POPULAR WIRELESS, July 13th, 1929. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

BUILD THE P.W. "KUTTEMOUT" TWO (See Page 574)

Popular Wireless

Every Thursday PRICE 3d.

No. 371. Vol. XV. INCORPORATING "WIRELESS" July 13th, 1929.

SPECIAL FEATURES IN THIS ISSUE

Those Capacity Effects. Truths About Chokes
Your Anode Current. Little Things That Matter
Microphone Reactions. For The Set Builder
"P.W." WHITE PRINT No. 32

Our cover photo shows George Robey broadcasting during his successful South African tour

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RADIO WEATHER—MERITORIOUS MOTIONS—THE MORSE NUISANCE—NOT LIKE HOME—

RADIO NOTES & NEWS

AMATEUR HONOURED—TAMING OF A FAN—THE SCEPTIC'S THREE—R.A.F. PAGEANT.

A Portable in Practice.

THE theory of portables is, I suppose, that one completes the enjoyment of natural surroundings by listening to dance music, etc. The other day I and a few friends loaded up a car with picnickery, intent on an afternoon in the woods. Someone lobbed a portable in and we let it stay. Hours later, as we reclined and smoked after tea, a voice said, "What about hitching up the radio?" Chorus: "Oh, let's have a rest from that; what more do you want than this?"

Broadcast Weather Charts.

READERS possessing Fultographs may be interested to know that if they are willing to co-operate in reporting on the reception of the broadcast weather charts sent out by 5 X X on Tuesdays and Thursdays between 2 p.m. and 2.25 p.m., they can obtain a supply of prepared paper and envelopes from "Wireless Pictures" (1928), Ltd., Dorland House, 14-16, Regent Street, London, S.W.1.

Meritorious Motion.

RATHER too late to be announced here beforehand came the news of a Radio convention to be held at the North-East Coast Exhibition, under the auspices of the Northumberland and Durham Group of Radio Associations. Two proposed motions attract me: (1) That this convention considers that in view of the fact that the B.B.C. are entirely dependent upon the licence payers for its income, the said licence payers are entitled to more detailed information as to the disbursement of the funds in the administration of the B.B.C.

Meritorious Motion, No. 2.

THOSE long words send me into another note—No. 2: "That the system of dealing with complaints respecting oscillation is cumbrous and inadequate." Both very pertinent points, but I am sorry that there was not another, dealing with the Morse nuisance. Let us hope that the motions were carried *nem. con.*, and that the B.B.C. official who was to be present took full note of them. But is it all of any use?

The Morse Nuisance.

THAT brings me again to the subject of Liverpool. Letters flow in, from which it is clear that Morse in that district is more than a nuisance: it is a blight. Every part of the programmes appears to be spoiled. One writer asks what the public can do by way of revolt. Well, the B.B.C. and the Post Office have got to be made to investigate the trouble, and this might be done by the municipal authorities. Investigation must precede prescription, and is the first thing required. That done, the steps to be taken are up to the B.B.C. and P.O., and depend upon their findings.

Not Like Home.

I HEAR that the U.S. Army Signal Corps is organising an amateur radio system with the object of providing extra communication channels during a national disaster, the idea being to augment or replace land lines which may be brought down by flood, fire or tornados. Probably there is not the same need in this country, but I am struck by the manner in which amateurs are regarded by the U.S. Government, which actually does not look upon them as a pest to be stamped out by lack of encouragement.

Prominent Amateur Honoured.

MR. FREDERIC LLOYD, who is well known to amateurs, especially in the Sheffield district, has been selected to receive the honorary degree of Master of Engineering (M.Eng.) by the University of Sheffield. Mr. Lloyd and his son, Mr. Harry

(*Continued on next page.*)

THE PREMIER'S SET.

This is the three-valve set which was built by "P.W." and installed at Mr. Ramsay MacDonald's house at Hampstead some three or four years ago. A full description of this "Premier" Set was published in "P.W." at the time, and it is interesting to note that wave-change switching was incorporated, another switch bringing in or cutting out one of the L.F. valves as required. The set worked excellently, and the Premier was very pleased with the results obtained from it.

NOTES AND NEWS.

(*Continued from previous page.*)

Lloyd, did a lot of useful work with their private broadcasting station before the Sheffield relay station was opened, and this recognition is well deserved.

Obstruction by Proxy.

AN amusing incident occurred on Derby Day—Trigo apart—in which Mr. J. A. Whatnall, a director of a well-known radio company, was an innocent performer. He left a portable set in his car in Throgmorton Street while he went into an office, and while he was absent some wag switched the set on, tuned in the Derby broadcast and collected a gorgeous crowd. The British Bobby who loomed up eventually, devoid of humour, alleged that Mr. Whatnall had caused an obstruction by giving a demonstration from his car.

The Taming of a "Fan."

CONGRATULATIONS to Mr. C. G. Allen on his recent marriage. Mr. Allen is the man who goes up in aëroplanes and gets 3 L O, and things like that. Probably his ambition is to get hoisted up on a waterspout and then tune in the Byrd Antarctic Expedition. Whether marriage will put a stop to his interesting and useful capers, of course, I dare not predict, but I have not much hope for the best.

S.O.S.

WILL P. L. (Plymouth), on whose letter I commented in our issue of June 15th, please send his address? I have a letter for him and have unfortunately lost his address.

How About this List?

E. J. B. (Evesham) calls my attention to a list of stations which he says he has been able to get on the loud-speaker at almost any time during the past year. There are thirty-seven stations in the list, all continentals except six, which are B.B.C. This bit of reception was done with a two-valver and seems to me to be extraordinarily good, especially as E. J. B. adds K D K A and W G Y as makeweights.

Eighteen Years Ago.

WHILST browsing amongst some files dated 1911, I found an article describing the work of the s.s. Florizel as an Arctic sealer. The author was the vessel's wireless operator, and his name was E. T. Fisk. Mr. Fisk is now Managing Director of Amalgamated Wireless (Australasia) Ltd., the great state-controlled company which runs Australian radio, including the Beam services.

Ladder of Success.

APPARENTLY the profession of telegraphist inspires its members and helps them on to the rungs of the ladder of success. I know seven men who either are now or have been heads of large wireless telegraph companies, and who were formerly telegraphists. I have seen other ex-operators climb to high positions in Government telegraph services abroad. And I may recall the fact that Edison was once a telegraphist.

The "Sceptic's" Three.

J. N. (Southampton), aged 14, has a "Sceptic's" Three. If he was a sceptic before he acquired it I can only say that it is a sad case for one old enough to know better. However, there is no doubt about his getting "Radio Feriby" "at tremendous strength," and some 20 other stations—"not whistles." This set has so charmed our young friend that I doubt whether he will ever try another, though in his weak moments he flirts with the notion of an S.G. All-Wave Unit.

Local Interference.

IN spite of having had an electric therapeutist—or whatever these ultra-violet ray chaps call themselves—for a near neighbour I have not, until recently, suffered any interference from his apparatus. But some months ago he must have installed a new doo-hickey, for one night I was absolutely drowned out. I now get his performance dead on 5 G B's tune almost every night. As he is a badly-wounded ex-soldier I hardly care even to mention the matter. Is there no protective device? I know of none.

SHORT WAVES.

OBVIOUSLY.

When is a portable set not a portable set?
When it's too jolly heavy to carry.

* * *

Wireless enthusiast (with portable set in country): "I wish that beastly bird would shut up; they're broadcasting a nightingale singing in a few minutes."

* * *

A TRANSOCEANIC PIONEER.

Bugville Announcer: "This is station W B U G, Bugville. Mr. H. Fly, the great aviator, has just completed his successful flight over the 'C.' The mayor's committee are meeting him at the Battery and will escort him to the Terminal."—"Radio News."

* * *

SEE HOW THEY CATCH.

"I notice in my wireless programme that the Aberdeen station has two items announced for 4 p.m. and 5.55 p.m. on the same day, both entitled 'Fishing News Bulletin.' I have told a good many fishing stories myself, but this fertility intrigues me. I shall listen-in raptly."—"Daily Sketch."

* * *

D X fan (tuning in a Spanish address on his receiver): "Hurrah! That's C Z E, Mexico City, right off the bat."

Radio Widow: "Huh! Why on earth didn't you get a set that could talk English?"

* * *

There was a young plumber of Park,
To whom the angels beckoned,
Because he WOULD hark
To a lightning spark,
And believed in "Safety Second."

* * *

"Wireless Sets on Drifters" runs a headline in the "Dundee Courier and Advertiser."
Long may they drift—and far, say some!

The Professor Explains.

APROPOS my comments on Professor Low's alleged prediction that we may one day be able to broadcast breath, he tells me that I must have read a misprint, the correct word being "health." This explanation is a great relief to me, because although I look for the evidences of a lively imagination in his utterances about the future, I thought that the idea of broadcasting air passed the permissible limit. Professor Low still sticks to his idea of the possibility of broadcasting odours, but as the sense of smell is, I understand, actually brought into action by *contact* of volatile *matter* I cannot believe that smell could be induced by non-material means.

A Good Idea.

LOOKING in the other night at a friend's I found him accompanying a broadcast violin solo (already being accompanied by the B.B.C. piano) on a 'cello, and the combination was delightful. In order to keep the 'cello "in the picture" he muted the strings. This suggests a variation of the usual "musical evening" which would be a pleasant novelty if skilfully done. Perhaps the B.B.C. might co-operate occasionally by rendering items suited to the purpose.

Radio Law in Argentina.

VERY elaborate regulations governing radio have recently been enacted in the Argentine. Besides kicking all stations outside the city, the power used has been limited by the authorities to between 500 watts and 10 kw. (antenna). No tests or experiments between 10 a.m. and midnight. Precise stipulations intended to prevent interference are made, and the work of the stations is to be closely observed.

Protecting the Listener.

BUT three features of the new rules struck me as original. Firstly, it is laid down that the primary object of transmission must be to offer the public highly artistic and cultural programmes. There's a smell of Chamber Music about that. Next, the predominance of music transmitted by mechanical instruments will not be permitted. Good! And thirdly, all programmes must be submitted to the Post Office eight days previously, and the authorities may object to any item. Let us hope that our Post Office does not fall in love with that notion.

"Sic Transit . . . "

AFTER a brief, inglorious existence the "kilohertz" has died of sheer decay, and to mourn its passing there are only a few word-fanciers. Nobody but stylists wanted it, although when one comes to consider the matter the word is quite as sensible as "Ohm" or "Volt." Frequencies are now by general agreement to be expressed in "kilocycles per second" (k c/s), and it is to be hoped that after a time we shall get back to the first usage and talk of "wave-length."

The R.A.F. Pageant.

IN order to keep the public attending this pageant informed as to the nature and progress of the events the Marconiphone Public Address System has been installed. It will consist of about sixty powerful loud speakers, the greatest number ever used in this country. The last amplifying stage consists of five 32-valve power banks, the total number being nearly 180.

"Some" Amplifiers.

THE electrical energy for this titanic system is derived from a motor-generator developing 350 volts, and Exide accumulators giving 2,000 volts, the total H.T. current being 6,000 milliamperes. Roughly calculated this would seem to be equivalent to the consumption of 1,000 three-valve receivers. The L.T. and loud speakers will take more than 350 amperes at 6 volts. The plant weighs nearly 4 tons, and 12 miles of heavy armoured cable will be used.

ARIEL.

MICROPHONE REACTIONS

The heading photograph shows Mr. Eric Dunstan at the announcers' "mike" a short time before he left the B.B.C.

This is a collection of the impressions of famous broadcast artistes as they stand before that awe-inspiring tyrant—the microphone.

CLAPHAM AND DWYER, the Silly Asses (Jointly).

MICROPHONE? We don't care a hoot—nor does Cissie. We're hardened radio criminals and quarrellers, as you might say.

We're too interested in our own patter to think of the microphone, although we're always hoping people are listening.

JACK PAYNE, Leader of the B.B.C. Dance Orchestra.

