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Popular Wireless

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No. 447. Vol. XVIII.

INCORPORATING "WIRELESS"

December 27th, 1930.

Realistic Radio

**WITH THE
P.W.
"CLEAR-CUT"
CONE**

**FULL
DETAILS
INSIDE**

The illustration shows a hand in a dark suit sleeve pointing towards a large, circular speaker mounted inside a rectangular metal cabinet. The speaker is labeled "CLEAR-CUT CONE". To the left, the words "Realistic Radio" are written in a cursive script. An arrow points from the text "WITH THE P.W. 'CLEAR-CUT' CONE" to the speaker. In the bottom right corner of the illustration, the text "FULL DETAILS INSIDE" is written in a bold, blocky font.

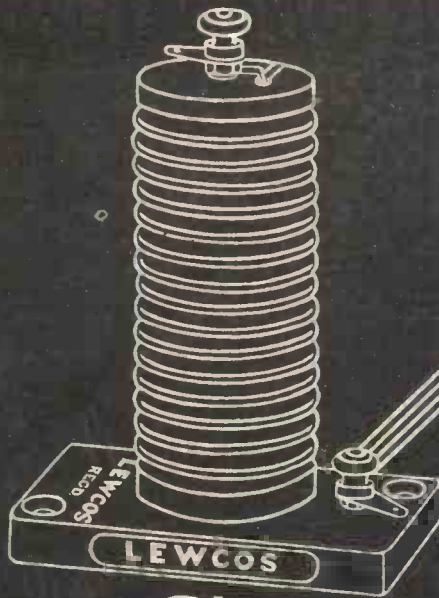
OTHER SPECIAL

ARTICLES THIS WEEK

THE BEST WAVE FOR BROADCASTING. BY CAPT. P. P. ECKERSLEY, M.I.E.E.
Where The Milliams Go. The New Ardenne Radio.

BROADCASTING IN 2030

By VERNON BARTLETT, CHRISTOPHER STONE, M. STEPHAN and SIGNOR TOSCANINI



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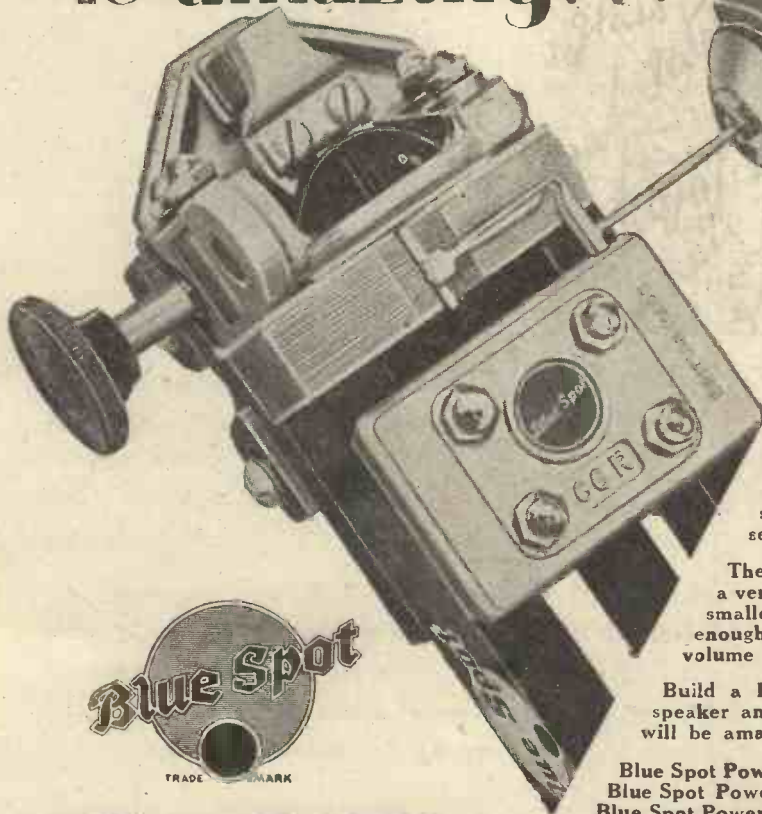
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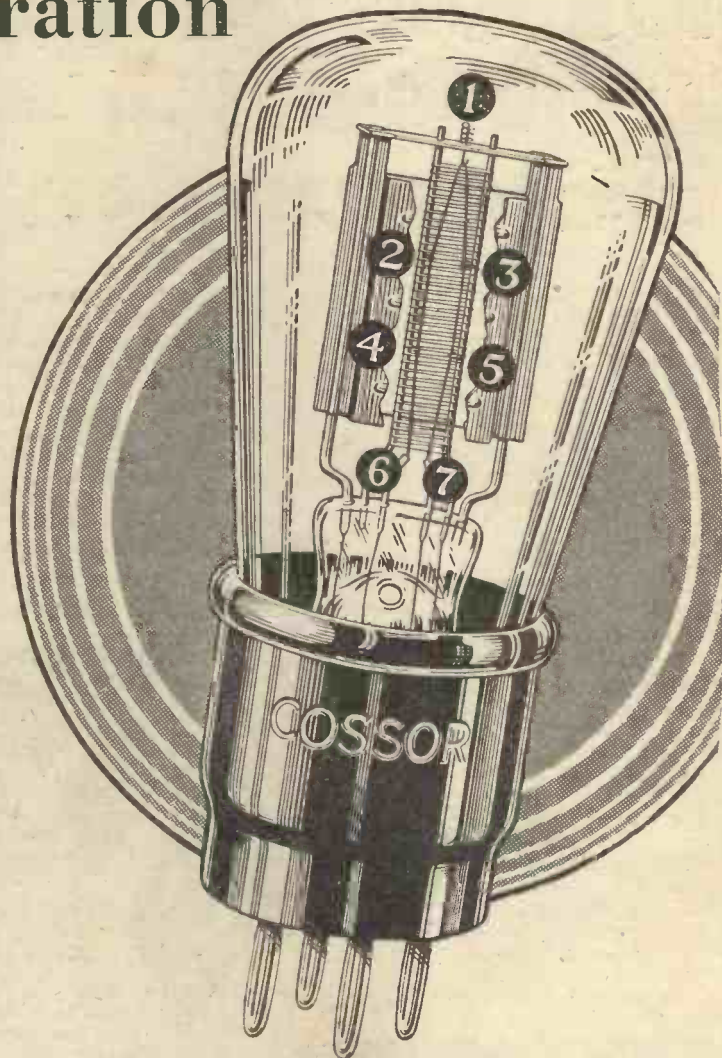
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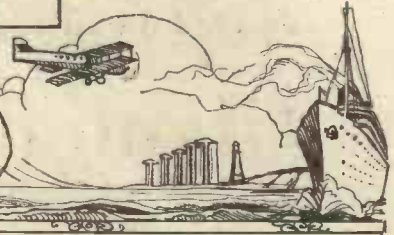


THE NEW
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**CAT AND RADIO!
 DO WE REVERSE?
 "AND THE NEXT PLEASE."
 AN OLD TIMER.**

RADIO NOTES & NEWS

**PUFFING BILLY.
 HOME CONSTRUCTION.
 RADIO SHIPS.
 NEWSPAPER SCIENCE.**

The Cat and Radio Again.

IN view of the anecdote which I recounted in these columns about a dog who twitched its limbs in time with a radio dance band I was interested to read in "The Times" a letter from a lady who states that her cat has a pash for the B.B.C.'s new orchestra, and waves its tail to and fro when listening to the loud speaker. It would be interesting to learn whether this cat has ever seen Sir Henry Wood conducting!

Wireless Construction Blindfolded.

NO doubt you will like to hear about Mr. W. Jacques, of Thrapston who, so says the "Northampton Echo," has not only succeeded in making a one-valver, complete with accumulator, etc., in the space of 2 3/4 ins. x 3 ins. x 6 ins. (inside), but made a two-valver in two hours and ten minutes, whilst blindfolded. All the components were mixed up before he began, and his feat included the drilling of the panel!

At the end of the time mentioned Mr. Jacques was receiving Radio Paris on the set!

I congratulate him—on demonstrating that for the "home constructor" there are still worlds left to conquer. Things were getting a trifle tame!

Let's Be Accurate.

HO, ho! Here's a good one! Let's be accurate, even though we use a slide-rule.

A man told me, the other day, while we were trying to solve a bit of mathematics, that during his early days as an engineer he was testing a certain machine together with another fellow—a youngster from college who was proud of his facility with the slide-rule. The square root of each reading had to be taken. "H'm!" said the youngster. "Square root of sixteen?" He worked his rule and then continued, "Er—three—point—er—nine—nine—nine . . . Ah—call it four!"

Do We Reverse?

PEOPLE sometimes think me a little particular when I crack jokes at the expense of the newspaper radio "experts," especially those who write for the Sabbath papers, but I find the temptation irresistible; they are sometimes such "easy meat." A well-known and generally sound evening paper published last month an article from its New York correspondent in which it was solemnly stated, apropos the Americans' desire to

the subject be 5-year plans or radio. I see it reported that the "People's Commission of Soviet Posts and Telegraphs" (Golly!) have made a five years' plan for the development of broadcasting. Only sixty-two more stations are to be built and allowed to add their quota of ruskys to the already tortured ether; and, as a result of this, so they say, they expect that the total number of listeners will exceed 14 millions! Evidently they anticipate having enough leisure to sit down and listen despite the other five-year plan.

CRYSTAL SET ON XMAS CARD!



She is going to spend a Happy Christmas, for the postman has delivered a Christmas Card on which is mounted a complete crystal set. By adding 'phones, etc., both the London stations were heard at good strength!

listen to B.B.C. stations, that the drawback is that they have to sit up so late in order to do it, because 8 p.m. in London is 1 a.m. in New York, and 2 a.m. in Chicago. Ay, and Thursday in Italy!

"Holy Russia" Thinks Big.

I DON'T know about the "holy," but the Russians, or those who rule them, certainly have no small ideas, whether

weight, ancient, crystal set which was still working. Mr. H. A. Beal, 41, Silwood Street, Rotherhithe, S.E.16, asks us to state that this set is located at his address. He says that the set is an object of wonder and admiration for all who see it, and that it has had a successful career in various exhibitions.

(Continued on next page.)

"And the Next, Please."

J. R., or perhaps J. K., of Manchester, fires in a psalm of praise for a certain make of valve with hair packing as an "anti-pong" device. I am rather surprised to learn that any "pong" trouble is experienced with up-to-date valves. "Why don't makers supply the complete parts for the 'P.W.' coil?" Perhaps they will when they read this. "Why don't we publish an article entitled, 'Valve curves and how to read them'?" My memory is bad, but I have a "hunch" that this subject has been done more than once. Finally, J.R. (or J.K.) says that it is the ambition of his life to "catch me bending" on electrical matters. Ee, lad, ye're not the only one! There are thousands waiting to catch poor old "Ariel"—and one of these days I shall make a "bloomer" deliberately, just to see 'em snap at it!

News of An "Old Timer."

I N "P.W.," June 28th and August 2nd, we published photographs of a heavy-

RADIO NOTES AND NEWS

(Continued from previous page.)

The "Puffing Billy."

THIS set, which is ten years old, measures 19 in. by 19 in. by 9½ in., and is built of 5-16th oak. In order to avoid what is called the "dead end" effect which is sometimes experienced when taking a tapping off a large solenoid coil, each of the 95 turns of the tuning coil is brought to a stud, making a circle of studs 11½ ins. in diameter. In order to enable the coil to be divided into nine sections there are nine switches, by means of which any section can be cut out. There is also a valve amplifying circuit included. Truly the "father and mother" of a set! The "Puffing Billy" or "Rocket" of radio receivers.

"Kind Words Will Never Die."

MR. C. E. RUSSELL, described as "an author and writer"—the difference between the two being subtle—is reported to have told Mr. M. Aylesworth, the head of a U.S.A. broadcasting system, that "here one hears insufferable balderdash, buffoonery, jazz, trivialities, tuneless songs, uninspired singers, inane jests, barbarous jocosity." He was referring to U.S.A. broadcasting, of course, and added that he believed radio in America to be a menace to public welfare and a powerful narcotic to public culture." Doubtless there is nothing for Mr. Aylesworth to do now but to turn his attention to the peanut trade!

The Vital Force of Radio.

NOW hearken to Captain Barber, Chairman of the Radio Manufacturers' Association on this side of the Atlantic, as he purrs over radio at the R.M.A.'s Annual Banquet. "Radio has eased the burden of millions, and has done more than all the churches to help the soul of man. In spite even of the Sunday programmes of the B.B.C. it is the most vital force in the country to-day." Just as exaggerated as Mr. Russell's indictment of American radio. Most of the culture spoken over our ether was and is obtainable from books; it is not the product of wireless. Wireless is a form of distribution only; cheap amusement, education and information.

Home Construction.

IN the same speech Captain Barber is reported to have waxed sarcastic over the "home constructor." "All you want is a good designer, who will provide you with a kit of pieces and a few miles of wire. Then, with a coke hammer and a pair of tongs, you can get Berlin in the bathroom." (Roars of laughter, no doubt, from the manufacturers of complete sets). Well, the "home constructor" is a much more "vital force" than radio; he is the potential inventor and improver of radio technique. Marconi himself was the first radio amateur, tinkering for love of tinkering. So never mind, boys—continue your experiments.

Radio Ships?

IN a speech at a dinner of batti-wallahs, (electricians), it was stated that in the future we may be able to propel light and heat ships by means of radio. Whilst we can shove a ship like H.M.S. Centurion about by radio, I do not believe that it will ever be possible to propel one to

India or Australia by means of energy transmitted by electro-magnetic waves. Moreover, granting that it were possible, I think that oil would be a cheaper prime mover—or even coal. If, during the next thirty years, I prove to be wrong—I will publicly recant.

A Cry from Canada.

FOLLOWING the letter from South Africa bemoaning the lack of enterprise shown there by British radio manufacturers, comes another, this time from Canada. "Reginan" tells me that the Americans hold the market there. "In my opinion," he says, "the English manufacturer doesn't want the overseas trade. I wrote to Mr. —, who advertises in 'P.W.' about a microphone three months ago, but up to date he has not replied. I can get an American mike which will suit my purpose." He is thinking of building the "Sharp Tune" Two—but here again, where's the British

SHORT WAVES.

RUSSIAN BROADCASTS.

Moscow squalling.—"Daily Mirror."

"Wireless set in gaol causes a revolt," runs a headline in the "Evening Standard." They probably thought they were at least safe from it there.

GETTING ON.

We are rapidly becoming "Englified" in the North, it seems! In a certain shop window I notice they are advertising: "UmbrellaRs Recovered."

Or is it an ideaR of the B.B.C.?—"Bulletin and Scots Pictorial."

"Stuttgart, accused of jamming Daventry, now says this is tit for tat, as Daventry has been jamming Stuttgart. . . . Without real co-operative goodwill under international direction, the whole world would be reduced in time to a state of wireless chaos," we read in the "News-Chronicle."

But it would still be a "jammy" place to live in.

There's a lot to be said against the use of loud speakers in private gardens. For instance, there was the case of the neighbour who knocked at the front door of a house and owing to the loud speaker in the garden, failed to make anyone hear that he wished to borrow the lawnmower!

A reader from St. John's Wood recently wrote suggesting that the B.B.C. should bottle Chamber Music and sell it as weed-killer.

This seems rather unfortunate, as it apparently has quite a bracing effect upon the said reader.

Resident in Flat No. 1: I hear you want to buy my wireless set. How much would you give me for it?

Resident in Flat No. 2: Three pounds more than you paid for it, sawed, split and delivered.

manufacturer of the parts?" Let us hope that these letters will be taken to heart by those whom they concern.

Warning to Aerial Erectors.

AS a matter of fact the instance to which I am about to refer shows that even the innocent bystander should be aware. It was reported last month that a young lady of Durham was asked by a friend who was on a ladder, erecting an aerial, to put her foot on the bottom rung to steady the ladder. This she did, but at the same time seized the aerial, which had been thrown over an overhead electric cable. She was unconscious for two hours, and was lucky not to lose her life. So if there are power lines near you with which you might become involved during aerial erection—keep away! Have an indoor aerial, or

at least give the job over to professional linesmen.

(H)airbrushes.

WHAT a lot of people know all about the special brushes for coating surfaces with paint, slutions, etc. I select two letters. N.P.S. (Boscombe) says that "spray painters" have been in use for over twenty years; that they are gadgets for the projection of liquids in the form of a fine spray produced by compressed air, and that they are used in at least sixteen trades. If anyone would like to experiment with this process they might try their luck with J. McK. T's (Paisley) suggestion and use a scent spray operated by a foot pump, not by the lungs—but it doesn't sound very hopeful to me.

Death to Interference.

WHEN one complains to the Post Office that an electric haggis-mixer is making haggis of the B.B.C. programmes, they (the P.O.) beat their breasts and say that they have no power to remedy the evil. Why don't they get the power, or move the authorities who have it? In Belgium the town of Ciney has made a bye-law under which all users of electrical machinery must equip it with apparatus to prevent interference. Penalty for offenders—a fine of 5-15 francs, or quod up to seven days. The town of Brockville (Canada) has made a bye-law ruling that all electric signs must be muzzled so as not to interfere with broadcasting.

Newspaper Science.

