, and it may be necessary to place short temporary leads from point to point before you can give the absolute O.K. to various stages in this way.

We are afraid it is going to be a long and tiring job, but short of pulling the whole set to pieces, or using proper testing instruments, it seems the only way to cure the crackle and ensure yourself a Happy Radio Christmas.

THE "CRYSTACHOKE."

In last week's description of the coil for the "Crystachoke," on page 702, the number of turns was given as 55 (of No. 24 D.C.C. or D.S.C.). This should have been 60 turns as shown in the diagrams, but as a matter of fact 55 turns will work quite well in most cases.

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THE HEAYBERD L.T. TRANSFORMER.

F. C. Heyberd & Co. have asked us to point out that the wording of the advertisement of above which appeared in "P.W." Nov, 15th, may give a wrong impression, and that no "eliminator" is required. If the valves in a receiver are substituted by indirectly-heated valves, all that is required for the latter is the appropriate L.T. transformer.

FOR THE LISTENER

(Continued from page 722.)

Contrasts.

Most of us are familiar with Derek McCulloch's voice telling us in which square Mr. Allison is exhorting Bastin to shoot. He arranged an interesting little programme of sportive and musical contrasts which, since I am old enough to have ridden a bone-shaker and young enough to have taken a pillion-rider on a motor-bike, I enjoyed very much.

Mr. Allison was in the programme, in his best Cup-Tie-Final manner. Indeed, Mr. McCulloch would be as lost without Mr. Allison as would Boswell without Dr. Johnson. "And everywhere where Allison went, Derek was sure to go!"

Somebody is sure to make a nursery rhyme about them some day!

A.P.H.

The initials are familiar to all readers of "Punch," and listeners had a taste of

Mr. Herbert's quality in the wholly delightful "Policeman's Serenade" which formed part of a concert of light music the other evening. Mr. George Baker was excellent as the Policeman, and Vivienne Chatterton, with her bird-like voice, so charming as the amorous Susan that I felt I would willingly become a "gentle burglar," too, if only she would sing to me!

"If."

Lord Dunsany's play came over very well.

The opening was, I thought, a little confused. It did not grip me, or I did not grip it, immediately. This, it seems to me, is a weakness in a radio play, which should absolutely nail down the listener in his chair from the start.

But after the noise of the railway station had faded out, and Ernest Thesiger and Gladys Young had the microphone to themselves, the play went smoothly and entertainingly to its end. Thesiger, of course, was good; but I was particularly pleased with the way in which Miss Gladys Young played up to him.

Her first scene was a little triumph. I expected a great deal from Lilian Harrison in the not too easy part of Miralda, and was not disappointed. This actress seems to me to have all the tricks in her bag, and with her drawling and seductive voice she got the rather exotic and sinister part of Miralda well across.

Some of the players stumbled at their words, for which there is no excuse in a studio performance.

Lance Sieveking.

I always anticipate the productions of Mr. Lance Sieveking with much pleasure. He usually has some original and brilliant idea up his sleeve.

Nobody is defter at the control panel than he is. He has the sharpest eye for effect. He has outgrown what seemed to me a fault, namely a tendency to give us too much panel and too little play. I congratulate him on his production of "If."

His idea of marking the passage of time by having voices to repeat the days of the week and the months of the year with increasing rapidity until they ran up and out on the note of a siren, was extremely clever.

My only criticism is that perhaps he used this device too often. But it was a vastly amusing trick.

Toc H.


The little share we were allowed in the Birthday Festival of Toc H at the Albert Hall must have created a deep impression. Mr. Clayton's description of the forming of a Chain of Light all round the world on Birthday Night had all the eloquence and fervour of simplicity.

The idea is itself so beautiful, and so quickens the imagination and the memory, that the simple statement of it came charged with power.