During the time I'm broadcasting I am always intensely aware of my audience. It is as though there were a "third eye"—a kind of telepathy—between the dancing or listening wireless fans and myself, and I always feel their presence and their appreciation.

Jack Payne.

ALBERT SANDLER, the Violinist.

When I am broadcasting from the studio, I am conscious of nothing unusual, save perhaps that my violin seems to have an unusual clarity, and even this is not noticeable after a time. I just become lost in the music I myself am playing.

Albert Sandler.

MARIO de PIETRO, the Mandolinist.

The atmosphere of the studio does not worry me in the least. There are drawbacks—such as the small audience and the apparent distortion of sound—caused by the total lack of echo, but one gets used to it. Studio or concert hall are now all the same to me.

MISS ENID CRUICKSHANK, the Contralto.

I like broadcasting because the studio is so private! Being an operatic singer, I display rather a lot of facial expression when I am singing; and in a concert hall, this is apt to be rather embarrassing. For example, if I am singing a song from "Carmen" to a concert audience, and, entering into the character of the part, roll my eyes, people think I am mad. But in the studio, I can make as many faces as I like, and nobody cares a scrap.

Enid Cruickshank.

RONALD GOURLEY, the Blind Entertainer.

I find working in the studio very pleasant. Being blind, the peculiar gadgets which I am informed it contains—the curtains, the microphone, and other such things—do not affect me. The inspiring hand-clapping is often absent, but this is a minor detail. One seems to be able to reach the children through the microphone, and this is why appearing in the children's hour has always been one of my greatest pleasures.

TEX McLEOD, the Spinner of Ropes and Yarns.

My emotions whilst I'm before the "mike" are curiously mingled. I feel like a policeman at a football match—interested, and yet stifled. I seem to be all boxed up in the studio and badly in need of air, as though I were in the Black Hole of Calcutta. My father was a Scotsman, and all that is worst in my nature comes uppermost. I am wondering all the time whether anyone is listening—and how much the B.B.C. are going to pay me.

MATHESON LANG, the Well-known Actor.

When I first broadcast, I was very doubtful as to whether I should suit the microphone, and was quite certain that I couldn't express my personality in my voice. Since then, however, my fear of the "mike" has vanished. There's nothing in it!

Matheson Lang.

SIR WALFORD DAVIES, the Lecturer on Music.

To describe in detail the emotions I experience when broadcasting would take far too long. My feelings are so diverse that to put them all on paper would be well nigh impossible.

TOMMY HANDLEY, the Comedian.

Ladies and gentlemen—awful! Oyez! Oyez! Like an egg-cup in a steak and kidney pie wondering whether he will escape being ate, or whether he will go down with the rest. Like my Aunt Matilda

Sir Walford Davies.

(Continued on next page.)

MICROPHONE REACTIONS.

(Continued from previous page.)

when she discovered someone has left the bath taps running and that there is a flood of water coming down the stairs. Sing a song of sixpence. Happy when broadcasting? Certainly not.

WILL HAY, the Schoolmaster Comedian.

Broadcasting is like holding a tea-party. There is nothing at all to worry about. No make-up, no props, no clothes, no scenery, no action—nothing! One just talks into the microphone and there you are!

Mabel Constanduros.

MABEL CONSTANDUROS, of "The Buggins Family" Fame.

I always imagine my audience very clearly and can tell by the laughter of the studio audience, or by their amused expressions, whether I am getting my humour over as well as I wish to. Otherwise, my emotions are very mingled indeed, and quite impossible to describe.

BARRINGTON HOOPER, the Tenor.

I feel a wee bit nervous when I broadcast. I know so many people are listening to me, and, consequently, my nerves are in a state of "high tension." Besides, the lack of echo in the studio always seems to play havoc with my voice, and although I am informed I'm going over all right, I always feel a little worried because I can't recognise my own voice.

CHRISTOPHER STONE, the Gramophone Record Critic.

Before I started broadcasting, I imagined that it would be alarming. In reality, I have never had a moment's nervousness. I feel perfectly ordinary, and nothing—not even the silence of the studio—affects me in any way.

Albert de Courville.

ALBERT de COURVILLE the Revue Producer.

Ghastly! That is the only word which describes my feelings when I speak to that horrid, but wonderful listener—the microphone. They cage me in a room with a lot of technical experts who look at me as though I were some kind of natural curiosity, and then ask me to broadcast. Nervous? I would rather be shipwrecked any day. "Then why broadcast at all?" you may ask. Well, after all, there's a fascination about the wireless studio, isn't there?

REX EVANS, the Entertainer.

I feel perfectly normal. My cabaret experience has accustomed me to an "intimate" audience, and the microphone is nothing if not that.

BRIGHTENING UP RADIO?

A week-end school in the north, for the training of leaders of wireless discussion has been opened in conjunction with the B.B.C.

TOO MUCH "ANTI-PONG"?

By G. P. K.

WHY is it that practically every modern set has sprung valve holders all the way through? Is it really necessary? What about the sets of a few years ago? Some of them were quite large receivers, yet rigid valve holders were used, and if you had asked the owner whether he had trouble with microphonic effects, he would quite probably not have known what you meant. It certainly makes one wonder whether the present fashion for sprung holders is based on any real necessity.

It is true, however, that conditions have changed somewhat in the last year or two. Modern valves certainly tend to be decidedly more microphonic, partly because of different methods of construction which have had to be introduced to make it possible to turn out some of the newer types, but much more largely because of the very much higher amplification factor of the modern types. It is, indeed, the actual excellence of the modern valve which seems to make it more prone to this trouble.

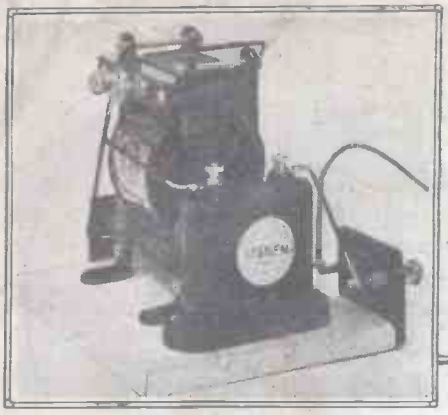
A Very Real Problem.

How very real the problem can be, too, is known to everyone who has ever observed that placing the loud speaker quite close to a fairly powerful set has been sufficient to send it into a continuous microphonic howl when certain types of valves were used.

All the same, it is possible that we are going a little too far in employing anti-microphonic holders as widely as we do. If you look at the question carefully, you find that a sprung holder is really only needed for certain special positions in the set. The H.F. stage (or stages), for example, certainly does not need such a holder, because any low-frequency noises set up here will not be passed on to the detector. As a rule, there is also no need for a sprung holder for the last valve, since jars here will only produce quite small noises in the output. Really, it comes down to the fact that it is only for the detector valve (and very occasionally the first low-frequency valve) that we actually need a sprung holder.

Cutting Down Cost.

For the detector (and possibly the other valve mentioned) a sprung holder really is extremely desirable with modern types of valves, but in the vast majority of cases it is quite permissible to use a rigid holder for the other parts of the set (portables excepted, of course, because of risk of damage). Hence, if you want to make a set as cheaply as possible, by all means use rigid holders everywhere except for the detector, or if you want to make quite certain, use them everywhere except for the detector and first low-frequency valves. A small point, but one quite possibly worth while from the point of view of the man who is always making up different sets and has in consequence to keep a careful eye on his expenditure on components.



TRUTHS ABOUT CHOKES

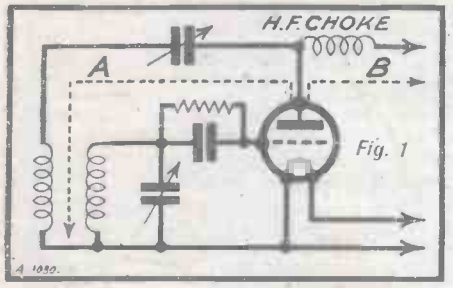
An interesting article which explodes some popular fallacies about H.F. Chokes.

By G. P. KENDALL, B.Sc.

CAN you remember that boyish desire to cast half a brick into a greenhouse for the sake of the soul-stirring crash which would follow? I am being assailed by a recurrence of that mischievous impulse, and since the "greenhouse" upon which I have my eye seems thoroughly to deserve it, I am going to yield to temptation and heave my metaphorical half-brick.

The particular glass edifice which has caught my eye is the common belief that a really highly efficient H.F. choke is needed in the ordinary reaction circuit, and it seems to be high time that somebody took a shot at it. Let us just take a look at the circuit and see what the choke really does.

What happens is this: we have upon the plate of the valve some high-frequency impulses which naturally tend to make



their way down to filament, and you will see that in the circuit sketched there are two paths which they can take, marked A and B. A is the normal reaction path through the reaction condenser and the reaction winding, while B is through the H.F. choke, through the 'phones, intervalve transformer primary or what not, and so to the H.T. battery and down to filament.

A Simple Criterion.

Now, what we want is to ensure that we shall always be able to get a sufficient quantity of the high-frequency impulses to go round through the A path to give us the desired reaction effects. Thus, all we require in our H.F. choke is something which will make the B path sufficiently difficult to give our impulses a decided preference for the A path.

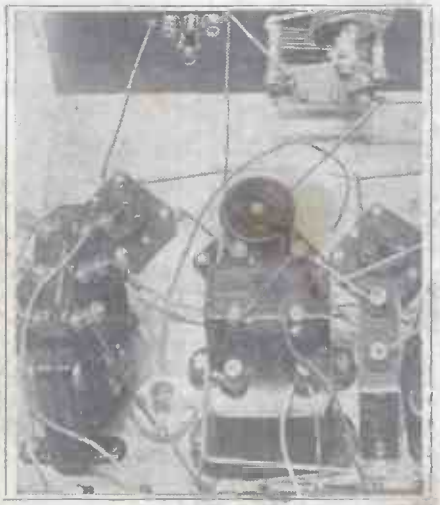
Here, then, is a standard by which we can criticise a given H.F. choke from the point of view of its use in the ordinary common or garden reaction circuit. In practice we can say that a choke is good enough for this work if it provides a sufficiently high impedance to send enough current round the A path to produce adequate reaction at any desired point on the tuning range.

Now, that is really not at all a high standard, because we are not asking our H.F. choke to act as a complete barrier to high-frequency currents, but merely to make things a little difficult for them. A really perfect choke would refuse to pass any H.F. currents whatever, but something very much less than that will do for our reaction circuit.

Effect on Reaction Control.

If you try it out you will find that some very crude windings indeed will serve the purpose quite well and they do *not* make any difference that you can discover in the actual reaction control. It has sometimes been suggested that poor H.F. chokes are responsible for floppy reaction control, but that seems to be a fallacy. So far as I can discover an H.F. choke which is merely poor does not impair the reaction control unless it is possessed of a certain definite fault.

This other point is a matter of what is called the natural wave-length of the choke. Every winding, you will understand, must

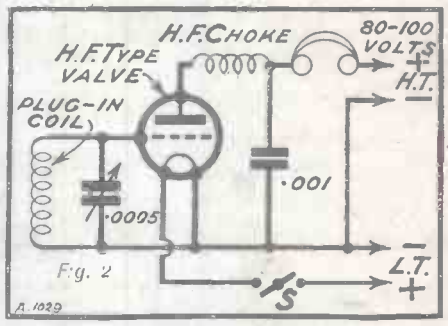


Unlike the L.F. choke, the H.F. type may have objectionable radio frequency tuning properties.

have a natural wave-length of its own, and if that of a high-frequency choke comes anywhere near the wave-lengths being received, then indeed you will get real trouble, proper reaction control being quite out of the question.

This, however, is an entirely different effect and does not affect my argument, which is that choke efficiency is a much over-rated factor in reaction circuits. As a matter of fact, any old winding will do, provided that you see that its natural wave-length falls well above your tuning range, in other words that it contains plenty of turns and is reasonably free from harmonics.