F. C. (Charlton) writes enclosing a cutting from the "Daily —," which states that two Frenchmen, M. Givelt and M. Couplex, have invented an organ which has no pipes or wind; which draws its sound from the atmosphere and can ventriloquise. No doubt it can also juggle with balls and make smoke come out of its ears! M. Givelt is credited with saying that there were already in existence a number of instruments drawing music from the atmosphere." Frankly, I think he has been misreported, because only poets and reporters, and bad ones at that, think the air contains music.

From Our Toro Correspondent.

I HAVE to thank A. B. T., of Toro, Uganda, for his friendly letter and for a useful idea which I have passed to the technical wallahs as he asked. But when he asks me to dish up a joke which I have forgotten, I confess that my heart bleeds for him because there is nothing in the basket. Perhaps he can overlook this and find a strain of humour elsewhere in these notes. Oh, by the way, A. B. T. thinks that he detects a "tinge of cynicism" creeping into "P. P. E.'s" articles. No! That's just a cheap fountain-pen!

A Historic Hint.

THE little wooden shack on Long Island, where Marconi worked at his transatlantic experiments in the early Jays of wireless, is to be preserved as an historic relic. Good idea! But if it were Edison's shack his twin soul, Hy. Ford, would take it away to Dearborn, together with some of the dirt underneath and some of the air overhead! However, I expect they will hang a picture of Edison inside, just to give the place the proper tone. ARIEL.

THE BEST WAVE for BROADCASTING

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



WHAT are the best wave-lengths for broadcasting? I have seen articles on this subject which appear to be slightly misinformed, and as I have made this my pet study, perhaps I may be allowed to base this article on some later ideas and ideals. Briefly the longer waves go further over land. The longer waves are, therefore, better for broadcasting.

A station's aerial emits waves. These can be considered as straight lines, representing the rays of energy as they go outwards (see Fig. 1).

Two Kinds of Rays.

There is a ray we may call the ground ray, because it radiates along the ground. Broadcast listeners live on the ground, and it is the ground ray which gives them their service. But there are space rays which go upwards. These, we suppose, hit an electrified layer and are bent earthwards again.

Thus a station can send rays (space rays) all round the world because they echo about between earth and sky and do not escape into the cold spaces of the universe to be there lost for ever. On the whole, short waves keep within this annular sky-earth-bounded space better than long.

But, bouncing about as they do, they are apt to be inconstant and never the same. This trouble is called fading. Fading does not matter (because it can be eliminated) in commercial telephone and telegraph working, but it is a fundamental disadvantage in broadcasting. Thus broadcasting must rely on reception of the ground ray.

Fading Troubles.

It is quite true, as any enthusiast will demonstrate any night, that one can hear, and hear well, via the space ray, but—it fades more or less. Rome! famous Rome! Yes, I have heard all the stories, and I just *know* it fades, because I have listened. Not badly often, but quite badly enough sometimes. The space ray can never satisfy the engineer for service, much as it may amuse the reacher-out as a hobby.

So we go back to the real problem—the transmission of the ground ray. This ground ray is steady, it does not fade but,

There is no one in a better position to give authentic facts concerning this fascinating subject than Captain Eckersley, and no one able to present them in a more readable manner.

(1) THE GROUND RAY.

passing as it does over the ground, it gets tired by having to come in contact with things on the ground.

Trees and bushes, and telegraph wires, and houses, and the partly-insulating, partly-conducting nature of the ground itself, all rob the waves of their energy, and so the ground ray soon dies away; caught in the things of the earth.

A Good Analogy.

One of the better analogies in all this is to consider that the wireless station blows a gigantic wind from off its aerial. This wind blows along the ground, and it gets caught up in trees, and houses, and hedges, and hoardings, and so loses energy.

A strong wind is blowing. You are walking in London. Here it is still as a June day of flaming sunshine; round the

caught up into eddies, and dissipated in energy in that copse, the copse is no shelter 100 yards away; and the wind blows the tree tops anyhow.

So with electric field intensity from a wireless station. Here in Balham the strength is wonderful, there in Streatham it is weak, up on the housetops it is better, down in the basement you are sheltered. On the open plain outside London it is steady, but just behind this hill it is poor while the strength closes in again as we move away from the sheltering hill.

How Long-Waves Score.

Nevertheless, because of the houses, the hills, the trees, the earth, and the things on the earth, the wind gets feeble and feeble *on the ground* as we move further away from the source. Up in the unimpeded sky it blows the clouds to pieces and any upland again gets fuller force—the sky wave is stronger because it finds no obstacles.

But what determines how far away we can appreciate a sensible disturbance? In wireless the dying away of strength of the all-important ground wave is determined only by two things, the conductivity (used in a large sense) of the earth, and the length of the wave. We cannot change the effect of the earth, we can change the length of the wave.

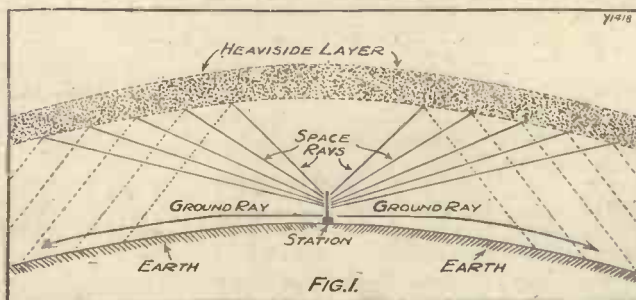
Now the wave-lengths allocated to broadcasting are the more unsuitable the shorter they are. Daventry 5 X X, with its wave-length of 1,500 or so metres, gives direct ray "service" over ordinary sort of pastoral country to 200 or 300 miles; London National (261 or so metres wave-length) gives a similar service to 30 or 40 miles. London National is susceptible to shielding and variabilities among houses, and gives a poorer service in Kensington than Kent.

Direct Rays Needed.

As to indirect (and always fading) service—it is very good in Madrid! But we want direct ray service, and so we want longer waves and the most suitable are those between 600 and 2,000 metres.

They give direct ray service, non-fading service, steady service; they give programmes, and it should be the principal task of the forthcoming international conference to provide the waves according to the needs of the several claimant services.

HOW RADIO WAVES RADIATE



A pictorial representation of the two kinds of rays circulated by a wireless broadcasting station.

corner, woof, and hat goes flying, overcoat blown about your legs, you stagger with the force.

You are, however, more sheltered in town. Go up to the roof tops and the wind is steadier and stronger. Motor out into the country, and on the big plains the wind roars at you. And even if it has been

SPENDING ON THE GRAND SCALE

MAKING £1,200,000 LOOK SMALL.

AN INTRIGUING ARTICLE

By THE EDITOR.

THE publication of the B.B.C. Handbook for 1931 (in which, among other things, may be found some illuminating facts about the Corporation's income and expenditure), the controversy about subsidised opera, and the steady upward trend of licence figures, have all contributed to the creation of another great wave of popular interest in the B.B.C. in general and broadcast programmes in particular.

Public opinion seems to have been startled, even thrilled, by the announcement that, next year, the B.B.C. will have £1,200,000 to spend—£1,069,648 from the licence revenue, and about £140,000 a year from profits from publications, etc.

It certainly is a grand sum! One million two hundred thousand pounds! Actually to spend! Well might some newspaper writers be forgiven the misuse of the word "romantic."

One daily paper has already stimulated public imagination by inaugurating a £1,000 competition—the main idea being that its readers should vie with each other in sending in a list of ways and means for spending such a huge sum of money on broadcasting.

Could You Spend a Million?

The competition should prove successful, and some of the suggestions sent in by competitors will probably be weird and wonderful; and even provocative of thought for the mandarins of Savoy Hill. The more one thinks of spending one million two hundred thousand pounds in one year, the more fascinating the idea becomes, and at the same time more appalling.

If *you*, dear reader, were given that sum to spend *intelligently*, you would be tackling no light task. You would probably have a nervous breakdown before 1931 had drawn to a close. We should!

Some Expensive Ideas.

But when it is a question of the B.B.C. spending this huge sum, it appears to be the easiest thing in the world, as easy as kiss your hand, as the saying is. The way the B.B.C. can make £1,200,000 look like the cash resources of a child's money-box is simply astounding.

"It's easy," says the B.B.C., in effect,

SPEAKING ACROSS THE SEAS!



Recently Messrs. Heinz arranged simultaneous banquets in eight different countries. President Hoover gave a special speech in America and this was picked up by radio at the various centres. Above is the scene in London.

"quite simple. £780,000 on programmes, £100,000 on the new orchestra, £12,000 on administration expenses and depreciation, £300,000 or so on new construction work, £7,000 on opera (perhaps more)." And there you are!

Seems simple, doesn't it?

And yet the B.B.C. apparently are apprehensive of being hard up in the not distant future!

It's not surprising. The change-over

from the old twenty-one stations system to the Regional Scheme was expensive—the full cost has yet to be met.

Each Regional, for instance, costs between £120,000 and £150,000; and on top of this the B.B.C. has been "stung" for Income Tax!

The new orchestra ran away with £100,000; but although this seems expensive the result will undoubtedly justify the expense.

For the first time in the history of music—and that goes back to the day when Adam first discovered how to whistle to Eve—

Have you seen the January

WIRELESS CONSTRUCTOR?

NOW ON SALE - - - PRICE SIXPENCE.

It is a

SPECIAL XMAS

and

NEW YEAR NUMBER

Packed with fine features for all.

this country will be the possessor of the finest orchestra in the world. And that's something the world would have scoffed at as impossible a few years ago.

On the whole it is understandable why the B.B.C. people don't think the spending of £1,200,000 too difficult. Big ideas have been conceived, and to "put them across" big money is necessary.

It seems even "bigger and bigger money" is wanted. Six and something (5d. to be precise) out of every 10s. licence fee, is not a big enough share, although it totals to £1,069,648 in a year. The odd bobs and pence go to the Post Office and the Treasury.

The Treasury's Nest Egg.

But that is an old story. You all know about the nice little nest egg the Treasury has accumulated; and you all know about the row that has been raised because Mr. Snowden wants to return a few thousands to the B.B.C. for the benefit of British opera and, incidentally, listeners.

The row has been loud and prolonged, and founded on such a conglomeration of distorted facts, fancies, prejudices and general misrepresentations, that it now looks as though the Treasury will not have its nest egg nibbled at. Which is a pity.

If the scheme *does* fall through the B.B.C. may try and conjure up *all* the necessary cash. But it will be a crying shame if it has to.

THE INFINITE VARIETY OF THE RADIO PROGRAMMES



Broadcast touches upon every phase of our social structure, and above you have two good examples of this. On the left you can see the Prince of Wales behind a microphone, while on the right a loud speaker is being used for a broadcast geography lesson to a class of boys in an elementary school!

The P.W. "CLEAR-CUT" CONE

A loud speaker, designed on absolutely novel principles, that constitutes a complete break-away both in construction and in the very realistic results it gives. It can be easily built at the cost of but a few pence above that of the unit and we are sure it is destined to set a new standard in reproduction. Build it—so that you will have an instrument capable of doing justice to the output of your P.W. set.



ONE of the most tantalising things about so rapidly progressing a science as radio, at any rate to those behind the scenes, is the length of time we seem to have to wait before new inventions reach the stage of practical use.

There are practical difficulties, but they can be overcome, and the reward is sufficiently great to make it well worth while to take a little trouble.

There do not appear to be any patents which can interfere with the free develop-

ment of the idea. There are patents covering some of the best methods of producing a free-edge effect, but the effect itself is apparently clear of all restrictions.

Since there is, therefore, no question of injustice to any inventor who may be trying to get the idea developed commercially, the "P.W." Research Department has determined to take a hand in the matter.

Frankly, we have grown tired of waiting to see the benefits of the free-edge cone made

Cone we have embodied a method of achieving the free-edge effect at its best in a very simple and practical way. Not merely that, but our method confers another very important advantage: it provides a type of double cone which greatly improves the uniformity of response of the speaker to different frequencies.

Relieved of Damping.

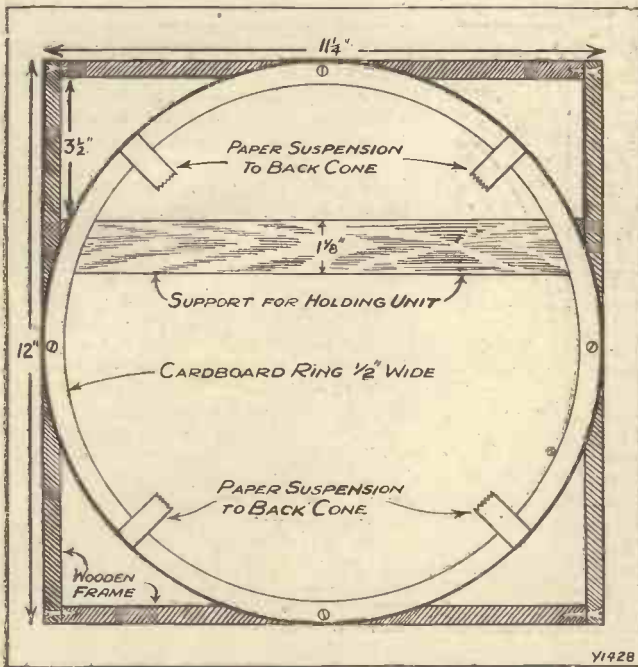
With so much made clear by way of introduction, perhaps we had better pause a while and tell you what a free-edge cone is and what it does. Well, by free-edge we mean that the edge of the paper cone is not attached to a leather, rubber or fabric "surround." It is left entirely free and the cone is supported at some other point.

The result is that the edge is relieved of the acoustic "damping" effect of the usual suspension, and so it is free to reproduce a whole range of higher frequencies which are normally absent or very weak.

It is sometimes argued that these higher frequencies are of little importance, but you have only to listen for a while to a good free-edge speaker to realise how far out

(Continued on next page.)

NOVEL FOUR-POINT SUSPENSION



The back cone should be fixed to the cardboard ring by four paper strips. No other cone-fixing should be employed.

We know that they exist, and we suspect they will be of great importance, but there is nothing for it but to wait as patiently as we can until they come along.

Neglected by Trade.

The "free-edge" cone for loud speakers is a case in point. It is now close on three years since the writer of this article first heard such a loud speaker in action, and was tremendously impressed thereby, yet how many real "free-edge" instruments are there on the market? To all intents and purposes there is none, certainly none at all, apart from some rather costly moving-coil types.

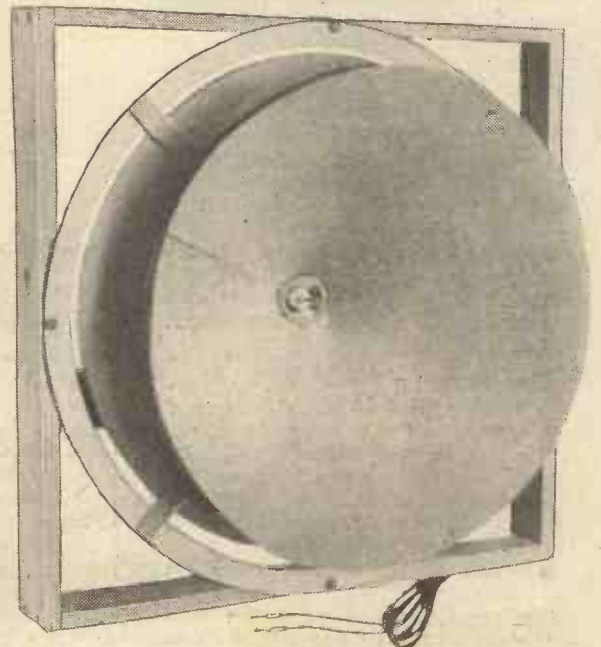
Yet we have here the means to effect a real and substantial improvement in loud-speaker reproduction. Why not exploit

available through the usual channels. We have accordingly decided to develop it ourselves and show our readers how they can embody it in a loud speaker of the home-made type.

This decision has involved us in a great deal of experimental work, for it is one thing to know that the free-edge cone is capable of giving exceptionally fine reproduction, and quite another to devise a really satisfactory method of suspending such a cone.

We have succeeded, however, and in the "Clear-Cut"

COMPLETELY FREE-EDGED



The front and complete cone is entirely free-edged, and by this means a wonderful response is obtained.

THE "P.W."
"CLEAR-CUT" CONE.

(Continued from previous page.)

this contention is. There is so great an improvement in brilliance and naturalness of reproduction that all other speakers sound quite dull and lifeless by comparison thereafter.

However, we must be brief and get down to constructional matters without further delay.

First, you make an ordinary single cone of the usual medium weight (120 lbs. per ream) "Kraft" paper, then attach to this a sort of half cone, seccotined to the back, and going off at an angle. Dimensions for

then pull up the plaster strips until they are only just free from slack.

We must be very brief, but we think that you will be able to manage the rest of the assembly with the aid of the photos. Having finished your chassis you can work it just as it is at first, but to get the full benefit of the very fine bass it will give, you want a "baffle," and this point we will deal with in an early issue.

the main cone all round the guiding line. This is an important part of the job, so it should be done with great care.

