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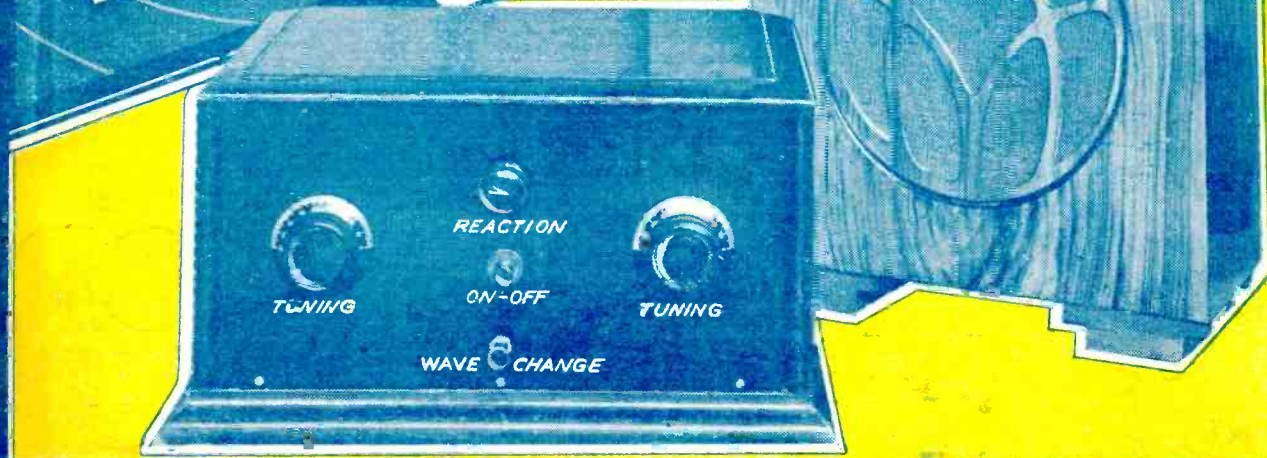
Popular Wireless

No. 619.
Vol. XXV.
April 14th,
1934.

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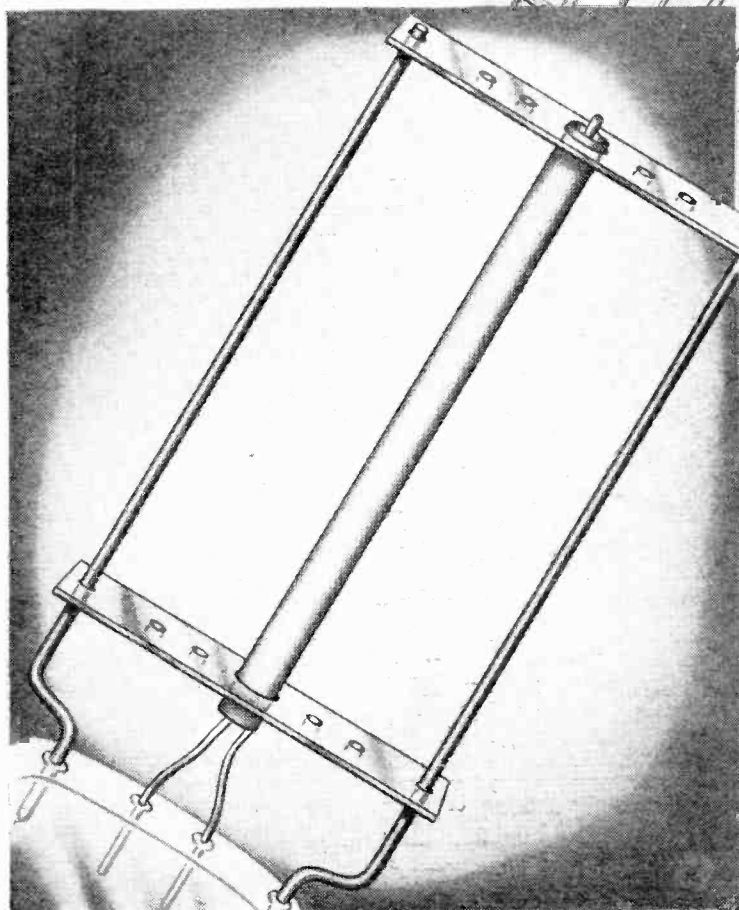


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POPULAR WIRELESS

THE FIRST AND FOREMOST RADIO WEEKLY FOR THE CONSTRUCTOR & AMATEUR EXPERIMENTER

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ON ONE VALVE
FLYING FEAT
RADIO WEATHER
CLUB NOTES

RADIO NOTES & NEWS

LIVE AND LEARN
"NIGHT AND DAY"
TRUE TO LIFE
B.B.C.'s BURGLARS

Life Is So Full.

I MUST confess that I sympathise with the Scottish parson who expressed his fear that if the meenistry interfered much more with his golf he would be forced to give up the meenistry.

For with the cubbing of sprig the claims upon my leisure time, such as it is, become insupportable. There is the garden, a whole-time job for one pair of hands and one set of lumbar muscles; and there is taking Arieline for lovely walks in the gloaming; and there is going to watch the Ariette play tennis.

Hi! Where do I get a minute for radio revels?

The Search Magnificent.

BEFORE leaving the domestic scene I invite you to compare notes with me over last Sunday's affair *chez* Ariel. (All the best columnists use *chez*.)

Well, the music stopped suddenly, and I said that the B.B.C. had broken down. After a time I became less confident and twiddled the knobs, only to find that, with all the volume control out, the signals were normal. One valve gone? Bad connection?

I dived into the set and made exhaustive tests, drawing blank. Then, as I dived yet deeper, the Ariette, who was at the window to watch an aeroplane, remarked: "There's a long piece of wire dangling over the lawn." Down-lead had come so adrift from lead-in tube. G-r-r!

Proper Precautions.

THE wave of criticism of the B.B.C.'s internal organisation which swept over some portions of the Press early in March contained much which gave me a pain in the neck. Nothing was too trivial for comment.

One point in particular struck me as singularly short sighted, and that was the complaint that artistes are asked to wait until their bona fides have been checked before they are escorted to the studios.

Considering what mischief could be perpetrated by an interloper with evil designs, I think that the B.B.C. is fully justified in exercising the greatest caution.

Done on One Valve.

REFERRING to a Roche reader's toot about his one-valve and thirty stations, as I thought I should, so I indeed have received competing claims. W. L. E. (Woking), using a "W. L. S. Short-Wave One," has picked up and held WCAU. His aerial was an indoor "sausage."

W. L. E., by the way, finds that "atmospherics" are nearly always stronger during full-moon period, and prefers a fortnight later. This is not in accord with other observers.

Personally, I think that the moon does not come into the picture at all. Don't all write at once, though; slay me piecemeal.

Keeping It In the Family.

THE Hubbard Gold Medal for outstanding geographic achievement has been awarded to Mrs. Lindbergh, the wife of the flying colonel of that name, for her work as wireless operator, aerial navigator and co-pilot on the flight which she and her husband made last summer. I believe it was the flight for surveying a route for the proposed North Atlantic air service.

She is the first woman to receive this medal, and has now drawn level with the colonel, who already has it. Three cheers for a gallant little lady!

Blame the Wireless Waves.

HOW hard the "radio-makes-the-weather" theories die! The discussion is still raging, ding-dong, in a West Country paper, wherein a true believer gives his opinion that, with every advance in the power of radio stations, cloud formations become increasingly electrical.

This same seeker after truth writes: "There is a North Magnetic Pole. How is it, then, that, with the continued increase in wireless, the winds should be persistently northerly for the last 12 months?"

That's an easy one. If we didn't have a North Magnetic Pole *all* the winds would be southerly and the fur trade would be a perfect flop. But without a north there could be no south, and so the whole darned compass would be upset because of radio.

Another Radio Club Under Way.

THE Glasgow and District Radio Club advises me that the response to my note about its formation was "good." It has now grown up, has held its fourth meeting and is a going concern. Fine!

But more members are needed, and anyone in Glasgow who is inclined to take Ariel's advice to join a radio club should write, enclosing a stamped and addressed envelope, to the Secretary, Mr. H. Duff, 90, Budhill Avenue, Shettleston, Glasgow, E.2.

Women Announcers.

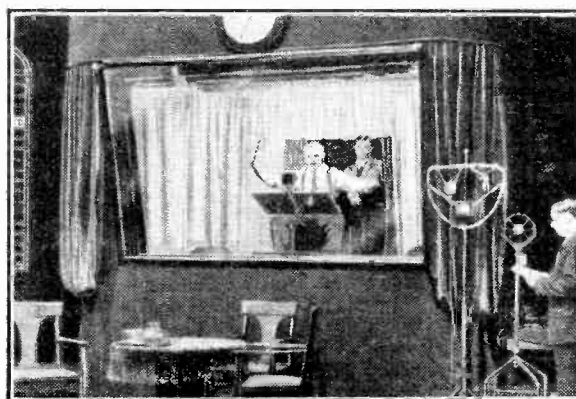
WHEN Miss E. L. Spratt, of the B.B.C., stated that Mrs. Borrett was removed from her job as announcess because so many women wrote objecting to one of their own sex, she revealed that the B.B.C. is capable of being influenced by correspondence: though it may be, of course, that they were not really convinced, but preferred Mrs. Borrett's absence to an intolerable flux of heavily underlined female squawks.

I see no more reason why a woman should not be an announcess—provided her voice is suitable—than that a man named Gurples should not be a railway porter.

But, it is to be observed, the B.B.C. did not try again.

(Continued on next page.)

UNDER LISTENING CONDITIONS



A new photograph from Budapest showing the sound-proof conductor's cabinet (at the end of the concert studio), in which the musical director listens to the orchestra through a loudspeaker while conducting via the glass window.

PLAYING FIVE THOUSAND RECORDS!

We Live and Learn.

I HAD always thought that church bells were rung by strenuous people dangling on the ends of long ropes; but an announcement made in connection with a proposed broadcast of the carillon of St. Patrick's Roman Catholic Cathedral, Armagh, has added to my knowledge.



It seems that there are things called "notes" which have to be struck very forcibly with the side of the hand. The carillonneur wears pads on his hands to protect them from bruising.

I should hate to be a hasty-tempered carillonneur's little boy!

A New DX Club.

A NEW international organisation, the Universal DX Radio Club, has come into being. Its headquarters are at 2559, Polk Street, San Francisco, U.S.A., to which all inquiries should be addressed.

I can tell you now, however, that the subscription is 1 dollar 20 cents for the first year and 85 cents per year thereafter.

By the way, Mr. Leslie W. Orton, of the A.-A. R. and T. Society, is an Hon. Vice-President of this club, but inquiries should not be made to him, but to Frisco.

The Trip Wasn't Wasted.

MY story about the highly paid engineer who made a journey of 125 miles by sea in order to "vet" a wireless station, only to find two telephone tags not connected to the receiver, is ably capped by D. B. K. (Sydney, N.S.W.), who tells how, ten years ago, he was sent from London to near Aberdeen on a "servicing" job which actually amounted to no more than the replacement of one burnt-out valve.

But his host kept him there for a whole week for shooting, fishing and, I have reason to believe, elbow lifting. What a complacent employer was D. B. K.'s, though!

Much in Little.

R. H. (Fulwood).—In order to save currency difficulties for a fellow-fan, perhaps you would send copy, anyway. Address is E. Björkmann, c/o Tollpost A.S. Oslo, Norway.

S. S. F. (Exeter).—Yes, I am sincere in my notes about the value of radio clubs—and your local club is ready for you to test the matter.

L. A. (Homerton).—Doubt whether the fitting of a directional aerial worth trouble and expense.

K. P. R. (Dundee).—This is not a "film" paper, and I don't know Greta's address. (Come, come!) Ask Marlene.

Better Late than Never.

TO congratulate the B.B.C. for its abolition of the "ghost-in-goloshes" interval signal might smack of sarcasm,

considering that the change has been so long on the way, despite our frantic beckonings.

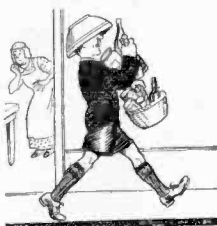
How on earth it was compassed one cannot imagine. Consider the committees, reports, memoranda, etc.! One hopes that nobody resigned rather than withdraw Standing Order X—Z/CQ 6349!

However, now that reason has prevailed we may rejoice in a signal worthy of the status of British broadcasting.

This Science is Dreadful.

MY son and heir is supposed to be learning chemistry, and he is very profound when speaking of acids. During the "hols" he alarms his ma with home-constructed explosives—which never do what they ought—and annoys the kitchen by purloining all the available pots and bottles.

He has recently been investigating my battery, and the other day he approached me and uttered these words, like an accuser: "That acid contains decimal thirty-five per cent of 2FePRQX"—or some such gibberish.



been presented with a silver cup to be awarded to the competitor who makes the best S.W. receiver up to three valves, asks whether we can give details of any similar competition held in the U.K. which would serve as a basis in framing the rules of its competition.

I should like to help these exiles, so will anyone who can provide the required information kindly write to me, c/o The Editor?

How True to Life!

MR. C. C. PATERSON, O.B.E., in delivering the Faraday Lecture at the Institution of Electrical Engineers on March 15th—and how I wish you could have heard it!—spoke of the travel of electrons: how, when moving, they have a wave character and, when colliding, a particle character.

And, *inter alia*, he made this pregnant remark: "So long as any travelling thing has not arrived it has only a probability of arriving." Our office-boy—to the life! "But once it gets there, there is no longer any probability about its being there; its presence is a fact."

Yes, and he demonstrates it by whistling "Riding on a Rainbow"!

Groucho in a New Role.

GROUCHO, of the famous Marx Brothers, agrees with Eddie Cantor about the undesirability of studio audiences, and is equally funny in his remarks on the subject. He says that it is hard for him to work in front of an audience which has not paid to get in!

"When we were on the stage," he adds, "for years we were used to working without an audience for our shows, and we don't like to break down a tradition." Besides,

he says that he is uncomfortable in front of a studio audience, and so is the audience, and their discomfort invariably increases his, and so he is in favour of preventing all that discomfort!

Preparing to Repel Boarders.

THAT'S what the landlady's Irish stew does, too. I refer, however, to the B.B.C.'s latest coup de something or other, no less than the fitting of Broadcasting

House with burglar-proof shutters. Somebody has (a) been trying to abduct the Controller of Output or (b) trying to set light to ten tons five kilogrammes three gills (North Country size) of hitherto absolutely unused Foundations of Music.

But—to revert to my customary seriousness—what has the B.B.C. worth sneaking other than the petty cash and the stamp box? I know! It must be the scores of "Wozzeck"!



ON THE AIR THIS WEEK:

Claude Hulbert (National, April 12th).