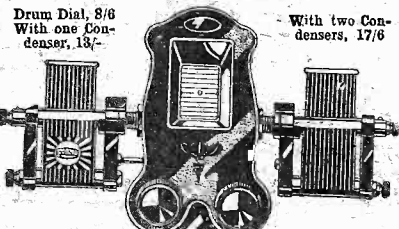
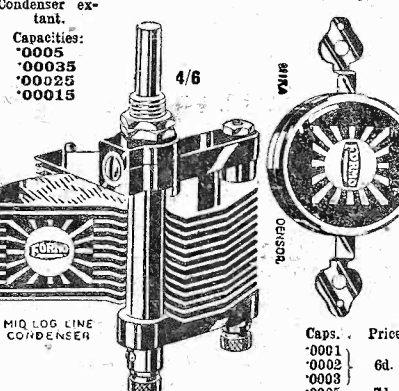
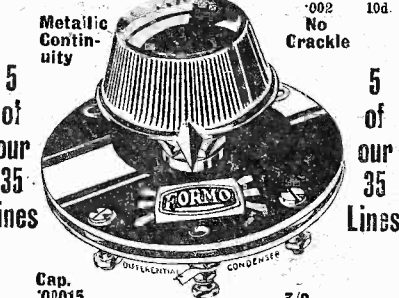
Detective Story.

Many of us have pleasant memories of a detective story which was broadcast in weekly chapters not long ago, and therefore look forward eagerly to another to be begun in the New Year. A group of well-known and clever authors are taking part in complicating the story, and we shall no doubt have a pretty hard nut to crack.

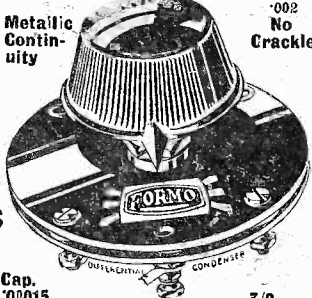
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TECHNICAL NOTES

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

Fieldless Coils.

I HAVE more than once been asked whether the use of so-called fieldless H.F. coils is an alternative to the use of screens in an H.F. amplifier. The point of the question is, of course, that if the coils are "fieldless," there would appear at first sight to be no possibility of interaction and coupling between one stage and another, and therefore no need for screens.

This is a very natural question, but with regard to the fieldless character of the coils, there is a snag in this, as in so many other things. The fact is that no coils are actually fieldless, and the most you can say is that the external field is *reduced* by a special arrangement of the turns. There are several such arrangements, as you know, one being the binocular or side-by-side arrangement, whilst another is the toroid formation.

Astatic Combinations.

Long before wireless, arrangements were often proposed for neutralising the field of one coil by that of another. For example, the coils of a galvanometer are sometimes arranged in "astatic" formation, but the astatic effect is never one hundred per cent.

As regards the H.F. amplifying stages, even assuming that the coils were completely self-contained electro-magnetically, so that there were no stray field, there would still be possibilities of inter-action, due to other components and conductors, so that even truly fieldless coils would not do away entirely with the need for screens.

For really satisfactory results when using much H.F. amplification it is very important to avoid stray coupling as completely as possible, but I am afraid that it is by no means sufficient to rely entirely upon the design of the coils themselves, without using screens.

A Common Cause of Trouble.

It is surprising how few people will go to the trouble to examine—and replace, if necessary—the grid-bias battery in a receiver or amplifier. This is all the more strange in view of the fact that, whilst the G.B. battery has an exceedingly important influence upon the proper functioning of the valves, it is as a rule, a very minor and inexpensive item, supplying comparatively few volts and needing renewal only at very long intervals.

It is true that in a powerful amplifier the grid-bias battery may be, in fact, a full-size, high-tension dry battery, and therefore a fairly considerable item to renew. But I am thinking more particularly of the majority of cases where the grid-bias battery is called upon to supply, perhaps, only 3 or 9 volts.

In many cases, bad results are due to this grid-bias battery having been left without examination for a very long time, perhaps even a couple of years, during which period its voltage has gone down to zero (or even less, as the Irishman said!).