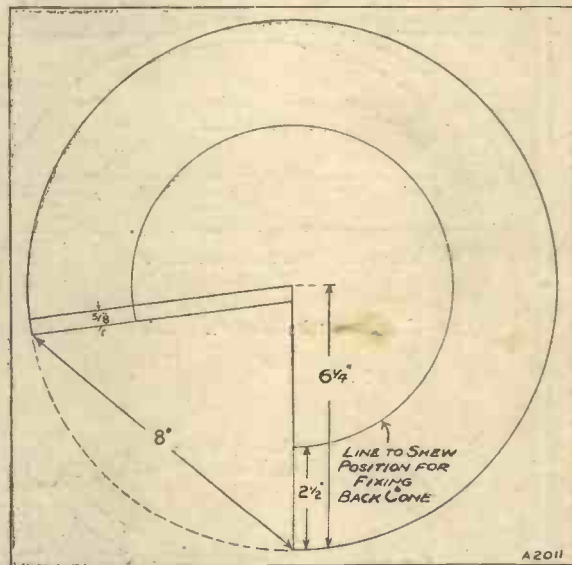
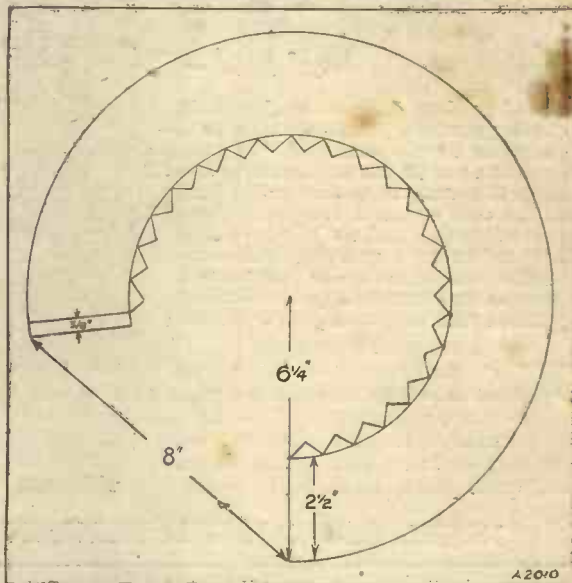
The Back Cone.

There are perhaps just one or two practical points we might mention before we leave you, however. For example, there is the matter of the attachment of the back cone to the main one.

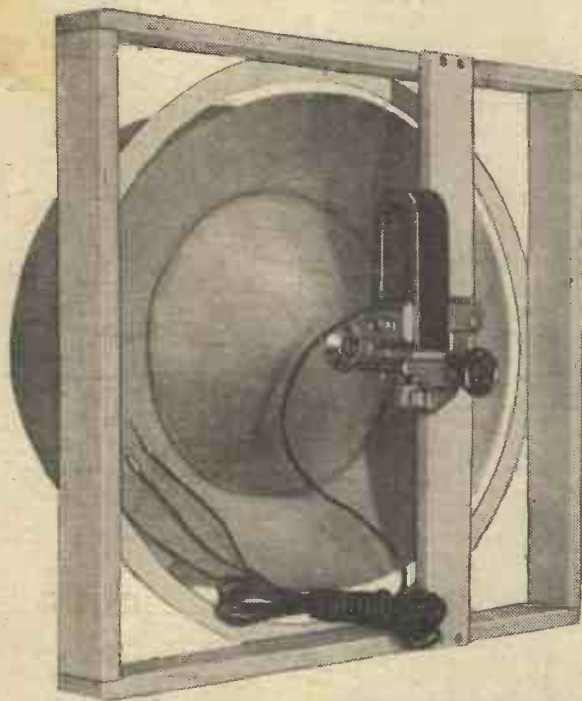
To make this as easy as possible, describe a circle on the main cone before it is seccotined in to shape —i.e. while it is still in the flat, to provide a guiding line along which to stick the back cone. The position for this line is indicated in the middle diagram on the right.

Note that the inner edge of the back cone is to be cut out with triangular teeth all round. It is these teeth which are actually stuck to the main cone. Smear each tooth evenly with seccotine, wait until it begins to get tacky, then press them on to

A NEW CONE COMBINATION



SIMPLE UNIT FIXING



The wooden framework is a very simple affair, and you don't need much carpentry skill to be able to fashion it.

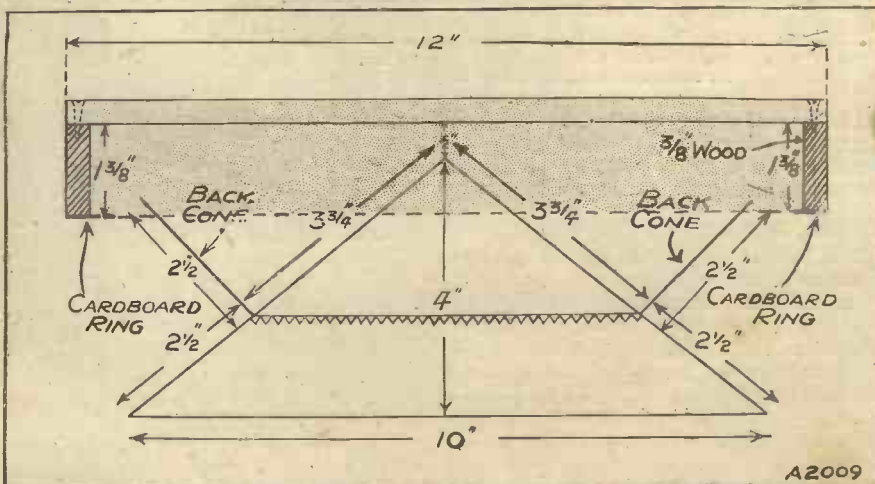
these, and a semi-sectional diagram will be found in the illustrations on these pages.

Having got your double cone stuck together and all joints between paper well pressed together with the fingers, put this assembly aside to dry for some hours, with the mouth of the main cone resting on a flat surface, and a small weight (about 1/2 lb.) on top.

The Cone Suspension.

The main portion of the chassis is of wood, and the diagrams show you how to put this together very easily. The driving unit goes on the strip at the back, and the dimensions given suit the Blue Spot type R unit. (A little modification will enable other good units to be employed.)

That done, cut the cardboard ring you see attached with small screws to the front edge of the wooden frame. The actual suspension is by means of strips of adhesive plaster between the back cone and this ring. See photos and diagrams and



At the top you have the exact dimensions of the back cone, while in the centre those of the front cone are given. The fixing details are contained in the bottom diagram. Carefully tackled, you will not find it at all difficult closely to duplicate the construction of the original model and so duplicate the very fine results it gave.



THIS is the season of snow. This white mantle of Nature may even have made its appearance in your district before now. But if such is the case, let us hope that, so far as your radio activities are concerned, it has dealt with you kindly.

There's no doubt, however, that a snow-storm can play havoc with an aerial, and especially with one which, owing either to age or to insecure suspension, has fallen into what we might term an infirm and feeble condition.

Heating the Aerial.

After all, snow, in the mass, is not exactly a light-weight material, and no matter how picturesque to an æsthetic eye aerial wires, insulators and spreaders may appear when draped with a goodly layer of this wintry element, the extra degree of strain to which the whole aerial system is thereby subjected may, in many instances, prove disastrous.

Many commercial stations and well-known broadcasters, for instance, take special steps to combat the settling of snow and ice on their aerial systems. The Marconi station at Carnarvon sends up into its aerials a heavy current in order to heat up the wires so that the deposition of snow on them may be prevented.

Some time ago, I believe, it was reported that the great French station at Sainte Assise, which, as you probably may know, possesses a most elaborate aerial network, supported at a height of some 800 ft. above the ground, entered into a calculation of the total extra weight which is thrown on the aerial after a heavy snowstorm.

Four Hundred Tons.

The authorities of this station worked out their estimate to the tune of approximately four hundred tons. No wonder, therefore, that these people are rather keen on the matter of electrically heating their aerial in severe weather.

Dealing, however, with purely amateur aerials, it is obviously an impossibility in these instances to send a heavy electrical current up into the aerial. Generally speaking, so far as the actual elevated portion of the aerial system is concerned, the best the amateur can do is to take every precaution to see that the aerial is fitted to withstand a reasonable extra strain, and,

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

Snow and ice can play havoc with your radio, and there are other factors which may affect it during the winter unless you take precautions.

of course, to shake off, by means of a gentle swaying of the downlead, or of the halyards, any snow which may happen to remain on the aerial system.

Snow, however, is not the greatest cold-weather enemy of the aerial system. As a matter of fact, a slight deposit of snow on an aerial will quickly be blown away—that is to say, if it remains *snow*.

Often enough, however, the snow turns to ice, which congeals around the aerial wire and insulators. More snow, perhaps, comes along after a while, and, maybe, the process is repeated, thus considerably

apart. Result, after the subsequent thaw—a weakened place in the wire.

Insulators, of course, may crack under the deteriorating influence of ice and snow, owing to similar causes.

Generally speaking, signals are not usually found to “go off” during snowy weather. Ice and snow are reasonably good insulators. It is when the thaw comes along that decreases in signal strength may appear owing to insulation-leakage troubles.

In many instances, the lead-in system of the aerial may prove a most vulnerable area in snowy weather. Snow and moisture may creep down the lead-in tube if the latter is not properly protected.

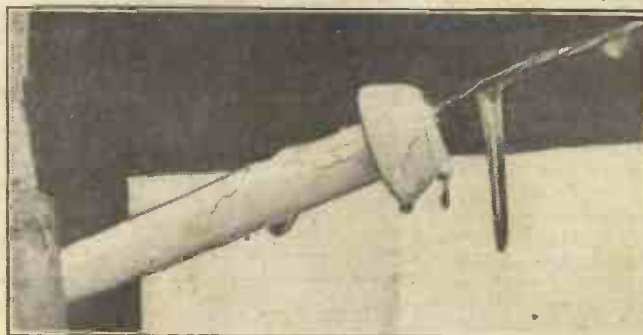
Leaky Lead-in Tubes.

They may freeze and so crack the tube, or, when the thaw comes, they may (and, indeed, they are most likely to) give rise to leakage troubles. See, therefore, that your lead-in system is in good order, and is well protected from

the elements during spells of cold, snowy and frosty weather.

There are cases where you have aerials suspended over house roofs, and in their neighbourhood may be chimney-pots. In such instances, although the aerial owners may have troubles galore owing to the metallic corrosion of the wires from the sulphurous gases of the chimneys, the same hot gases will serve to retain the aerial wires in a snow- and ice-free condition.

ICICLES ROUND THE INSULATOR



Keep your aerial free from snow and ice, for not only do they add considerable weight, but may cause the insulators and lead-in tube to crack.

increasing the total strain on the aerial points of suspension.

Besides this, there is another danger to be borne in mind in considering the effects of wintry weather upon an aerial system. I refer to the expansion of water in the process of freezing.

A drop or two of water may find its way between the strands of a stranded-wire aerial. The water then freezes, and, in freezing, it expands and forces the wires farther

Country aerials, however, and particularly those situated on moorland heights, are, I think, the ones which are the most likely to have to withstand the rigours of snowy weather, and it is to these that special attention should be paid during the winter's inclement spells.

Hailstorms have been known to throw an extra strain upon aerial systems, but, of course, the amateur can hardly guard against possibilities such as these.

LATEST BROADCASTING NEWS.

GOOD TALKS UP NORTH.
DUBLIN AT BELFAST—
THE ROOSTERS AGAIN—
LIVERPOOL CATHEDRAL—
CARDIFF MAKES MERRY, Etc.

THE regular talks on Current Topics by Mr. W. P. Crozier, Assistant-Editor of the "Manchester Guardian," have long been a feature of the Northern programmes.

This is a feature which the officials of the Talks Department at Savoy Hill might do well to examine, and—if they can overcome the prejudice that prevents them understanding the true value of a journalistic training—incorporate into their own trifling effusions as something worthy of the general requirements of listeners.

A Wonderful Summary.

The position of an assistant-editor (and there are scores about besides Mr. Crozier) is unique, inasmuch as it provides exceptional opportunities of access to the kind of material which the public really wants, while the long and intensive training of his profession supplies a critical ability unequalled in any other walk of life.

At the end of next week Mr. Crozier will finish another year of microphone work with a review of events in the North as they have happened in 1930. A year ago he gave a wonderful summary for 1929, and it is no idle boast to say that thousands of listeners will eagerly await his analysis of the many important phases of Northern life.

There is, of course, another side—the humorous—of current events, and this also will be the subject of a broadcast talk to Northern listeners on Tuesday evening, December 30th, when Mr. Gordon Phillips, "Lucio" of the "Manchester Guardian," speaks under the title of "The Purple Past—Light Relief in 1930."

Dublin at Belfast.

The good relations which seem to be now firmly established between the officials of the Irish Broadcasting Service at Dublin, and of the B.B.C. at Belfast, will result in another visit by the famous Abbey Players to the Ulster station on Monday, January 5th, to present two plays—Lady Gregory's "Spreading the News" and J. M. Synge's "The Shadow of the Glen." (The last-named is the author of the famous "Play-boy of the Western World.")

The Roosters Again.

A much appreciated item of the programmes for West Regional listeners, and one which has for its main object the provision of entertainment for blinded soldiers and sailors, is the concert organised by the Marchioness of Bute, which is to take place in the City Hall, Cardiff, on Saturday, January 10th. The programmes will consist of orchestral numbers, and an entertainment by what is probably the most famous of all war-time concert-parties to survive—the Roosters.

Liverpool Cathedral.

To Liverpool Cathedral, that truly magnificent building, the construction of which has just been completed on Merseyside, goes the microphone next Sunday evening, December 28th, for a relay from all stations taking the National programme of a "People's Service" at which the Rev. Canon C. E. Raven will preach.

The acoustic properties of the Cathedral make it particularly suitable for broadcasting, and as Canon Raven has a great reputation as a theologian and lecturer—he has been Hulsean Lecturer at Cambridge and Noble Lecturer at Harvard—the service will no doubt rank high among religious broadcasts of the year.

A Dickens' Fantasy.

Mr. Howard Rose, the senior producer under Mr. Val Gielgud at Savoy Hill, will be responsible for directing "A Pickwick Party" production for National listeners on Monday, December 29th.

This Dickens' dream fantasy, which has been

written by Stanley C. West, with music by Marjorie Broughton, takes place on Christmas Eve at the Marquis of Granby Inn, where most of the well-known characters in Dickens' works will come to life—namely, Sam Weller, which will be played by Kingsley Lark; Mr. Pickwick, Stanley Cooke; Mrs. Micawber, Gladys Palmer; Dora, Elsie Griffin; Jingle, Bernard Ansell; Mr. Warble, Robert Chignell; Mr. Micawber, Joseph Farrington; Sairey Gamp, Lena Maitland; and many others.

Cardiff Makes Merry.

Cox's Mayfair Café, at Cardiff, will be the rendezvous of all who want an enjoyable evening, on a date yet to be finally decided in mid-January, when the Cardiff Radio Traders' Ball, arranged under the auspices of the Cardiff and District Radio Club, will once again take place.

The proceedings, in so far as it is possible, will be broadcast, and listeners will look forward not only to the dance music, but to an excellent cabaret show which is in process of organisation. It is good to know that the proceeds are to be devoted to the Wireless for the Blind Fund.

Hogmanay in Scotland.

The officials in charge of Scottish broadcasting are delighted with their achievement in getting Mr. Walter Barrie to take the chair at the broadcast Hogmanay Ceremony which will be heard by all Scottish listeners on New Year's Eve. Mr. Barrie will be supported by singers and fiddlers who will illustrate his humorous remarks with old Scottish songs and tunes.

NEXT WEEK

The "New Coil"
DX UNIT

It gives you
MORE STATIONS
and
LESS INTERFERENCE

COMING SHORTLY:
"MAGIC" WAVE-CHANGING

How to adapt a "Magic" Set to incorporate the wonderful new "P.W." Dual Range Coil!



FOR THE LISTENER.

By "PHILEMON."

A critical survey of some of the recent programmes, with frank comments on the fare provided and the way it is served up.

A Christmas Story.

THAT was a good Christmas story James Whelan told us of a Scotsman who knew that the turkey was only big enough for his wife and himself, and therefore said to his four children: "Which of you would like a penny instead of turkey?" All hands went up, and they got their pennies, and watched their parents wolfing the bird.

And when the pudding came in, "Now, who will have a penn'orth of Christmas pudding?" said Pa. I trust the youngsters found some way of paying the old rascal out before the holidays were over.

A Debate on the Theatre.

Did you hear Mr. Hugh Walpole and Mr. Osbert Sitwell discussing "What's Wrong With the Theatre?" with Mr. C. B. Cochran butting in? It had interesting moments, but on the whole was not a very successful debate. The fault, I think, was Mr. Sitwell's, who had evidently prepared beforehand some extremely snorty criticisms which were so outrageous that it was difficult to give heed to them.

So the affair was one-sided; and with Mr. Walpole very amiable, and Mr. Cochran very cautious, the discussion got nowhere.

(Continued on page 780.)

THOSE RADIO PLAYS

by G.V. DOWDING, ASSOCIATE E.I.E.E.

Our Technical Editor pleads for life and laughter in radio drama rather than death and despair. He also has something to say about the presentation of B.B.C. plays, and the "crazy technique" often adopted.



WHAT do you expect for your ten-shilling licence fee? Entertainment? Education? Well, you get plenty of the latter, anyway, for the educationists have a firm grip on the organisation of Savoy Hill. But I, for one, am not quarrelling with them so long as they leave plenty of programme time clear for entertainment "pure and simple." Few of us want to listen even to one station all the time, let alone two, so selective listening is essential as well as being highly desirable.