Part author of "Postman's Knock," in the revival of which he will appear this week. Started life unluckily, being born on Christmas Day, so that he only gets one set of presents for the two celebrations! The son of a doctor, learnt how to act at Cambridge. Has broadcast regularly since 1928 as himself, as a quarter of "Those Four Chaps" and with his wife, Enid Trevor. Once inherited £14,000. Likes home life and pictures (moving) and lives in Chelsea.

Ever since then my set has kicked over the traces, the morning milk has been stolen and the spare bedroom's ceiling has had a damp patch.

"Night and Day."

THE 1934 catalogue of H.M.V. records is an astonishing production of 400 pages, covering some 5,000 records. Some painstaking computer connected



with the Gramophone Company has declared that it would take five weeks, playing day and night, to reproduce them. Perhaps some scientist with a passion for checking facts would care to try

the matter out in practice.

And which do you think is the most popular of these records? Handel's "Largo," of which there are fifteen different recordings.

Can Any Club Help?

HERE'S a chance for some radio club to oblige another overseas and to gratify the writer of these notes.

The Radio Society of East Africa, having

ARIEL.

TELEVISION



I HAVE devoted a good deal of space recently in this series to considerations of the likely future development of television, and we have seen that the most noteworthy tendency to-day is in the direction of more finely scanned pictures, permitted by the exploitation of shorter wavelengths for transmission.

How long it will be before there is anything in the nature of a regular service of this type for public use it is hard to predict, and it is open to doubt whether those who are experimenting on the ultra-short waves are not off on the wrong tack: such waves present very great difficulty from the point of view of general use by the non-technical public.

It appears possible, however, that some sort of compromise wave will be found which will permit considerably improved pictures to be transmitted without making the problem of reception too difficult. It therefore seems time to review the question from the practical point of view and see what would have to be done in order to take advantage of such a transmission, if and when it materialises.

The Type of Set Needed.

First of all, of course, we should have to provide ourselves with a short-wave set designed for the best results on the particular wave ultimately chosen, but that is not a matter which will present any special difficulty to the reader of "P.W." No doubt the Research Department will have the necessary practical design all ready when the time comes.

It is interesting to note, however, that such a design will most probably differ somewhat from the conventional short-waver intended for the reception of Morse and telephony. It will require to be laid out with very great care to ensure proper reproduction of the very high modulation frequencies which will characterise the fine-detail transmissions of the future.

In all probability it will be difficult to make very full use of reaction without some loss of detail, and I think this is likely to lead to more determined attempts to exploit H.F. amplifying methods if the wave is not too ultra-short.

Detection methods will almost certainly need to come under review for the same

A Problem of Progress

By C.P.
KENDALL
1934

reason, and here the lessons of the high-quality broadcast receiver will no doubt be applied. Some form of modified power-grid rectification will very possibly be found helpful, while the anode circuit of the detector will also require some general cleaning-up, the problem here being to exclude H.F. currents from the low-frequency amplifying circuits without by-passing the higher modulation frequencies.

Low-Frequency Considerations.

The low-frequency amplifying side of the receiver will also need a deal of care, for it will have to cope successfully with a range of frequencies extending far beyond the usual audio limits. To me it seems certain that we shall be driven to the use of resistance-coupled amplifiers, and even these will call for some skill in design.

These, however, are not things which will cause much concern to the hardened radio enthusiast, for he has seen much more

The replacement disc will require a larger

number of holes, the exact number being fixed by the scanning frequency of the new transmission. In most instances a new synchroniser will also be required.

It has been suggested that it will be possible to use our existing discs by running them faster, but I am not very optimistic about this idea. The necessary increase in speed is likely to be considerable, and the present driving motor could hardly be expected to do it, even with the aid of gears.

Synchronising Difficulties.

Moreover, there would be acute synchronising difficulties, and in any case this method would not take full advantage of the improved detail of the new picture. Opportunities for actual test have been

lacking so far, but I doubt whether the scheme is practical.

The mirror-drum receiver will be a bit of a problem, too, and the simplest way out will be the obvious one of a new drum and synchroniser. This is a pretty expensive business, so it is not surprising to learn that experiments are being made on a

method of optically multiplying the scanning lines of existing drums.

The method of which I have heard promising reports just lately uses a supplementary oscillating mirror driven by a cam gear, and it seems to offer considerable hope of quite a cheap conversion scheme. Of course, it can only be applied easily if the new transmission differs merely in the number of scanning lines: if the picture

frequency is likewise increased it would require to be supplemented by running the drum faster, which may or may not be possible in any given case.

A Flexible Method.

A really well-made drum should permit of running at double speed, although this may call for a more powerful motor in some instances. Drums which do not run absolutely smoothly and without the least sign of tremor or vibration at their present speed, of course, will most certainly not tolerate any such increase.

When we come to the cathode-ray system of reception we find the problem becomes

simple in the extreme, and we begin to realise what a truly flexible method this really is. All we have to do here is to make quite a trifling alteration in our time-base circuits, and then a few minutes of adjustment will bring the apparatus in step with

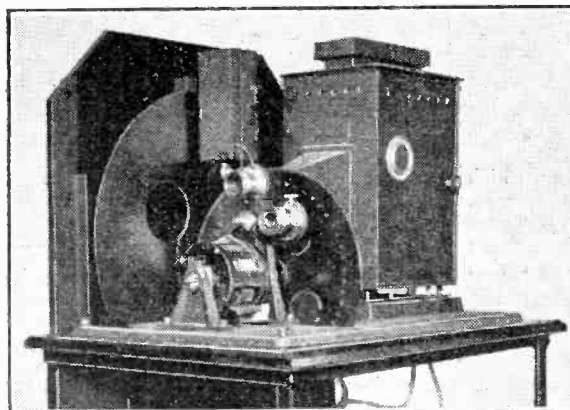
(Continued on page 126.)

One of the drawbacks to progress in television development is the fact that new inventions or methods are liable to cause the experimenter's apparatus to become out of date almost as soon as it is bought! So, in this practical article, Mr. Kendall deals with adaptations to television gear due to better scanning methods at the transmitting end.

difficult problems come and go in the past. They are all amenable to treatment by known methods, and I doubt if they will give us much real trouble.

The question of the necessary adaptation of existing television gear is a little less easy, and I think it is here that the reader will be glad of some definite information.

Naturally, the steps to be taken will depend entirely upon the nature of the



This very professional-looking outfit is the back of a Marconi television transmitter's scanning device. In practice it is mounted on a stand which carries heat-dissipating resistances, controlled from a switch on the front of the instrument.

scanning and synchronising apparatus used in any given receiver, so we must consider the various types separately. The simplest type, using a neon tube and a disc, will call for the more severe overhaul, and it will be found in most cases that a new disc will be needed.

AFTER negotiations of many months a kind of working arrangement has been arrived at between the B.B.C. and the Royal Philharmonic Society. Under this there will be a reduction of the number of B.B.C. public concerts next season, and Sir Thomas Beecham will conduct on at least two occasions for the B.B.C., Dr. Boult returning the compliment for the Philharmonic.

That Staff Memorial.

That Sir John Reith was able to produce a special memorial of personal loyalty from his staff when he visited the House of Commons recently was due to the initiative of Miss Taylor, of the Finance Department. Miss Taylor is one of the pioneers of the B.B.C., having been secretary and principal assistant to Rex Palmer when he was London Station Director, and afterwards in charge of artistes' booking.

They Didn't Sign.

I hear that there were rather more than eight hundred names on the memorial. This means that there were about a hundred abstentions, most of them, no doubt, due to the rushed character of the procedure.

Anyway, the circumstances of the abstentions will not escape comment.

Meeting Press Attacks.

The B.B.C. has not been nearly so calm as usual in the face of recent Press criticism. In the past such criticism was studiously ignored—often an effective "re-tort" in itself.

It looks as though, as the time draws near for the revision of the B.B.C. Charter, that institution will come under increasingly searching scrutiny. If there is any loss of nerve at Broadcasting House, affairs will go badly for the B.B.C.

The Organ in Trouble.

The much-discussed organ installed in the Concert Hall of Broadcasting House, at a cost of between seven and eight thousand pounds, is likely to become a "white elephant."

The trouble is not with the organ, which apparently is a highly efficient instrument. The trouble is that when the organ is played the noise penetrates through several floors of the studio tower, putting out of action at least six studios.

A pretty problem!

Continental Programmes.

I hear that the B.B.C. is making another effort to get the sponsored programmes in English from the Continent suppressed. Pressure is being brought to bear both on continental governments and broadcasters.

"WHITHER HOGSNORTON?"

Mr. Gillie Potter, advertised to speak on the above subject, did not once in the course of his lecture mention the word "Hogsnorton"!



The Café Colette Orchestra, with Walford Hyden, its leader.

FEWER B.B.C. CONCERTS?

News about broadcasting and broadcasters.

Meanwhile, those interested in the sponsored programmes are organising in self-defence, and have a Parliamentary Committee.

Back to "Sweet" Music.

Henry Hall's recent statement that comedy dance numbers no longer attract popularity, and that we are back again in the "sweet" melody era, will please those few dance band directors who have never succumbed to the temptations of "hot" music.

Charlie Kunz and the Casani Club Orchestra make a case in point. We shall probably be hearing more of them during the summer.

Prince George's Homecoming.

When Prince George returns from his South African tour he is to be entertained at a banquet at Grosvenor House on Wednesday, May 2nd, and arrangements

VOICED FROM LONDON.

Heard on the London National:
"The number you have just heard was on His Majesty's Voice Record No. - - - -"

have been made to include his speech in the National programme.

The banquet is being given by the Royal Empire Society, the British Empire League, the African Society, the Victoria League, the Overseas League and the British Empire Club.

Sir Austen Chamberlain on "England."

Sir Austen Chamberlain will propose the toast of "England" at the annual banquet of the Royal Society of St. George, which is to be relayed from the Connaught Rooms to National listeners on April 23rd.

Another topical programme will be the performance, on April 24th, of Clemence Dane's great classic, "Will Shakespeare," in

honour of the dramatist's birthday. Val Gielgud, B.B.C. Drama Director, will produce the play.

The "Broadcast Beauties."

The Eight Step Sisters are shortly leaving the B.B.C. to tour a number of theatres and music-halls.

In their place the B.B.C. is searching the country for representative British girls who can sing, dance and look beautiful.

It will be strange if this decision has not something to do with the present developments in television.

Birmingham "Rep's" Twenty-First.

The Birmingham "Rep" will soon be celebrating its coming of age, and the B.B.C. is marking the event by broadcasting a performance of "Sad About Europe," which takes place on Wednesday, April 11th.

The production will be preceded by a talk by Sir Barry Jackson, in which he will give some reminiscences of the early days of the Birmingham "Rep" and of the famous experiments by which the theatre broke new ground.

Regional Director as Interviewer.

Mr. Percy Edgar himself will be appearing before his own Regional microphone on the following evening, when he will interview Tom Costello for reminiscences of the early days of variety.

Birmingham produced many famous entertainers. Vesta Tilley, George Lashwood, Pat Rafferty, the Flying Dillons, the Flying Hanlons and the Brothers Griffiths are a few that can be added to the list with Tom Costello, who incidentally was seventy years of age when he made his first microphone appearance.

Concerts from Torquay.

Two concerts by the Torquay Municipal Orchestra and another concert relayed from the Princes Theatre, Yeovil, are in the West Regional programmes on Tuesday, Thursday and Friday, April 17th, 19th and 20th respectively.

Schoolgirl Prize-Winner.

The solo artiste in the first, which will take place at the Pavilion, Torquay, will be Mabel Ritchie, a soprano singer who started winning prizes when she was a schoolgirl, and now plays leading rôles in both grand and comedy opera with the Covent Garden Company. London listeners know her for several fine broadcasts.

Audrey Piggott, who will play 'cello solos in the second Torquay concert (to be relayed from the Spanish Barn, Torre Abbey), also began her musical career when very young.

O. H. M.

DIDN'T KNOW WHERE HE WAS.

A dance music announcement from the London Regional:
"This is Roy Fox and his Band broadcasting from the Kit Cat Res - - - Er, sorry! From the Café de Paris, London."

ON THE SHORT-WAVES

OUR SPECIAL SECTION FOR SHORT-WAVE ENTHUSIASTS

Conducted by **W.L.S.**



“HOTTING-UP” is a term with which all motorists and most radio enthusiasts are very familiar. Its appeal to both classes probably has something to do with the idea of getting something for nothing. So long as we don't expect to get *too much* for nothing, all is well! ★.....

This same hotting-up business, however, is two-sided. Very often it consists merely of doing something, as an afterthought, which ought to have been done in the first place. It is particularly this side of the business that I want to deal with.

Every single reader of these notes must have wondered, at some time or other, why two apparently identical receivers gave such different performances. If you were lucky you asked why yours was so much better than somebody else's. If, on the other hand, you were unlucky—but why bring that up?

Two Critical Sections.

It is my opinion that there are two main departments of short-wave radio in which many fail. The first is the detector, and particularly the aerial circuit, and the second is the L.F. amplifier.

There is not much point in arranging a very efficient detector circuit if you don't possess an equally efficient arrangement for

can readily be adjusted to suit all needs; Terminal A1 gives tight, untuned, inductive coupling; while terminal A2 gives capacity coupling with a variable degree of "tightness," according to the setting of the coupling condenser.

HINTS ON "HOTTING-UP"

Never decide that you have reached finality with your short-wave receiver. However good the results it may give they can always be improved by "hotting-up," some suggestions for which are contained in this authoritative contribution.

Although I am rather chary of saying so, it is my opinion that the aerial coupling on short waves should always be as tight as possible, provided that it does not introduce undesirable effects. The chief fault among practically all short-wave enthusiasts is that they don't know an undesirable effect when they hear one.

Coupling that is too tight may cause dead spots in the tuning, inselectivity, instability or, of course, in an extreme degree, it may stop the set oscillating altogether.

So many people tighten up their coupling until the last condition is reached, and then try to remedy matters by using a larger reaction coil. This is all wrong.

Decide, first of all, on the size and position of your reaction coil, and then make your coupling as tight as you can without introducing flatness into the tuning.

Test Your Aerial "Injection."

Now for those who err in the other direction. I have met people who use an untuned aerial coil, of a quite unsuitable number of turns, coupled far too loosely. In more than one case I have completely upset the apple cart by showing them that signals are every bit as strong with no aerial on the set at all!

Just try this test—remove your aerial and earth it, and find what you can hear. It will probably have the effect of making you think deeply about your coupling device. Every "hotted-up" set should certainly be equipped with the two alternative schemes shown in Fig. 1. The rest is a matter of individual experiment.

Now for No. 2! So many folk don't seem to have the foggiest notion of what one good L.F. stage ought to do. They use a cheap and nasty transformer, a doubtful valve, any old value of grid bias and hope for the best. If it doesn't come up to

expectations they slam another stage on the end—probably worse than the first—and grumble about threshold howls and instability.