It may be objected that the H.F. choke in the anode circuit of the detector valve serves another purpose, in addition to enabling us to get reaction, in that it helps to keep H.F. currents from getting through

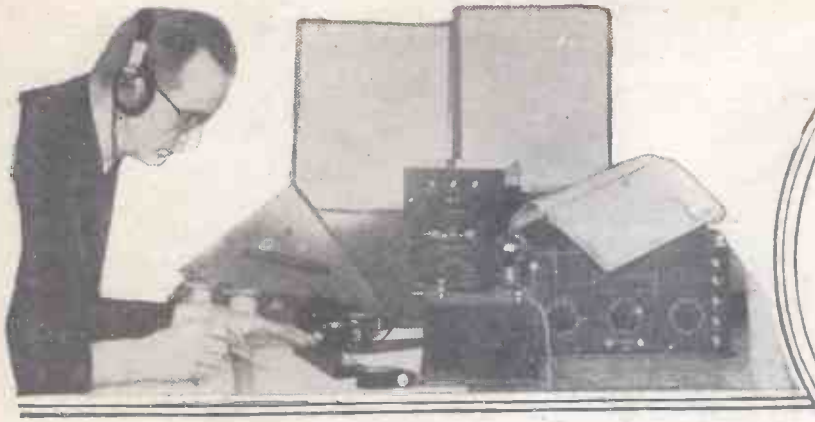


into the low-frequency portion of the set. It would seem from this point of view that a really good H.F. choke is desirable, but it must be remembered that in the great majority of cases where the set is sufficiently large to make it worth while to worry about small stray H.F. currents, other precautions are taken to exclude them.

What is Really Needed.

To sum up, I suggest that if you think matters over you will realise that it is quite unnecessary to worry about extra high efficiency in H.F. chokes used purely for producing reaction, the only point to worry about being to see that the natural wave-length of the choke falls well out of your tuning range, that is to say, above about 2,000 metres in most cases.

Now for the exceptions to the rule which I am suggesting. There are a number of occasions when a choke is really used for true H.F. choking purposes, and it is as well to be quite clear in one's mind as to where these instances are to be found. As a general rule, you can take it that if an H.F. choke is found in the anode circuit of a high-frequency valve then it is a REAL choke that you want.



FOR THE SET BUILDER

ACCUMULATOR CARRIERS.

THE presence of an excessive amount of plate material and sludge at the bottom of an accumulator which has been in use for some time may often be traced, not merely to any inefficient charging and discharging to which the battery may have been subjected, but also to a series of sudden jolts which it may have experienced from time to time.

There is certainly no doubt of the fact that an accumulator which is carried about from place to place as steadily as possible has a much longer life—other factors being equal, of course—than one which has been jolted about in a thoughtless manner.

The idea illustrated in the accompanying photograph will do much to prolong the life of many an accumulator which is used for work with portable sets and is, therefore, carried about.

Stops Shocks.

In the illustration, the lower strip of wood in front of the accumulator carrier has been removed, in order to reveal the insertion of a strip of sheet metal, the gentle curve of which acts as a shock-absorber, and so prevents excessive jolts from being transmitted directly to the interior plates.

The strip of metal may be inserted in the base of the accumulator carrier in a variety of ways, but generally the best method will be found to consist in the use of small screws placed at each corner of the metal strip.

The weight of the accumulator will, of course, tend to flatten the metal strip out, and, therefore, for the latter article a strip of metal should be selected which will just have sufficient strength and rigidity to bear against the weight of the accumulator with a gentle yielding pressure.

Note the "shock absorber" that is fitted.

NOTEBOOK NOTIONS.

Do not use twisted wire for long loud-speaker leads running round the house, as undesirable capacity is introduced by this method.

* * *

The efficient switching of a complete H.F. stage is very much more difficult than that of an L.F. stage.

* * *

If you use an H.T. dry battery with a screened-grid valve remember that, as the voltage of the battery invariably falls after a time, it may be necessary to give the S.G. plug a little more "voltage" than the makers recommend, owing to the voltage drop inside the H.T. battery itself.

* * *

Even for short-wave reception it is possible to get good contact with screw-down terminals, but soldered connections, owing to their permanency and certainty, are much better.

* * *

A break in the primary winding of a low-frequency transformer is very easily located with a pair of telephones in series with a flash-lamp battery.

* * *

Among the commonest causes of crackling noises are bad connections at the accumulator terminals, and imperfect joints in the wiring.

* * *

Do not forget that crackling noises may be caused outside the set by a faulty aerial or earth system.

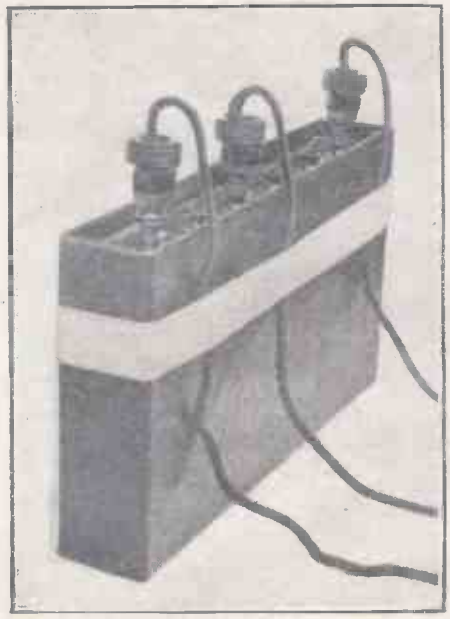
A GRID-BIAS HINT.

VERY frequently the leads to the grid-bias battery of the receiver, especially if they are not differently coloured, become mixed up, and time is occupied in tracing out the right connections. Even, too, when the leads are differently coloured for the purpose of ready distinction, they are at times apt to become entangled with the other connections of the set in the neighbourhood, and possibly short circuits of a more or less harmful nature may thereby be set up.

So Very Simple!

All possibility of troubles of this nature may be eliminated entirely by adopting the scheme which will be seen clearly from a glance at the illustration herewith. Merely procure a rubber band of the requisite dimensions, and, when the grid-bias battery leads are in the correct and required position, slip the rubber band over them, allowing the leads to be a little slack above the band so that the plugs can be readjusted if required.

This scheme will not only save trouble owing to mixed-up leads, but it will also help to maintain the grid-bias portion of the set in a neater condition than would otherwise be the case.



A rubber band solves a problem.

YOUR ANODE CURRENT

By D. GLOVER.

HERE is a confusing point. You are told to watch the needle of a milliammeter connected in the plate circuit of the last valve in order to detect (and subsequently eliminate) distortion. If the needle flickers, something is wrong. Yet a flickering needle surely means current fluctuations, and it is current fluctuations that you want to operate the loud speaker!

But no, you cannot be getting perfect results unless the needle of that milliammeter remains perfectly steady. Yet that instrument measures current, and surely if the needle remains absolutely stationary only a steady current of the value indicated is flowing through the circuit.

Of course. the fact is that the current is far from being a steady unidirectional current. It is rising and falling with terrific rapidity all the time. No ordinary meter

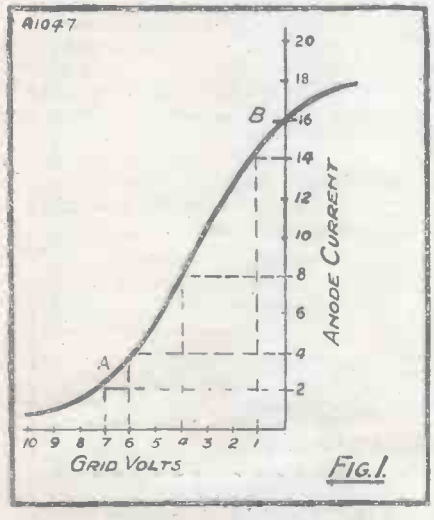


FIG. 1.

could hope to follow it, and even if it could the movements would be so fast that the eye would not be able to see them. The needle would vanish in a misty blur.

"Bends" At The Ends.

The milliammeter registers the mean current that is flowing. It remains to all intents and purposes quite unaffected by current variations at a low frequency which correspond with the speech and music impulses that are being dealt with.

If you look at the characteristic "curve" of an amplifying valve you will see that it is a straight incline over the greatest part of its length. At each end there is a curving, and here you will see the significance of "upper" and "lower" bend.

The curve is grid volts (input) plotted against plate current, the increasing height of the curve representing the increasing current, its length indicating the grid volts range.

Let us be a bit looser—it is quite permissible now and then—and think of the alternations of current dashing up and down that curve. So long as they dash up and down the straight part so will the needle of the milliammeter remain stationary.

Do you know why the milliammeter in the anode circuit of a power valve register no current changes when a set is operating properly?

The reason for this is that equal decreases and increases in the grid volts input below and above a certain "mean" point will produce exactly equal decreases and increases in plate current. Two less grid volts, 2 more grid volts, might, for instance, mean 5 the less or 5 the more anode milliamperes.

The actual figures might be a current falling to 6 milliamps and rising to 16 milliamperes. But, you might say, why should not the milliammeter show some signs of all this electronic activity, especially as the 6 to 16 milliamps rise and fall is the event of only an instant, this being followed by smaller and greater variations by the thousand per second.

A Flickering Needle.

As I have said, the needle cannot follow such rapid rises and falls; so long as the rises and falls are of similar magnitude the needle remains steadily in the centre as it were.

But if the grid volts should be such that you run off the straight part of the "curve," then the rise and fall of anode current is not going to be even and the meter needle will begin to flicker.

Let me bring in a few simple sketches to illustrate this point. Fig. 1 is a characteristic curve of a mythical power valve. While you feed the grid with an input varying anywhere between 1 and 7 volts you work on the straight part of the curve. You might give the grid 4 or so volts grid bias, hoping your "signals" will cause variations not exceeding 3 volts above 4 or 3 below. The full 3 volts above or below that point will produce an anode current 6 milliamperes above or below a "mean" of 8 milliamperes.

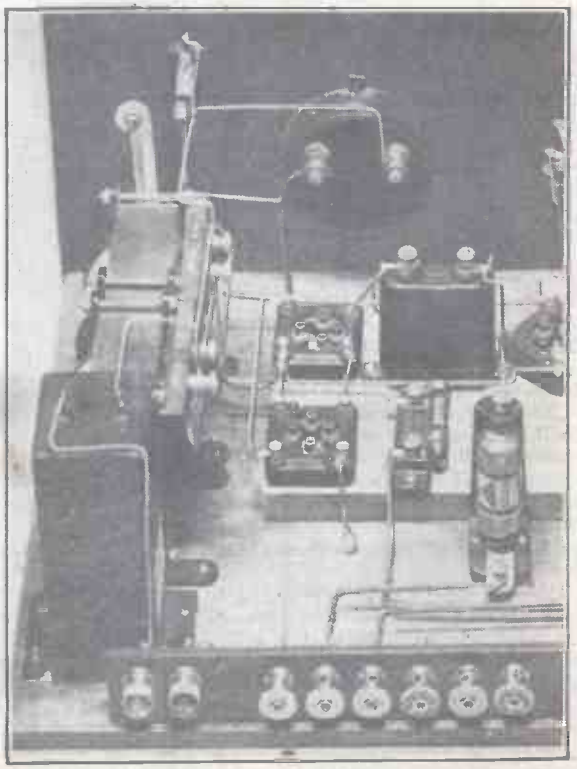
But supposing you fixed your grid bias at 6 volts. Then a 3 volts increase would make but the fraction of difference in anode current that would a 3 volts decrease in grid potential.

Overloaded Valves.

Rectification would be taking place. Instead of equal grid voltage changes meaning equal anode current variations, these latter would become very irregular. Every now and then the mean current would rise or fall, and this would be illustrated by the flickering of the milliammeter. Audible indication would also be available in serious distortion.

You will now gather the significance of the term "overloading" as applied to a valve. Overloading occurs when the impulses on the grid are so great that you run up to the bend in the curve.

It is then that the milliammeter needle starts to flicker. If the valve is of the small power variety, adjustments of grid bias may not overcome this trouble. It should be the aim of the amateur to use valves capable of handling the various inputs in the different stages without much overloading occurring.



The L.F. end of a powerful set when everything necessary to avoid distortion has been done.