Variety and Vaudeville.

What sort of entertainment does our radio give us? First and foremost, there is music, and we get plenty of that. There are dance bands, military bands, symphony orchestras, quintets, quartets, octets, nonets—every conceivable kind and size of musical combination, playing all sorts of music. On the whole, I think the music department does very well. Some of us may grumble at or deride the prominence given to the "highbrow" element, but an impartial examination of any week's programme reveals a pretty decent selection of diverse "numbers."

The variety and vaudeville departments keep their ends up excellently, although I do not think that they are given either the scope or the financial assistance they deserve.

There remains the Dramatic Department, and, from an entertainment point

of view, it is my opinion that it is failing us very badly indeed. The psychologist might find radio plays a highly interesting study. They say that the radio drama is in the process of developing a new technique. It is, and a more neurotic, morbid and depressing technique it would be hard to conceive.

Being, as I hope, an ordinary, normal kind of person, it gives me the shivers. During the past year or two I have watched this tendency towards broadcast neurosis with consternation.

That some of the plays are beautifully produced, and are simply magnetic in their appeal to the senses, makes it all the worse.

Those "Grave" Complexes.

Many of you may be violently disagreeing with me, but withhold your judgment until the end of this article; think the matter over, and then see if you don't revise your opinions.

Take first of all the selection of plays that are broadcast. I don't know who is responsible for this, but it is plain that he is riddled with "grave" complexes.

Here are just a few of the plays that have been put "on the air" by the B.B.C. during the past year or so. "Tintagel"

(the description of a child dying); "Danger" (death in a mine); "He" (a woman going mad); "The Flowers Are Not For You to Pick" (a drowning man's fleeting thoughts); "The First Second" (The first second after death); "The Crossing" (death in a train smash); "Obsession" (a man obsessed by the thought that he'd killed his brother); "Copy" (a re-enacted murder); "The Jest of Hahalabad" (predicted death).

Not a very cheery lot, is it? People certainly do go mad in real life, people die—we've all got to die—but I, for one, don't want my radio to remind me of such things. Every one of us has a morbid strain in our make-up which it is sometimes difficult to suppress, so I think it is unfair for the B.B.C. to go out of its way to stir it up.

I do hope that they don't make a practice of dramatic morbidity in order to "get over" effectively. That is a horrid thought. You see, there is nothing like a chilly death scene to grip the emotions. Every budding dramatist knows that, and every budding dramatist works a horrible death scene into one of his first plays. Afterwards, most of them realise that the "classicals" have a corner in such ideas, so they turn their attentions to the best modern method of ensuring success, i.e. the risqué. (But that is quite rightly barred by the B.B.C.)

More Neurosis.

I grant you that good comedies, or good dramas without deaths or Parisian touches, are very hard to write, but surely it is better to give healthy productions of such characters infrequently rather than descend to the depths of gloom and despair to complete standardised schedules?

Of course, there is a very large following for the morbid—note how well the newspapers sell during particularly ghastly murder trials—but surely the B.B.C. should leave such things alone.

So much for the selection of dramatic material. Now, how about the presentation? Here, the neurotic element seems to be at its best—or, I should say, worst.

A man is dying. The producer doesn't let him get it over nice and snappily. Oh, (Continued on page 778.)

"THE MAN WITH A FLOWER IN HIS MOUTH"



Referring to this play, of which the B.B.C. has broadcast a television version, Capt. Eckersley said in a "P.W." article: "The play itself is macabre in the extreme, and concerns, if my mind serves me, a man haunted by a filthy disease." The photo shows you a scene from the play.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



R.I.'s MAKING "P.W." COILS.

A GREAT compliment has been paid to the new "P.W." Dual Range coil. Radio Instruments are producing it in quantities! I believe this is the first time R.I.'s have diverted from the L.F. and mains sections of sets with a new H.F. component for about a year.



Messrs. Radio Instrument's version of the "P.W." and "M.W." Standard Dual-Range coil.

Further, I fancy it is the very first time R.I.'s have entered the market with a coil due to anyone except themselves.

But R.I.'s know that our new coil is a good coil and one that will do nothing to impair their very high reputation. And you may be absolutely certain that they would not place their trade mark on anything that did not reach a high standard.

As a proof of the thoroughness and enthusiasm with which Radio Instruments devote themselves to the manufacture of radio apparatus, it can be mentioned that every one of these dual range coils they are making is given an independent test both for wave-length and inductance on every one of the windings.

I have had several of the R.I. versions of our standard coil unit sent to me and I have no hesitation in saying that they are excellent pieces of work—every bit as good as our own original models in point of electrical efficiency, but a hundred or so times superior in regard to workmanship and finish! But then, they were wound on large precision machines, while our own were laboriously wound by hand!

But the very best feature of the R.I. coil unit is its price—12s. 6d., which is of course, as cheap as any that are made. In that it is an R.I. it becomes real value for money!

It is to be obtainable through all the usual factors and dealers.

A COLOURED LEAFLET.

J. J. Eastick & Sons, Ltd., offer to send to any reader a copy of their latest coloured leaflet of Ealex products.

NEW RED DIAMOND SWITCH.

The Jewel Pen Co., Ltd., announce a useful addition to their range of Red Diamond switches. This is a single-pole double-throw type, having a push-pull action and arranged for single-hole panel mounting, that has a dead spindle.

By insulating the spindle from the various contacts and terminals, the switch can be used on a metal panel without having to be insulated in any way.

A switch of this kind is also very useful for certain wave-change and pick-up

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.

switchings. It is a well-made article having a neat, definite action. The terminals are of a substantial character and carefully placed to facilitate wiring.

CONCERNING PUSH-PULL.

Ferranti, Ltd., inform us that they are now able to supply their Push-Pull Audio-Frequency transformers with separate grid bias tapping on the secondary to enable the output valves to be biased separately where required.

This is not at present a standard arrangement, but can be carried out at a cost, additional to the list price, of 5s.

Ferranti's say that if valves are within 20 per cent of their rated characteristics they do not consider separate biasing desirable, and that they are also of the opinion that most valves should be sufficiently near in their characteristics not to necessitate this separate biasing. But they have arranged to supply transformers as above, as such consistency is not always met with in the case of the very large valves.

CLIX ANODE CONNECTOR.

If you use an S.G. valve you will find a Clix Anode Connector a safe and tidy method of making connection to its top terminal. It is certainly a most useful addition to that fine range of Lectro-Linx's terminal devices which contributes so much to trouble-free radio.

BURNDIPT RADIO RECEIVER.

In home-constructor sets appearance is an important factor to which designers and constructors alike pay strict attention. Nevertheless, in a commercial set appearance is even more vital. To be completely successful, it is quite essential that a set should have a first-class shop-window and showroom "presence."

In this respect the Burndept A.C. receiver de luxe is advantageously placed. Its appearance is striking, and yet unostentatious. It has those compact lines which suggest woodwork fashioned for a set, and not a radio receiver built into a cabinet.

It is an all-mains outfit, and it uses a screened grid H.F. valve, and one of those new Mazda A.C. Pens. It has a valve rectifier and complies throughout with the latest I.E.E. regulations.

The two-wave bands it covers are 210 to 560 and 900 to 2,100 metres. The reaction is smooth throughout. The outfit gives plenty of volume from a number of stations when used with an outdoor aerial and the selectivity is adequate. Altogether it is a fine set.

CORTABS DE LUXE.

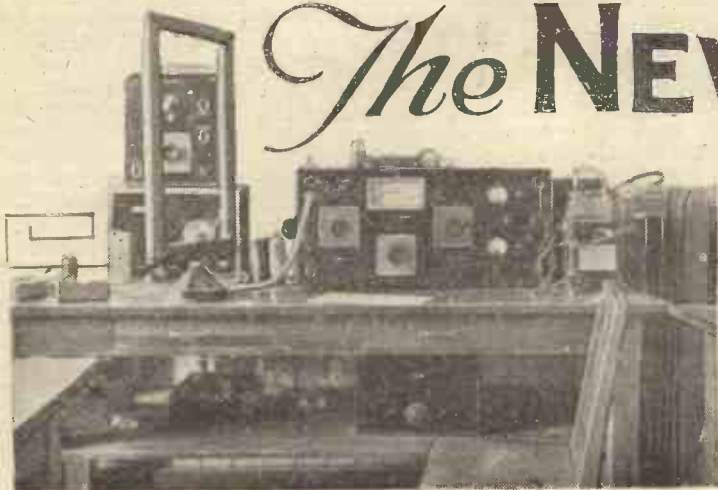
These are label devices for leads. Each Cortab is provided with two holes through which the lead is threaded. There is a very plain marking such as "H.T.+3" followed by a white space and then "volts." You can write in the space with a pencil the actual volts you find needed.

A packet of Cortabs de Luxe, sufficient in number and markings for an up-to-date set including S.G. and pentode valves, costs one shilling. They are made by those well-known ivorine specialists, Money, Hicks, Ltd.



The Burndept A.C. receiver has a handsome appearance, as you can see. Down control tuning is provided, and the loud-speaker is situated behind the ornamental fret.

The NEW ARDENNE RADIO



By OUR BERLIN CORRESPONDENT.

The description of a wonderful scheme originated by a well-known Berlin radio engineer. If it is put into practice by the German broadcasting people, as is quite possible, distant stations will be brought to the "door-steps" of the lucky listeners concerned.

THERE is, of course, a striking difference between receiving conditions in city areas on the one hand, and in the open country on the other. The field-strengths of remote stations in large cities are reduced to small fractions of what they are in the open country, whereas, on the other hand, interference is several times as strong.

This is why remote stations can, within the precincts of cities and in their immediate neighbourhood, be received only with the very best and most elaborate sets.

It has occurred to Manfred von Ardenne, the well-known radio engineer, of Berlin-Lichterfelde, that a very efficient means of securing satisfactory reception with simple and inexpensive sets would be obtained by raising the field intensity of remote transmitters sufficiently to drown all interference. How this is possible will be briefly stated in the following:

An Ingenious Scheme.

Outside the city, where there is no material absorption of waves coming from remote stations (whereas within the city area, this may grow up to 90 per cent), and where the average of interference is only about 1 to 2 micro-volt/metre (as against 50 to 100 micro-volt/metre inside the city), there is installed a high grade receiving plant.

This receives and amplifies the fields of a certain number of remote transmitters. This modulated high-frequency of certain remote transmitters is used to modulate an ultra-short wave radiated by beams into the centre of the city.

The transmitted high-frequency, or rather the transmitted field of remote transmitters, is there filtered out and, after due amplification, radiated from a relay transmitter the energy of which has been so designed as to secure throughout the city area a field intensity of remote transmitters amounting to 10 to 20 per cent of that of the local transmitter. This would enable excellent reception to be obtained with the very simplest type of two or three-tube feed-back receivers, with the same minimum of interference as in receiving the local transmitter.

Selective or Aperiodic!

There are two varieties of field amplification, viz., selective and aperiodic amplification; whereas the former comprises the transmission of a given number of transmitters, e.g. the ten best European trans-

mitters, aperiodic field amplification, according to von Ardenne, means the transmission of the whole range of radio waves between, e.g. 200 and 600 metres.

Selective amplification should preferably be used to begin with, being more simple to carry out in actual practice and entailing the use of a considerably smaller relay transmitter. A simple calculation shows that in a city of the size of, say, Greater Berlin a 10-kw. relay transmitter would be quite sufficient.

Making D X "Local."

The operating expenses of a field amplifier plant are of about the same order of magnitude as those of a normal radio transmitter.

Reception, according to von Ardenne's scheme, then, is as selective as in connection with high-grade multiple-circuit receivers, and as free from interference as local reception.

Inasmuch as each large city can be fitted with a field amplifier such as this, an extraordinary increase in the number of subscribers is to be anticipated.

Selective programmes, which for technical reasons could not be strictly realised even in connection with Berlin and Koenigs-wusterhausen, will thus be placed at the disposal of European listeners. The best European transmitters being chosen for transmission, listeners in city areas will have the same international choice of programmes as those living in the country.

It may be said that the most important problem in connection with this scheme, viz. the multiple modulation of ultra-short waves, has been solved satisfactorily, that any interference by the local transmitter—or, inversely, interference in the local transmitter by field amplification—is strictly avoided, that fading in the remote transmitters is balanced by a special compensation in the relay receiver.

May be Tried.

At the recent joint meeting of the German Electrical Society and the Heinrich Hertz Radio Society this scheme was placed before an expert audience by von Ardenne, who in this case, as in connection with his well-known triple radio valve, has been co-operating with Dr. S. Loewe.

The debate following the young inventor's address, of course, brought out a certain amount of adverse criticism, but the general impression was that the scheme was well worth a trial. This was also the opinion expressed by Dr. Bredow, Secretary of State for Wireless Broadcasting, who, in the course of the debate, insisted on the desirability of this test.

ARDENNE'S APERIODIC AMPLIFIER



The aperiodic high-frequency power amplifier used by von Ardenne in experiments with his interesting radio programme rediffusion scheme.

SHORT-WAVE NOTES.

Have you heard all six continents on telephony? Below you will find a useful hint in this connection, together with "red-hot" news about short-wave stations worth listening for and details of a suggested test.

By W. L. S.

THERE is just time to wish a last-minute "Happy Christmas" to all my English readers; and I must apologise to all the short-wavers overseas for forgetting that their copy will take some time to arrive. But, at all events to them I can sincerely wish "A Prosperous and Interesting New Year."

Whether the tremendous pile of letters I have accumulated is supposed to represent a sudden revival, or merely a new form of Christmas cards, I cannot say. The fact remains, however, that my correspondence nowadays covers a generous portion of the breakfast table, and I am left marvelling at the time people find to listen all over the short-wave spectrum and discover new stations.

Complete Call-Sign List.

First of all let me answer those who are desirous of getting hold of a complete list of amateur call-signs. The "Amateur Call-Book" can be obtained from the R.S.G.B. at 53, Victoria Street, S.W.1, price 4s. to non-members, and contains the addresses of all the world's amateurs, kept up-to-date month by month.

Next we have a crop of letters about LSX, Buenos Aires, who is in great demand as being capable of supplying that sixth continent! The other five are easily received, but if we take North and South America as separate continents (as the A.R.R.L. do), we do not find many listeners who have heard all six of them on telephony.

My most reliable source of information quotes him as working on 28.98 metres daily from 0100 to 0400 G.M.T. His full title is "Grad-Radio, Buenos Aires," and not "Grand Radio," which is a pardonable error.

His transmissions consist mostly of gramophone records, and are received at excellent strength all over England. On a two-valver, last time I sat up as late as that, I had him at comfortable speaker strength.

Transatlantic Working.

W2XAF is also very good in the evenings nowadays (on 31.5 metres, of course) although conditions from Transatlantic work on the amateur bands are very poor indeed.

Re VK2ME, about which sundry enquiries have been reaching me, he is only an experimental station, and on his own admission he has no regular hours at all. When he is on he works on 31.28 metres and relays VK2BL and VK2FC, the two big long-wave broadcast stations.

Next, with reference to the crowd in the neighbourhood of 50 metres. "J.O.", of Nottingham, reports the consistent reception, with a "Magic Four," of W3XAL on 49.18; W8XK on 48.86; W2XE on 49.02; W9XF on 49.83 (this latter being Chicago), and a Toronto station on 49.22. Quite a good bag for a band one metre wide!

This same reader reports 5SW and PCJ

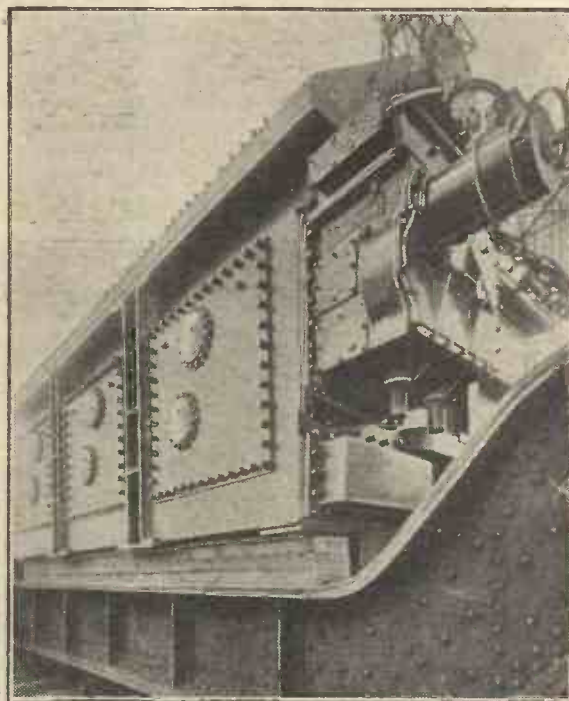
very poor, but Lyngby, Zeesen and Rome overpowering. Incidentally, I do not know how many try to get Rome or 80 metres nowadays, but he is far stronger to me on that wave than he was on 25.4. On 80 he is actually about the same audio strength as Brookmans Park on the same receiver!

Use of Old Prefix.

Now for an interlude. It is rather remarkable to note that two separate readers have heard Morse stations signing "EU—" and then the call-sign, and comment that in the new books ETA-ETZ are given as Ethiopia, with no mention of "EUA-EUZ."