There should *never* be the slightest need to use more than one note mag. for head-

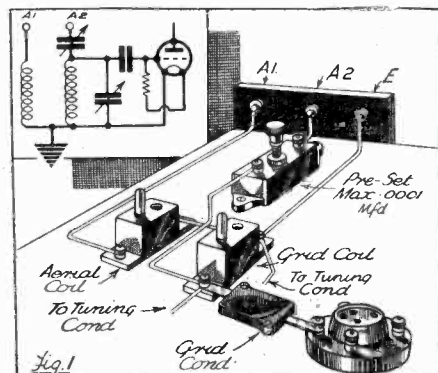
phone work. Don't spoil the efficiency of the transformer by putting resistances and volume controls across its secondary. If the latter is necessary it shouldn't be of a lower value than 1 or 2 megohms.

Use choke-filter output, as in Fig. 2. This is a great help in keeping things stable, and is one of the best cures for that annoying disease known as "head capacity,"—a "hand capacity" run riot and chased up the 'phone leads.

Use Good Quality Parts.

¶ The low-frequency side of a short-wave receiver should receive at least as much attention and consideration as the similar part of a set designed for medium and long-wave reception. Many people seem to be of the impression that the quality obtainable from short-wave stations is pretty poor anyway, and therefore it is of no avail to use good L.F. transformers. Such an idea is quite fallacious.

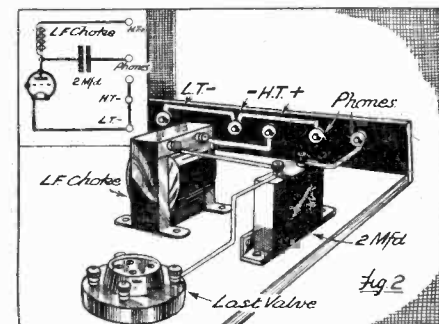
CURING "HEAD CAPACITY"



With a circuit arrangement such as that shown here, almost any degree of aerial coupling can be obtained.

transferring your signals into it from the aerial. Our American friends often refer to this part of the set as the "injector"—a very expressive term.

Fig. 1 illustrates an easy way of arranging a flexible aerial coupling device that



A filter circuit not only overcomes "head-capacity," but improves the general stability of the receiver.

Use a good transformer, a good valve, don't economise on H.T. and be careful with your grid-bias value. If only you will take a little trouble over all this I can promise you that it will be amply rewarded.

In a later article I want to deal with some of the finer points of "hotting-up," but so many people obviously haven't yet grasped even the elementaries that I feel quite justified in rubbing them in first.

On the Short Waves—(Contd. from previous page.)

WHAT READERS ARE SAYING

RECENT remarks about the Soviet commercial stations using high power on the amateur wavebands have brought forth a letter from Mr. Don B. Knock, Technical Editor of "Australian Radio News," on the same subject. He says that even in Australia they are a very serious nuisance. Why do they do it?

"S. I. K." (Barnstable) has logged an interesting series of intelligibility tests on the transatlantic 'phone in the region of 30 metres. They consist of word-lists and series of proverbs with one wrong word in each. He also had the thrill of his life by hearing W I X A Z relaying the ceremony of the coronation of the young Emperor of Manchukuo via Tokio.

Two Sets on One Aerial.

"R. S. W." (Towcester) has heard an Australian, probably V K 2 H R, on 28 metres, and X G R, Shanghai, on 26 metres.

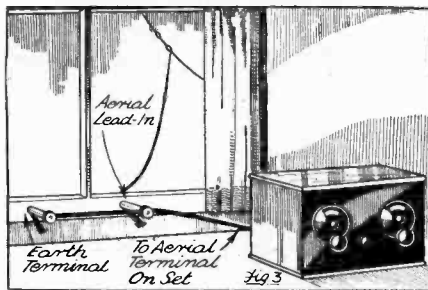
"R. H." (Purley) asks for identification of two stations. The first appears to be Jeloy, Norway (42.92 metres) and the second Zeesen, Germany, on 25.21 metres.

"A. W. A." (Hull) quotes a very interesting method of running a short-wave set and the family broadcast set *simultaneously* from the same aerial. He simply connects his B.C. set to the end and the short-waver to the centre! There is not a trace of interference between the two sets.

"I. S." (Glasgow) has succumbed completely to the short-wave "bug," and sends a long and newsy letter. He is very enthusiastic about the use of an S.G. stage, as in the "H.A.C. Three-Valver." His bag of short-wave broadcast stations shows five African, sixteen North American, five South American and one Australasian station, so he appears to thrive on it!

By the way, "I. S." suggests that readers ought to look for Barranquilla, Colombia (H J I A B B), on 46.5 metres round about midnight.

REDUCING STATIC



This suggestion will be of special interest to readers who have to use a long earth lead.

By way of contrast with the foregoing, "F. H. B." (Worcester) also has an "H.A.C. Three-Valver," but "detests two tuning dials," and has cut the S.G. stage out!

"H. J. B." (Manchester) comments on the good conditions prevailing up there of late. I am not sure whether we poor Cockneys find them so good down south, but we certainly have had a rest from those long "dead" periods lately.

"J. W. H." (Stoke-on-Trent) has a few choice remarks to make about short-wave condensers that develop wear in the bearings and make nasty noises. He says that the slightest trace of "rock" in the panel fixing bush will start them off. I have always found a smear of graphite grease the best cure for this trouble.

He wants to know of a firm specialising in the remagnetising and rewinding of headphones. I suggest he gets into touch with E. Mason, 44, East Road, London, N.1.

"T. D. M." (Brierfield) wants identification of a station on about 49.4 metres, the announcements from which "sound like Spanish or Italian." I should suggest Skamleback, Denmark, as a possibility. From other remarks that he makes, however, it seems like Maracaibo (Venezuela). Has anyone found him on that wave?

Using H.F. Pentodes.

"J. W." (Wimbledon) strongly recommends screened H.F. pentodes as substitutes for the normal S.G. stage on a short-waver. He promises a remarkable gain in selectivity as well as sensitivity, probably owing to the lower inter-electrode capacity. He also mentions a very bright scheme for improving band-spreading which I hope to deal with later.

The sketch on this page shows a brain-wave for those who are troubled by severe local interference. The aerial is simply connected direct to earth and the set hitched on the common point! It gives a sort of H.F. potentiometer effect, depending on how near the top of the house you reside. I find it extremely useful, and managed to listen right through a severe thunderstorm the other day. W. L. S.

I ASKED last time in these notes what was the most beautiful melody, and suggested that the *Londonderry Air* would take a lot of beating for first position in the hearts of the music-loving public. Right or wrong, it seems that it is not the most recorded piece of music, according to the information supplied by one of the leading gramophone concerns.

That title goes to Handel's *Largo*, which has been rendered scores of times by all sorts of artistes, and which is not yet by any means exhausted as a "number."

Another "Largo" has just been "waxed" by the famous cellist Pablo Casals, who is unfortunately not often heard on gramophone records. This piece is by Vivaldi, and is accompanied on the other side by two tuneful dance movements of great fascination. They are Valentine's "Gavotte" and de Laserna's "Tonadilla." (H.M.V. DA1118.)

FINE ORCHESTRAL RECORDINGS

Two orchestral items on H.M.V. records deserve special mention this week. One is the ever-popular "Berceuse" by Jarnet, accompanied by the same composer's "Prælude," and the other disc contains "Chopiniana" by Glazounov. The former record is made by an orchestra conducted by John Barbirolli, and is of light character, while the other recording is made by the London Philharmonic Orchestra under the baton of Sir Landon Ronald. This recording takes up three sides of twelve inches each, the fourth side (completing two records) containing the delightfully rendered "Bees' Wedding" and "Spring Song" of Mendelssohn.

Peter Dawson is still going strong, to the delight of thousands of gramophone users. His latest achievement in the world of wax is the recording of the world-famous "Joggin' along the Highway" and another favourite, "Here is my Song." Breezy recordings that will appeal to nearly everybody. (H.M.V. B8120.)

One of my favourite tenors is Heddle Nash, whose pure, even production is always a wonder and delight to me. His must be one of the finest of voices for recording, and he is at his best in "To Mary" and "Mary." These gems are to be found on Columbia DB1319, and all lovers of pure tenor ballad singing should hear them.

With Arthur Sandford at the piano, Debroy Somers has launched further into the "canned" classics type of recording by playing the first of what promises to be a new series called "Classics in Cameo." He has chosen Tchaikowsky's *Concerto in*

ROUND the RECORDS

Selections and recommendations from the latest gramophone lists



B Flat Minor. It does not appeal to me, though I am ready to admit that Somers has crowded a wonderful amount of the atmosphere of the original work into the two sides of the twelve-inch Columbia on which it is recorded.

To the classically minded music lover I should think that the record will sound somewhat of sacrilege, while to the light or "popular" fan it will be more or less unintelligible. It is a record that must be heard to be believed.

Down the scale (according to the "best" musicians) or up towards the light (in the view of popular music lovers) we find that Debroy Somers has made a most attractive disc containing "The Little Dutch Clock" and "Sun in my Eyes." They are quite different from one another, and both enjoyable. (Columbia CB711.) The kiddies will enjoy the former, too.

If you have a hobby you should listen to that prize pair, Clapham and Dwyer, discoursing on everything in general and nothing in particular, as recorded on Columbia DB1323. They call the record "Hobbies," but you will hear how much they get said about any hobby when you try it over.

ITEMS FOR DANCE ENTHUSIASTS

I have had a large number of dance and similar items in the last batch or so of records, and it is difficult to pick out any particular items without being unfair to others. One record that attracts me very much is by Decca of the dainty Fred Hartley Quintet playing "Midnight, the Stars and You" and "No More Heartaches, No More Tears." It is on F3916, and I am sure you will like it.

The Street Singer's efforts on Decca F3913 do not appeal to me, but as he is very popular with a lot of people I feel I must draw your attention to the record so that you can make your own choice. He is singing "Take me in Your Arms" and "Sleep, My Darling, Sleep."

Ray Warren, in "Croon To Me," on another Decca is also worthy of notice, though here again the division of like and dislike will be fairly well defined. Anti-crooners will not be attracted, of course.

Among the very latest records I have received are several light music gems that will appeal no less for the personalities that are depicted thereon than for the voices and numbers they sing. I refer to Noel Coward and Yvonne Printemps in two recordings from the new *Conversation Piece* album I mentioned last time; to Evelyn Laye singing two of Ray Noble's numbers from the film *Princess Charming*; and to Gertrude Lawrence, who sings two items from *Big Business*.

The Noel Coward record is well worth hearing, though it is mainly taken up by Yvonne Printemps. She does all the singing, the small amount of talking sufficient for the listener to grasp what it is all about being done by Noel Coward. On the disc is "I'll Follow My Secret Heart" (marked as Act 1 Pt. 1 and Act 1 Pt. 2) and taking up both sides. You'll like it.

TWO CHARMING EVELYN LAYE NUMBERS

Evelyn Laye is altogether charming in "The Princess's Awakening" and "Love is a Song." Both are tuneful numbers, of which I prefer the latter, and of course, theatre-goers will need no introduction to the charms of her personality and voice. Gertrude Lawrence sings "What Now" and "An Hour Ago This Minute," two very attractive numbers from the recent radio musical comedy *Big Business*, of which the last is deserving of special notice on account of its melody. All these records are made by H.M.V.

"Coffee in the Morning and Kisses in the Night" is the alluring title of one of the numbers in the latest Brunswick record releases. It is sung in usual harmony style by the Boswell Sisters with the Dorsey Brothers Orchestra, and is coupled with "Song of Surrender" (01711). There is a little too much solo singing for my liking and not enough of the characteristic harmonising of the famous sisters; but it is a good record, and one that you should hear.

So also is the latest disc by Aileen Stanley, popular American star, who makes a very attractive record of her hits on 01722 (Brunswick). It is called "Aileen Stanley Song Successes," and on it she records such famous numbers as *Gonna Get a Girl*, *Side by Side*, and *Here Am I*, *Broken-hearted*, all of which she weaves together into a semblance of a story. K.D.R.

MORE RECORDS IN BROADCASTING?

IN the recent "Scrapbook for 1909," Charles Brewer and I drew on the combined resources of studio and gramophone record more extensively than is usual. In this hour of music and drama we used a cast of sixteen, the B.B.C. Theatre Orchestra, an organ, "effects" and about a score of gramophone records. Some of these last we dipped into for only a few seconds—as in the case of the reproduction of words spoken by the late Sir Ernest Shackleton on a record made in 1909.

It was to us an interesting experiment in what can be done in this way. Recorded sound is destined, I believe, to play an increasingly important part in broadcasting.

There will always be some programmes that must be "actual" as distinct from recorded. But records have certain legitimate uses, and the prejudice against them in some quarters is disappearing—at least in Europe.

Extraordinary Prejudice.

In America this prejudice is quite extraordinary. American listeners would not approve of our action in "Scrapbook" of playing a record, specially made in Paris, of M. Blériot's description of how he crossed the Channel in an aeroplane twenty-five years ago; they would want Blériot at the microphone in the flesh or not at all.

Unable to get him personally, Brewer and I preferred the record as a valuable and (I think) satisfying substitute.

The B.B.C.'s rule in these cases is to tell listeners frankly that a record is used. Only in exceptional circumstances is there any concealment. On the afternoon of Christmas Day the "round-the-world" programme included an apparent relay from New Zealand; but it happened, for technical reasons, that the afternoon hour was not a favourable time for reception from the Antipodes, and rather than risk a fiasco the B.B.C. "took" the speech from Wellington several days before Christmas and recorded it.

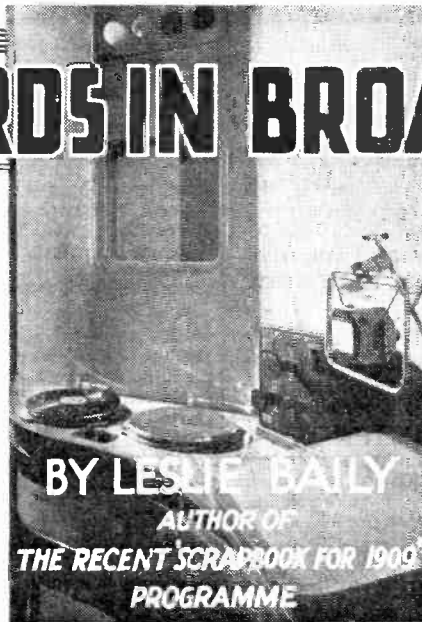
I contend that in the above instance the B.B.C. was perfectly justified in its little deceit. No good purpose could have been served by telling listeners that it was a record, and it would have prejudiced the artistic cohesion of the programme.

Wholesale deceit would, of course, be quite easy on the radio in these days when gramophone recording is so good as to be almost indistinguishable from a studio broadcast; and, in fact, some of the Continental stations are guilty of flagrant false pretences.