LATEST BROADCASTING NEWS.

THE TELEVISION POSITION

INTERESTING POSSIBILITIES—MR. ADRIAN BOULT'S APPOINTMENT—CHANGED ATTITUDE OF THE GOVERNORS—THE PROBLEM OF TALKS?—THOSE VACANT GOVERNORSHIPS.

THE forces are gathering for another big war between the B.B.C. and the Baird Television Company. It is about a month since it was announced that the Germans had begun a daily transmission of Baird Television. This "deal" apparently was put through chiefly by Captain Hutchinson and Mr. Sydney Moseley, who also formed a new German Television Company.

Returning from their Berlin success the ambassadors of Baird Television discovered deadlock in England. The former P.M.G., Sir William Mitchell Thompson, had practically instructed the B.B.C. to give certain limited and conditional facilities to the Baird Company. Negotiations to this end had failed, and the prospect of agreement faded out. The B.B.C. offered three quarter-hour periods a week outside programme time. The Baird Company asked for an hour a day inside programme time with a three years' guarantee.

Interesting Possibilities.

There was no middle course between these extremes. While it is not yet possible to speak with certainty of the next developments, it is believed that the Baird interests will attempt through Parliament and the press to force the new Postmaster-General to intervene rather more effectively than his predecessor did. But it is unlikely that the move will succeed at least to the point of reversing B.B.C. policy.

If nothing comes of this, then the Television people will seek entirely independent facilities, comprising frequencies for speech as well as vision. They will begin simultaneously a new kind of campaign against the B.B.C.

The present relations between the Baird Company and the B.B.C. are full of interesting possibilities. It should not be ignored, however, that there are still factors at work on both sides anxious to avoid a final and irretrievable breach.

Middle opinion is inclined to the view that the B.B.C. should be careful not to give the impression of any bias against the Baird Company. If the new system of television is really as hopeless as the B.B.C. makes out, then for heaven's sake let it strangle itself in public, and cut all the cackle about it!

Mr. Adrian Boult's Appointment.

Mr. Adrian Boult, of Birmingham, will become Music Director of the B.B.C. on January 1st next.

It is believed that he will make sweeping changes both in personnel and in the work. From the accounts published of remarks made by Mr. Boult in America, during his recent visit, it is clear that the guiding principle of his administration at Savoy Hill will be to make up the programmes mostly from material in existence outside, and considerably to reduce the work actually done in studios.

In view of this attitude it is probably just as well that nothing has come of the National Orchestra proposal which Sir Thomas Beecham and Mr. R. H. Eckersley have been attempting to translate into practice. Indeed, there may not be need of the orchestras already in being at Savoy Hill.

Changed Attitude of the Governors.

Recent allegations about conditions of work in the B.B.C. appear to have aroused the Governors from their previous policy of aloofness. They have decided to keep in much closer contact than formerly with members of the staff, who are to have direct access on all matters of grievance.

This is an important move and one which is likely to have far-reaching consequences. For one thing it should give more security of tenure to appointments in the B.B.C. An increase in the number of people directly concerned in staff appointments will naturally slow down the machinery of dismissal.

The Problem of Talks?

The B.B.C. is giving much attention now to talks. Mr. R. H. Eckersley is credited with pressing on Sir John Reith a new policy which would combine all departments of the spoken word under one head. Thus, the present Department of Talks, News, and Adult Education would be merged into one Speech Section with considerable saving of staff and simplifying of organisation.

But what is of more importance to listeners, there would be considerable reduction of the proportion of programme time devoted to talks, and music would receive more definite and continuous priority than ever before.

If this "merger" is effected there will be several fresh resignations of senior officials. The staff of the B.B.C. now is about 1,000 strong. There have been only 143 departures from all causes in seven years, and the official view is that it would be better to cut down more rapidly and add just a little fresh blood here and there.

Those Vacant Governorships.

Speculation is still rife about whether or not the new Government will take advantage of the opportunity to fill the two vacancies on the B.B.C. Board, and if they do who will be the recipients.

It is suggested in some circles that Captain Ian Fraser, former M.P. for St. Pancras, and head of St. Dunstan's, would be a particularly good choice for a Labour Government to make. It would be in a sense a sequel to the Conservative Government's choice of Mrs. Philip Snowden, whose name, curiously enough, was originally suggested to Mr. Baldwin by none other than Captain Fraser himself.

FROM FINLAND.

This photo shows the amplifier and control panel at the Lahti Wireless Station.

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

THE FUNCTION OF THE EARTH.

A SIMPLE PRECAUTION—SIGNAL IMPULSES—MILLIAMMETER READINGS—TYPE OF VALVE, ETC., ETC.

ALTHOUGH beginners are frequently advised that the earth connection of the receiving set is quite as important as the aerial, there seems for some curious reason always to be a difficulty in getting this fact generally accepted. Perhaps it is because everyone knows that the broadcast energy comes in at the aerial, and therefore an aerial (or its equivalent in some form or other) is clearly necessary; whether it runs to earth or not appears to be regarded as a minor consideration.

Now, this way of regarding the situation is really quite wrong, for the broadcast energy does not simply come in at the aerial, it enters at the aerial for the express purpose of finding its way to earth. Perhaps I might go further and say that the energy, which transforms itself into electrical oscillations in the aerial-earth-receiver system, must have a proper oscillatory circuit in which to operate. It is true that an oscillatory circuit may be provided in the absence of an earth connection altogether, but it is generally correct to say that the sensitivity or receptivity of a high-frequency circuit for the reception of broadcast energy is much greater when a good earth connection is present.

I want you to keep the idea clearly in mind that the earth-connection is to be regarded as "part and parcel" of the aerial, a break being made for the purpose of inserting the aerial circuit of the radio receiver—that is, the break is introduced into the aerial earth system for the purpose of diverting the oscillatory current through the receiver.

(*Continued on page* 584.)

Little Things That Matter

The performance of a set may be made or marred by one little, insignificant point —as will be seen from this article.

By L. ROBINS.

THE old proverb "take care of the pence and the pounds will take care of themselves" might well be adapted for radio circumstances into "take care of the little points and the results will take care of themselves."

It is no exaggeration to state that it is the little things that matter in a wireless set—matter sometimes far more than the big things.

Probably the smallest thing in a wireless set is the actual joint between a wire and a component or between a wire and another wire. But small though this may be it is important and upon it may depend the success of the whole receiver. A poor joint, caused by the connection being tarnished or by a dry soldered joint, is quite enough to upset the whole working of the set and may defy the listener in his attempt to find where the fault lies for a very long time indeed.

Not only may a poor joint in the wiring give rise to weak signal strength or complete loss of signals, but it may also cause such faults as motor-boating or instability. If the joint is in the grid circuit instability may occur, or if the joint is in the H.T. circuit and is common to several valves, then the resistance of that little joint may cause motor-boating.

The First Examination.

So the first things to look out for when you build a set are the joints. Go over each one carefully, making sure that none are dry soldered, that there are no badly screwed or dirty contacts. And together with the joints examine such things as valve pins, valve-holder sockets, coil pins, coil sockets, terminals and any moving points such as rheostats, potentiometers, switches, etc.

All moving contacts should be scrupulously clean if good results are to be ensured. Bad contacts may defy detection for a long time, but will almost certainly give rise to unsatisfactory results and possibly cause complete cessation of operation of the receiver.

Another small matter which is often overlooked is the grid-bias battery. This being a small battery which is often placed in a set and which when once connected up correctly can be left without attention for quite a long time tends to be completely overlooked, but there comes a time when even the grid-bias battery requires attention.

We are all familiar with the necessity of recharging low-tension batteries, or having a look at the H.T. battery to see if it has run down, but a great number of people forget the grid-bias battery simply because they are under the impression that as it gives no current it cannot run down.

We assume, of course, that the battery is kept *clean*, for this also is an essential feature to the success of a wireless receiver. Dust is a deadly enemy and should be kept out of the receiver as if it were some disease.

But apart from keeping the grid-bias battery clean one must remember that all dry batteries have what is known as a "shelf-life." In other words, they will gradually deteriorate.

An Important Battery.

The grid battery will last a certain number of months (the number varying with the climatic conditions under which the battery is kept, and with the actual make of the battery), but then it will begin to deteriorate more rapidly and lose its voltage.

So after about five or six months one should test the grid-bias battery with a voltmeter and make sure that it is absolutely

Testing the valve holder of a set to see if good connection is made with each socket.

up to scratch. Test each cell separately and see whether the 1½-volts is obtained from each cell. If not, the grid bias battery may become a source of trouble, and in radio it is far better not to meet trouble only half way, but to go the whole way and stop it before it starts!

Another little point which may seem a very small matter, but which is nevertheless a very important one, concerns the use of the grid-bias battery when the set is working.

A certain amount of grid bias has to be given to the low-frequency valves, but it should be remembered that although this bias has to be found by the trial and error method, yet the various tappings should not be altered while the set is in operation. The grid-bias plug should never be taken out of its socket in order to place it in another one while the H.T. and L.T. are on.

Removing the grid-bias plug means that for the time being the valve is without bias of any description, so that its internal resistance drops and the H.T. immediately causes the emission of the valve to go up considerably.

This is very bad for the valve, and if done repeatedly may well ruin the filament, especially if the valve is of the super-power variety.

Saving the Filament.

Always switch off the L.T. or the H.T. or both, before moving any grid-bias plugs. This may take a little longer, it may seem a little more difficult to judge the reproduction owing to the greater lapse of time in between each test, but it is well worth it in the end, for it keeps the valve in its best condition and keeps it from prematurely losing its emission.

Negative grid bias acts as a definite check on the electron flow, and when this is removed one can imagine the electrons running absolutely riot inside the valve—to the detriment of its filament.

Finally, watch your aerial and earth. Very often troubles in a set can be traced to broken strands in the aerial or to the outside earth lead, which may not be making proper connection to the earth pin or to the water-pipe. Or it may be a bad contact on the earthing switch outside the house.

At this time of the year it is a good plan thoroughly to overhaul the aerial and the earth, going over every joint meticulously to keep the whole system free from soot and verdigris, even digging up the earth pin or plate if poor contact is suspected.

RADIO PROGRESS.

Marquis Marconi and the Future of Wireless—The Prague Plan and 5 G B's Wave-length—Selectivity.

By THE EDITOR.

IN a Press interview, Marquis Marconi pointed out that the public appetite for new marvels is never satisfied; especially in connection with wireless will the Marquis's observation bear the strictest test of accuracy for, ever since broadcasting caught hold of the popular imagination, there have not been wanting prophets who, if not with honour, have at least in their own country spent a good deal of time in forecasting—generally inaccurately—the future of wireless and the marvels it would accomplish.

Nonsense About Television.

All this is generally based on the assumption that progress is inevitable; and that, because wireless is marvellous to-day, it must inevitably be more marvellous to-morrow. As Marquis Marconi pointed out in his interview, people are told that we shall have aeroplanes without pilots, the machines presumably being controlled by wireless and guided by the directional beam system. And, of course, there has been more nonsense talked about television than we have space herewith to enumerate in detail.

Talking of television, Marquis Marconi said: "Experiments in television, which aims at showing an audience what is going on thousands of miles away, are constantly being made, though the results hitherto obtained are not great. In the realm of air navigation, pilots are kept informed by wireless of the weather conditions they may expect, but this is a different thing from controlling aeroplanes from the ground and dispensing with pilots altogether."

In connection with television, he went on to say: "I do not say that television is a practical impossibility. One of these days we shall find the key. I do not share the opinion that television will kill the film. The relation between television and films will be similar to that which exists between wireless and the gramophone. Television and radio will tell us about things that are taking place, but this will not appeal to everyone. Plenty of people will still prefer their favourite plays or music, and they will go to picture palaces or watch their own private films just as they now prefer their favourite gramophone records."

Future Developments.

But Marquis Marconi also points out that, while one section of humanity is indulging in dreams about the future marvels of wireless, there is still another section of humanity consisting of pessimists, the kind of people who conclude that wireless is a failure. Marquis Marconi draws the conclusion that the future will undoubtedly bring greater and greater developments in wireless.