(Continued on next page.)



Yes or No?

RELIABLE COMPONENTS DISPEL THAT DOUBT

WHEN you build a new set you are always eager to test it. What a disappointment when it falls far short of your expectations—or even fails to function at all. You check with the blue print—re-check the circuit—test the connections and find nothing apparently wrong. You even go so far as to dismantle and reassemble with the same miserable result—it won't work, or at most the reception is decidedly imperfect. When you fathom the reason—some component is not because you considered "any old part" would do, as it not better to obviate disappointment and save much worry and trouble by following the advice of experts? FIT BULGIN and get the best from your set. Don't hesitate, send for our 60-page catalogue, enclosing 2d. postage.

Is good as it might be, or broken down—all that work, time and annoyance

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TECHNICAL NOTES.

(Continued from previous page.)

If there is no bias applied to the grids of the valves it doesn't say much for the prospects of the filament emission, and, incidentally, what you may think you are saving on the grid-bias battery you are losing many times over in H.T. current consumption.

Overloading.

Some little time back I was talking in these Notes about the important question of the overloading of valves. Of course, you always bear carefully in mind the danger of overloading the low-frequency amplifier, and particularly the output stage. It is for reasons of this kind that valves—so-called power and super-power valves—are designed to handle a large amount of energy without distortion.

But the overloading may equally take place at the detector and, as a matter of fact, I think probably much more trouble arises from overloading the detector than from overloading in the subsequent stages, and frequently it is unsuspected.

Detector Operation.

The incoming signal by the time it reaches the detector stage should, of course, for the best possible results be raised to a certain degree of strength, or rather its strength should be within certain limits. If it is *below* the required strength, naturally it will not operate the detector efficiently, whilst if it is *above* the desired range it will overload the detector.

In cases where a fair amount of high-frequency amplification is used, or where powerful local stations are being received, there is a great danger of the overloading of the detector taking place.

Fortunately, however, in these cases it is quite a simple matter to prevent this trouble, and the method of preventing it consists simply in reducing the strength of the signal.

Controlling the Strength.

There are various ways in which the strength of the signals can be cut down before they reach the detector: one simple and quite satisfactory method is to introduce a resistance into one of the tuned circuits of the H.F. amplifier.

In this way the strength can always be adjusted so that, even though you tune in to different stations, giving very different signal strengths as received on your aerial, the actual strength delivered to the detector is roughly the same in all cases. If you can have a meter in the circuit, so as to give a definite indication of the strength of the signals, so much the better, although it is not essential.

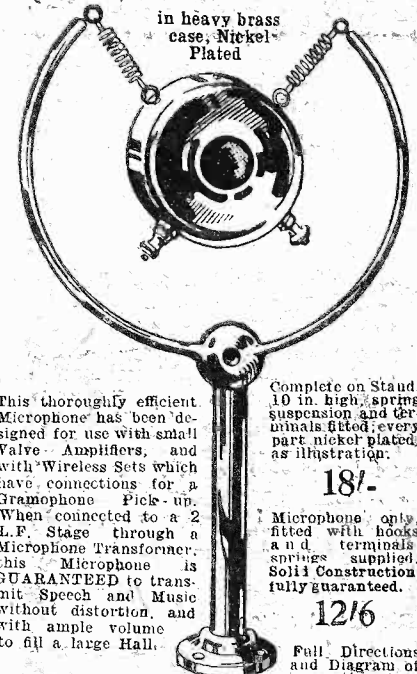
Underloading.

Of course you will notice that in the foregoing I am assuming that the power of the transmitting stations (or the amount of high-frequency amplification in your receiver) is such that the signals can always be delivered to the detector at a strength which is on the "positive" side, so to speak, and therefore can be adjusted by merely cutting down.

There will be, however, cases where the strength of signals is actually too weak,

(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

and here, beyond giving them the maximum high-frequency amplification of which the H.F. end of your receiver is capable, there is nothing more that you can do.