Is the Real Thing Essential?

But, to do the B.B.C. justice, it has very rarely bamboozled the public. It is not true that the song of the nightingale is relayed from a record! And every time you hear Big Ben's chimes on the wireless they really are coming from the great clock at Westminster.

It would be quite easy to put over these (and, indeed, almost any) programmes from specially made records. But there is an over-riding psychological objection. The



who gives us a vision of a B.B.C. almost entirely mechanised for entertainment. What do you think about it?

listener likes to feel satisfied that he gets his time direct from Big Ben; that he listens to a bird which really is at that moment singing to the summer night in a Berkshire wood; that the variety show which he is enjoying is actually going on in a B.B.C. studio.

Slightly more polished artistic results might perhaps be achieved if we were to record the variety show and then, at the hour of the broadcast, simply play the records to the public. But the public wouldn't stand for it. They want the

WILL THIS EVENTUALLY—



The human element—or mechanised programmes? A scene from a radio play (the methods of which Mr. Baily condemns) and one of the banks of turntables in Broadcasting House for record broadcasting.

"real thing." This applies, at any rate, to programmes such as variety, talks and outside relays in which the sense of "actuality" is important. It applies less to music; and less still to radio drama, which depends on the opposite to actuality—on establishing an illusion.

When you go to the cinema you don't expect to see and hear "actuality." You are offered recorded sound and sight—recorded on a strip of celluloid. Why, then, should anyone object to radio plays from records? They would be superior to the plays as transmitted now direct.

Isn't the present system of broadcasting plays fantastic? After a series of nerve-racking rehearsals the cast and producer assemble on the evening of transmission. They go into their studios in a thoroughly nervous condition. Each knows that by making a mistake he can kill the show. This applies especially to the producer, who sits at the dramatic-control panel drawing sound and speech from the numerous studios. This is about the most exhausting job I know.

It is Gone for Ever.

And when the show is over it is gone for ever! If it is to be heard on the alternative wavelength on another night, everybody must go through the same ordeal again. How much better it would be to produce the show in those same studios several days beforehand and, after getting it right in every detail, put it on records; then use these for as many transmissions as desired.

This, I feel sure, will come.

It would mean the installation by the B.B.C. of either sound-on-film or wax-disc recording apparatus, but that, in any case, is under consideration.

It may be that this recording controversy will be shelved by the arrival of television. When it comes as a regular entertainment it may be mainly in the form of transmissions of cinema film. You will sit at home, watching and listening to Mickey Mouse or Greta Garbo—in other words, to recorded entertainment!

—BECOME THIS?



USING A PICK-UP

and other radio matters of practical interest to all enthusiasts are dealt with fully and lucidly in our special weekly article for beginners

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

PARALLEL FEED TRANSFORMERS AND UNITS.

PARTICULARLY with the nickel-iron core L.F. transformer it is often desirable to arrange that the H.T. current does not flow through the primary winding.

By this means the saturation of the core is prevented and a greatly improved response frequently assured.

A parallel-feed circuit is shown at Fig. 1. The H.T. current reaches the anode of the first valve through the resistance, and the L.F. impulses are communicated to the primary of the transformer through the fixed condenser.

If it is desired to avoid the voltage drop in the resistance an L.F. choke can be used in its place.

The ratio of the transformer is unaffected by this method

"SHUNT" FEEDING

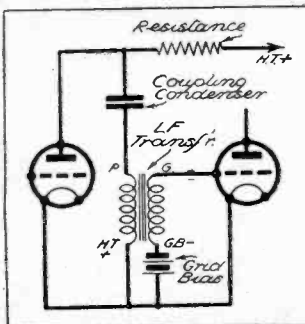


Fig. 1.—A parallel-feed circuit. The H.T. reaches the anode of the first valve through a resistance.

of connection, but there are other circuits which enable the ratio to be varied.

For example, Fig. 2 shows a scheme for obtaining a higher ratio. The primary and secondary windings of the transformer are joined in series and assist each other.

The ratio of a 1 to 4 step-up transformer becomes 1 to 5 owing to the inclusion of the primary winding in the secondary circuit.

The transformer has become an auto-transformer.

If the connections to the primary winding are reversed it will act in opposition to the secondary winding, and the effective ratio becomes 1 to 3.

Therefore it will be seen that when the primary winding

assists the secondary (as in the diagram) the ratio is increased by the addition of 1 (a 1 to 4 becomes a 1 to 5, a 1 to 3 a 1 to 4 and so on), but when the primary is reversed the ratio decreases by 1.

PICK-UP.

A gramophone pick-up is in many respects similar to a microphone. But instead of it being actuated by sound waves, its motive force is derived from the wavy grooves of records which vibrate the needle backwards and forwards.

There are two types of pick-up in common use—the "needle armature," in which the needle itself generates the current by its movement between the pole pieces of the magnet in the pick-up, and the ordinary moving-iron variety.

Pick-ups vary considerably in sensitivity, but there are very few these days which cannot provide satisfactory results when two amplifying valves of normal magnification are used.

Volume Control is Essential.

But, in any case, records vary a great deal, so that it is practically essential to employ a volume control to adjust the input from the pick-up to the desired degrees.

Some pick-ups have what is known as a "rising bass characteristic." In plain language that means that the device gives emphasis to the bass notes. The object of this is to compensate for the falling-off of bass that occurs in records.

SERIES WINDINGS

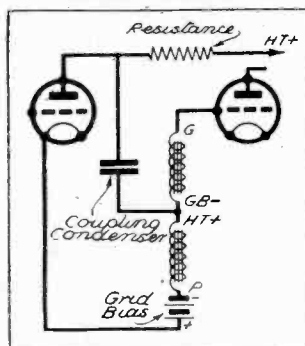


Fig. 2.—Here the primary and secondary windings of the transformer are joined in series, so that the transformer has become an auto-transformer.

But here, again, records vary considerably as with the different makes, and there is proportionally more bass in some than in others. Therefore, whether or not the pick-up is in any way "corrected" in its response, a tone control is an advisable fitment, and such is usually to be found as standard equipment on the modern set.

From Radio to Gramophone.

A simple form of radiogram switching is shown in Fig. 4. By the operation of a single-pole double-throw switch either radio or record working is available at will.

The diagram shows the detector valve only, though, if there are two stages of L.F. amplification and the pick-up is a rather sensitive one, then it may be as well to feed in at the first L.F. valve, for it will be

TRACKING—GOOD & BAD

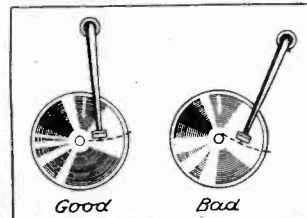


Fig. 3.—Illustrating the right and the wrong ways of fixing a tone-arm in relation to the record.

appreciated that a detector valve becomes an L.F. amplifying valve pure and simple when a pick-up is connected to it.

Note should be made of the position of the grid leak. Owing to its high resistance it does not affect the operation of the pick-up; but if it were joined to the "radio" side of the switch there would probably be a noisy change-over owing to the "opening" of the grid circuit.

It is important that the grid should be joined to the slider of the potentiometer volume control. If it were connected to one of the other terminals and a pick-up connection taken to the slider, tone would be altered as with volume adjustments owing to the consequent change of resistance across the pick-up.

The Adaptor Method.

The switch needs to be of very low self-capacity, otherwise radio will break through when the pick-up is working.

The grid bias will depend upon the valve. Sometimes one-and-a-half volts is sufficient, and seldom is more than three required.

To alter an existing set for radiogram switching often necessitates rather troublesome reconstruction. An alternative is to use an adaptor. The scheme is illustrated in another diagram (Fig. 5).

The detector valve is removed from its holder, placed in the adaptor, and this latter inserted in the vacated valve holder,

It is convenient to have the volume control on the motor-board of the gramophone. Any type of gramophone can be employed, but care should be taken to ensure that the motor runs at a uniform and correct speed.

"RADIOGRAM" SWITCHING

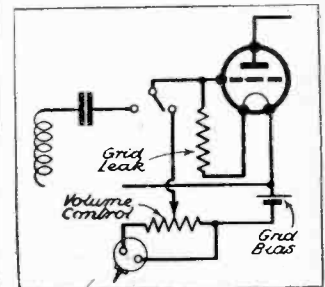


Fig. 4.—The connections for a switch to give radio or gramophone working as desired.

Good tracking is another desirable feature. That is to say, the needle must keep in line with the record grooves as closely as possible through the whole playing.

Usually the pick-up is offset (placed at an angle) to the tone-arm in order to maintain satisfactory tracking. In any case, the position in which it is fixed on the motor-board has to be chosen with care.

Generally the user need not worry about needle pressure, for the weight of the pick-up is a design factor, and some are even provided with carefully adjusted compensating balance weights in the tone-arm.

PRACTICAL WIRING

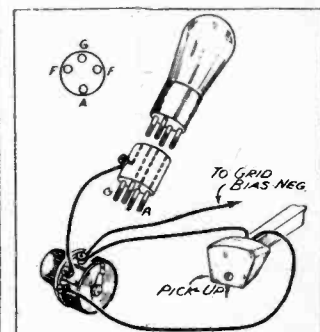


Fig. 5.—How to wire an adaptor for plugging-in a pick-up and volume control to a radio receiver.

A stop to make certain that the pick-up cannot swing right over to the other side of the record is most essential.

It should be remembered that the leads to a pick-up are in effect grid leads. Therefore, they are fruitful sources of possible instability.

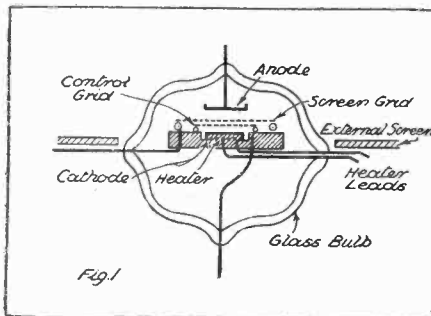
Pick-up leads should, then, be kept as short as the circumstances permit. But with quite short leads instability often results. A cure is to use metal-shielded leads, the metal shielding being connected to earth.

HELPING the ELECTRON

WE may soon grow accustomed to valves that almost require sugar tongs to pick them up. In the last dozen years we have gradually become familiar with shorter and shorter wavelengths.

With a little care ordinary standard valves can be made to function on 5 metres. Usually the tuning coil consists of only about one turn, and the condenser is as small as possible. But readers who keep their eyes open will have seen accounts of wonderful experiments, by Marconi himself and others, with wavelengths much shorter still—for example, 50 centimetres (half a metre). What about valves? Ordinary valves are quite impossible for several reasons.

Everybody knows that to tune to any wavelength one must provide inductance and capacity, and it isn't necessary always to have them in the same proportion so long as the two multiply together to give the right amount for that particular wavelength. The parts of the valve itself have a small capacity—usually something like a fiftieth of the maximum capacity of an ordinary variable condenser.



The arrangement of the electrodes in the new valve is shown in this sketch. Note the position of the external screen.

Also the connecting wires inside the valve have a tiny inductance. Small though they are, even if nothing whatever is added outside the valve, they add to one metre or thereabouts. So, obviously, there is no hope of getting lower in wavelength unless something is done to reduce the capacity and inductance of the valve.

The Delay in Transit.

There is another snag. The current inside the valve, between filament and anode, is carried by the tiny electrons that are shot off from the hot filament and attracted to the anode by the H.T. battery. They move at an amazing speed—something like 1,000 miles a second—and have only a small fraction of an inch to travel.

You might think that the time taken for the journey could safely be left out of account. This is an electron starting, that was! But you have to remember that when the wavelength is one metre it means that 300,000,000 complete waves have to be formed every second. So the

It doesn't take an electron long to travel from filament to anode, but it's long enough to count on the ultra-short waves! So special tiny valves have been designed, the operation and construction of which are here described

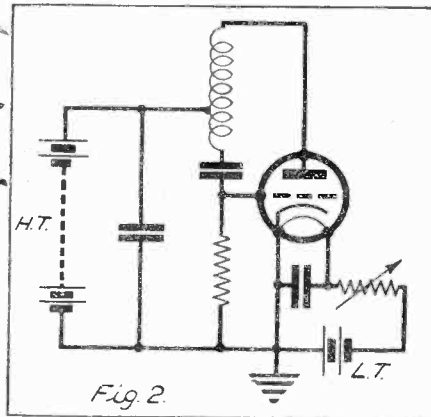
By M. G. SCROGGIE, B.Sc., A.M.I.E.E.

time taken for the current to traverse the valve has to be small, compared not only with our leisurely ideas of travelling, but with one three hundred millionth of a second.

As it happens, this delay in transit, although it throws the orthodox system of working out of commission, does actually form the basis of quite a different type of valve. What I have just explained will prepare you for the rather novel idea of controlling wavelength by H.T. voltage—for the higher the voltage the faster the electrons are pulled across.

Valves Are Just As Efficient

Most of the experiments you have read about have been carried out with valves of this sort. Not only is their exact method of functioning still hotly debated by high-brow scientists—that in itself would not be enough to prevent practical people from getting on and using them—but they are



This is the type of circuit with which the valve being held in the right hand of the man in the photograph is used. In his left hand is the actual receiver employed.

very inefficient and rather awkward to use. It is at the receiving end that they are particularly weak. So the valve people have been busy trying other ways of tackling the problem.

If an ordinary valve is built on a reduced scale, all the limits to its application to ultra-short waves are reduced in the same proportion. The electrodes have a smaller area and therefore less capacity. The leads are shorter and so less inductive. The electrons have a shorter distance to cross to get to the anode.

But, you may say, surely the valve is less efficient—there is less filament, and the efficiency of modern valves is due to the large expanse of filament or cathode that is available. True—but this is offset by the reduced clearances between the electrodes.

Actually our reduced valve has just the same "slope"—or "goodness"—and the same amplification factor as the full-size edition. The only thing that does suffer is the amount of power that can be handled.

An Ingenious S.G. Type.

If you have rather good sight you may be able to see one of these tiny valves between the finger and thumb of the gentleman in the photo; the right hand, not the left—that is the whole receiver!

Two types of valve have been made experimentally: a triode and a S.G. model. Both are globular in shape and about three-quarters of an inch in diameter—roughly the size of a marble. The clearances between the electrodes are only a few thousandths of an inch, so the parts can't just be slung together.

The construction of the S.G. valve is rather clever. A small porcelain disc is used as a foundation, and the electrodes are held at the appropriate distances from it—and one another—by rings of different thicknesses; see Fig. 1. The anode doesn't matter so much, and is supported from the opposite glass wall.

In spite of their small size, both types have "slopes" well over one milliamp per volt; which is quite good for any American valve. The electrode capacities are a tenth of the usual amounts.

(Continued on page 124.)