"Many now unknown developments of this branch of knowledge will be disclosed; but even if human thought is transmitted more and more rapidly from one part of the globe to another, and everything is done faster and faster, I could not tell whether humanity will be any happier than it was in the days of stage coaches. All I know is that the public wants new things; that men, always athirst for knowledge, clamour for progress."

The Prague Plan.

Readers will remember that when the Prague Plan was made public, a good deal of speculation was aroused by the statement that the wave-length of 5 G B was to be altered from 482 metres to 399 metres. The fact that 2 L O retained its wave-length of 358 metres was the clue to the trouble, for it was anticipated that the majority of sets in use to-day would not be sufficiently selective to prevent interference between 2 L O and 5 G B.

5 G B's wave-length was originally altered because of interference by Langenberg. But an announcement has been made recently to the effect that there will be no reduction in the wave-length difference between 5 G B and 2 L O. This is a wise move, for although Langenberg is a nuisance, and does interfere, it is certainly, as the "Times" points out, a lesser evil than the almost inevitable evil which would arise from bringing 5 G B so close to London's wave-length.

It is, of course, a pity that we must still put up with Langenberg's interference, but when one remembers that the majority of people in this country pay their licence in order to hear British broadcasting, it is only fair that home listeners should be considered first.

Poor Selectivity.

But the fact that the B.B.C. decided that the original alteration in 5 G B's wave-length could not be made serves as a timely reminder that selectivity in the average wireless receiving set is not all that it should be. We, in POPULAR WIRELESS, and our contemporaries, "Modern Wireless" and "The Wireless Constructor," have published time after time selective receiving sets which we know, from exhaustive tests, would have met the new wave-length arrangement as it was originally set out in the Plan de Prague, and we did not anticipate that many readers who have built those sets would be very much worried by the change in 5 G B's wave-length. In short, we did not anticipate readers of ours who had followed our instructions in building our specially selective receivers, would have found interference between 5 G B and 2 L O of very great moment.

Improve Your Sets.

Nevertheless, it isn't everybody in this country who takes the trouble to build a selective set. More's the pity. If they did, and if readers were to concentrate more on selectivity, in preference to loudness of signals, we feel sure that the quality of reception would not only improve but that, as the benefits of progressive radio technique were appreciated, it would not be necessary for the B.B.C. to abandon the idea of reducing the separation between 2 L O and 5 G B.

As it is, listeners will now still have to put up with Langenberg's interference, unless by some happy chance something can be done in the near future to alter Langenberg's wave-length. It is, frankly, rather disappointing to find that, after six or seven years of broadcasting there are still so many people who have not taken the trouble to make their sets selective enough to withstand the original alteration put forward in the Plan de Prague.

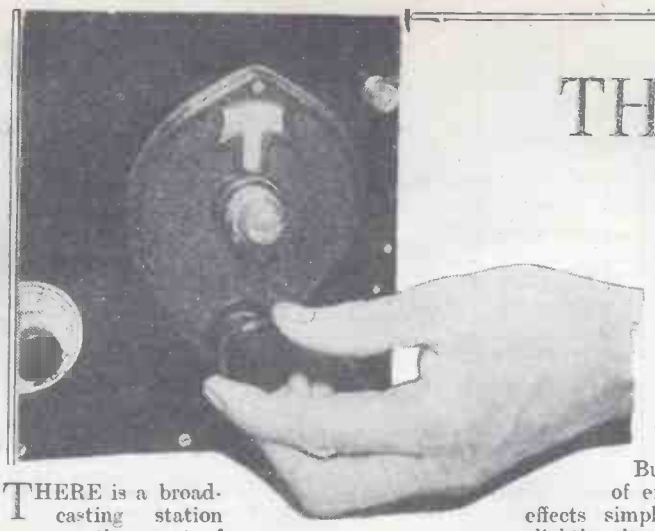
Once again we invite our readers who particularly want to improve the selectivity of their sets, to consult the Radio Queries Department of POPULAR WIRELESS, where, for a very small fee, they can obtain circuit diagrams and ample information which will meet their needs.

CHEAP SET SCREENS.

THE tin or aluminium foil, which is often to be found in cigarette packets, has a number of radio uses. You can apply it for making fixed condensers, but such home-made condensers have to be very carefully made in accordance with such specifications as are laid down from time to time in "P.W." in order to obtain correct capacities.

A further use for tin-foil is screening. Ordinary standard screening for separating valves can be made by sticking tin-foil on cardboard or thin wood, but it is difficult to make good electrical connection between the different sheets of foil used, so that plenty of overlapping should be allowed. The whole of the inside of a radio cabinet can be covered with tin-foil, should it be necessary to provide such complete screening.

It is not often that this is necessary, but there are cases where serious interference from mains can be eliminated by this means. Such screening must, of course, be connected to the earth. You must make sure that your home-made screens do not cause short-circuits. This can easily happen, for instance, if you cover the underneath of a baseboard through which screws project from components.



THOSE CAPACITY EFFECTS.

An article that should prove of interest and value to the practical amateur. By C. RADFORD.

THERE is a broadcasting station on the coast of America which acts very curiously. Its wave-length changes as with the rise and fall of the tide. It is said that the engineers who have investigated this affair are completely baffled, and can offer no explanation. But, no doubt, it is another of those peculiar capacity effects which we are always meeting in radio.

Capacity is one of the most important factors in wireless. It is one of the triumvirate which forms the basis of H.F. energy calculations. Inductance and capacity are the qualities of a tuned circuit which decide its frequency characteristic, while resistance is there to pare off some of the very valuable current.

Very Close Adjustments!

Capacity is, of course, the factor which, by the handy variable condenser, you smoothly vary in order to slide from one radio programme to another. I cannot help thinking that in the case of that American broadcaster the sea acts as a self-adjusting condenser—alters the characteristics of the aerial.

Have you ever had your set so finely adjusted that when you got up and walked away your station faded away into inaudibility? Modern amateurs do not tune as closely to the oscillating point as many used to; they prefer to bring in another valve and have plenty of margin to play with. But in the earlier days, when it was the fashion to squeeze just as much out of one valve as humanly possible, capacity effects had to be taken very seriously into consideration.

Those were the days when the mere entry of another person into the room was quite enough to throw the set into violent oscillation. But, as I have said, we do not now consider that sort of thing either necessary or desirable. Nevertheless, we do still come across capacity effects of striking natures, despite all the neutralising, grid-screening, and set-screening that is done.

A Mysterious Case.

A receiver is neither ancient nor badly designed to offer slight hand-capacity. True, this is the kind of thing the designer of a present-day outfit sets himself out to eliminate, but it does happen at times that a very tiny degree slips in during the making of a compromise. The design of even a modern set is beset with compromises.

But don't accuse your set of exhibiting hand-capacity effects simply because the tuning slightly alters when you remove or place your hand on one of the tuning dials. This effect may not be due to capacity alterations at all. I came up against this fact with a four-valve set I recently built myself.

Honestly, I do not like hand-capacity effects. I know I can quite easily compensate for them by bringing in a tiny bit more capacity than is wanted before my hand leaves the dial, so that the diminution of capacity so caused brings back the correct tuning; but, all the same, I hate the idea of the imperfection it signifies.

So when this four-valve set I have just mentioned seemed to possess the symptoms of hand-capacity to quite a marked extent, I asked myself why this should be so. The circuit is a straightforward one, and

A modern variable condenser having its moving vanes "earthed" to the frame. This is not the one which evinced the trouble described.

consists of one stage of neutralised H.F. amplification, followed by a leaky grid-detector circuit incorporating the very stable, staid Schnell reaction arrangement. There are two L.F. stages, one of these being transformer-coupled and the other resistance-capacity coupled.

Very efficient screening is arranged, although not essential, and there is plenty of anti-motor-boating and other such stuff to render the hook-up both modern and docile. And the results this receiver gives are very fine, while I must not forget to add that all the variables have their moving vanes connected to earth, and that these and all other components are of the very latest kind.

Nevertheless, there were all the symptoms of pronounced hand-capacity effects. You juggled the variables and brought in a nice, lusty foreigner, gave the dials a final touch, removed the hands with a flourish, and lo! the station vanished from the loud speaker.

The Cause of the Trouble.

I will not weary you with a recital of the investigations and researches that I carried out, because the joke is very much on me. But I eventually found that the trouble (for as such did I regard it) was due to a very slight fault in the construction of one of the variables.

This condenser had ball-bearings, but one bearing was not fixed correctly. There was no indication of looseness—the movement of the vanes was apparently first-class—but a very slight pressure on the dial was sufficient to move the vanes *en bloc* a little way backwards. You will notice that as you grip a 4-in. condenser dial, you tend to push it towards the panel. At least, I do.

And, in the instance of the four-valver, this was quite enough to throw the component off tune. When the pressure was released the vanes moved a wee bit forward. You might think that this would leave the capacity setting unaffected, for as the vanes move laterally the distance between the surfaces of the moving vanes and the fixed vanes on the one side alters proportionally as with the variation of distance between the other sides.

Perhaps this should be so, but after tightening up that ball-race the "hand capacity" completely disappeared.

The Reaction Control.

You come up against a different sort of hand capacity with the variable condenser that operates the reaction adjustments. With this the diminution or increase of volume is not a tuning alteration, but is due to a variation in feed-back effects. In order to eliminate it, the Schnell system is often adopted in modern circuits.

This enables the one set of vanes to be earthed. In other circuits condensers having three terminals are sometimes used. Two of the terminals are employed for the normal circuit connections. The third connects a shielding plate to earth.

It is a very good thing that hand-capacity has been more or less mastered, for undoubtedly it was the cause of a lot of unnecessary oscillation interference in those earlier days about which so many die-hards talk with maudlin regret.

W G Y'S RELAY.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should be interested to hear how many of your readers heard the broadcast from W G Y on the 31-metre wave-band, of the roar of the Niagara Falls during a relay of the proceedings of the commemoration of the fiftieth year of lighting of the falls by electricity.

The transmission was excellent, and was heard perfectly on the loud speaker on v.-2 L.F. receiver.

Yours truly,
PERCY R. SOLDER.
(2 A O Z)

P.S.—The above transmission took place on Saturday, June 15th, 1929, 8 p.m., American time.

New Southgate, London, N.11.

THE "TITAN" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I again add my name to the long list of the past, congratulating you and staff on such a fine production as the "Titan" Three. I made her up as per list, using a B.T.H. transformer, 2-1 ratio, with a 120-volts high-tension and super-power in last stage (all Mullards), and I must say I have made a lot of sets in years gone past from POPULAR WIRELESS circuits, but this one tops the bill in all senses, and as Mr. P. W. Stacey, near Whitchurch, Hants, mentioned in last week's "P.W." (June 15th), with a Blue Spot speaker all notes are most realistic. He sure has had the same thrill as myself. She's splendid!

Yours truly,
J. FAHEY.

Brynamman, South Wales.

THE B.B.C. RESIGNATIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the resignations of Captain Eckersley, Rex Palmer, C. E. Hodges, and Cecil Lewis; although all listeners will be very sorry to lose them, we must remember that these men are essentially pioneers.

They are men with ideas and the initiative to carry them out.

Broadcasting seems to be settling into a groove and is becoming a mere matter of routine.

Is it surprising that they should emulate Alexander?

Yours faithfully,
E. PUNTER.

Surrey.

S.G. VALVE VOLTAGES.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a short article recently published in your journal on the subject of calculating the requisite resistances for supplying the volts to the screen of an S.G. valve, the author states that the volts supplied can be found by the following formula: Volts = H.T. volts $\times \frac{R\,R_1}{R_1+R_2}$ when R_1R_2, etc., are as shown in the sketch. He actually suggests that the suitable values are about 25,000 ohms.