Reaction Points.

Whilst on the subject of receiving different stations, particularly in cases where the response is on the weak side, I should like to mention how important is the proper use of reaction. You know full well the great advantage of reaction, which, in effect, neutralises the resistance of the circuit even sometimes to the point of rendering it self-oscillating.

Reaction, however, like many other good things, is very apt to be abused, and I have often noticed listeners, especially beginners, placing far too much reliance upon reaction.

Aim at Maximum Efficiency.

There is often a temptation to skip the efficient design and construction of different parts of the receiver, and to rely eventually upon a good slice of reaction to make up for any deficiencies.

This is all very well, but remember that reaction should be used sparingly, and that there are definite limits to the relative amount of reaction which can be used, without spoiling the quality of the reproduction.

In other words, you should endeavour to get every ounce of signal strength and quality *without* reaction, and then bring in a judicious amount of reaction for the purpose of gaining a reasonable increase in volume without distortion.

I need say little about the ordinary control of reaction, as this in itself is a perfectly straightforward matter and means nothing more than the turning of a control.

The Need for Skill.

This, however, is not all that goes to it, for the reaction is not always independent of the tuning or, rather, perhaps I should say the tuning is not always independent of the reaction. Consequently, reaction must generally be adjusted for each setting on the tuning dial or dials, and if there are more tuning dials than one, the independent adjustment of these calls for quite a fair amount of skill, especially if you are searching for distant or weak transmissions.

If you are relying to any appreciable extent upon the reaction to give you volume, then obviously you have to follow your tuning adjustments very closely with adjustments of the reaction control, otherwise you may miss the station you are looking for.

This sometimes calls for a good deal of patience and, furthermore, you have at the same time to be very careful not to overshoot the mark and put the set into oscillation.

A Useful Rule.

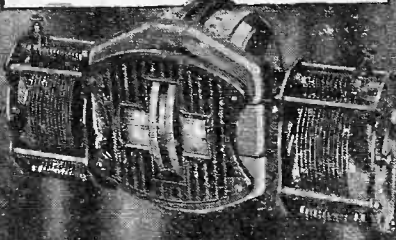
A useful hint in this connection which may help you when searching, is that when you alter the tuning so as to tune the set for lower wave-lengths, the effect upon the reaction is generally the same as though the reaction control had been turned up: that is, as though you had increased

(Continued on next page.)

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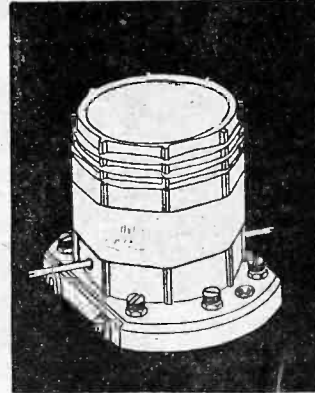
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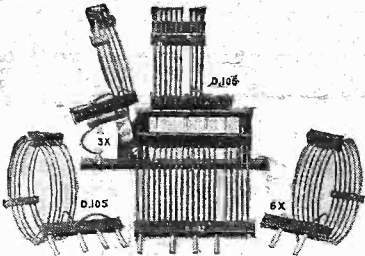
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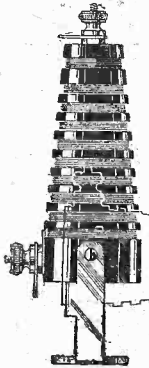


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TECHNICAL NOTES

(Continued from previous page.)

reaction, whilst if you adjust the tuning dial for *higher* wave-lengths, it is as though you were leaving reaction behind, that is, as though you had reduced the amount of reaction.

It follows from this that if you are gradually altering the tuning in the direction of higher and higher wave-lengths you must *follow* with the reaction control, whilst if you are tuning down to lower wave-lengths the reaction adjustments must *recede*, otherwise the effect of the tuning will, as it were, catch up and over-run the reaction and will put the set into oscillation.