"ECKERSLEY EXPLAINS"

IN QUEST OF QUALITY

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

THE suggestion which arose out of my article on the "perfect set" seems, as I think about it, to be really constructive.

Single sideband transmission is, of course, well known. The transatlantic "long-wave" telephone uses single sideband transmission. But I do not think the suggestion to use single sideband transmission for broadcasting could have been seriously considered unless the receiver has a chance to evolve itself into a single sideband receiver. With the coming of the superheterodyne into Europe (it has long been established in America) we find ourselves with a means to achieve single sideband reception very simply.

I have been guilty of missing some points when I have discussed, in these pages, the relative merits of the straight set and the super. I have not seen these points brought out by the exponents of the super, so I will do it for them.

Station Selection.

In the past it seemed to me that there was little to choose between the super and the straight sets. In the former you have to have some filtration of signals, some tuning, that is, before the first detector. That tuning has to be fairly good to eliminate "second-channel interference." (The principle of the super involves the use of an oscillator which keeps a fixed frequency difference from the "wanted" signal.)

Suppose the wanted signal is of a frequency 700 kc. Then the oscillator is made to have a frequency of, say, 800 kc. The beat frequency is $800 - 700 = 100$. But there may be another station sending on 900-kc./sec. frequency. This beats with the oscillator, too, to make 100 kc./sec., because $900 - 800 = 100$, too. The second-channel interference is caused by the 900-kc. transmission (unless "tuners" are arranged to accept the 700 and tune out the 900).

But, you say, it doesn't require much tuning to select between two stations of 200-kc./sec. frequency difference. (The difference is always twice the beat or intermediate frequency; you will realise this by considering the example I gave you above.)

That looks true until you realise that selection in straight sets relies upon detector demodulation—that is, selection in straight sets only requires that the wanted signal should be about three or four times as strong as the unwanted, at the detector; the rest of the selection takes place due to demodulation effects.

The Question of Demodulation.

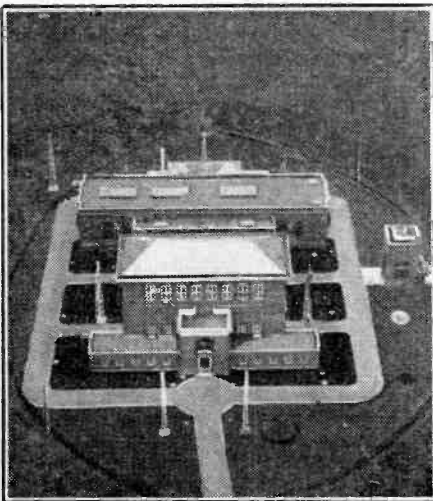
In a "super" there is no demodulation as regards second-channel interference, and although the frequency difference may be 200 kc., or of that order, the selection required has to favour the wanted signal not as 10 : 1, but more like 100 : 1.

So I was perfectly right when I said that high-frequency tuning or filtration of signal

or selection presented nearly as difficult a problem in a super as in a straight.

What I missed when discussing these things before was that, in a super, you have the chance to make a really narrow window through which to see the wanted-station

"TRANSATLANTIC PHONE"



"The transatlantic 'long-wave' telephone uses single sideband transmission." Our photograph shows the station house at Rugby which deals with this class of work.

spectrum, and that, given a reasonable amount of money to spend on the design, this can be made so narrow and so steep-sided that we could use the super as a single sideband receiver.

I UNDERSTAND

on the highest authority that there is to be a very considerable extension in the commercial set-making activities of Messrs. Radio Instruments in

the near future. Plans are in an advanced state for the production of four entirely new models, the first of which is to be available at the end of April.

My informant tells me that the first is to be a de-luxe superhet receiver for A.C. mains which will be priced at approximately 18 guineas, and an outstanding feature of the design is that no controls will appear on the front of the cabinet.

R.I.'s have established a reputation for quality articles which is second to none, and for that reason I look forward with more than usual interest to the release of details concerning these new models. "P.W." readers may rest assured that further details will be published in these notes as soon as they are available.

New Ferranti Circuit Tester.

Ferranti's, famous of old for their electrical measuring instruments, have

Mark you, I think that the superheterodyne of shoddy design is probably, unconsciously, turned into a single sideband receiver, more or less, by the user. He adjusts his dials to give him what he considers to be the nicest noise.

The properly designed super, plus single sideband transmission, could get over all this ambiguity.

To find recommendations for the super is perhaps more difficult than to find condemnation for the straight set. I have been doing analytical and practical work on "tuning." I find that a straight set with variable-mu volume control offends against every desirable quality in a decent design. But I will take back all that and say that, for a price and with given compromises, I couldn't advise anyone to use anything else!

Price for price, the straight set still wins. In performance the cheap super and the cheaper straight are probably on a par—with, perhaps, a slight gain if the designer of the super knows what he is doing.

My Job is to Explain.

My job in these articles is to explain. There are so many "ifs" and "ands" and "buts." Let me summarise.

I was asked, "What would I do to design 'the perfect set'?" I said, give me better transmission and I will give you a better set. What would improve transmission? Why, to stop the overlap of station sidebands, to send "single sideband transmission." How would that help the receiver? By allowing one to design single sideband receivers so that there wouldn't be any inter-station interference.

But I added, gratuitously, one has to consider the cheap every-day receiver. Which is better of that class: the super or the straight? My answer is that formerly I could find little difference; to-day I do see that, properly designed and even in the cheap class, the super might be better. Everything is wrong with the straight set, considered from an ideal standpoint, but it works by compromise. The day must come which sees its obsolescence. It will come by cheapening "super" technique.

THE LINK BETWEEN

Notes of interest to buyers by

G. T. KELSEY.

recently produced an A.C.-D.C. circuit tester which, from the descriptive matter, has every appearance of being a sort of radio "Aladdin's Lamp"! It measures

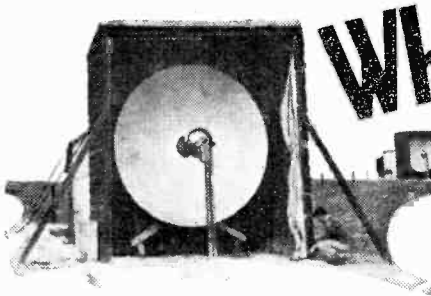
A.C. and D.C. volts up to 600, A.C. milliamps from 0-1, D.C. milliamps up to 750 and resistance up to 50,000 ohms. As a matter of fact, with an external voltage supply of 600, it will measure resistance up to 30 megohms.

Very Moderate in Price.

The price of this new instrument is £5 15s., a figure which, in my opinion, is very moderate. It's a lot of money, I know, but you calculate what it would cost you to buy separate instruments to do all that this modern wonder does, you will readily appreciate why I regard the price as so very moderate.

Just as a matter of passing interest, readers may welcome the news that it is available on hire-purchase terms. It can be obtained for a deposit of £1, and 12 monthly payments of 9s. 7d.

(Continued on page 126.)



Why "OPTICAL" WAVES?

CAN wireless radiations be part light waves and part radio? It's a question which anyone not fully conversant with short-wave lore might ask, for the descriptions "optical" and "quasi-optical" are frequently applied to wavelengths of five metres and less.

The fact that both radio and light waves are vibrations of the ether (though widely different in frequency) has nothing to do with this close classification of the two types of vibrations. The reason, though many will not agree with me, is really due to coincidence.

Controlled by the Transmitter.

When ultra-short waves were first investigated, they were found to exhibit certain characteristics which were very similar to those of light. Hence the derivation of the term "optical waves."

Chief among these characteristics was the fact that the rays apparently travelled in straight lines and did not follow the earth's curvature like those of longer wavelength.

The distance that a person can see on a perfectly clear day depends upon his height above the surrounding country, assuming the latter to be quite level. Similarly, the range of ultra-short waves was assumed to be controlled entirely by the height of the transmitter.

Another feature which increased the parallel between light and ultra-short radio waves was the complete failure to detect any reflected ray from ionised layers above the atmosphere of the earth.

Suspecting the First Flaws.

The "clinging" factor in the simile was produced when it was found that a large parabolic metal reflector focused these short waves into an unidirectional beam just as the reflector of a car headlamp directs the light from the bulb.

The first flaws in the descriptive parallel were suspected when organised tests on five metres were started. Reports of reception outside the optical range became quite frequent—too frequent to be dismissed as freaks.

So the term "quasi-optical" was introduced to cover the case, the word "quasi" being used as meaning "more or less," rather than in its strict dictionary sense.

Enthusiastic Dutch amateurs, by extensive tests, eventually decided that five-metre waves were $1\frac{1}{3}$ times optical waves. That is to say, they travelled one-third as far again as light waves might be expected to reach.

History-making Tests.

But the well-defined and complete shadows, produced by hills where "five metres" were concerned still seemed to uphold the "optical" analogy. This

effect is very well illustrated by the diagram below.

The sketch crystallises the data obtained with a portable receiver in a car during the POPULAR WIRELESS history-making five-metre tests from one of the Crystal Palace towers last year.

Starting from the bottom of the tower itself, I journeyed in roughly a south-westerly direction, taking measurements of

The contention is raised in this article that we are not justified in singling out the ultra-short waves as recipients for the terms "optical" and "quasi-optical." It is a contention ably backed by sound arguments and clearly propounded

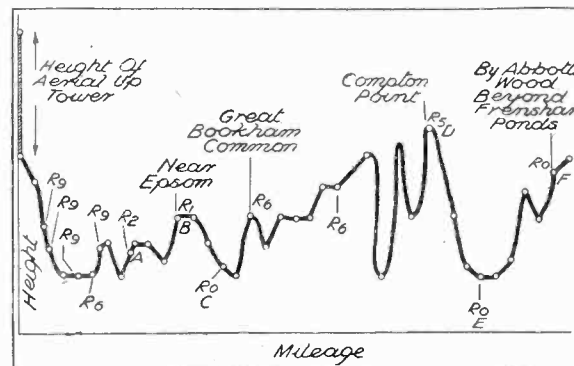
By A. S. CLARK.

strength wherever it was possible to stop the car dead on a compass course from the Crystal Palace. The figure shows the elevation of the land on the course, the ratio of height to distance being considerably exaggerated for the purpose.

Complete Lack of Reception.

The low strength at A and B can be attributed to local conditions, but the complete lack of reception at C and E is obviously due to shadow effects: similarly at F, although a line joining this point to the transmitting aerial is only just interrupted by the high peak D.

HOW HILLS AFFECT STRENGTH



In this diagram, the wavy line represents the elevation of the country in a direct line from the tower which carries the aerial of a five-metre transmitter. The numbers following the letters "R" represent signal strength at the various points.

These facts would certainly appear at first sight to bear out the supposition that ultra-short waves are propagated in straight lines and do not bend downwards to the earth. But as real proof they do not bear close investigation.

After all, the ordinary broadcast wavelengths suffer from shadow effects produced by mountain ranges. Surely it is merely a matter of degree, the shorter the wavelength the more noticeable being the effect?

And that brings me to my contention. All radio waves exhibit the same properties as those which have caused the higher frequencies to be termed optical.

The difference is merely a matter of degree. And since light waves, like radio waves, are electro-magnetic vibrations of the ether (only of much higher frequencies), it is natural that the shorter the radio waves the more they exhibit phenomena usually ascribed to light.

Why the Sun Looks Red.

Considering the other points that were mentioned at the beginning of this article, we have first the fact that so-called optical waves appear generally to stop short at the same point approximately as light.

This is easily explained. It is well known that the lower the wavelength the sooner the ground wave is absorbed. If you go low enough it is quite natural that the ground wave at some frequency will only travel as far as light. And, anyway, remember that light waves bend round the earth's surface to some extent; that, as a matter of fact, is why the sun looks red when it sets.

(As a point of interest it may be mentioned that Marchese Marconi recently showed that consistent reception of very short waves is possible beyond the optical range.)

The reflected ray of ultra-short waves probably originates at a layer so high above the earth's surface that the ray fails to touch the globe at all on its downward path.

And, finally, focusing. Well, even the comparatively long waves used for beam transmissions can be focused by "wire-mesh" reflectors. And so could any other radio wave if large enough reflectors were made.

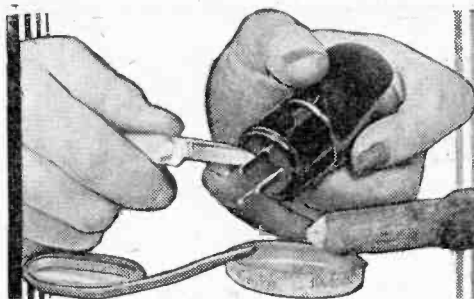
Producing Light.

It is entirely a matter of degree, and I submit to you that the term "optical waves" is very loose and not truly descriptive by any means.

Having shown, in the foregoing, that the only real difference between light and radio waves is in frequency, since they are both electro-magnetic vibrations in the ether, an interesting supposition arises.

It is this: Suppose, one day, we are able to produce sufficiently high frequencies by radio means for the wavelength to come within the light part of the spectrum, shall we have produced light?

If we have, some amazing effects are to be expected in the form of colour radiations from the aerial. Similarly, we may one day be able to detect light by means of a radio receiver.



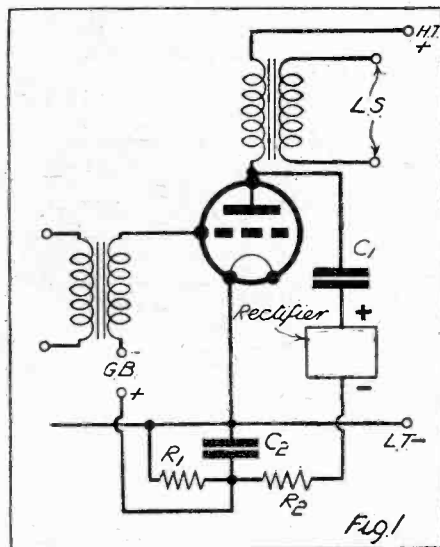
NEW USES for OLD VALVES

THE new systems of getting a large loud-speaker output for an H.T. current consumption within dry-battery limits, Q.P.P. and more especially Class B are now all the rage; but revolutionary and excellent as they are we cannot shut our eyes to one obvious drawback—the necessity for special components and valves.

If this matter of initial expense is the only obstacle to your enjoyment of the luxury of mains-set volume, which Class B undoubtedly gives, and if you can be content with just a little less volume, there is another way out—the battery-economiser system. This achieves the same result of maximum volume for minimum H.T. current consumption at much less expense.

No special transformers or valves are required: just a few minor alterations to

KEEPING DOWN CURRENT



A typical economiser circuit for anode current control, using a dry rectifier.

your present receiver and a few extra components. In fact, the experimenter with a well-assorted junk box will find that this remarkably good alternative to the Class B system will cost him practically nothing at all.

How the Scheme Operates.