What he has apparently forgotten is that the impedance of the valve is in parallel with R_2, and is of a figure that does not warrant its complete exclusion. Using his own figure of 0·5m/a. for the consumption from screen to filament and assuming a pressure of 70 volts (60 to 80 are average figures) the impedance of the valves is thus about 140,000 ohms. This, in parallel with R_2, produces an impedance of only 21,000 ohms instead of 25,000 ohms, which is a difference of about 16 per cent. When one remembers that the screen volts affect the slope of the valve very considerably, and that the slope is more important to an S.G. valve than its magnification factor, it will be realised that the error is appreciable.

This point is especially worthy of note in the case of the AC/S, the Cosmos screened-gridder; where the screen current is much higher and a series resistance should never be used to drop the volts. When working with a standard A.C. eliminator with an output of about 250 volts, the potentiometer device may be connected across this directly, R_1 being 50,000 ohms and R_2 being 25,000 ohms. This allows for the impedance of the valve and will give the most suitable voltage to the screen. The moulded resistances reviewed by your Technical Dept., in the same issue, are a very convenient form of resistance to use.

Yours faithfully,
R. M. KAY, B.Sc.Tech.,
Radio Experimental Society of M/c.

CORRESPONDENCE.

W G Y'S RELAY.

THE "TITAN" THREE—THE B.B.C. RESIGNATIONS—S.G. VALVE VOLTAGES—RADIO FAULT-FINDING.

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

CHARGING L.T. BATTERIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was interested in the letter from Mr. Flowers, of Essex, on the subject of charging L.T. accumulators with Leclanché batteries. As I missed the numbers which contained previous information on this subject, I should be glad to receive a few particulars relating to the method, the type of battery used, the name of the publishers of the handbook mentioned, and any other particulars which might be useful. The writer states that the charging costs about 1d. per week. I do not wish to contradict the statement, but I am anxious to try it out for myself. I thought that I was getting good results by other methods, and the Daniell type of battery, but the cost is considerably more than the writer states. And may I state here, on behalf of the skilled worker, that I am just as willing to receive tips from the amateur as I am willing to give them.

It is by the exchange of experiences in these matters that we all learn and gather information.

Thanking you, I am, dear sir,
Yours faithfully,
W. H. GRAYLING.

Cambridge.

RADIO FAULT-FINDING.

The Editor, POPULAR WIRELESS.

Dear Sir,—You have published many excellent articles dealing with the defects that arise in various types of wireless apparatus and receivers and the means of remedying and curing them, but, judging by my own feelings in the matter, I do think, in spite of the excellence of some of the fare provided, that the question from the aspect of *diagnosis* has not been dealt with nearly as fully as it might and this criticism applies to the whole of the popular wireless press. There have been, of course, several articles that have touched more or less lightly upon the recognition of the symptoms of certain wireless diseases that afflict our receiving sets, and I have learnt a great deal from the extremely useful booklets that have been distributed from time to time by "P.W."; but in spite of that, and although I have had a fair amount of experience in testing my own sets and those of various friends, I still have difficulty in telling what is wrong in certain cases where the symptoms that present themselves are those that I have not come across before or which do not answer to the usual correctives.

For instance, we are told to insert a resistance between the centre-tap of a split secondary-coil and L.T.—to prevent the generation of parasitic oscillations, but, although I have read the theoretical explanation of the generation of these latter, I have never yet come across an article explaining how the presence of these latter may be *detected*, or how one can, say, *distinguish* between them, H.F. getting through to the L.F. side, or distortion due to L.F. oscillation above audio frequency—any of these singly, or if all three should be taking place together.

Again, I cannot recall reading how one can find out whether the detector valve is being overloaded except by means of substituting a big power valve in the last L.F. stage and then testing with a milliammeter and a process of elimination. But very few folk, except a wireless fan, will be found to have spare valves lying by them, so that the above test is not likely to be of much value to the man who receives an S.O.S. from a friend whose set won't work and who rushes in to perform first aid.

No doubt other types of trouble will readily occur to you where the behaviour of a set may be so mysterious as to render extremely difficult the detection of whatever faults and defects may be existing unless the owner and/or operator, as the case may be, has some really sound idea of how to proceed and, what is of paramount importance, to recognise the trouble when he comes across it. So far, I feel that the subject has been dealt with somewhat cursorily from the special aspect that I am emphasising, and I wish to ask you if you do not think that it would lend itself to a series of articles dealing with fault-finding in general and *diagnosis* in particular. When the former point is dealt with in fair detail, and the latter is so lightly touched upon, it seems to me to be analogous to teaching a man First Aid without showing him how to recognise his patient's injuries when he reaches him.

I should be interested to hear your opinion on the above suggestion, as if *I* experience this as an ordinary, common-or-garden amateur, there must be, surely, thousands of others floundering about in the same difficulties, or I am unique.

Yours faithfully,
Hampstead, N.W.6. M. JOSEPH.

[ED. NOTE.—Mr. Joseph's suggestions are welcomed by the Tech. Dept. of "P.W." which is always prepared to give close consideration to constructive criticism of this nature.]

SHORT-WAVE NOTES.

By W. L. S.

I HAVE been in touch with one or two large manufacturers of broadcast receivers during the week, and they all seem agreed that there is "no real demand" for short-wave sets on the commercial scale.

Why this should be, none of them could say for certain, but apparently the decision has been made in each case that it would not pay them to produce a short-wave receiver, however good or cheap.

Can it be that short waves are in need of more boosting? Or is it that the "home constructor" type, who is, I suppose, the supplier of the greater number of short-wave enthusiasts, is dying out or losing interest?

Active Stations.

It seems extraordinary that this comparatively new branch of radio, which seems to take such a firm hold over those who have once taken it up, should be a white elephant to the manufacturers.

I, for one, will supply an additional advantage of short-wave reception—if you have an oscillating neighbour, leave him at it and listen in peace on 40 metres and below! You will have plenty of alternative programmes and you can always listen to 5 S W if you want to hear what 2 L O is doing.

New commercial stations keep on cropping up in the amateur bands; apparently the usual air of apathy pervades the departments responsible for watching the ether and seeing that no one's toes are trodden on. Woe betide the amateur who goes outside his band and interferes with a commercial!

South London seems to be the most active spot in the country, as far as amateur transmission is concerned, at all events over long distances and in the 20-metre band. Among the active stations now are G 5 W K, G 6 H P, G 6 N T, G 6 W Y, G 6 Q B, and others, all of whom seem to be able to work any part of the world just when they want to. I think several parts of the country (and other countries) could take a lesson from the transmitters and general arrangements of the "South London gang."

The High-Power Broadcasters.

Can the high-power short-wave broadcast stations, by the way, be attaining anything like the efficiency that the amateurs boast with their 10-watt transmitters? If they were, surely they would be putting the most enormous signals into all parts of the world, considering the strength that a good "10-watter" will produce in Australia.

I have been accused, in all good spirit, by a reader of contradicting myself at frequent intervals! I plead guilty, without qualifications. It simply can't be helped; by the time I have written about one particular "set of conditions" they have gone and another set taken their place. Thus, one week I say that conditions are remaining good longer than is their wont, and another I am bewailing the fact that the good conditions are all over!

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Send as many ideas as you like, each complete Scheme to be accompanied by 25 "SUNRIPE" 10's empty packets or 25 Coupons from the 1 oz. "SUNRIPE" Mixture packets (or any quantity of both, making 25 in all).

You have until September 16th next to send your ideas, which must be addressed to R. & J. Hill, Ltd., "S" Dept., 175, Shoreditch, London, E.1.

All entries become the absolute property of R. & J. Hill, Ltd. whose Directors will judge them on their merits, and award the prizes. Their decision will be final and the awards will be advertised in this paper on October 26th.

Illustrated List of the "SUNRIPE TWINS" Gifts will help you in this competition. Copy of the List, together with FIVE FREE COUPONS, sent Post Free on application to "SUNRIPE TWINS," c/o. R. & J. Hill, Ltd., 175, Shoreditch, London, E.1.

Should you not be successful in winning one of these "Advertising Ideas" Prizes, the empty packets or coupons you send in with your effort will count towards any of the "SUNRIPE" Gifts, to be selected by you from the Gifts List.

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FROM THE TECHNICAL EDITOR'S NOTE BOOK

Tested and Found—?

WATES VOLT-AMP. METER.

THE Standard Wet Battery Co. are offering a meter at 8s. 6d. which should prove very useful to the radio amateur. It is of the watch pattern, and it has two voltage ranges, 0 to 6 and 0 to 150, and, additionally, you can take measurements of 0 to 15 milliamps. Thus the little instrument enables you to test L.T. and H.T. voltages and also anode current.

It is also possible by a simple bridge method to test the voltage of an H.T. eliminator, a task which otherwise necessitates high resistance, expensive meters. But to do this you require an H.T. battery.

The Wates Volt-amp meter is a neat and well made article, and a test showed that its efficiency is greater than one would expect. Anyone could find a use for this handy article, even although he already possesses other measuring instruments. A case for this meter is available at 2s. 6d.

TRULY ALL-WAVE RECEIVER.

Philips Lamps Ltd. have placed in production a four-valve set comprising an H.F., Det., 2 L.F. circuit which covers the range of 10 to 2,400 metres. A screened-grid valve is used in the H.F. stage, and Messrs. Philips claim efficient amplification at every wave-length covered.

MAGNUM H.T. AUTO FUSE.

The price of this Burne-Jones line is 1s. 3d., and you can regard that figure as being very low indeed, as an insurance premium against burning out your valves. The auto-fuse consists of a small baseboard holder and a flash-lamp bulb, having a filament which burns out at a low current. And when the bulb is removed, after having done its duty, the two terminals of the holder are automatically shorted.

Providing you have rectified the fault which resulted in the blowing of the fuse you can carry on, but, as Messrs. Burne-Jones point out, the set, in such circumstances, is not proof against short circuits, and a new bulb should be fitted immediately it is available.

Normally, bulbs are provided which blow at ·5 amperes, although for sets taking lower filament current special bulbs are available which fuse at ·06 amp. The Magnum H.T. Auto-fuse is the kind of article which should figure in every valve set.

MORE "EKCO" MAINS UNITS.

I have always considered the L.T. problem more acute than that of the high-tension. An accumulator with its sulphuric acid is a nasty sort of thing to have about the house and, when one has the electric-supply mains running all over the place, it seems anomalous to have to mess about with batteries. But it is only very recently that L.T. mains units have become available.

"Ekco" are, as usual, well to the fore, and with their L.T.1 A.C. model there are no half measures. No limitations, such as having to use ·06 valves, have been entertained and you can get up to 1 ampere out of it if you want it.

Thus you can use it to run a ten-valve set, provided the ten valves are of the ·1 ampere type. Alternatively, you can take four ·25 amp. or cater for a combination of five ·1 ampere valves and two ·25 amperes.

Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

The following is a brief description of the unit by the makers: "This unit provides L.T. current only from A.C. mains for 2-, 4- or 6-volt valves up to 1 ampere. No alteration whatsoever is necessary to the receiving set. Just plug in!—that's all! This unit is also most suitable for use in conjunction with an A.C.-H.T. unit, as a socket is provided into which can be plugged the adaptor of an H.T. unit. A switch is fitted on this L.T. unit, so that when an H.T. unit is used L.T. and H.T. are both controlled at that point."

The current consumption is very low, the cost of 1,000 hours with electricity at 6d. per unit being approximately 7s. 6d.

As with all "Ekco" units, this L.T.1 A.C. is built on safe and sound lines. It has a heavy metal casing of an adequately protected character. On the panel are a meter, voltage controls, the switch and terminals. A plug adaptor and cord are fitted.

As to the price, this is £8 15s. the complete L.T. outfit. A goodly sum, but you can only regard such an article as inexpensive at that figure. In view of its reliability and the trouble and time it saves it is undoubtedly a most attractive proposition. On test we found it, again as with all other "Ekco" units we have tested, hum-free and in every way eminently satisfactory.

The voltage adjustment is easy, and you can, of course, opérate any normal kind of set with it, just as efficiently as if you were using an accumulator. A Westinghouse metal rectifier is employed and this also figures in the "Ekco" A.C. model C.2 A.C.

AN "ALL-POWER" UNIT.