Reducing Trouble.

I expect the effect I have just mentioned above is familiar to most of you, but at the same time if you bear it in mind when actually turning knobs simultaneously it will help you to avoid a good deal of random work and to find the station you want with the minimum of trouble.

Transformer-Coupling Peculiarities.

I have been asked whether it is satisfactory in the case of transformer-coupled amplification, using two transformer-coupled stages, to use the same type of transformer in each stage, or whether it is better, as is sometimes urged, to use different transformers?

If the two transformers were perfect, there would be nothing to say against this arrangement. In actual practice, however, even the best transformers are not perfect, and the reason why some people prefer not to use two identical transformers is because, owing to their defects being more or less identical, they are occasionally apt to give rise to a certain type of low-frequency oscillation.

Coupling Devices Not Perfect.

On the other hand, if two good transformers differing from one another in characteristics are used, it is more likely that the defects of the one will not, so to speak, "play up to" the defects of the other, but will tend rather to counteract them, with the result that perfectly good overall results are obtainable, whilst the set remains stable.

At first sight it may appear strange that two identical high-class transformers should not necessarily give the best possible results, but it merely turns on the fact that although the transformers may be of high quality they are not and can never be *perfect*.



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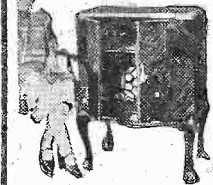
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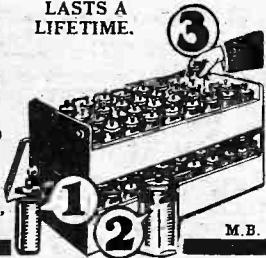
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THE "CONTRADYNE" TWO
(Continued from page 732.)

diagram will show you how well we have succeeded in this endeavour.

However, there is one little practical point we should like to bring to your notice. It is our invariable rule so to arrange the layouts of "P.W." sets that it is possible to wire them up in a perfectly efficient manner without any soldering whatever.

The parts are always arranged so that if you connect up the circuit with leads running from one terminal point to another in any convenient order perfectly efficient wiring will result. There is never any need to solder one wire to another at some intermediate point, although it may sometimes be done in our own models to secure neatness of appearance.

No Soldering.

Some of our readers do not seem to be aware of this, so by way of demonstration we have wired up the "Contradyne" Two entirely by the terminal-to-terminal method. It does not contain one single soldered joint. Evidently pretty easy to make! All "P.W." sets are like that, remember.

With this point cleared up we can leave the rest of the work to you.

**WHEN YOU HAVE READ
YOUR XMAS
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**DON'T FORGET TO
TELL YOUR FRIENDS ABOUT IT**

Now you want to know how the controls work, and you will be ready to try out the set. The use of the series aerial condenser we have already dealt with, and it just remains to tell you how the switches work.

The upper one controls the "Contradyne" coil; put it to "off" to bring the coil into circuit, i.e. for work on long waves. For the medium waves put it to the "on" position, so short-circuiting the "Contradyne" coil.

The wave-change switch works similarly, being put at "off" for long waves and "on" for medium. With most switches, by the way, you push the knob inwards for "off" (long waves), and pull it outwards for "on" (medium).

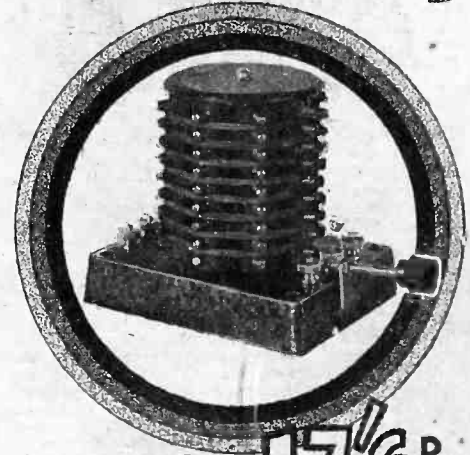
The Valves Required

Now you just want some valve and voltage details and you can start. For the detector (V_1) use a valve of the H.F. or "special detector" class, and for V_2 one of the L.F. or ordinary power type.