The bare bones of the battery-economiser circuit are, first, the over-biasing of the output valve so that during silent intervals its anode current is very small, and, second, a device which reduces the negative grid bias by an amount depending on volume. Thus the output valve consumes only just sufficient anode current to suit the volume to be handled, with the net result that the average H.T. current load is much reduced. You can then afford to use a bigger power valve without increasing your annual bill for H.T. batteries. The full advantage of

Many valuable uses can be found for old out-of-date valves, including such modern schemes as automatic volume control and battery economisers. Below are given constructional details that will be of interest to all set-owners.

By "KRYPTON."

the system is, of course, only realised by using a larger output valve than your present one.

If you are now restricted to a small-power valve you can with this system change over to, for example, a super-battery pentode without increasing H.T. running costs.

As you will see from Fig. 1, the only additions to be made to your receiver are a connection to the anode of the output valve and a change in the grid-bias circuit. A separate grid battery of double the voltage normally recommended for the output valve is required here.

Varying the Grid Bias.

Part of the L.F. output, insufficient to affect volume, is fed through C_1 to a rectifier which produces across R_1 a positive bias, acting in opposition to the fixed-negative bias. This positive bias rises on a loud signal, producing the desired increase in anode current, but not more than is necessary for distortionless amplification.

The other components, C_2 and R_2 , form a decoupling filter, preventing L.F. interaction between grid and anode circuits. Thus the only parts required other than the rectifier are two fixed condensers and two resistors, all of which you are almost sure to have lying about.

For the rectifier you can use a Westector, but why not save expense and use one of your old valves? Practically any type will serve, but as the filament supply must be quite separate from that of the receiver, choose a low-consumption type.

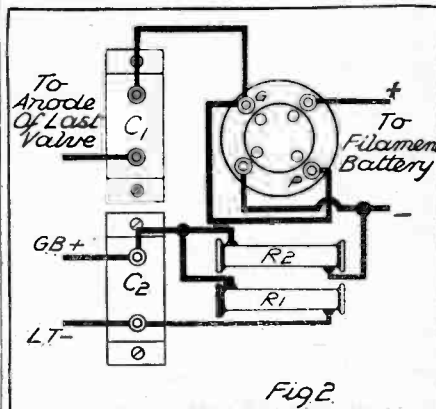
The old .06 dull emitters are ideal for this circuit, as they can be fed from a dry cell, while a 2-volt valve can be run from

your spare accumulator. The advantages of the system are such that the purchase of a small, cheap accumulator for the rectifier valve can be recommended.

If you can't find room on the receiver baseboard for the battery economiser components you can make them up into a small, compact unit, as depicted in Fig. 2. The condenser values are not critical—1 mfd or .25 mfd for C_1 and anything from .1 mfd upwards for C_2 .

It is very important, however, that the insulation of C_1 be above suspicion. The resistor R_2 should not be less than 100,000 ohms or more than 250,000; start with 200,000 ohms for R_2 and 50,000 for R_1 , which will suit most valves.

VALVE RECTIFICATION



How a valve can be employed to replace the dry rectifier shown in Fig. 1.

The amount of positive "back-bias" depends largely on the resistance of R_1 , so that some experiment with different resistors may be necessary. Reduce R_1 as far as you can before distortion becomes noticeable, a good idea being to use a variable resistor for R_1 .

A similarly arranged scheme could also be devised for A.V.C., using an old valve as rectifier.

CURING BREAK-THROUGH ON LONG WAVES

TO prevent medium waves breaking through on the lower long-wave readings it is customary to put a .0003-mfd. condenser across the aerial coil: across the long-wave section only, to save switching it out when tuning medium waves.

I have noticed, however, that this is not always suitable. In my case the capacity needs to be .0001. So try different values if you are troubled.

A medium wavetrap in series between terminal A and the aerial coil can be

fairly effective also, and this method has the advantage of allowing you to tune down as low as before.

An Interesting Variation.

What has been engrossing me, though, is a curious variation of the former device. Across aerial and earth I put a .001 condenser. Then between terminal A and the start of the aerial windings on the coil I put a .00075 variable. Not only is break-through thus eliminated, but there is a decided means of selectivity on the long waves themselves.

Expect plenty of shift on the lower readings as you tune. The more you increase the variable condenser capacity the more the positions will vary on the dial. E. E.

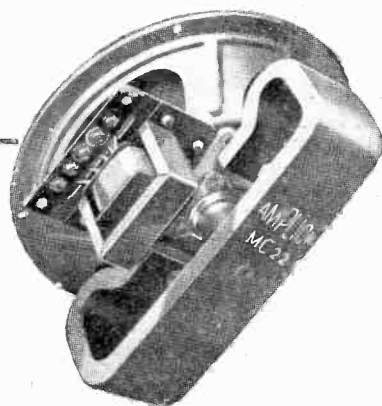
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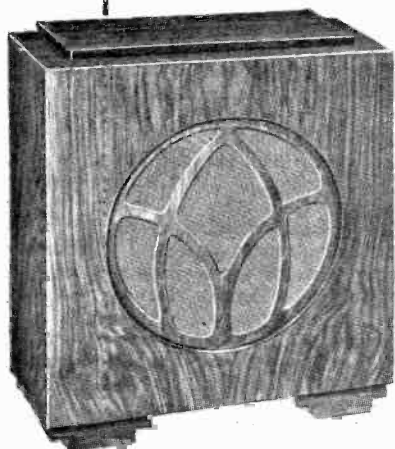
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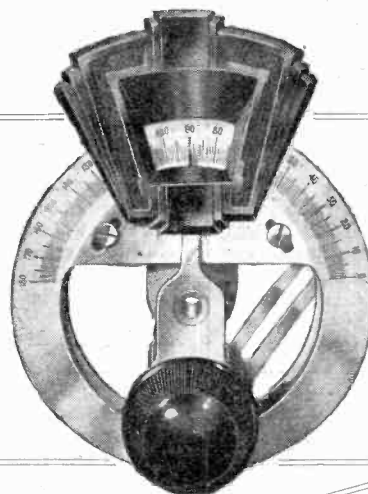


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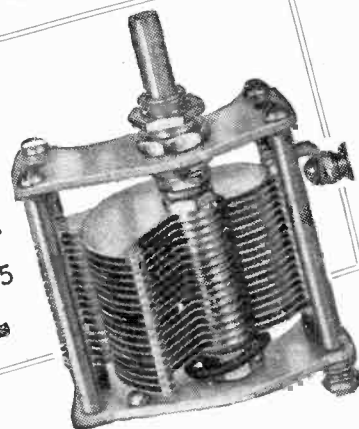
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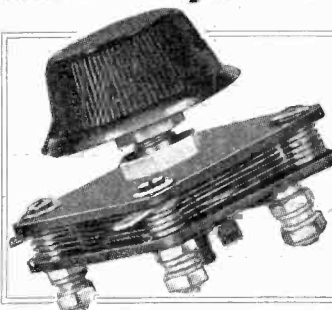
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STATIONS WORTH HEARING

A résumé of recent listening conditions on the broadcast wavebands, with special reference to the wavelength problems of the European stations between 1000 and 2000 metres.

By R. W. HALLOWS, M.A.

THOUGH the new scheme for the long wave band suggested by the Geneva meeting of the U.I.R. has not yet been officially accepted by all of the countries concerned, a good many wavelength changes have been made by long-wave stations since I last wrote, and, generally speaking, these have had good effects.

If the new scheme is adopted the long-wave band will extend up to 1,948 metres instead of 1,875 metres. This very long wavelength is assigned to Kaunas, and if it is adopted it is possible that this station—a 7-kilowatt—may be quite well heard over here. It is proposed that Huizen, which was discontented with the 1,345-metre wavelength allotted to it under the Lucerne Plan, should go to 1,886 metres. This arrangement should prove satisfactory to the Dutch authorities, for 1,886 metres should be even more favourable for long range than the 1,875 to which the station has clung so tenaciously.

Luxembourg is at last to be recognised and to have an official wavelength of 1,304 metres. The Eiffel Tower disappears altogether from the long waves, since the French Government has undertaken to make it shortly a medium-wave station.

The Tangle Above 1,000 Metres.

The countries responsible for most of the trouble on the long waves are Russia, Sweden and Poland, which between them have four "wandering" stations—Minsk, Kharkov, Motala and Warsaw. The Conference decided not to allot a particular wavelength to each of these stations, but to hand over four channels to the countries concerned, leaving them to fight it out between themselves. These wavelengths are 1,365, 1,389, 1,442 and 1,796 metres. Everybody is sure to try to grab the longest wavelength. It will probably be seized by the station which gets there first and has the loudest voice!

One hopes sincerely that the scheme will go through, for it would probably straighten out such tangles as still remain on the long waves. It must, though, be remembered that it can at best be only a temporary measure, for there are several other long-wave stations projected or building which have been authorised by the Lucerne Conference. Amongst them are Madrid and proposed stations in Syria and North Portugal. When these come into operation a further reshuffle may become necessary.

Those Mystery Heterodynes.

Present conditions on the long waves are a considerable improvement upon those prevailing a month ago. Huizen is now free of the background interference which used to spoil its transmissions so frequently; Radio-Paris has adopted a wavelength of 1,648 metres, and by doing so has got rid of the incessant heterodyne from which it suffered for over a month after the inauguration of the Lucerne scheme. Zeesen

is also perfectly clear, and Motala often comes through well. Warsaw, however, is frequently heterodyned. Luxembourg is completely reliable at all times, and both Kalundborg and Oslo are often good.

There has been one very interesting phenomenon on the medium waves at intervals during the past few weeks. Certain stations below 300 metres were suffering from heterodynes, particularly after about ten o'clock in the evening. The monthly wavelength reports of the U.I.R. disclosed no European stations working on wavelengths that could cause these whistles.

Caused by An American Station!

Like many others, I was much puzzled over this. I suspected that harmonics of long-wave stations might be responsible, but there seemed to be none that fitted in.

The solution of the mystery came with startling unexpectedness. I was using one night a receiving set of an experimental

BUTTONHOLING "MIKE"



M. Alex Virot, the well-known French "running commentator," wearing in his buttonhole the smallest microphone ever used for an outdoor broadcast. The occasion was the famous six days cycle race at the Paris Velodrome d'Hiver.

kind which had been specially made to obtain selectivity of a far higher order than is usual in broadcast receivers, even of the superheterodyne type. At the time there was a strong heterodyne on Hilversum from a station that was working obviously very close to its wavelength of 301.5 metres.

By hairbreadth tuning I managed to separate the offending station from Hilversum, but for a long time it was impossible to discover what it was, for, as I have said, the set was but an experimental one, and in its then condition good quality was not obtainable when selectivity was at its highest.

Trouble from High Power?

At length I did receive the call-sign—WBZ, of Springfield, Massachusetts, U.S.A.!

This station, which is rated at 25-kilowatts, operates on a wavelength of 302.2 metres, and in frequency it is separated by less than 5 kilocycles from Hilversum. It was coming through particularly strongly at the time—strongly enough to cause a heterodyne at a range of over 3,000 miles.

Since then other listeners and myself have identified on various evenings several American stations at hours between 10 p.m. and midnight. Some were hardly strong enough to cause audible heterodynes; others unquestionably did so.

As several American stations are considerably increasing their power this summer, the long-distance heterodyne may become something of a nuisance next autumn.

Some Good Alternatives.

Comparatively few changes have occurred on the medium wavelengths, though several heterodynes that were in existence a month ago have been cleared up. This is due partly to better wavelength keeping on the part of stations as a whole and partly to the bringing to book of some of the smaller fry which were wandering off their proper group wavelengths and causing a good deal of trouble.

One of the worst affected stations during the first two months of the Lucerne Plan's existence was Leipzig, which was almost invariably heterodyned. There are signs that an improvement is taking place here, for on several evenings prior to the writing of these notes I have had Leipzig strongly and clearly.

Milan also is now rarely heterodyned, whilst Berlin has been quite free from this trouble for some little time. Hilversum is no longer suffering from the long-range or any other heterodyne, and the Poste Parisien is now very rarely interfered with. An interesting station is Heilsberg, which is generally perfectly clear until about nine o'clock at night, after which time a piercing whistle develops. This heterodyne is *not* of transatlantic origin. It is due to the fact that the Spaniards and the Portuguese go in for very late evenings. Their stations don't, as a rule, start regular programmes until about nine o'clock, but once they have got under way they continue until all hours of the morning.

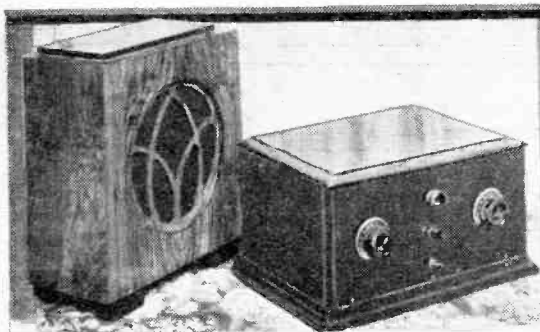
The Best Wavelength's.

Heilsberg's late evening heterodyne is due to Barcelona EAJ 15, which has the unenviable distinction of never having used the same wavelength on any two nights during the past month! This seems rather a shame, for Heilsberg is one of Europe's best-behaved stations, keeping exactly to its prescribed wavelength.

The best part of the medium-wave band is still that above 300 metres, and the cream of this is the "belt" between 400 and 550 metres.

In this comparatively narrow belt there are no less than fifteen stations which can be received evening after evening with certainty at full loudspeaker strength and with no heterodyne interference. These are Munich, Rome, Stockholm, Paris PTT, Sottens, Langenberg, Lyons PTT, Prague, Brussels No. 1, Florence, Vienna, Stuttgart, Athlone, Beromünster and Budapest.

Were there nothing else to choose from, these alone would provide the listener with a magnificent selection of programmes.



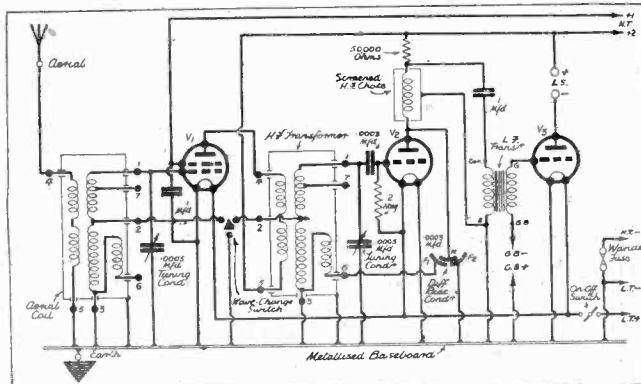
The NEW EVERYBODY'S THREE

LAST week we announced the coming of the New "Everybody's Three" and gave the reason for its construction—namely, selectivity.

There are thousands of listeners and would-be listeners who live almost in the shadow of a powerful transmitter—Brookmans Park, Moorside Edge, Falkirk and so on. They like the local programmes sometimes, but, like the rest of the country, they want to get something other than that ladled out to them by the B.B.C. And they want to get it without having to indulge in an expensive receiver.