This C.2 A. unit eliminates all batteries by providing complete H.T., L.T., and G.B. current supplies from A.C. mains. And it does this without necessitating alterations to the existing wiring of a receiver and existing valves can be used.

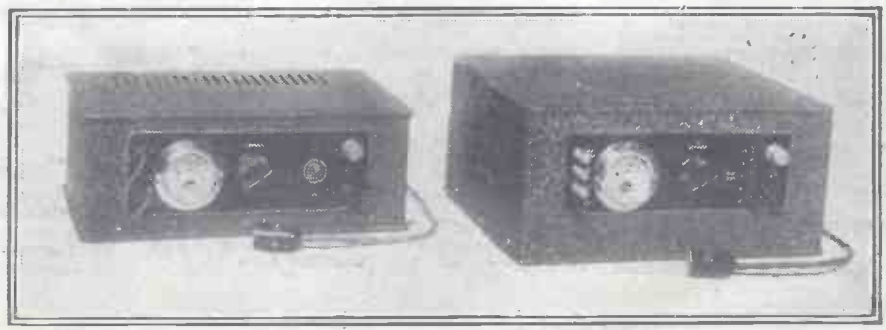
There are three H.T. tappings, one for an S.G. valve, a 60-volter for the detector and 120 to 150 for an L.F. valve. Any voltage of L.T. between 2 and 6 is available from ·2 amp. to a maximum of ·5 amperes.

Thus you can use three ·1 amp. valves, and one ·15 amp. power valve, five ·1 amp. valves or, in fact, any combination of valves with the same voltage rating, providing the total current consumption does not exceed half an ampere. There are five grid-bias tappings available up to a maximum of 13 volts.

And you get all this merely by plugging the unit into the nearest light socket. The price of the A.C. C.2 A. is £10 17s. 6d., and this, too, we found on test to be completely satisfactory as a substitute for all batteries, within the power output of this particular model. The smoothing is completely adequate. There is a more expensive unit capable of providing everything in the way of H.T., L.T. and G.B. demanded by the most powerful multi-valver.

FINE AMERICAN EQUIPMENT.

The Rothermel Corporation, Ltd., have sent us several publications dealing with the high-class American products which they handle. Included are an informative booklet dealing with the Magnavox dynamic loud speaker and a copy of the third edition of the "Great Voice" booklet, which is also very largely concerned with that instrument.



The two "Ekco" units described on this page. To the left is the L.T. unit and to the right the "all-power" unit.

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

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc. to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. 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.

DOES A NEUTRALISED RECEIVER OSCILLATE?

H. G. (Canonbury, London, N.).—"Being a believer in keeping the ether clean, I don't want to use a set that is capable of causing interference with the neighbours. But I *do* want distance, and I am told that a good neutralised H.F. set cannot oscillate. Is this a fact?"

It *is* possible to cause interference with a set of the neutralised type, because by inexpert handling the adjustment of the balancing condenser may be thrown out, and thus the set becomes de-neutralised and capable of causing strong interference when unskilfully handled.

On the other hand, a properly neutralised set is capable of receiving dozens of foreign stations without causing the slightest interference with neighbouring sets, provided the neutralising condenser is correctly adjusted so that the set is properly balanced.

HOW TO NEUTRALISE.

"CASABIANCA" (Ipswich).—"What is the best method of adjusting a neutralising condenser?"

The following method of neutralising is recommended for use in sets provided with a reaction control and employing one stage of H.F.:

Set the reaction control at minimum, and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are in step with each other, it will probably be found that the set is oscillating.

To test for oscillation, touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular set). Oscillation is denoted by the strong clicks caused every time the plates are touched and released.

You will probably find that the set will only oscillate under the above conditions when the two circuits are in tune with each other, and this can be used as an indication. It is convenient to start the operation at some point near the middle of the tuning range. Now increase the capacity of the neutralising condenser. (In the case of such condensers as the Gambrell "Neutrovernia" this means screwing downwards.)

Test at intervals for oscillation as this is done, and you will presently find that the set has ceased to oscillate, and will not recommence even when the tuning dials are slightly readjusted. Now increase the reaction a little until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases.

Slightly readjust the tuning condensers again, to make sure that the set is completely stable once more. Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been "over-shot." Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation, but cause it to become stronger.

Your object must be to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation. It will then be observed that when the two tuned circuits are in step, and the set is brought to the verge of oscillation, a slight movement of the neutrodyne condenser in either direction will cause the receiver to break into oscillation.

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

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

It is to be understood that in the preceding notes, where a reaction condenser is spoken of, any form of reaction *control* may be understood.

A PICK-UP PROBLEM.

T. B. W. (Cold Norton, Birmingham).—"I was never tempted by the gramophone as such, but, being a keen radio fan, I felt I was missing something in not using a pick-up. Eventually I fell for one, and then rigged up a motor and gramophone turn-table from parts, finding it a great deal better fun than I had anticipated.

"The only trouble now is that I appear to be playing too fast. What is the best way of checking up the speed of the revolutions of the turn-table, and what is the best speed to run at?"

All you need to check up the speed is a good watch or clock with a minute hand and a piece of stamp edging or sticking-plaster to stick on the turn-table. Then count the number of times that it passes a given point during a one-minute run, and slow it down until you get a speed of 78 revolutions per minute, which is the usual one for the modern record.

MIXING TWO AND SIX VOLT VALVES.

"SCREENED GRID" (Lincoln).—"The set was originally built up from a description in POPULAR WIRELESS, but it has been subject to so many alterations of one kind and another that I hesitate now to give it a name, although I can say that its circuit is really screened-grid H.F. (tuned-anode), detector, and two (resistance-coupled) low-frequency magnifiers.

"In connection with the screened-grid valve I am in a bit of a difficulty because I have decided, in view of the results obtained, to use a two-volt screened-grid valve instead of a six-volt for which the set was originally built. What I want to know is whether it is better to arrange for the filament supply to be tapped off the accumulator separately for this two-volt valve, or whether a suitable resistance should be included in its circuit to cut down the filament at that point to two volts. Which is the better plan?"

Theoretically it is a much better plan to work the whole of the accumulator evenly than to tap off so that one cell has to supply more filament current than the other two. The method of arranging a resistance in series with the filament to give the required two volts instead of six volts is a perfectly sound one, and placed as you are we should certainly adopt this plan rather than that of arranging to tap the accumulator at 2 volts. Incidentally it is also much less trouble in operation once the circuit has been modified by the insertion of the correct value of resistance.

WAVE-CHANGE SWITCH FOR THE "TITAN."

Inquiries are often received relative to the adoption of an on-off filament switch of the type shown in the accompanying illustration to act as the wave-change switch in one or other of the "Titan" sets.

Such switches *can* be used with great success if a small modification is carried out to convert them from 2-point to 3-point switches.

At present each terminal is connected to its respective spring, and when the switch is "off" these two are separated by the insulation on the plunger. When the switch is "on" these two points are joined together by the metal end-piece on the plunger.

What is required for a "Titan" wave-change switch is a 3-point switch, all the points being separated when the switch is "off" and all joined when the switch is "on." These conditions will easily be satisfied if a flexible lead is fixed to the metal end-piece of the plunger, for when "off" this will be disconnected from *both* the terminals, and when the switch is pulled "on" it will be joined to both.

In some types of switch the metal end-piece unscrews from the insulation, and the extra flexible lead can then be placed under

it. In other types the end-piece is fixed, so the extra flexible lead must be soldered to it.

In use the connections are: Each *terminal* on the switch to its respective "S" terminal on the "Titan" unit; and the extra flexible lead from the metal plunger to earth (or earthed filament leads, etc.).

THE P.W. "KUTTEMOUT" TWO.

(Continued from page 576.)

it should be noted, it is also rather desirable should be variable within limits, and the scheme we have adopted provides this control. The idea is this: from the upper end of the first tuned circuit a lead comes off to a neutrodyne condenser on the baseboard, and the small impulses which pass through this are fed through a portion of the detector grid circuit coil to give the desired coupling effects.

This is adjustable within limits, by varying the setting of the neutrodyne condenser (you will realise that this is not anything to do with true neutralising, of course), and you will find that for the normal degree of selectivity required for even quite severe conditions this condenser can be left adjusted to maximum.

Making It Up.

Turning now to the practical details of the assembly of the circuit in set form, we will take first the tuned circuits. First of all, note that every part required in the set is of perfectly standard pattern, since it is part of the attraction of the new circuit that it calls for nothing special whatever. Each of the two tuned circuits requires a ·0005 mfd. variable condenser, either the slow motion type or a plain one with vernier dial being very desirable, since tuning is sharp. The two coils are of the X or centre-tapped variety. The first one, namely, the one in the aerial circuit, can be either an X or a centre-tapped variety

With small and medium aerials and for only a normal amount of selectivity a centre-tapped coil is recommended, and you should try the aerial on both the alternative aerial terminals, one of these bringing in a series condenser and giving higher selectivity. This arrangement gives a degree of selectivity which is likely to be sufficient for all normal purposes, but in cases where an exceptionally high degree is wanted then use an X coil in this first socket, and try the flexible lead on each of the two tapping points provided on the coil. (You are not likely to need the series condenser under these conditions.)

A Coil Point.

It is also to be noted, by the way, that if your aerial is a decidedly large one an X coil is desirable here, even if you only require the normal degree of high selectivity provided by this circuit. A centre-tapped coil with a large aerial will rather flatten the tuning.

In the second tuned circuit an X coil is also required, and you should again try the flex lead on each of the terminals on the coil. You will generally find that only one of these is satisfactory, the other giving excessively sharp tuning and rather weak signals, and with no proper control of reaction.

(Operating and assembly details will follow next week.)

TECHNICAL NOTES.

(*Continued from page 568.*)

A Simple Precaution.

For similar reasons it is obviously desirable not to have the aerial proper in too close proximity to the earth connection, as otherwise some of the energy will pass direct to earth without going through the radio receiver.

A good earth connection is in the majority of cases very important for the successful operation of the set and if half the trouble spent upon the aerial were devoted to the earth-connection it would often be very much better spent. It is surprising what a difference is sometimes made to the working of a set by trying a different "earth."

You may be using an earth which is apparently quite good—such as a connection to a radiator or a waterpipe—but, in fact, the ultimate earth contact may be a poor one. If you take a large metal plate—a sheet of tinfoil, or even a number of tin canisters—buried in moist earth with plenty of water poured over them before re-covering with earth, and make a good connection to this "earth" by means of a low-resistance conductor, you will probably find that you get much better results than before.

Long Playing Record.

News reaches me of a new type of gramophone record which has been developed in the General Electric Laboratories at Schenectady, U.S.A., by Dr. C. W. Hewlett. This record is of the photographic type and is upon a film which moves to and fro in a special machine. The film is about 30 or 40 feet long, and the "sound tracks" are of almost microscopic dimensions.

There are a large number of these tracks lying parallel to one another along the length of the film, and these are successively traversed by the photo-electric pick-up. It is claimed that in this way a musical selection occupying as much as two hours can be recorded upon a film no longer than about 30 feet, and two or three inches in width.

Important Step Forward.

Efforts have long been made to find some means of recording lengthy selections in comparatively small and compact form and, if this new American invention does all that is claimed for it, it certainly will mark an important epoch in the development of sound reproduction.

ANODE FEED RESISTANCES.

L.F. OSCILLATION is often caused by a high-resistance or bad H.T. battery. This gives rise to what is known as battery coupling, and yet to cure it we use a high resistance in series with the high tension. At first it is difficult to see why this is not the same as resistance in the battery, but further consideration along the lines outlined in the following paragraphs will show the difference.

In the first place we will consider the question of battery coupling. This phenomenon is produced by a common resistance in the anode circuit of two or more valves.

An Important Point.

Fluctuations in the current flowing in the anode circuit of one valve are fed back by this common resistance to the anode of one of the other valves. Thus we get L.F. feed-back, which may lead to howling, buzzing, motor-boating, distortion or any of the other complaints caused by instability on the L.F. side of a set.