The H.T. voltages should be as follows. About 60 volts on H.T. + 1, adjusted for the smoothest reaction and best volume on distant stations. On H.T. + 2 you want just the usual 100 to 120 volts.

The only actual adjustment to be made in the finished set after you have got it working is the position of the tapping leads on the "Contradyne" coil. Try these on various pairs of the terminals on top of the coil until you find the setting for maximum volume and complete freedom from interference.

**Excellent
Selectivity**



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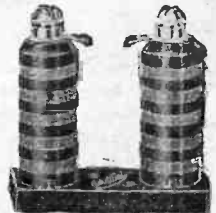
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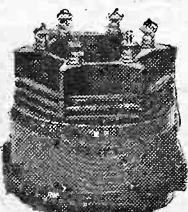
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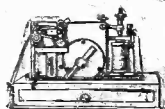


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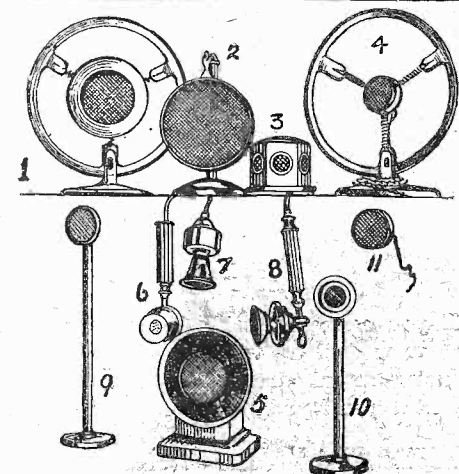
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A VISIT TO THE NORTH REGIONAL

(Continued from page 727.)

The third set supplies the grid negative voltages, and the layman's idea of a grid-bias voltage will receive a shock when he hears that as much as 2,000 volts G.B. is to be used at Moorside Edge.

Spare generators are provided for all purposes, so that if one machine breaks down another can be switched into circuit. The power from the generator-room goes to the transmitters via cables which run through a vault underneath both these rooms.

Safety First!

The transmitter-room, a lofty hall 74 ft. long and 60 ft. wide, is the most fascinating room of all. Down the sides of the hall are arranged a series of large aluminium cases with glass doors. They are about 6 ft. high and contain the inductances, valves, and other components of the two transmitters.

By opening the glass doors the engineers can obtain access to the apparatus, but the opening of the doors immediately cuts off the power supply. Safety first!

The aim of the B.B.C. to give a broadcast service of 100 per cent reliability is evident in here, too, for if any valve fails a spare can be switched into circuit in less than fifteen seconds.

The two transmitters are identical, each being capable of putting about 70 kilowatts into the aerial, but the one radiating on 301 metres wave-length will probably work on higher power than the one on 479 metres, owing to the greater attenuation on the shorter wave-length.

The transmitters were designed by the B.B.C. from data obtained from the Daventry Experimental station. Air-cooled and water-cooled valves are used, and about 10,000 gallons of wafer a day is required for the latter.

The Cooling System.

Pumps down in the vault circulate the water through the valve jackets. The heat of the white-hot anodes heats the water, which then passes outside the building to a cooler—a bank of pipes through which the hot water flows while cold water sprays on the outside.

Cooled, the water now returns again to the valve jackets. The system is designed so that in summer weather the water leaving the valve jackets will not exceed 110 degrees Fahrenheit.

The end block of the building contains two control-rooms and two quality testing rooms (one for each transmission), a kitchen, mess-room, offices, and so on.

As we walk out of the entrance hall at this end of the station we look back at the modest and simple building which contains so much wonderful and expensive apparatus, and we feel that the sadly antiquated broadcasting service of the North of England is at last being brought bang up-to-date.

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