The answer to this riddle is that the Russian amateurs are still using the prefix "EU" that was allotted by the A.R.R.L.

NOT FOR A SHORT-WAVER!



This is a photograph of a huge 60,000 KVA capacity transformer recently built by Messrs. Ferranti, Ltd., for working at 132,000 volts. It is shown on a special type of railway truck employed to convey monster transformers.

in 1926 or so, and refuse to recognise Washington Convention suggestions. Their prefix should be RA, but they invariable use EU, and, moreover, call the station they are working by its old prefix instead of the new one!

Reception of Amateurs.

On the subject of amateur transmissions, several readers have at some time reported excellent reception from I-1MM, the Italian amateur working on the 40-metre band until a few weeks back, when he

suddenly disappeared. Other excellent transmissions logged on 40 metres were from G5TZ (Coves), G6WT (Cornwall), G6RG (Galashiels) and a number of Londoners whom it would be invidious to single out. I-1RO is off the air because he appears to be on a visit to the United States.

I wonder how many readers could guess the actual number of regular broadcast transmissions between 10 and 80 metres? I am afraid I shall not be believed when I state that it exceeds 100, but that is so! And I propose for the next few weeks to give details of some of those not too often heard in this country.

Try for These Stations.

Just to liven things up I also invite claims from readers who think they are the first to hear any of them. This week I suggest the following: RV15, Khabarovsk, Siberia, on 70.2, from 0900 to 1200 G.M.T. VE9CL, Winnipeg, Manitoba, on 49.5 from 2330 onwards. VPD, Suva, Fiji, on 38.0, daily at irregular times.

PK6KZ, Makassar, Celebes, on 25.5, from 1140 to 1440. (I think a special order of merit might be instituted for this one!) FZR, Saigon, Indo-China, on 18.5, daily at irregular times.

Just in case I am thought a hypocrite, I may as well say that I have heard three of the above myself, but confess that the others have beaten me completely. I will look out another five specimens for next week!

Another interesting test that I propose to carry out one day is to name a certain period of six or twelve hours, and to invite readers to send in a complete list of all short-wave stations heard during that time. As well as being interesting from the "rivalry" point of view, this would also be quite valuable in furnishing information concerning the locations in which certain stations are best received. I am sure the Editor will not mind displaying the name of the sender of the best list, together with the list, in prominent type. I do not, however, propose to award a "W.L.S. Cake" every week.

WAVE-LENGTH INFORMATION

Some Interesting Short-Wave Brevities.

The Canary Islands have recently been testing on a wave-length of 41.7 metres from 10.30 p.m. onwards.

The Barcelona Radio Club sends out gramophone records and news on 50 metres every Saturday between 8 and 9 p.m.

Turin recently altered its wave-length to 29.62 metres.

Recent experiments show that much of the energy radiated between 5 and 8 metres breaks through the Heaviside Layer and is lost.

WHERE THE MILLIAMPS GO



Have you ever considered exactly why your H.T. battery runs down so quickly, just where the juice is going? This short article provides some useful data on the vexed subject of anode current consumption.

By K. D. ROGERS.

ON the face of it this seems rather a peculiar title for an article, doesn't it?

I can imagine you all saying: "Of course we know where the milliamps go—into the set!"

Quite right, but where into the set do they mostly go? You naturally reply: "The L.F. portion of it." And you probably leave it at that with a feeling that, in any case, it is no good talking about where the milliamps go, and that once gone they cannot be brought back.

That's perfectly true, but one can, after all, control their going. In the first place, let us get it into our minds that if we want really good loud-speaker reproduction, those milliamps have got to go. We can economise to a certain extent, although, perhaps, we cannot economise as much as we should like.

"Can I Cut Them Down?"

For instance, if you are the owner of a three-valve set using a screened-grid detector, and an output valve, and you want good pure reproduction from your local, you have got to supply that set with a certain number of milliamps.

Probably you can get quite good loud-speaker reproduction with about ten to twelve. But you say: "Oh, but that's a costly job. Cannot I cut it down?" You can cut it down, but you run a risk of spoiling the reproduction. Let us examine it more closely. The screened-grid valve takes a certain amount of anode current and screened-grid current. We will allow it

3 or 4 milliamps. It will take about that when properly biased, I expect. The detector takes a negligible quantity—call it a half, or call it one, but for the sake of argument we will call it one. That's 4 or 5 milliamps so far, and leaves five or a little more for the last valve.

Now, in order to work a loud speaker properly we must have a fairly large plate

POWERFUL PENTODES



Pentode valves are inclined to "walk-off" with more milliamps than we expect. The Lissen on the left is fairly economical, while the 2-volt Mullard takes a total of about 16 m/a. max.

current variation in the anode circuit of the last valve. In other words, we want milliamps.

Now, a small power valve takes about 5 milliamps or more. Without a large anode current we obviously can't get a very large anode current charge, and therefore the valve cannot be expected to carry a very large signal to provide the loud speaker with energy.

So if we use a small power valve we shall get a certain amount of amplification and a certain amount of power, but we must beware that we do not overload the valve on the local station.

An Expensive Business.

In order to be able to carry a bigger input voltage, and therefore to provide a bigger output, one must have a larger power valve, always assuming, of course, that the set is capable of providing a fair input to that valve, as it will in the case of our S.G. three-valver.

But this larger power valve, unfortunately, wants more milliamps. This is going to be rather an expensive business if run from a dry battery? Yes, I am afraid it is, and that is why mains high-tension is becoming so popular.

For all but moderately small sets—that is,

sets taking not more than 7 milliamps, it is not an economical job to use ordinary small dry H.T. batteries. The double- or the triple-capacity batteries are much more economical in the end, though they cost more initially; and whether you use a small or a large set, if you can possibly run it off the mains, do so. You will gain a big advantage.

People who use moving-coil speakers, and want big volume out of their speakers, usually look upon 20 milliamps as nothing really large, and those 20 milliamps very often go mainly in the last stage.

To Work a Moving Coil.

During the last few months we have had placed on the market a new 4-volt valve, the P.X.4, for use either with A.C. or battery filament supply, and which takes 6 amp. on the filament. It has an anode consumption, when properly biased, of something like 40 to 50 milliamps. That's a lot, but it takes a lot to run a moving-coil speaker at really loud volume, and if you have ever used one of those valves you will be surprised at the comparative ease with which even that type of valve will overload. In other words, it's not a colossal valve, after all.

But most of us do not want a valve of that calibre. I only take that as an example of where the milliamps can go if we like to let them. Fifteen to twenty milliamps is usually enough for a sensitive speaker even of the moving-coil type in an ordinary small living-room. It is unnatural or unpleasant to

(Continued on next page.)

TWO HUNGRY VALVES



The P.X.4 and the Mazda A.C. Pen, two valves designed for output work. The former takes about 50 m/a. (max) and the latter 25-30 m/a.

MORE MAINS TYPES



The Corsor A.C. Power and the Six-Sixty 4X S.G. A.C. valve.

WHERE THE MILLIAMPS GO

(Continued from previous page.)

have a loud speaker going so strong that it shakes the floor and gives you the impression that the orchestra or brass band is actually in the room. No one would think of inviting a brass band into a small drawing-room, and unless you want that sort of volume there is no need to go for that really high milliamperage. Up to twenty is usually quite sufficient.

PUNCH!



The Osram P.625 A, which takes 25 milliamps, can provide plenty of output power.

Not Easy!

But it is not easy to get up to twenty unless one uses a mains unit, and that is why I want to stress the advantage of the mains unit and the all-mains set. To run a set having a 15- or 20-milliamps consumption in anything like an economical manner without a mains unit (and when I say economical I

mean comparatively so) one has to use a triple-capacity H.T. battery, and these are expensive.

I do not want you to think that I am advocating high H.T. wattage consumption. I do not like high anode consumption any more than you do, but with the present design of valves, in many cases it's got to be.

A valve is not capable of manufacturing power; it has got to get it from somewhere, and, neglecting the power supplied to the filament, it comes from the H.T. battery or mains unit, in the form of milliamps at a certain voltage.

What They Take.

Now, if you look at a list of modern power valves, you will find very few that do not want seven or more milliamps.

To work a three-valve set having two L.F. stages, quite satisfactorily, you need a super-power valve in the last stage, and that super-power valve is greedy. It wants milliamps; it wants seven or ten or more, according to the size of valve, dependent in turn upon the loudness of reproduction you want from your speaker. And so we see where most of those milliamps go.

And now, as a rough guide for set constructors, let us list in a general form the various types of valves and see how greedy or otherwise they are.

Resistance-capacity valves want half a milliamp. Detector valves, as a rule, want about half to 1 milliamp, if not of the power-detector type. Ordinary type H.F. valves want about 1 milliamp. Screened-

grid valves, even when biased, may want from 2½ to 4 or 5. First L.F. valves can usually get along all right with about 2 or 3. Second L.F. valves, if not super-power or big output valves, can usually manage with 4 or 5; and small output valves usually want between 5 and 8. Super-power valves of the small type, such as the P.2 or the P.220 want about 10; and when we get past these to the P.220A we find that 12 or 14 milliamps is not too much. Then the P.240 is a hungry valve, requiring still more, and finally we come to the range of really large super-power valves, such as the P.625, with 16 to 18, and the P.625A with 20 to 25 milliamps. Pentodes we must also look after, or they will sneak away with more milliamps than we expect.

Don't Under-Bias.

The above figures are given with approximately 120 volts H.T., and it is supposed that the valves are properly biased. If you do not bias them properly you naturally alter the milliamp consumption. If you give them too much bias you lower the milliamperage and may ruin the quality of reproduction, though a little overbiasing is sometimes beneficial in saving H.T., but *under-biasing* must be guarded against, as one would the plague. It is costly in regard to milliamps, and it may be costly as regards the emission of the valve (which, after all, is the same as the milliamps), and therefore the life of the valve.

Watch the Pentode.

So watch that last stage. If you use a pentode, watch it more than ever, for pentodes have a nasty sly way of getting rid of milliamps without one knowing. One reckons the plate of a pentode may take say, 12 milliamps, but one is liable to forget

PLENTY OF POWER



A corner of the new "Exide" accumulator store opened at Bristol by the Chloride Electrical Co. Ltd.

the screening grid, which usually "walk off" with another three or four, depending on the make of the valve.

I know one pentode valve which takes 26 milliamps on the anode when properly biased, and on top of that the screening grid takes another seven, bringing the total up to 33—no joke for a person with only a dry battery or a small mains eliminator.

So do not forget when next you build your set, or if you consider buying a mains unit, that you want to take carefully into consideration those milliamps. You want to make sure you can supply all the milli-

amps required by your set at the correct voltage. If you are on the mains there is no need to grudge a few milliamps to your power valve—it will repay you a thousand-fold; but if you use dry batteries you have to be more careful.

Calculating the Consumption.

Before you build a new set, therefore, work out in your own mind how many milliamps it wants, to see if you can supply them. Nothing is more disheartening than to build a set, to get the valves and then find that either your batteries do not last long, or that the mains eliminator hums like fun simply because it is trying to supply too many milliamps.

A valve-maker's catalogue will soon show you how much anode current each valve is going to take, and by adding the figures so obtained together you get the total consumption of your set. It is very surprising how rapidly those milliamps add up.

FOR THE CONSTRUCTOR

S.G. VALVES, USING UNITS, Etc.

When joining up a flexible wire to the terminal on the top of the bulb of a screened-grid valve, remember that the thread on the nut should not be strained by tightening with pliers, as a good finger-tight connection is quite satisfactory.

If you use a D.C.—H.T. mains unit, it is an excellent plan to insert a .001-mfd. condenser (fixed) in series with your aerial terminal inside the set.

Do not destroy the leaflets and instruction charts which you may get from time to time when purchasing components. Use a drawing-pin to hold them all inside the lid of the set, where they will always be easy to find and may prove invaluable if you decide to alter the circuit in some way.

The lead-in from an indoor aerial, as from an outdoor aerial, should generally come from one end of the parallel wire (or wires), or from the centre.

An extra pair of "hands" for holding small work while it is soldered can easily be improvised by slipping a strong elastic band over the handle of a pair of pliers.

SUCCESSFUL SOLDERING.

The golden rule for successful soldering is to keep the iron and work clean, and at the correct temperature.

The numbers on a tuning dial have no direct relation to wave-length, but merely indicate the position of the moving plates in relation to the fixed plates.

If you wish to relate the figures on your condenser dials to the wave-lengths covered you must "calibrate" the set.

"Calibration" simply means the preparation of a list, chart or table showing wave-length figures and the corresponding condenser dial reading.

A calibration "curve" not only enables you to refer back to stations previously picked up but it also shows you the condenser readings for other stations.

BROADCASTING IN 2030!

A short time ago British broadcasting celebrated its eighth birthday; the completion of eight years of progress in microphone science and art. In less than ten years radio has revolutionised the world, tremendous strides having been made.

If all this happens in less than a decade, what will a century bring?

That is the question which famous broadcasters and writers venture to debate in this interesting symposium.

CHRISTOPHER STONE,
The Gramophone Critic.

IN a recent British film it was indicated that in ten years we shall have combined wireless telephones and televisors in everyday use. If this is going to happen in ten years, and remembering what has happened in the past ten years, how shall I debate what shall be a century hence? No, I can merely indicate the general trend of the way things will probably go.

In my own field, gentlemen, one thing is certain. The circular gramophone disc will go. It will be replaced by some kind of sound-on-film system in a long roll, corresponding very closely to the manuscript rolls we had in the early days of writing. Thus, there will be no need to break up a symphony into twelve equal parts and jump up to turn the record at each part until the effect of the music is ruined twelve different times.

Portable Sets Paramount?

We shall just sit still and do nothing, as the fortunate possessors of gramophones which automatically change the records are able to do to-day.

Also, I see much in the portable set. In all probability the fundamental system

A "RECORD" BROADCASTER



Mr. Christopher Stone, who is a brother-in-law of Compton Mackenzie, is well-known for his gramophone record broadcasts.

underlying this idea will be expanded until every radio gramophone — there will be no mere separate radio receivers or gramophones — will be all electric, without aerial or earth, and equipped with television apparatus by which we shall see studio programmes, current events, or the latest films according to the alternative programme we select — there will be dozens from which to choose. But we shall probably have these things within thirty years and they may be antiquated and out of date before 2030.

Before care-free wireless sets can become

universal, however, every country will have to be "electrified." Several European countries are still relying on gas for their main power, so there is still much to be done.

SIGNOR ARTURO TOSCANINI,
The Famous Italian Conductor (in a special interview).

Broadcasting certainly has done a lot in its ten years of life, but I am not altogether sure that its work has been "to the good" as you say. In the world of music, at least, radio has done nothing but separate the heart of music from its body. At the moment, you cannot hear an orchestra through a loud speaker. You merely hear a tune — a very, very different thing. The ordinary loud speaker of to-day has no more to do with true music than has a hurdy-gurdy.

GREAT AMERICAN CONDUCTOR



Toscanini, the world-renowned conductor, who recently gave a series of concerts at the Queen's Hall, with the New York Philharmonic Orchestra.

It is hoped, however, that within a century much change will have been wrought. Broadcasting on the Continent and in America must be freed from the chains, either of State or of Advertising, which encompass it. If I had my way, every broadcasting station should be ruled by a selected body of musicians, dramatists, and other satellites of the creative arts.

Waiting for the Perfect Speaker.

Eventually a perfect loud speaker will be invented, and then every sphere of human activity, the placing of each separate brick on the wall of civilisation will be broadcast from one station or another.

Not a public event but will not be described to listeners, not a concert that will not be overheard by the microphone, not a single speech of note that will not be followed by millions.

There will be no studios as we know them. Every place will be adapted to the



microphone, and the broadcasting headquarters will be occupied only by programme organisers and engineers.

VERNON BARTLETT,
Whose informative treatment of international affairs forms one of the most popular features in the programmes.

I believe that the discovery of wireless will prove to be much more important than that of printing. With its help, in a hundred years, war will certainly have disappeared; this method of settling disputes has long since ceased to be profitable, for the means of waging war have become so expensive that both victor and vanquished are ruined by it.

End of Language Barrier.

But misunderstanding, fear and distrust have often proved more powerful than commonsense. In 100 years, we shall, I suppose, have such a development of wireless communications that even the most remote parts of the world will be at least as well known to us as our next-door neighbours are to-day.

Propaganda will be useless as a method of working up the feelings of one nation against another. Indeed, I doubt if nations as we know them to-day will still exist, because we shall have rid ourselves of the barrier of languages.

Some international tongue will be universally spoken, as Latin was spoken by the relatively few educated people in the Middle Ages, and we shall not think of a German or a Russian or a Siamese as being

"NO MORE WAR"



Mr. Vernon Bartlett believes broadcasting will eventually ensure international peace.

(Continued on next page.)

ROUND THE WORLD WITH THE "P.W." "MAGIC" THREE

A fascinating account of a "P.W." reader's experiences with the "Magic" Three in all corners of the globe.

The Editor, POPULAR WIRELESS.

Dear Sir,—Perhaps the following notes of a voyage round the world, using a "Magic" Three circuit will be of interest to S.W. enthusiasts. Results seem to me excellent, considering that home-made coils (without bases) and unsuitable valves with only 80 volts H.T. and long battery leads were used.