It is very important that the resistance of an anti-motor-boating device should be in one H.T. supply lead only, and not in a lead common to more than one valve.

This is largely the difference between the two cases. Actually motor-boating can sometimes be cured by using separate H.T. batteries, the reason being obvious from the foregoing remarks. The fluctuations in the anode circuit of one of the valves is not transferred to any of the others since there is no common battery.

We may now turn our attention to the actual working of an anti-motor-boating device. You will all be familiar with the scheme. An anode resistance of from 50,000 to 100,000 ohms is connected in series with the H.T. lead to the detector valve, and then 4 mfd. in fixed condensers is shunted between the set side of this resistance and H.T.—.

The Only Difference.

The scheme works in a somewhat similar manner to that of the H.F. choke and reaction condenser in an ordinary Reinartz circuit. The only difference is that the currents being dealt with are low-frequency instead of high-frequency.

A high resistance acts on L.F. pulses in the same way as an H.F. choke does on the high-frequency currents. In other words, it is working really as an L.F. choke. Actually it could be replaced by a low-frequency choke, although there are certain reasons why a resistance is generally preferred.

Thus it will be seen that the steady anode current is able to pass to the valve, but the fluctuations are stopped by the "resistance-choke" as we may term it. But if this was as far as we went no very useful purpose would have been served. Another path for the varying currents to get back to the filament must be provided. Hence the object of the fixed condensers.

These must have a fairly high value, otherwise some of the lowest frequencies will not be passed, and it is these particular frequencies that are most likely to cause trouble.

We have thus shown how an extra resistance can be used to nullify the effects of battery resistance.

THE "P.W." "WHITE PRINTS."

A UNIQUE SERVICE FOR OUR READERS.

White Print No. 32 :: An A.C. to D.C. Conversion Unit.

This week we publish the thirty-second of our White Prints. This page may be easily and safely torn out—along the dotted line overleaf—and the "White Print" filed. In due course you will thus have available an encyclopædic collection of the best circuits used in modern radio practice. The last "White Print" of the series will be published on the last page next week.—THE EDITOR.

THE slow but steady progress of the national scheme for standardisation of electricity supplies means that many areas previously fed with direct current are being converted to an alternating supply, and the change-over presents something of a problem to users of mains H.T. units.

In at least some areas it is understood that when the change takes place the local authority undertakes to replace existing apparatus with its alternating-current equivalent, but how far this applies to home-constructed apparatus is not known. In some cases, no doubt, the owner of a mains unit specially suitable for his set will not be particularly anxious to have it replaced with some equivalent which may not serve his purpose quite so well, and for one reason or another there will no doubt be many instances where mains users will prefer to consider the question of conversion of existing apparatus rather than complete replacement. At first sight it might seem that such conversion is rather a difficult business, but as a matter of fact by installing quite a simple little conversion unit between the old D.C. H.T. unit and the new A.C. mains the matter becomes decidedly simple.

Easily Made.

This week's White Print gives a design for such a conversion unit, and an examination of the diagrams will show that it is a very easy constructional job, although it embodies one or two rather expensive parts, the two principal ones being a mains transformer which will cost something in the neighbourhood of thirty shillings, and a smoothing choke costing perhaps twenty shillings.

The scheme is a fairly simple one, comprising merely a small power transformer, a full-wave rectifying valve, and a simple preliminary smoothing circuit, which means that partially smoothed current will be delivered to the old input terminals of the D.C. H.T. unit, the smoothing in the old unit being quite sufficient to complete the operation, and deliver the necessary pure direct current to the various positive outlets and so to the receiver.

The smoothing circuit consists of two separate 2 mfd. condensers, one directly across the output of the full-wave rectifying valve, and the other one on the further side of the single smoothing choke. The output connections of the conversion unit are taken to an ordinary batten-type lamp socket, instead of to the usual two output terminals. This will be found a very convenient scheme in operation, since most mains units are provided with a lamp-socket adaptor for connection to the mains. This enables the extra unit to be connected up very simply, the lamp adaptor being slipped straight into the output socket of the conversion unit, the conversion unit itself being connected to the mains in the usual way by means of a piece of flex with an adaptor or plug on the end.

Safety Precautions.

At the input end of the unit you will also notice that a fuse is provided, a point which will appeal to those who like to ensure the maximum of safety in their mains apparatus. As a matter of fact, with A.C. apparatus fuses are not strictly necessary, since short circuits which will affect the mains are practically impossible. At the same time, this fuse is shown to indicate the method by which more complete security can be obtained if desired.

LIST OF COMPONENTS.

- 1 Baseboard, 10 in. × 6 in.
- 1 Power transformer of the correct voltage rating for your mains (see details given in text).
- 1 Valve holder.
- 1 Ordinary mains fuse, and fuse wire blowing at 3 amps or less.
- 1 Smoothing choke. (See text.)
- 2 2-mfd. condensers, working voltage 250 or over. (See text.)
- 1 Batten-type lamp holder.
- Wire, flex, screws, etc.

Now a few words about the choice of suitable parts for the unit. First of all, the two reservoir condensers must definitely be of the high working voltage type, specially produced for mains working. The lowest safe working rating for these condensers is 250 volts, and it is preferable that they should be of 300 volts working rating or over. By the way, you may be interested to know that the correct working voltage rating for a condenser is exactly half the "test voltage" sometimes quoted. Thus a condenser specified as "tested at 500 volts" is one which may be used at working voltages up to 250, but not over.

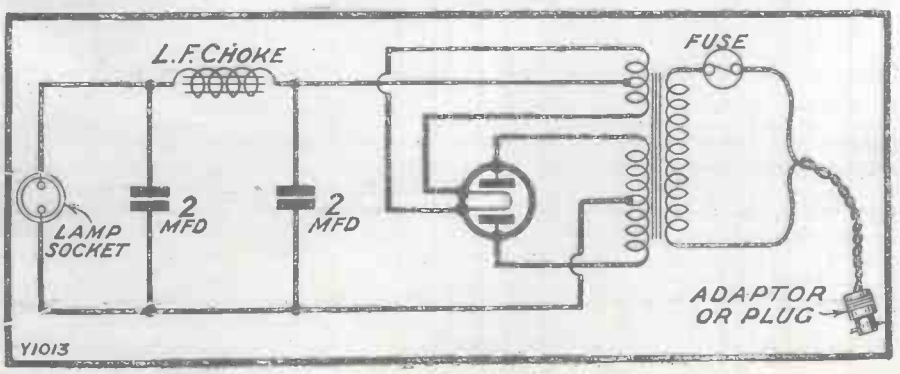
The smoothing choke should be of the heavy duty low D.C. resistance type and an inductance of from 20 to 40 henries is desirable. In good makes you will find that such chokes can be obtained with a D.C. resistance of from 200 to 300 ohms. The rectifying valve, as will be noted, should be of the full-wave type, suitable examples being available in most of the well-known makes. The type of rectifying valve to be employed should be decided before obtaining the power transformer, since the latter must have upon it a low voltage winding of the right voltage for running the filament of the rectifying valve. For example, if the rectifier is to be of the U.5. type, you will find that the filament requires 5–6 volts to run it and that means that there must be a 5- to 6-volt filament winding upon the transformer which you employ.

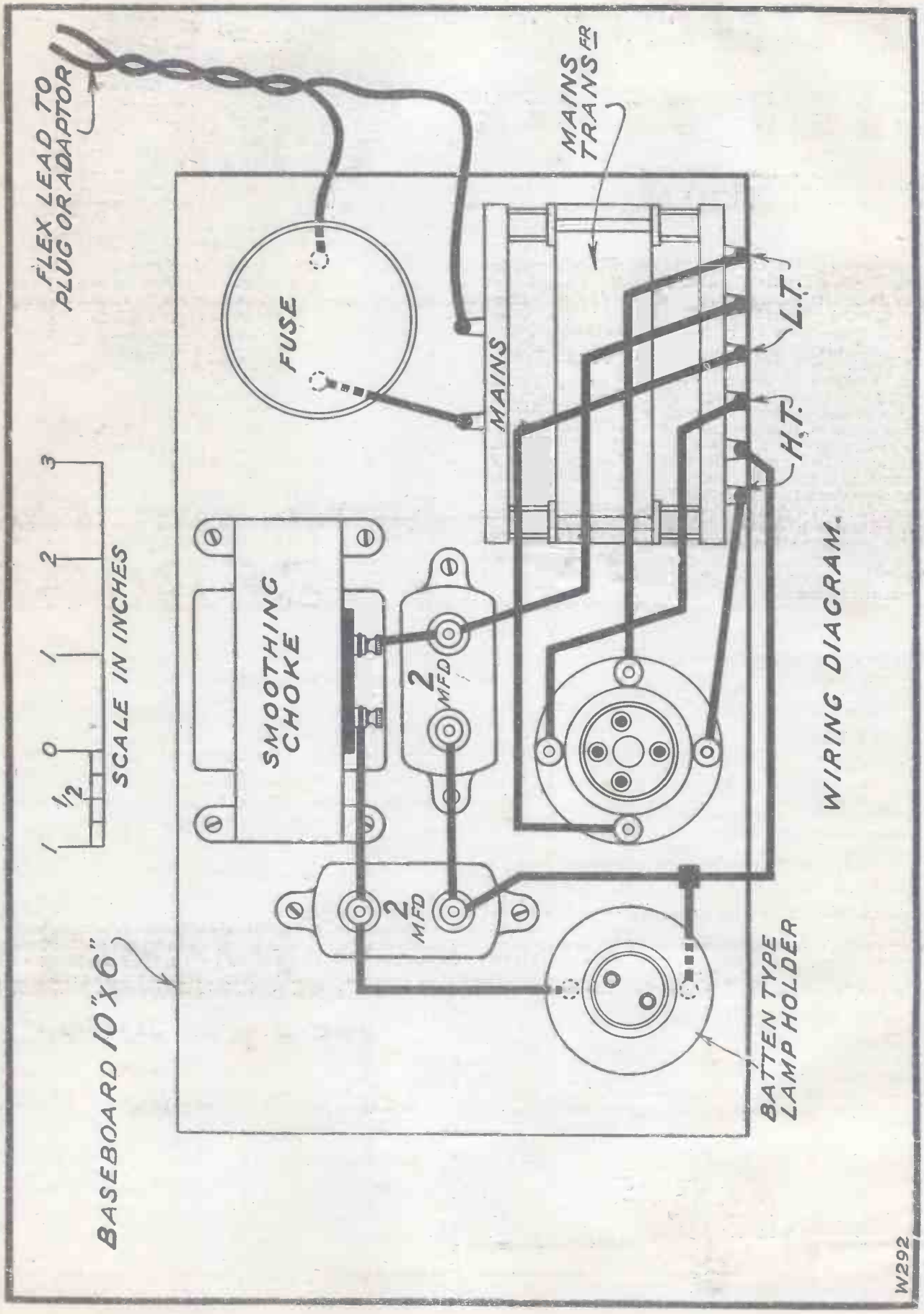
Transformer Windings.

This filament winding on the transformer should have a centre tap, and the transformer must also have a high-tension winding, likewise with a centre tap. A suitable voltage rating for this latter winding is 200–0–200, which will give you an output from the conversion unit to replace 200 to 220 volts D.C. mains. This is a point to be noted, since it means that if you replace the old D.C. supply with a rectified A.C. supply such as this conversion unit will give you, of roughly the same voltage as before, the voltages on the various tappings on your mains unit will be almost unaltered.

Constructional Details.

As regards the general make-up for a unit of this type, much can be left to the constructor. For example, on the very simple form of design shown overleaf, everything is assembled on a plain wooden baseboard, 10 in. by 6 in., and this is quite a handy scheme. If it is employed, of course, it is necessary to make up a wooden cover to fit over the whole unit when finished, as a protection. The necessary holes should, of course, be drilled in this cover for the input and output leads. If you desire to make a unit having a somewhat more professional appearance, you can put at the output end of the baseboard the usual panel, and mount upon this the lamp holder which forms the output connection for the unit.





CUT ALONG THIS DOTTED LINE

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