You cannot get a great deal of what you want in the world without paying for it. That is a fact that is generally recognised. To pick up the full number of European stations without fail means a really expensive set, even in these days of radio wizardry, and even with such a receiver it is doubtful if

Separately tuned stages precede the S.G. and detector valves in this design, whilst a shunt-fed L.F. transformer constitutes the coupling between the detector and output valves. The set also features the new Wearite Universal coils, cumulative grid detection, differential reaction and simplified wave-change switching.



The diagram above shows the full circuit details, and makes clear the method of connecting the new coil units.

the performance could be guaranteed. Such a set is beyond the means of most of us—even if we want so high a performance. As a matter of fact, probably very few really want so sensitive and selective a receiver; they may consider that its capabilities are the perfect ideal, but contemplation would immediately show that such an ideal is not by any means necessary to one's radio happiness, and that, after the first glow of ownership, the full powers of such a set would rarely, if ever, be used.

Cutting Out the Local.

What the average home constructor requires is a set that will enable him to cut out the locals without much trouble in favour of some of the chief continentals. He does not want all the Continent, with

its unending relays of the same programme, and what he demands as much as performance is inexpensiveness.

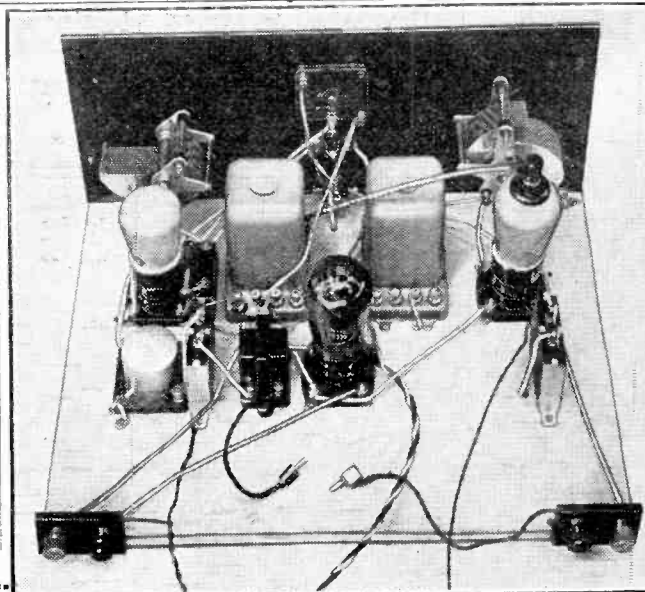
It was to satisfy such requirements that Wright & Weaire, Ltd., designed their new "Universal" coil. They realised that selectivity and inexpensiveness do not usually walk hand in hand, so they set out to design a coil that would allow really sharp tuning to be obtained without high price. Let the makers tell their story in their own words:

"Why should there be any greater need for selectivity under the present Lucerne Plan than there was under the Prague Plan which it has replaced? So far as the medium waves are concerned, both are based on a 9-kilocycle separation between stations as the minimum. So far so good; but there are other considerations.

Wavelength Wandering.

"Under the Prague Plan many stations failed to keep their wavelength, with the result that they heterodyned and were heterodyned by those on neighbouring channels. Amongst the worst offenders were the stations that were nominally using a common wavelength. In many instances

There is room on the baseboard for the 9-volt G.B. battery.



these theoretical common wavelengths became wavebands many kilocycles in width.

"Under the Lucerne Plan the countries of Europe have agreed that wavelength wandering shall cease. Stations with individual wavelengths may not deviate from their proper frequency by more than 50 cycles. This is also the largest deviation allowed on any kind of common wavelength, whilst upon certain shared and common

(Continued on next page.)

COMPONENTS

- 2 Wearite Universal screened coils.
- 2 British Radiogram No. 32 0005-mfd. tuning condensers, or Polar, Utility, Ormond.
- 1 Graham Farish 0003-mfd. differential reaction condenser, or J.B., Polar, Telsen, British Radiogram.
- 1 W.B. 2-point push-pull on-off switch, or Benjamin, Bulgin, Telsen, Wearite.
- 1 Wearite type G.W.C. 3-point push-pull wave-change switch.
- 3 Benjamin 4-pin valve holders (Vibroldier type), or W.B., Telsen.
- 1 T.M.C. Hydra 1-mfd. fixed condenser, type 25, or

- T.C.C., Dubilier, Graham Farish, Telsen, British Radiogram.
- 1 T.M.C. Hydra 1-mfd. fixed condenser, type 25, or Dubilier, T.C.C., Telsen.
- 1 Dubilier 0003-mfd. fixed condenser, type 620, or T.C.C., Graham Farish, Telsen.
- 1 Erie 2-meg. grid leak, 1-watt type, with wire ends, or Dubilier, Varley, Bulgin.
- 1 Erie 50,000-ohm resistance, 1-watt type, with wire ends, or Bulgin, Dubilier, Varley.
- 1 Graham Farish screened H.F. choke, type H.M.S., or Bulgin, Telsen, Wearite.
- 1 Bulgin L.F. transformer, type L.F.12, or Varley,

Ferranti, R.I.

- 4 Bulgin indicating terminals, or Belling-Lee, Clix.
- 1 Peto-Scott panel, 14 in. x 7 in., or Becol, Permeol, Goltone.
- 1 Peto-Scott Metaplex baseboard, 14 in. x 10 in.
- 2 Peto-Scott terminal strips, 2 in. x 1½ in., or Permeol, Becol, Goltone.
- 4 Clix wander-plugs, or Belling-Lee, Ealex.
- 1 Belling-Lee Wander-fuse.
- 1 Belling-Lee anode connector, or Clix, Ealex.
- 2 Clix accumulator spades, or Belling-Lee, Ealex.
- 1 Coil B.R.G. Quikon Wire.

THE NEW "EVERYBODY'S THREE"

(Continued from previous page.)

wavelengths the greatest permissible departure from the correct frequency is but 10 cycles.

"Compare these figures with the published lists of deviations under the old Prague Plan. Such lists contained only those stations which deviated by more than 1.9 kilocycles, or 1,900 cycles from their allotted frequencies; yet numerous stations were included in it each week.

ACCESSORIES RECOMMENDED

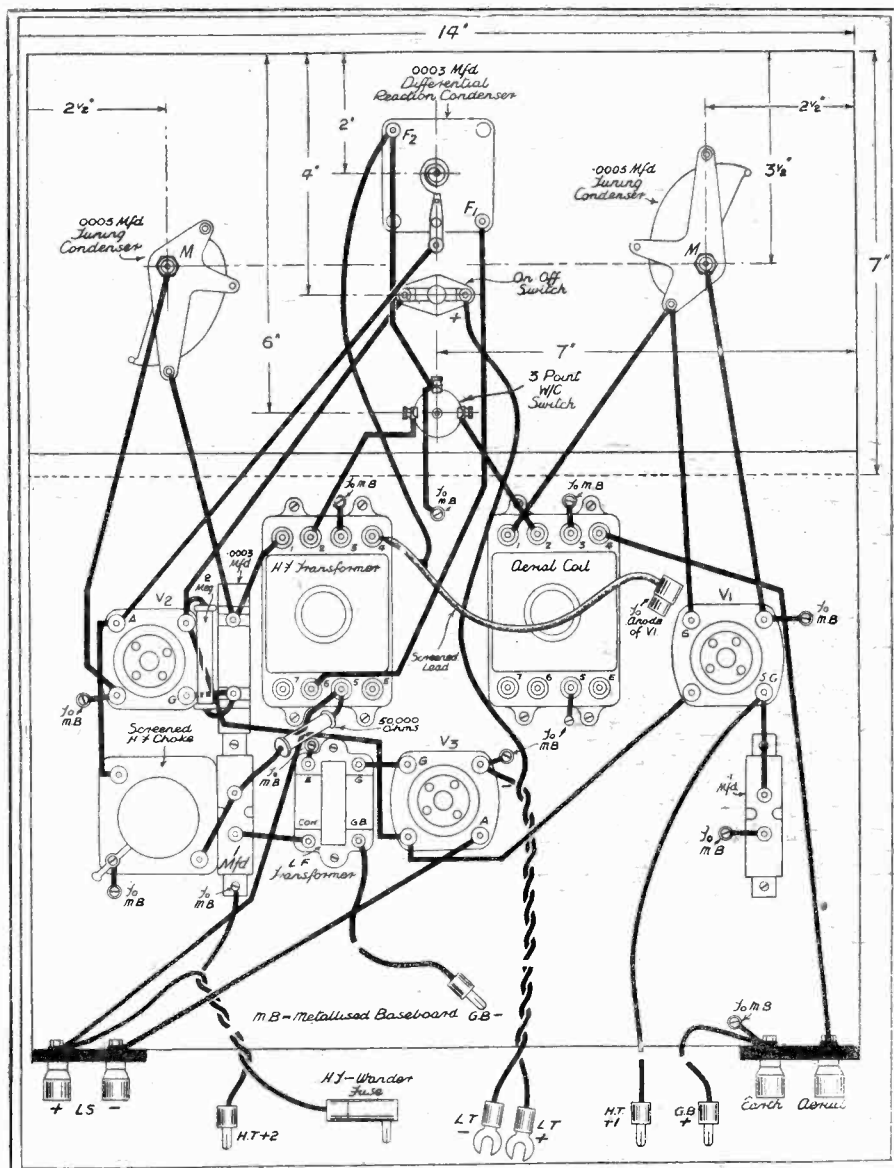
LOUDSPEAKER: Amplion M.C.44, W. B., Celestion, R. & A., Rola, Marconiphone, Blue Spot, Atlas, Ferranti, G.E.C., Ormond.
BATTERIES: H.T. 120 volts: Siemens, Lissen, Pertrix, Drydex, Ever Ready, Ediswan, Marconiphone, G.E.C., Hellesens, or Block H.T. accumulators.
G.B. 9 volts: Drydex, Hellesens, G.E.C., Marconiphone, Siemens, Lissen, Pertrix, Ever Ready, Ediswan.
L.T. 2 volts: Block, Lissen, Exide, Pertrix, Ediswan.

"The result of the far closer adherence to correct frequency demanded by the Lucerne Plan is that a much greater number of foreign stations are receivable by the set which possesses a reasonably good degree of selectivity.

Increases in Power.

"There is a second and possibly even more cogent reason why selectivity has now become of paramount importance. Enormous increases in power have taken place in some of the continental transmitters, and many more are to multiply their power threefold, fivefold or tenfold within the next few months.

"Even a not very selective set may be able to separate two comparatively low-powered foreign stations working upon adjacent



METALLISING ASSISTS EASY CONSTRUCTION.

The dimensions for drilling are given on the combined panel-and-wiring diagram above. Note how some of the connections to "earth" are made by leads taken to the Peto-Scott Metaplex baseboard—they are marked "To M.B." in the diagram.

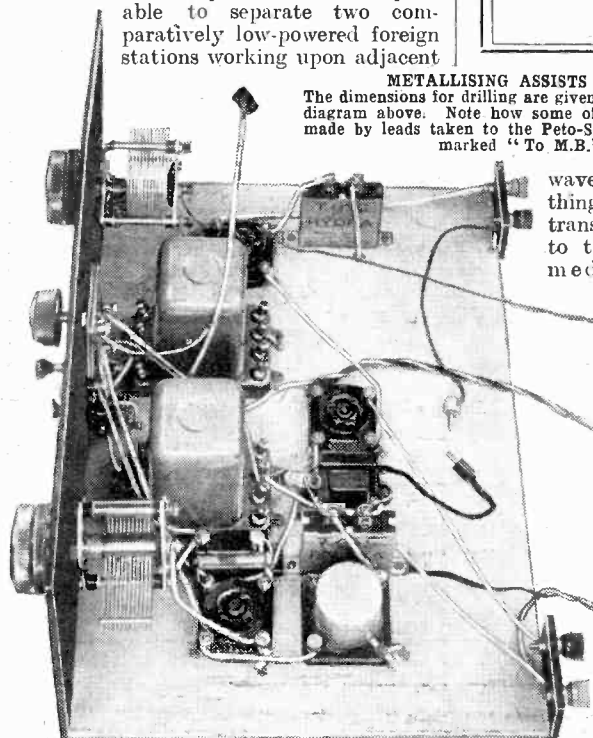
wavelengths. It is a very different thing to separate two high-powered transmissions, and more difficult still to tune in, clear of interference, a medium-powered station which has a high-powered next-door neighbour, or possibly two such neighbours, one on either side.

"Many set users will find that their existing apparatus is inadequate for the new conditions. It is to meet these

conditions and to save the listener from the necessity of completely rebuilding his set that Wright & Weaire, Ltd., the senior firm in the wireless components industry, have designed their Universal coil. It is called universal because it can be employed as a single aerial tuner or in double harness as a band-pass unit; it will act with equal efficiency as a high-frequency transformer, following plain screen-grid or variable-mu valves."

Two Tuned Stages.

Such, then, is the story behind the coils used in the New "Everybody's Three." The receiver consists of two tuned stages, making full use of the selectivity afforded (Continued on page 125.)



THE S.G., DET. AND L.F. VALVES TO CHOOSE

Make.	S.G.	Det.	Output
Cossor	220S.G.	210H.F.	220P.A.
Mullard	P.M.12A.	P.M.1H.L.	P.M.2A.
Mazda	215S.G.	H.L.2	P.220
Marconi	S.22	H.L.2	L.P.2
Osram	S.22	H.L.2	L.P.2
Tungsram	S.210	H.R.210	—
Hivac	S.G.220	H.210	—
Dario	T.B.422	T.B.282	T.B.122



The Pilot Kit
SERVICE was
founded in 1919.

NEW EVERYBODY'S THREE THE CONTRA-PHASE FOUR PILOT AUTHOR KIT EXACT TO SPECIFICATION

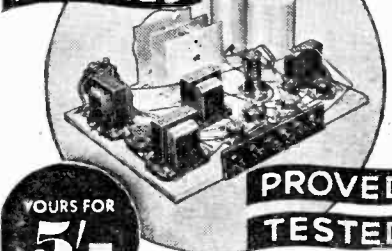


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IMPORTANT Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash, C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). OVERSEAS CUSTOMERS CAN SEND TO US WITH CONFIDENCE. We carry a special export staff and save all delay. We pay half carriage—packed free. Send full value plus sufficient for half carriage. Any surplus refunded immediately. Hire Purchase Terms are NOT available to Irish or Overseas customers.