Leaving England en route to Panama and New Zealand, and after getting the "feel" of the set, 5 SW, W 2 X A F, W 8 X K, P C J, etc., were heard regularly every night at good strength to Panama. Although the Pacific is noted for long ranges, this did not seem to apply to 5 SW, as Le disappeared completely for over a fortnight, but W 8 X K remained at excellent strength all the way to New Zealand.

"Local" Stations.

Apart from what one might term "locals" out there—Saigon, V K 3 M E, V K 2 M E, 7 L O, K Z R M, P L W, etc.—W 9 X F, W 8 X K were the best signals. I was one of the few in Melbourne to receive the obsequies for R101 victims via 5 SW. The latter on this occasion being very weak and fading marked.

Leaving Melbourne for home via Suez, 5 SW put in an appearance R 5 and stayed put all the way to European waters. Curiously enough, Zeesen, a station one sees boosted frequently as A1 abroad, was never heard at more than a whisper.

Rome on 25 metres came in at great strength several nights, until the wave was altered, and it was 10 days before I found her up near 60 metres, at equally good strength. Moscow on about 45 metres is a powerful signal.

The Buenos Aires Station.

I have just read Mr. Easter's letter in "P.W." November 1st, 1930, and can corroborate his remarks re the Buenos Aires transmission, except that I got the call as L S X pronounced "elley essey eckeo."

The station is situated at Monte Grande, Buenos Aires, and will, I believe, be eventually used as the telephony link with Europe. He was at great strength in the Red Sea on the speaker at 01.00 G.M.T.

The amateur radio club station of Socrabaja, Java, was heard on several occasions, and I placed his wave between 49.5 and 50; times of transmission between 12.30 G.M.T. and 15.00 G.M.T. when heard. The power used is low.

I was able, on the Indian Ocean, to receive the ratification ceremony of the London Naval Treaty from stations K E L (Bolinias Cal. 43.7), K B K (Manila 44.91), J I A A (Tokyo, approx. 38.5), V K 2 M E

(Sydney), 2 X A F and 5 S W. The latter was clearest and steadiest throughout the broadcast.

Commercial and amateur stations too numerous to mention were heard. At the time of writing, in Dunkirk, I have just been listening to Radio Saigon on 49 metres at good 'phone strength. This station closes down daily between 15.15 and 15.35 G.M.T.

Interval signal, stroke on a bell, but no direct mention of station name. Announcements are thus, in French: "Vous avez entendu—interprété par l'orchestre de Radio Saigon." Chinese programme about 12.30 G.M.T.

With good wishes to your excellent paper,

Yours faithfully,

"SEAGOING FAN."

Ed. Note.—It will be remembered that Mr. Easter in his letter said:—"A new short-wave broadcast station for British listeners to try for is L S H at Buenos Aires, Argentine. It is on the air from 8 to 10 p.m., eastern time, which corresponds to 01.00 to 03.00 G.M.T. I have been hearing it for a time now, but as the announcing is all in Spanish I was not able to identify it at first. The wave-length is 28.9 metres."

"BON SOIR, MESSIEURS"



M. Stephan broadcasting one of his famous French lessons from the London station.

BROADCASTING IN 2030!

(Continued from previous page.)

much more of a stranger than a man of to-day who comes from some other part of the British Isles and speaks a different dialect.

In all this the League of Nations (as the political organisation), aviation (as the quickest means of transport), and broadcasting in all its forms (as the most effective method of exchanging ideas) will play a very important part. In fact, without broadcasting, I doubt if the ideal of close political co-operation between all nations could possibly be achieved.

MONSIEUR E. M. STEPHAN, famous for his "French Lessons."

I agree with Mr. Bartlett. Solely through the tremendous power of broadcasting, I believe, long before another century has passed, perhaps within fifty or sixty years, that we shall see an International language.

This will be based on a mixture of English and American, varied in different countries only according to the accent of the country concerned. Thus, some of the outrageous

slang terms of the present will be respectable words in the future.

Wireless tends to standardise speech. Above all, it tends to standardise English. Even at the present time, we have many Continental stations giving frequent announcements in your language, and more people are learning it every day. With the advent of broadcasting over three hundred million people have come within its reach.

When Everyone Speaks English.

This is inevitable. Certain languages must disappear and must give way to English in the same way as the language of Brittany once gave way to the language of the French and is now little heard.

French, itself, is losing the footing it has long had as an international language, the language of diplomacy. English is replacing it. Similarly, the Bulgarian and Serbian languages are marked out for death. Radio is the murderer.

Yes, in a hundred years' time we shall all speak one language; the outlandish tongue of "the foreigner" will have disappeared.

MOORSIDE EDGE THE LATEST NEWS.

THE possibility that the North Regional station may not be in service as soon as was anticipated is indicated by an address given by the North Regional Director of the B.B.C., Mr. E. G. D. Liveing, at the Huddersfield Rotary Club.

Mr. Liveing said that the test transmissions would start early in the New Year. The B.B.C. did not intend to commit itself to any dates, but after a period of experiment the North Regional programme would be sent out on 479 metres, and later the National programme would start on 301 metres. Listeners could be certain that they would be receiving a full alternative programme service in June.

Mr. Liveing also hinted that it is not absolutely certain that the new high-power station will replace all the present North of England stations, except Newcastle. It has been known for some time that the Newcastle transmitter will be retained.

Relays to Remain ?

Mr. Liveing said that it was not intended to abolish the small relay transmitters in some of the outlying parts of the North of England until the B.B.C. was satisfied that listeners in those areas were obtaining a good service from Moorside Edge.

Presumably this refers to the Hull, Liverpool, and Stoke-on-Trent transmitters. Hull is 65 miles from Moorside Edge, Liverpool 48, and Stoke 45.

These ranges are, of course, only a very rough indication. Nevertheless, they appear to show that there is a risk, especially in Hull, of the new station (particularly on its 301-metres transmission) not being able to provide as good a service to these outlying towns as they obtain from their local transmitters.

An aerial, apparently of an experimental nature, has been slung between two of the masts at Moorside Edge; so perhaps, even if public tests do not start until the New Year, private tests will be carried out this month.

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CAPT. ECKERSLEY'S QUERY CORNER

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.

Switches for H.F. Circuits.

B. R. A. (Glasgow).—"I am about to purchase some switches for H.F. work, but in view of the advice published from time to time as to the necessity for using switches adapted for this class of work, I should be glad if you would advise me as to how to tell switches which have characteristics which make them suitable for use in H.F. circuits."

Your question is a little ambiguous. I do not know if capacity to earth is a serious factor or not, because I do not know in what circuit you propose using the switches.

But reading between the lines, are you not considering wave-change switches? If you are, capacity to earth does not usually matter, because your inductance is, in any case, in parallel with a relatively large condenser.

There are, of course, dielectric losses and the switches should therefore be mounted on good insulation, not "muckite." The contacts require to rub on and off and want to be particularly good if the voltages and currents are small.

If you are switching H.F. in non-resonant circuits capacity effects may be serious.

Choke Coupling.

M. S. (Plumstead).—"I have a couple of good high-inductance chokes, and I am thinking of using them for a super amplifier I am constructing. I have been told that these chokes will not give me such a good frequency characteristic as resistance coupling, and that the self-capacity of them will produce a noticeable high note loss."

"Will you please tell me whether this is likely to be the case?"

The point about choke-capacity coupling is that the phases of the voltages grid to earth, anode to earth, are largely different, and that the chokes and condensers may produce widely different impedances on different circuits throughout the frequency range, and so upset the conditions of magnification.

Furthermore, the "good high inductance chokes" do not necessarily give the correct anode impedance, even for good high-emission valves, and it is better to choose the correct value of resistance than the widely varying and incorrect value of choke.

No! Choke-capacity coupling is excellent when avoiding patents and making money, but I should not use it for your own purposes.

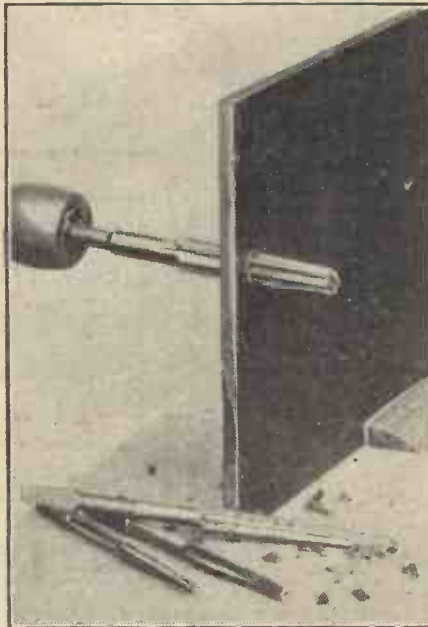
Morse "Modulation."

"INTERESTED" (St. Albans).—"Whilst listening to a recent outside broadcast from the South of England the transmission seemed to be spoiled by the presence of a noise not unlike very fast Morse, but which I could not eliminate by tuning. Is it possible for Morse to be picked up by the land-lines and to be broadcast from the National transmitter?"

Yes; and, unfortunately, this sometimes happens.

The B.B.C. hires land-lines from the Post Office. These lines run parallel to and in

ITS WHOLE-TIME JOB



The reamer is often looked on as an extravagance, and many constructors enlarge a panel-hole by penknife and patience. But in its own limited field the reamer is invaluable and makes panel-drilling a pleasure.

the same group as other lines carrying on the ordinary telegraphic and telephonic communication intrinsic in the Post Office system.

Sometimes the signals in one circuit or set of circuits induce a smaller copy of themselves in neighbouring circuits. The trouble can be eliminated, but circumstances occur, particularly with the more obso-

SWITCHES FOR H.F. CIRCUITS—CHOCO
COUPLING—MORSE "MODULATION"—
METAL PANEL FOR SHORT WAVES—
WHICH WIRE FOR AERIAL?

lescent type of equipment, when it is momentarily inevitable.

The Post Office are doing magnificent work in renewing much of their old plant, and, particularly with existing facilities, do everything they can to help the B.B.C. to consummate long-distance broadcasts.

Metal Panel for Short Waves.

G. G. (Hendon).—"Do you consider a metal panel has any advantages for short-wave reception? I have heard so many conflicting opinions that I am quite undecided as to what to employ on my new S.W. set."

Yes, I do like a metal panel, all things considered.

One cannot lay down too hard and fast rules, and say that unless everything is shielded no short-wave receiver will ever work; but one can say, in principle, shielding is very much to be desired, and in certain cases is a prime necessity.

Thus, as a metal panel is a convenient shield in conjunction with other shielding, it is for that reason to be preferred. Then, again, there is hand-capacity effect, and, while there are other ways of eliminating this, what is easier than a metal panel?

Which Wire for Aerial?

J. B. (Gidea Park).—"Can you tell me whether the gauge of wire used for an aerial is important? I have a quantity of No. 20-gauge hard-drawn copper, but I have been told that 7/22 is the more commonly used wire. If I use my existing 20-gauge wire, shall I get any loss of signal strength?"

Oh, no! For reception purposes one is largely independent in the matter of the gauge of wire.

Unless yours is a very exceptional case, you won't notice any difference in signal strength between the two aerials you mention. Reaction can increase a signal enormously, and makes one independent of the aerial resistance to a large extent; besides which the coils are of such resistance as to be overwhelmingly large compared to aeriels of 20-gauge and 7/22.

But the point is mechanical! A solid 20-gauge wire will be more inclined, if there is movement, to break; the more flexible stranded wire is, therefore, more commonly used. In view of the fact that many winter storms and March winds are waiting for us in the near future I should prefer the 7/22 wire.

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RADIOTORIAL

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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and 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

USING AN INDOOR AERIAL.

S. A. (King's Norton, Birmingham).—"It all began at the kids' party, when I had to bring a pair of steps indoors, and spend an hour hammering and fixing paper chains all over the house. And when that was done, having the hammer and the steps handy, I thought I would try an indoor aerial."

"Fixed it inside twenty minutes, and found it was the best bit of work I'd done for a long time. Selectivity seemed about twice as good as with the old aerial, and the dial bristled like a porcupine with possible programmes."

"If anything, it was better in long-distance reach than the old outdoor effort, and, best of all, it was quieter to work. Before there had always been crackles and hissing, but since changing over there has been perfect peace."

"What I should like to know is, why have I been led to believe that outdoor aerials are

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.

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LONDON READERS PLEASE NOTE: Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House.

better than the indoor? Why have I had to put up with an ugly pole and wire for so long, when I had better programmes in the loft than there were out in the garden?"

The idea that an outdoor aerial was always and necessarily better than an indoor aerial is a relic from the days of the crystal set—or very simple valve set—

reception. Especially was it true with the crystal set that the larger and higher the aerial (within limits, of course) the better the results.

But since H.F. valves have been vastly improved by the introduction of neutralising, and by screened-grid types, and since they have been coming into more and more general use, the necessity or advisability of a long outdoor aerial has declined.

In many cases a shorter aerial, giving a "sharper" pick-up, is to be preferred to a long outdoor aerial, because the set is quite capable of doing all the amplifying necessary for loud-speaker results.

The big outdoor aerial still scores in respect of the strength which it is capable of delivering to the set, but nowadays, with a modern set and valves, mere strength is often not so desirable as it was.

Nevertheless, for a crystal set or simple valve set without H.F. amplification, the outdoor aerial is often necessary if adequate strength is to be obtained, especially as indoor aerials vary a lot in efficiency—according to shape, situation, etc. So it will be a very long time before everyone who changes from outdoor to indoor, as you did, will find the same advantage as in your own case.

REDUCING THE CAPACITY OF TUNING CONDENSER.

H. E. G. (S. Tottenham, N. 15).—"In a recent 'P.W.' W. L. S. declared his faith in small-capacity variable condensers for tuning. I want to try the same myself. Would a '0003 in series with a '0005 variable bring the capacity low enough?"

This would be a suitable value to use if you want quite a big reduction. For the curious thing about capacities in series in this way is that the final effective capacity is always less than the least of the separate ones. By adding a '0003 to a '0005, you bring it down to less than '0003. If you added a '0001 to a '0005 you would get less than '0001. And so on.

In fact, the smaller the capacity you add in series the greater is the reducing effect.

(See also the reply to H.M.)

CONDENSERS IN SERIES.

H. M. (Hertford).—"How much do I reduce the capacity of a 2-mfd. condenser by joining a 1 mfd. and a '5 mfd. in series with it?"

The method of calculation is easy to follow and useful, so we will give it in detail.

The rules are:

(1) Write down your capacities.
(2) Divide each into 1, and add the results.
(3) Then divide that answer into 1, which will give you the effective capacity.

So, in your case, we first write down the capacities as 2, 1, '5. Dividing each of these into 1 gives us '5, 1, and 2. Adding these together gives 3'5.

The third step is to divide this into 1, and $\frac{1}{3.5} = .285$ approx. Thus, by joining the 2 mfd., 1 mfd. and the '5 together, you have a capacity of just under .3 mfd.

ADJUSTING GRID BIAS.

"PATER" (Colchester, Essex).—"I tell my boy he should not change the grid bias of the super-power valve unless he switches off the set first. But he still does it, and I can't for the life of me remember a good reason for

switching off first, so he is a bit sceptical about the whole thing.

"Calls me 'faddy'! But I saw it in 'P.W.' and I wish you would repeat the reason, as I remember thinking at the time what a good thing it was I saw your warning about it."

You are quite right to be a bit concerned about it, for if he continues to change grid bias without switching off, you will soon find yourself requiring a new super-power valve.

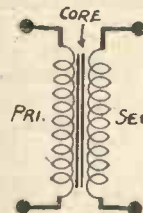
The reason why it is necessary to switch off is easily understood if you look at the valve's curve or maker's data on the subject of grid bias and H.T. You will see that the maker's allow for a certain maximum anode current to be taken, at a certain specified H.T. voltage, and with a definitely stated value of negative grid bias.

If you are going to use a fairly high value of H.T., you must use fairly high grid bias, too, or otherwise you will take too much plate current from the valve, and so damage the filament emission. (All the plate current is emitted from the filament.)

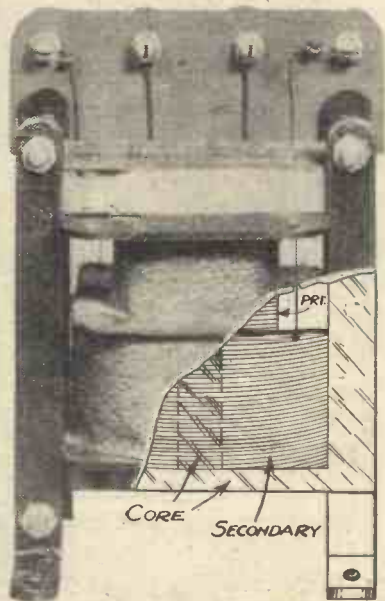
The makers will tell you it is important from the point of view of valve-life not to run the valve with

"INSIDE" INFORMATION

No. 11. L.F. TRANSFORMER



The "diagram" below shows how the two windings are assembled on a core, the ends of the windings being taken out to the terminals. This one is a step-up transformer—with fewer turns in the primary than in the secondary. The theoretical diagram (left) clearly illustrates the principle.



"P.W." DIAGRAMS.

too high a filament voltage, nor too low a grid-bias voltage. Doing either of these will shorten the valve's life.

Now consider what happens in a case like yours. We will assume that the G.B. voltage is supposed to be 21, the high tension at 150 volts, and the plate current at 20 milliamps.

The effect of using an altered grid bias of 18 volts would be to increase the plate current up to, say, 22 milliamps, and the proper way to try this is to switch off the set, change the plug to 18 volts, and then switch on again. All you have caused, in this case, is a little alteration to grid bias and to anode current.

Now suppose that the set was left "on" while the change was carried out. What happens?

Starting with 150 volts H.T., 21 grid bias, and 20 milliamps plate current again, the grid-bias plug is taken out and put into 18 volts instead. But at what a cost to the valve!

The grid bias goes suddenly from 21 to 0 (this latter is the G.B. value whilst the plug is in neither socket),

(Continued on page 776.)

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LITTLE STORIES OF GREAT MOMENTS



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do it!"**

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TELEGRAPH CONDENSER CO., LTD., N. ACTON, W.3.

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 774.)

and although the H.T. remains at 150 the anode current goes suddenly soaring up to perhaps 40 milliamps!

This is simply ruinous, for the normal plate current takes out of the valve nearly all it is capable of giving. A jump to anywhere near double its rated output is over-running it, just as seriously as a big increase in L.T. voltage would have done.

Of course, when the G.B. plug goes into the 18-volt socket, down goes the plate current to normal size again. But alas! the damage may all be done in that second or so that the valve has no bias at all; so remember it must never be "on" with no grid bias applied to it. In other words, it must always be "off" when the grid-bias plug is shifted from one socket to another.

THE POWER THEY USE.

N. P. (Leeds).—"Rome has been coming in so well that it recently started an argument. My friend declared that this was due to the fact that it had a higher power than any other station in Europe. Is that true?"

No. The aerial power of the Rome station is 75 kw. and there are several other stations in Europe using the same power in the aerial, amongst them being Stockholm (on an adjacent wave-length), Oslo, Norway, on 1,071 metres.

The new German Regional stations at Muhlacker and Heilsberg also have powers of up to 75 kw., though, being new, they may not yet be using the full punch of which they are capable.

Most powerful of all is the new Warsaw station, which is due to start up on Christmas Day on 1,411 metres, with an aerial power of 120 kw.!

HOW TO MAKE A "CONTRADYNE" COIL.

T. A. (Hale End, Essex).—"Though it is an old-fashioned set, it is perfectly O.K. except for the one trouble of the low-wave station coming through on the long waves. Otherwise the long-wave side is quite O.K., but when I get near the bottom of the condenser I can hear the London Regional plainly.

"I am told the other cure is a 'Conradyne' Unit. If this uses a simple coil, as I am told, can you tell me how it is made and the number of turns, etc.?"

Essentially the "Conradyne" coil is simplicity itself, consisting merely of a winding on a piece of 8- or 9-ribbed tube, 2½ in. in diameter and about

longest part of the business, but it is really quite simple with a sharp file, or if preferred the slots may be cut with a hack saw.

When finished mount five small terminals between adjacent ribs at one end of the coil, which we will call the top. The first of these terminals is labelled O, and it bears the beginning of the winding.

Each slot on the former has wound in it twenty turns of the D.S.C. wire (making a total of 200 turns in all), and tapplings must be taken to the terminals at the following turn numbers: The first terminal (which is marked with an O) takes the beginning of the winding, and at the 70th turn the wire is taken to No. 2 terminal. It is then carried on again, winding in the same direction all the time, to the 100th turn, which comes out at terminal 3.

The winding is carried straight on again after this to the 150th turn (which goes to terminal 4), and the final 50 turns, when wound on, are secured to the end of the coil (200th turn) (terminal No. 5). The coil is then ready for mounting.

This can be done in any convenient method, one of the best ways being to cut a strip of wood and jam it into the bottom of the coil, passing a screw through this into the baseboard. Alternatively any other convenient method may be used.

The remaining operations are very simple indeed, one terminal being marked A1 and the other A2. A1 is joined to one side of the on-off switch and to a flexible lead which can be taken to any of the terminals. The remaining side of the on-off switch can be taken to A2 and to 0 on the coil.

In use you simply join your aerial lead-in to the A1 terminal, and the A2 terminal then goes to the aerial terminal on the set. When the switch is in the "on" position the circuit is exactly as formerly, and the "Conradyne" coil is out of circuit. When you push the switch into the "off" position you bring the "Conradyne" coil into action.

You will find that the results from it will depend upon the setting of the flexible lead, which should be placed in turn on 70, 100, 150 and 200 terminals to see which gives the best results under your conditions of working, to exclude the low-wave station when working on long waves.

Curiously enough you may find that it actually improves long-distance stations, besides completely removing the trouble of the "local" coming through. But this is a side issue, and merely results from the aerial being brought more nearly into tune with the long-wave station.

The real purpose of the "Conradyne" coil is not to improve the long-wave stations so much as to exclude the local when switched over to long waves, and we think you will find after adjusting the flexible lead carefully that it is wonderfully capable of carrying out its job.

CONNECTIONS FOR A REJECTOR.

D. C. D. (Rochdale, Lancs).—"I am afraid that an ordinary wave-trap with a simple set like this will be no good at all, as I am only about nine miles from the new Moorside Edge station. At first, they said I must have a new set with H.F. valves, but I stood out against this, and in the end they admitted that though ordinary wave-traps were no good I might be able to separate both programmes when I wanted to with a 'Brookmans Rejector.'

"So I bought the set of parts, consisting of an ebonite strip, a couple of terminals, '0003 fixed condenser, two coil sockets, two switches, and three little variable condensers, two '00075 and one '0005 mfd. What are the connections for this? (The photograph does not show all the wiring.)"

The left-hand terminal is the one to which the aerial is fixed and this is joined to one side of the first '00075 variable, and one side of the '0003 fixed. The other sides of the '0003 and '00075 variable are joined together and taken to one side of the first switch and to pin of the coil holder.

The other side of this switch and the socket of the coil holder are joined to the remaining terminal on the '0005 variable, to one side of the second switch, and to the flex lead which goes to the second coil. The other side of this second switch goes to the other (A.) terminal, to the pin of the second coil holder, and to one side of the second '00075 variable condenser.

The final connection is from the other side of this '00075 to the socket of the second coil holder. In

use you simply tune each of the variables to cut out an unwanted transmission, and the corresponding switches enable you to bring in these stations if wanted.

LISTENING-IN NEXT DOOR.

E. T. M. (Glasgow).—"There are three sick people in the house next to mine, and I thought of running flex leads from my set to enable them to hear one loud speaker and one pair of 'phones. But I am now told this is illegal. Is that right?"

There is usually no objection to such a plan properly carried out, but the point is that in such a case both houses require a receiving licence. You might inquire at the Post Office to see if special facilities are afforded in cases of invalids, etc., but we are not aware of such exceptions, and we are afraid you will find that a second licence must be procured.

WAS IT TURIN?

L. M. C. (Chepstow, Mon.).—"In 'The Key to the Ether'—for which many thanks—it says that Turin calls itself 'Radio Turino' and works on 273 metres, but I get a station on 500 metres which says 'Radjo Turino.' It must be just about 500 because it is below

TECHNICAL TWISTERS

No. 41. Testing Condensers.

CAN YOU FILL IN THE MISSING LETTERS?

One good method is to join a voltmeter and battery in with the to be tested.

A momentary flick of the needle denotes insulation.

If the voltmeter needle shows a constant reading, the condenser is

When the full battery voltage is indicated by the needle the condenser is

Last week's missing words (in order) were: Maker, Gases, Specific Gravity, Gas, Burst.

Brussels No. 1, and I have heard this announced unmistakably. Does Turin use two wave-lengths?"

No. Turin's wave-length is 273.2 metres and the confusion must have arisen when Milan was relaying the Turin programme. Milan works on 501 metres with the same power as Turin, and possibly you heard an announcement intended only for Turin listeners, instead of the dual announcement.

GRID BIAS AND PLATE CURRENT.

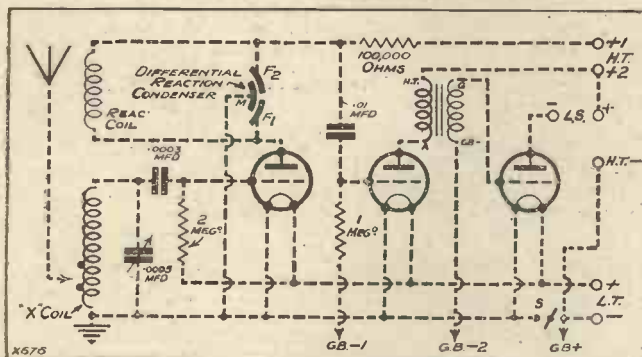
S. M. (Warwick).—"I have not used very high voltage on a very large power valve before, and there is one little thing about it that puzzles me. With 300 volts, actually on the plate of the valve, and the recommended grid bias, which is 27 volts (both measured accurately) I should get an anode current of just under 20 milliamps.

"Actually the anode current is well over 20 milliamps, though I can reduce it by using extra negative grid bias. In the circumstances which would be the better way, to run it with the wrong current or with the wrong bias?"

With very large valves of this type the figure which the makers give as representative do not invariably apply to all their particular valves. It is recommended that if the correct value of volts actually on the anode give slightly less anode current than the valve is rated for at that voltage, the negative grid bias should be decreased slightly.

(Continued on page 778.)

POPULAR "WIRELETS" No. 26



The dotted lines in the diagram above show the connections for the three-valve set, the "components" of which were given last week. As only X-coil selectivity is employed, the set would not give adequate selection near a Regional station, but it is almost ideal for the country listener with no local station quite near.

3 in. long. This is mounted on a wooden baseboard at about 4 in. x 4 in., with an ebonite strip measuring 4 in. x 2 in. to hold two terminals and an on-off switch.

For this coil you will need two ounces of No. 26 D.S.C. wire, a short piece of flex, and a few odd screws. The terminals are mounted at either end of the ebonite strip, with a switch in the centre enabling the coil to be cut out of circuit if desired.

The first thing to do is to file the ribs of the coil former, making ten file cuts in each rib. These cuts are placed equally along the former and form ten separate slots for the winding.

Each slot is about ¼-in. wide, and there is about ¼-in. between them. Preparing this former is the

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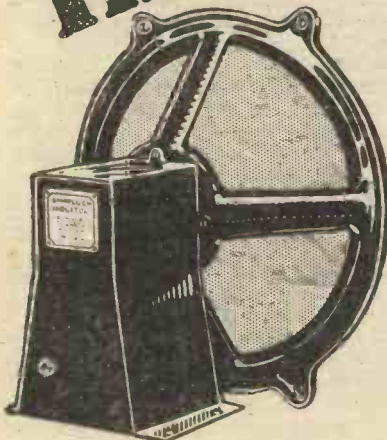


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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 776.)

Similarly, if the anode current is slightly greater (as in your case) than it should be at the given voltage, negative grid bias should be so adjusted to give the requisite anode current.

The average grid bias figures are given as a guide, and should not be followed too literally, for as stated, individual valves vary somewhat.

Do not forget that when adjusting grid bias to a large power valve, or for that matter to any L.F. valve, neither of the grid-bias plugs must be removed from the battery whilst the set is "on." It should always be switched off until the plug is put into the new position, and if this is not done there is a likelihood of damaging the valve's emission.

TOO MANY H.T. + TERMINALS.

R. E. (Old Trafford, Manchester).—"In my last four-valve set I only had two H.T. + terminals, and it was perfectly satisfactory, but in the new one I find there are four. Are all these really necessary?"

Having a large number of H.T. positive tapings on the set enables each particular valve to be given exactly what high-tension voltage it requires. For very selective and high-quality reception it is frequently necessary to adjust the high-tension accurately in order to obtain the best results, and it is difficult to do this for separate valves unless each has a separate high-tension supply.

It is for this reason that the high-tension positive terminal is duplicated or triplicated on multi-valve sets, and we think that in general it is a refinement that is well worth while.

AERIALS AND INSULATION.

D. G. D. (Huddersfield).—"Is it a fact that even if the lead-in is insulated it should not be brought close to the steel window frame? What difference can this make if a good insulated covering is round the wire?"

In radio we are constantly up against the fact that the ordinary insulator does not always "insulate." In the ordinary electrical sense of the term we say that air is an almost perfect insulator, but in wireless we use condensers with air dielectric, and we find that the wireless currents apparently flow across these just as well as though there was a connecting wire instead of air between the plates!

There is, of course, a technical explanation for this, but lack of space prevents us entering into it here. All we need say is that what is a good insulator to ordinary electrical currents, may, under certain conditions be capable of acting quite as a good conductor to high-frequency currents, of the type which we are dealing with in wireless reception.

It is this fact which conditions the position of the aerial lead. It may be properly "insulated," and therefore it may be quite impossible for the ordinary electric current to leak across from it to the steel window frame. But the aerial lead-in will not be carrying ordinary electric currents.

Instead it will be carrying high-frequency currents, which are able to "pass across" small spaces, rubber, air or other "insulation." Thus, in order to prevent this high-frequency current from running away to earth, the only safe plan is to remove the wire altogether from the neighbourhood of any conductive surface which is connected to earth.

It is for this reason that the lead-in should be spaced away from walls, roofs, metal windows, etc., as is frequently recommended in "P.W."

TESTING H.T. BATTERIES

IT is no fun at all being a "lone voice in the wilderness." I know, for I have had the experience. You know yourself that you are right—if you have the courage of your convictions, and you also know that others agree with you.

Nevertheless there is all the time an uneasiness in one's mind. One feels that there is a danger that unthinking critics may label one a "crank."

When, in due course, one's ideas are generally endorsed one gets one's reward. You feel you have accomplished something definite.

At this particular moment I have in mind the question of H.T. battery tests.

For years the general practice has been to give H.T. batteries continuous discharge tests through fixed resistances.

The results were plotted in the form of curves showing the declining voltages of the batteries against hours of discharge.

I have always maintained that such curves are practically valueless, and that they are liable to give false impressions of a battery's efficiency.

Quite Misleading.

I based this on the very evident fact that there are other things that affect the useful life of an H.T. battery besides mere zinc consumption.

For example, there might be poor insulation between cells which would impose a current drain that doesn't affect the battery's life appreciably during a matter of a few weeks, but which becomes important when months are considered.

But more serious is the matter of paste. It often happens that a battery's actual life in practice is more determined by its paste than by its actual zinc consumption process, which is part and parcel of its current generating powers.

When the paste dries up the battery ceases to be a battery, even although its zinc is in good condition.

And inferior paste does dry up too quickly when the battery is used in warm living rooms.

No, constant discharge tests are widely divorced from actualities.

H.T. batteries are used for restricted periods over months not continuously for so many hundreds of hours.

Quite recently I noticed a contemporary started to give H.T. battery "peried" test reports, and more recently still the Radio Manufacturers' Association passed the following resolution:

"A decision was made to recommend to members certain methods of testing H.T. batteries, and the following specification is given:—

"Batteries should be discharged through a fixed resistance for 30 hours per week (6 hours per day for 5 days per week), readings being taken at the end of each day's test until the voltage has fallen to 60 per cent of the nominal initial closed circuit voltage—such initial closed circuit voltage being taken as 1.35 volts per cell. For small type batteries the fixed resistance should be 150 ohms per cell, and for super-type batteries 100 ohms per cell."

Step in the Right Direction.

That is a step in the right direction, but I think 4 hours per day would be better—as being nearer the kind of usage H.T. batteries are subjected to by listeners. But the recommended resistances are fairly well chosen.

They provide for 15- and 10-milliampere discharges for super-type and small type batteries.

Well, I have advocated this sort of thing for years and years, and all H.T. batteries reviewed by "P.W." are tested in this way. But I expect the R.M.A. have the idea that theirs is a new and original suggestion. 'Twas ever thus! G. V. D.

THOSE RADIO PLAYS

(Continued from page 763.)

no. Agonised whispers are heard, "Dying, dy-ing, dy-ing, dy-ing," etc.

Someone kills someone else. Does he conclude his dirty work with an agonised ejaculation of remorse? Probably, but again the microphone phantoms contribute their dreadful comments, "You kil-led him. You kil-led him. You killed him, killed him killed him, killed him," etc., etc.

Another play personality remembers something during his last seconds of earthly existence. Once more the spectres of the ether take charge. "You're late for school, late for school, late for school, late for school. H-u-r-r-y up. H-u-r-r-y up. Hurry up, hurry up, hurry up," etc., etc.

All very effective, most effective, but, I maintain, a simply crazy technique. One that reminds one all too clearly that the gap between reason and madness is very narrow—too narrow for it to be right for the B.B.C. so to play on our deepest emotions.

Give us reality if you must, but for goodness' sake give us life and laughter rather than sorrow and death. That is what I, for one, ask of the B.B.C. We have all of us too many private miseries with which to contend without it being necessary for the B.B.C. to broadcast a quota to us. And how the feelings of some unfortunate listeners must be harried by at least a good many of the sporadic outbursts of the temperamental, art-for-art's-sake B.B.C. dramatic department!

Was I Cheered Up?

One evening not so very long ago, I happened to be feeling just a trifle "off colour." I hadn't suffered any particularly bad fortune, hadn't been recently bereaved or anything like that. I'm not often fed-up, and I wasn't very severely so that evening. I merely felt that I wanted something to divert my attention from everyday affairs: I didn't even seriously want cheering up. Fortunately, I seldom do.

However, I turned on the radio, deciding to listen to a play that was "billed" in the "Radio Times." I didn't know what it was about—in a usual B.B.C. terse manner, the thing was described merely as "A Play by —."

My goodness, didn't it make me happy! Didn't it send my spirits soaring up! It did—not!

That radio play was the most depressing experience it would be possible to imagine. A ghastly moan of sheer despair ran through the whole of it. The Dramatic Department scored a distinct hit. I shivered and trembled and would have switched off had I not been held by an unhealthily morbid curiosity as to the outcome of a groaning wretch's harrowing experiences. (I wondered how the actors could hold on to their sanity.)

You see, they'd got me firmly in their grip. The play was a huge success! It happened to be about the only day in the whole year that I was feeling slightly blue—a ripe candidate for neurosis. And my blues unhappily coincided with one of the periodic demonstrations of the B.B.C. Dramatic Department.

You may say it served me right for switching on a B.B.C. play, as I apparently knew what to expect. Correct, it did!

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SUNDAY GRAPHIC

FOR THE LISTENER,

(Continued from page 762.)

Speaking Voices.

Mr. Sitwell said that nowadays one could never hear what actors were saying because they spoke their parts so badly. Unfortunately for my belief in him, I had listened that afternoon to Henry Ainley and Balfie Holloway in the "Tent Scene" from Julius Caesar, and also to Noel Coward and his amusing playfellows; and I had heard with ease every single word they uttered.

Mr. Ainley has a glorious voice which he uses, as near as may be, to perfection. Noel Coward's skit on his own play, "Private Lives," was as entertaining, if not more so, than the play itself!

Dark Subjects.

I liked Alexander and Mose. I always do like these "negro" comedians, whether the negro part of them is in the skin or simply stuck on the face.

Their quiet, drawing voices and their simple fun. I liked it when Alexander got out a mouthful of polysyllabic words, as long as a sea-serpent and as heavy as the Encyclopedia Britannica; and Mose replied, "Says which?" After which, Alexander translated it into English, very short.

It reminded me of how George Graves used to say, "In other worrds!" Or was it George Robey? Anyhow, it was a George!

Theatrescope.

This was a medley of songs belonging mostly to the last generation; with a few modern ones thrown in for comparison. I do not think that anybody could honestly say that the old ones were better. Perhaps the range was a little wider.

I like the lilt and the catch in them; but I confess I sometimes wish that they were not always sung by love-sick swains—"I'm sighing for you," or "Calling for you," or "Longing for you," or "I want to be near you"—slightly monotonous perhaps.

How Would You Spend It?

That million pounds, I mean, which is reputed to be the B.B.C.'s income for next year.

My personal view is that the greater part of available money should be spent on the purely entertainment side of the programme; on the vaudeville, the plays, and the lighter music; and that the whole of this side of the programme should be placed under the direction of some Cochran of the wireless whom I would pay highly.

I put myself the other evening in the position of a man who comes home tired after his day's work, and wants to be amused. At 6.40 he had a spell of Brahms' pianoforte quartets; at 7 p.m. a twenty-five minute talk on "Live Stock Types for the Meat Trade To-day," followed by another twenty minutes of "The Need for Science in Commerce."

Then a quarter of an hour's interval. Then the symphony concert, followed at 10 o'clock by another talk by Wickham Steed on some topic of international politics. By that time I imagined the worker either in bed or drunk.

Wanted, Imagination.

The B.B.C. staff does not lack in earnestness; and that is a good quality. On the

educational side they do well. On the entertainment side there seems to me to be a lack of imagination.

I do not quite see how this is going to be remedied except by the appointment of a Director of Entertainment, a man with a flair for the "cakes and ale," with sufficient imagination to visualise a whole nation thoroughly enjoying itself in one house.

TECHNICAL NOTES

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

Pick-up Curves.

SEVERAL manufacturers of gramophone pick-ups have for some time past been supplying curves with the instruments, showing the response to the various frequencies for the usual musical range.

This is very satisfactory, and when you find a manufacturer prepared to supply an actual performance-curve of any instrument, you know that he has got beyond the guesswork stage and definitely understands the why and wherefore of the various points of design of the instrument in question.

It is, in fact, noteworthy that a considerable improvement in electrical pick-ups has taken place in the past two or three years, not only in regard to sensitivity, but also in performance, compactness and design.

A Curious Advantage.

With regard to the performance-curve of the pick-up, you will notice in some cases that this curve shows apparently an increasing sensitivity or response as the frequency falls, and you might think that this indicates a defect in the pick-up.

At first thought you will be inclined to presume that the ideal curve would be one which showed a uniform response over the entire range, as a matter of fact, the increasing response for the lower frequencies is an advantage in a pick-up, because it helps to counteract a defect which is necessarily inherent in gramophone records.

Amplitude Limits.

If you think about it for a moment you will realise that there is a definite limit to the amplitude (the side-to-side motion) of the recording needle, because if the needle were allowed to swing too far it would go into the next adjacent track.

If this limitation were not imposed, the recording expert would prefer to allow increasing amplitudes for lower frequencies. The fact that he cannot do so means that he has in effect to adopt a falling-response curve for the lower frequencies for his electrical recorder.

Now if the electrical reproducer has a rising-response curve in these regions, it makes up to some extent for the effect of the record and gives us more or less the same result as though we had an electrical reproducer with a straight-line curve and a record in which there was no restriction as to amplitude.

This peculiarity of the curve of the pick-up represents, in fact, rather an ingenious dodge for getting over a practical difficulty.

(Continued on page 782.)

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TECHNICAL NOTES.

(Continued from page 780.)

When contemplating the building of a new receiver I think it is safe to say that in most cases the design of the low-frequency amplifier is fairly easily decided. You have, of course, to decide what amount of L.F. amplification you require, and this to a large extent determines the number and type of valves; then as regards the question of inter-valve coupling this is (to some extent, at any rate) a matter of taste and fancy. The L.F. end of the set need not, and I think in most cases does not, cause any particular anxiety.

But the high-frequency amplifier is a different question altogether, and many experimenters have considerable difficulty in making a decision as to the amount of high-frequency amplification to use and also as to the type of valve which should be employed.

The moment you go in for elaborations in the H.F. you are apt to complicate the design of the circuit as well as the operation and control of the receiver when completed. It is for this reason that beginners, at any rate, are often advised to confine themselves to a single stage of H.F. amplification.

Planning H.F. Stages.

We have discussed previously in these Notes some of the points which arise in connection with the H.F. amplifier, including the use of screen-grid H.F. valves and ganged condensers.

Now I think it is often rather difficult to decide whether to use, say, a stage of neutralised H.F. amplification or to employ a screen-grid stage.

This largely depends on whether you attach more importance to H.T. current economy than to range or sensitivity.

If H.T. economy is the major consideration (and there are many cases where this is vital, but sensitivity not very important), then you would be well advised to consider using a stage of neutralised H.F.

Make-Shift Circuit.

Another point which I should mention is that to get the full benefit from the screen-grid valve the circuit should be built up to suit this particular valve.

It is a common thing for experimenters to make a sort of modification of an existing circuit—not primarily suitable at all for a screen-grid valve—and then, having fitted the new valve, to come to the conclusion that the S.C. is not all it is cracked up to be.

The screen-grid valve, like any other radio component—in fact, much more than most—must be used in proper and appropriate conditions if you are to derive the full advantage from it.

Finally, note that the effect of grid bias upon quality and H.T. current consumption—an important point with valves generally—is particularly important with the screen-grid valve.

The G.B. Must Be Right.

Unless the right amount of grid bias is applied to the valve you will find that the H.T. consumption will be very wasteful and, in any case, as mentioned above, even when the valve is used under correct conditions, it makes quite a fair demand upon a low-capacity H.T. dry battery.

(Continued on next page.)



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TECHNICAL NOTES

(Continued from previous page.)

Incidentally, the grid bias for the screen-grid valve generally amounts to one to three $1\frac{1}{2}$ cells.

Screen Voltages.

Perhaps before changing the subject I should emphasise the importance for really best operation of using correct voltages. For instance, the screen voltages applied to a screen-grid valve should be carefully adjusted and, furthermore, you should check up this voltage from time to time by means of a reliable voltmeter to make sure that it has not dropped seriously below the proper value.

If the voltage is derived from a dry battery, as is frequently the case, you may find that a screen-grid valve is misbehaving itself, and that the trouble is due to the screen voltage having gone all wrong.

The experience gained with the ordinary valve as regards falling voltages is quite misleading when it comes to a screen-grid valve; as you know, with an ordinary valve, if the voltage drops it generally means a gradual loss in the volume and quality of reproduction, but with the screen-grid valve various peculiar things may happen; for one thing the valve may be set into oscillation.

A Matter for Trial.

As regards the anode voltage for the screen-grid valve, this should in practically all cases be well up to the maker's specification and, in fact, I have often found that better results are obtained by applying even more H.T. voltage than that specified.

On the other hand, I should say that you can sometimes get apparently just as good results with a somewhat *lower* value of anode voltage than that specified.

This, however, is a matter which you can very easily discover for yourself. Sometimes the voltage of a battery which you have on hand just falls a little short of that required for the valve, and in such a case it is clearly a convenience if you find you can use the battery without the addition of any extra voltage.

De-Tuning.

I am often asked what is the simplest and most suitable method of controlling volume, but the answer to this question depends very largely upon the type of circuit used and also upon the conditions, and so I will indicate briefly some simple ways in which the volume control can be effected.

In the first place, taking a set which has only a single-tuned circuit and not requiring reaction, you can often obtain volume control for the local station by the very simple process of detuning.

Generally speaking, this method cannot be used in other cases for the obvious reason that you are liable to run into interference from other stations and also to introduce distortion—in many cases the distortion introduced in this way is very pronounced.

Another method is to put a variable resistance in the filament circuit, but this, again, is limited in its application. For example, if the filament current in the low-frequency amplifying valves is not up to

(Continued on next page.)

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TECHNICAL NOTES.

(Continued from previous page.)

the required value, it is practically certain that distortion will be produced.

Perhaps this will not be so noticeable if the actual volume of reproduction is very small, but if the volume is considerable you will find, as a rule, that this method has its drawbacks.

Potentiometer Control.

One of the commonest methods of volume control is to use a potentiometer which may, for example, be connected across the output side of an L.F. transformer, the slider of the potentiometer being connected to the grid of the succeeding valve.

In this way the voltage which is passed on from the transformer secondary to the next grid can be varied up to the whole amount of the voltage output of the transformer secondary.

In the case of an R.C. unit, the potentiometer volume control may take the place of the grid-leak, the resistance of the potentiometer being used for the leak, whilst the voltage passed on to the first L.F. valve is, of course, determined by the position of the slider.

Transformer Characteristics.

There is an important point to bear in mind with regard to volume control. Take the case just mentioned above, where a potentiometer is connected across the secondary of one of the L.F. transformers.

If the actual resistance of the potentiometer is too low, it will seriously upset the characteristics of the transformer and may for this reason, apart from any other, introduce distortion.

Generally, however, the total resistance of a potentiometer intended to be used as a volume control is pretty high, so that in the case of a component especially intended for this purpose the danger just referred to is not likely to arise.

As a general rule the resistance of a potentiometer intended for volume control purposes with a transformer should not be less than about half-a-megohm. If the volume control is to be used with an R.C. coupling stage, however, its resistance should be roughly the same as that of the grid leak which it displaces, a value of about 1 to 2 megohms being generally suitable.

Consider Your Filaments.

Where the dimming of the filaments is resorted to as a means of volume control it is better that this should be applied to the filaments of the H.F. valves rather than the L.F. ones.

At the same time, remember that the running of present-day dull-emitter filaments at much below their rated temperature is apt to do them considerable harm. In any case, as I have already mentioned, the control of volume by filament temperature should be avoided, if possible.

Referring to the question of power valves, which we were talking about some little time ago, readers are often in doubt about the best type of valve to use in the detector stage, especially where a power valve follows.

Sometimes we are told that a high-impedance valve should be used as a detector, sometimes that a medium-impedance valve will work best, whilst sometimes we hear

of a low-impedance, or virtually a power-valve, being employed.

For this reason a detector which can handle a fairly large input and output of power is sometimes referred to as a power detector, but this term is liable, I often think, to give rise to misunderstanding, especially with beginners; it simply means that the detector can handle a larger amount of power than is usually passed through the detector stage.

Perhaps the best way to consider this is to imagine we have a receiver in which either very powerful signals are being received or in which there is a large amount of high-frequency amplification, the result in either case being that fairly heavy power is supplied to the detector.

Rectification Methods.

Now suppose there is only a single stage of low-frequency amplification and that this comprises a power valve. Then in order to get the best out of the power valve it is obviously necessary to feed a fair amount of power into it and as this comes (in the case we are supposing) straight from the detector without any intermediate amplifying stages, it is clear that the power actually delivered by the detector must be fairly large, larger than it would be if we were going to have some intermediate step-up stages between the detector and the output valve.

The so-called power detector works in precisely the same way as the ordinary detector, that is, by means of grid-leak or anode-bend rectification. It is, however, important if the best results are to be obtained that a larger value of anode voltage than usual should be employed.

A Suitable Guide.

This has the effect of increasing the magnification and together with the low impedance of the valve enables large grid-swings to be dealt with without introducing distortion.

From the above remarks you will see that there may be no particular advantage about using a low-impedance power-handling valve in the detector stage unless the conditions both in the high-frequency and low-frequency parts of the receiver happen to call for such a valve.

A guide in the matter is the question of the amount of power which is fed into the detector and the amount of power which the detector is called upon to feed into the next stage. As I say, if the total amount of high-frequency amplification or the strength of the transmission is such that powerful signals are fed into the detector, or if there is not to be a great deal of low-frequency amplification subsequent to the detector, then there may be an advantage in using a low impedance valve for the purpose.

The Effect on Reaction.

I should mention, however, that it is not uncommon when a low-impedance valve is used in the detector stage for trouble to be encountered with the control of reaction. In fact, for general purposes I do not advise you to handle heavy power at the detector stage.

You will generally find it more satisfactory from every point of view to use a fairly sensitive detector efficiently operated and to rely for actual volume upon proper arrangement of low-frequency amplifying stages.

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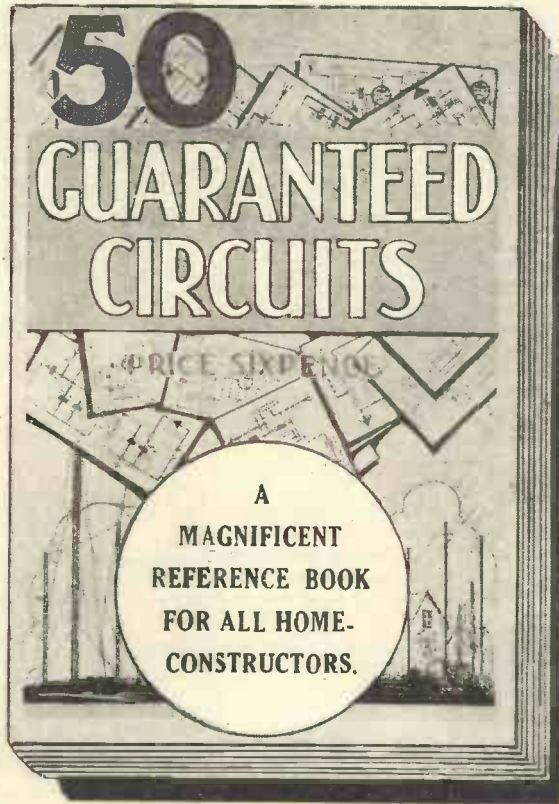
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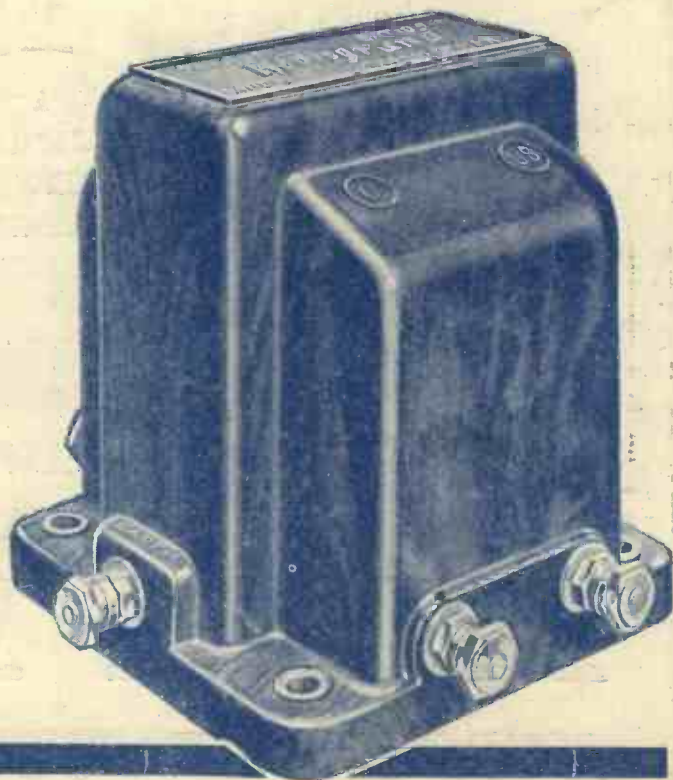
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