PILOT CLASS "B" FOUR KIT

**GUARANTEED
MATCHED**



YOURS FOR
5/-

**PROVED
TESTED**

Another PETO-SCOTT triumph—this latest Class B Battery 4 Kit at a popular price. Seven times the volume of an ordinary battery set, with outstanding performance equal to "main" receiver. Kits supplied with detailed "Simple to build" instructions and assembly blue print. Matched and tested components. Guaranteed for 12 months by Peto-Scott. KIT "A", less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £3/10/0, or 5/- deposit, balance in 12 monthly payments of 6/-.

KIT "B"—As Kit "A", but including 4 matched and tested Valves. Cash or C.O.D. Carriage Paid, £5/2/6, or 12 monthly payments of 9/6.

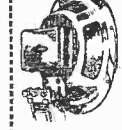
KIT "C"—As Kit "A", but including 4 matched and tested Valves and Peto-Scott Console Cabinet. Cash or C.O.D. Carriage Paid, £5/15/0, or 12 monthly payments of 10/6.

Recommended PETO-SCOTT SPEAKER. If required, add 22/6 to Cash. Prices or 2/- to each monthly payment.

NEW BLUE SPOT 29 P.M. PERMANENT MAGNET MOVING-COIL SPEAKER. With input transformer. Cash or C.O.D. Carriage Paid, £1/12/6.

Balance in 6 monthly payments of 5/-.
NEW ROLA CLASS B PERMANENT MAGNET MOVING-COIL SPEAKER AND AMPLIFIER. Complete with valve and input transformer. Two Models "A" for P.M.2B. P.D.220 and 220 B. "B" for 240 B. and H.P. 2 (state which when ordering). Cash or C.O.D. Carriage Paid, £3/11/0. Balance in 11 monthly payments of 6/6.

PETO-SCOTT PERMANENT MAGNET MOVING-COIL SPEAKER



Power and Pentode Output. Complete with input transformer. Send only 2/6; balance in 5 monthly payments of 4/- Cash or C.O.D. Carr. Paid. 19/6.

**2/6
DOWN.**

NEW GARRARD MODEL 202A. 12-in. Turntable. Electric Motor for A.C. mains. Cash or C.O.D. Carriage Paid, £2/10/0.

Balance in 8 monthly payments of 6/-.
ATLAS C.A.25. for Mains, Class B and Q.P.P. four tapings; 60/80, 50/90, 120, 150, 25 m/A. Cash or C.O.D. Carriage Paid, £2/19/6. Balance in 10 monthly payments of 6/-.

J. B. LINACORE. Complete tuning unit comprising matched coils, condenser, type BPB (battery) type BPM (mains). Cash or C.O.D. Carriage Paid, £3/9/6. Balance in 11 monthly payments of 6/6.

NEW EVERYBODY'S THREE

KIT "A" Author's Kit of First Specified Parts, including Ready-drilled Panel, Baseboard and Terminal Strips, but less Valves and Cabinet. Cash or £2-15-0 C.O.D. Carriage Paid or 12 monthly payments of 5/-.

KIT "B"
As for Kit "A", but with Set of Specified Valves only. Cash or C.O.D. Carriage Paid, £4/6/3, or 12 monthly payments of 8/-.

KIT "C"
As for Kit "A", but with Valves and Peto-Scott Universal Table Cabinet. Cash or C.O.D. Carriage Paid, £5/1/3, or 12 monthly payments of 9/3.

KIT-BITS You pay the Postman. We pay post charges on all orders over 10/- GREAT BRITAIN ONLY.

	£	s.	d.
1 Peto-Scott METAPLEX Baseboard, 14" x 10"	1	9	0
1 Peto-Scott Ready-drilled Panel, 14" x 7"	4	0	0
1 Set of Specified Valves	1	11	3
1 Peto-Scott Universal Table Cabinet	15	0	0
1 Wearite Universal Screened Coils	10	0	0
2 British Radiogram No. 32 -0005-mfd. Condensers	12	0	0
1 Bulgin L.F.12 Transformer	6	0	0

S.T. 500

KIT "A" Comprising Mr. John Scott-Taggart's Kit of FIRST SPECIFIED Components, including Telsen Class B Output Choke, Peto-Scott "Metaplex" Baseboard and Ready-drilled Panel and Terminal Strip, less Valves and Cabinet. With FULL-SIZE Blue Print and copy of "Popular Wireless" £5-5-0 Oct. 21st. Cash or C.O.D. Carriage Paid. or 12 monthly payments of 9/6.

KIT "B"
As Kit "A", but including 4 Specified Valves. Cash or C.O.D. Carriage Paid, £7-10-3 or 12 monthly payments of 13/9.

KIT "C"
As Kit "B", but including Peto-Scott Specified Walnut Table Cabinet. Cash or C.O.D. Carriage Paid, £8-9-9 or 12 monthly payments of 15/6.

KIT "CC" As Kit "B", including Peto-Scott Specified Walnut Console Cabinet. Complete with Baffle Baseboard Assembly, but less Speaker. Cash or C.O.D. Carriage Paid, £8-19-9 or 12 monthly payments of 16/3. If Peto-Scott Permanent Magnet Speaker required add 19/6 to Cash Price or add 1/9 to each monthly payment.

ALL THE RAGE GIVES SEVEN TIMES THE VOLUME

**PILOT
CLASS "B"
SPEAKER
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SUITABLE FOR ANY BATTERY SET Without Class B Amplification your present Battery Set is obsolete. Realising this, we have produced this marvellous, self-contained Unit, comprising guaranteed Peto-Scott Class B Moving-Coil Speaker, Class B Transformer, B.V.A. Class B Valve. Gives 7 times the Volume... with mains quality and power. Low H.T. consumption. SIMPLE TO CONNECT. JUST PLUG-IN the amazing 5-WAY Automatic Connector.

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Dear Sirs,—Please send me CASH/C.O.D./H.P. for which I enclose £.....s.....d. CASH/H.P. Deposit.

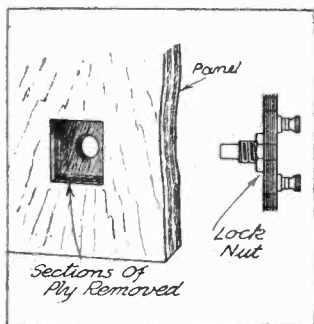
NAME..... ADDRESS..... P.W., 14/4/34.

ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D. CARRIAGE AND POST CHARGES PAID

Recommended WRINKLES

PANEL-MOUNTING COMPONENTS.

PANEL-MOUNTING components, although quite satisfactory for 2-in. panels, are not always suitable for a 5-ply panel, owing to the shortness of the threaded bush.

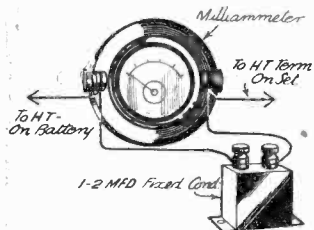


A tip for those who use five-ply wood panels.

Such components, however, are usually provided with a locking nut, and by cutting away two or three layers of the plywood with a sharp wood chisel it is possible to countersink the lock-nut and so bring the threaded bush through sufficiently to enable fixing.

A MILLIAMMETER HINT.

WHEN checking the total anode current of a set by inserting a milliammeter in the H.T. negative lead an incorrect reading may be obtained. This is due to the resistance of the meter causing instability.

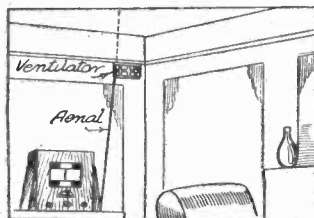


This scheme will prevent a milliammeter causing instability.

If a 1- or 2-mfd. condenser is connected across the meter this error should be eliminated and a correct reading obtained.

AN EFFICIENT INDOOR AERIAL.

THE problem of finding an efficient substitute for an outdoor aerial may sometimes be solved with ease



Unsightly wires can be avoided in this manner.

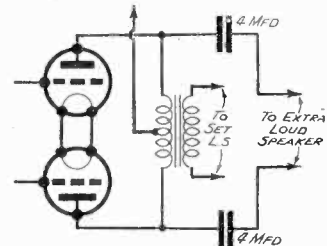
where a non-metallic ventilator shaft runs from the roof to the wireless room. Simply drop an insulated wire down the shaft. The extra height may well compensate for capacity to earth. An unused chimney may also be used for the same purpose.

ADDING A LOUDSPEAKER.

LISTENERS who possess a self-contained receiver employing a mains-energised loudspeaker and are desirous of fitting an additional one of the permanent-magnet type sometimes experience difficulty regarding the correct method of connecting.

In practice the above addition is in no way a complicated matter, and only two 4-mfd. condensers—in addition to the extra speaker—are necessary. The wiring is as follows:

A lead is joined from the anode terminal of the output valve to one side of a 4-mfd. condenser, and another lead from the earth line to a terminal on the other 4-mfd. condenser. The remaining terminals on these condensers are connected to the extra loudspeaker.



How to add an extra loudspeaker to a push-pull circuit.

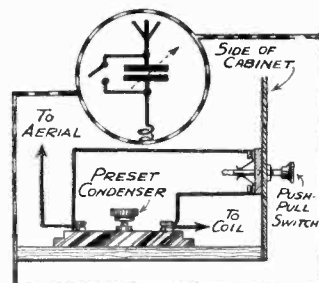
In the event of push-pull output being incorporated, two leads are taken from the two anodes of the valves to a terminal on each of the 4-mfd. condensers, the remaining terminals of which are joined to the additional speaker, as shown in the diagram.

SHORTING A PRESET.

CONSTRUCTORS who experience difficulty in obtaining adequate selectivity on the medium-wave band, due to the close proximity of the local transmitter, very often fit a preset condenser in the aerial lead as a method of remedying the trouble.

This method, although quite satisfactory for its particular purpose, offers a disadvantage in reducing the output of the receiver—especially on the long-wave band; and in some instances where high selectivity is not required on this band it is a good scheme to incorporate a switch of the push-pull type across the condenser, as shown in the diagram.

When the receiver is operating on medium waves the switch can be left open for selectivity purposes, but for long-wave working it can be closed. In this way the condenser can be short-circuited when not required.



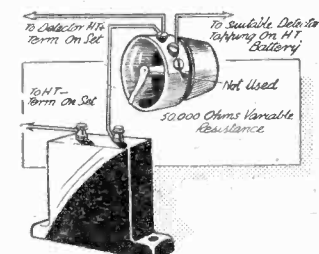
The wiring for a switch to cut out a series-aerial condenser.

IMPROVED SPEAKER ADJUSTMENT.

MANY loudspeaker units have an adjusting screw at the back instead of a knob, and are therefore not so readily adjustable when this is necessary as with the latter type. An improvement can be effected by soldering into the slot of the adjusting screw a short piece of strip brass (say one inch long) of suitable thickness, which can be turned like the winding key of a clock. If necessary, the piece of brass can be shaped in order that the "key" shall not foul other parts of the speaker unit.

AN AUXILIARY REACTION CONTROL.

WITH many short-wave receivers it may be found difficult to obtain sufficiently fine reaction control.



These additional connections do not affect the set's wiring.

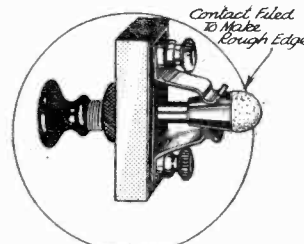
If a 50,000-ohms variable resistance is placed in series with the detector H.T. + lead, a 1-mfd. fixed condenser

being connected from the end of the variable resistance nearest the set to H.T.—the above trouble can be overcome.

The ordinary reaction control of the set should be used to obtain a rough setting. The variable resistance can then be used as an auxiliary vernier control.

BETTER SWITCH CONTACTS.

EVERY wireless constructor has at some time or other had a lot of trouble through the contacts of a switch getting dirty. The sketch below shows my idea of a self-cleaning switch. I have made my own switches for the "S.T.400" like this and found them very successful.



Self-cleaning of the contacts is assured by the roughened surface.

HOW MANY TURNS?

MANY readers no doubt use the hand-drill for winding chokes, etc., but probably it is not generally known that, instead of counting the revolutions of the drill chuck, the revolutions of the hand-wheel may be counted by first using the following formula, which does away with over fifty per cent of the counting:

First divide the number of teeth of the small wheel into the number of teeth of the hand-wheel, and divide the result into the number of turns required, which will give the number of turns of the hand-wheel. Example:

Hand-wheel, 40 teeth.

Small wheel, 10

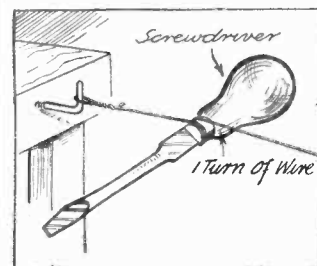
2,000 = number of turns required.

Therefore $\frac{2,000}{40 \div 10} = 500$ revolutions.

STRAIGHTENING WIRE.

THE following is a quick way of getting the kinks out of wire.

First fix one end of the wire to a suitable support. Then twist the wire once round the round part of a screwdriver. Draw the screwdriver slowly down the wire, keeping both ends taut, and a straight length will result.



Even bad kinks are removed from wire in this way.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others published will be paid for at our usual rates.

Each hint must be on a separate piece of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

The best Wrinkle in the issue dated March 31st was sent by Mr. C. R. Rowe, Ivinghoe, Aston, Leighton Buzzard, Beds., to whom a guinea is being awarded.

IF your set crackles and bangs like a friendly argument in Chicago

*don't be puzzled
find out why*

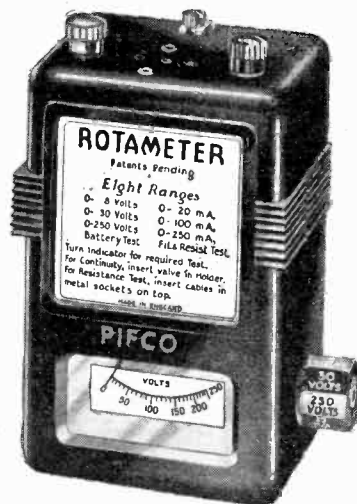
The easiest way to solve that problem—or any other radio problem—is to use a PIFCO Trouble Tracker. Just get one of these wonder instruments on the trail and even the most complex radio fault will hold up its hands and surrender. The PIFCO Trouble Trackers show the shortest way to 100% radio reception. Ask your dealer or electrician for a demonstration of a PIFCO.



● PIFCO "ALL-IN-ONE" RADIOMETER (above). For battery sets. Makes any test in a few seconds. Mottled bakelite case. Complete with leads. Price 12/6.

● PIFCO DE LUXE "ALL-IN-ONE" RADIOMETER Moving coil model, 125,000 ohms resistance. Tests everything. For electric radio, mains units, or battery sets. Finished mottled bakelite, complete with leads and case. Price £2 2s.

● PIFCO ROTAMETER (right). A radio testing instrument on entirely new principles. One needle operates on 8 separate dials. For electric or battery sets. Amazingly handy and accurate. No other instrument in the world like it. In black bakelite, complete with leads. Price 29/6.

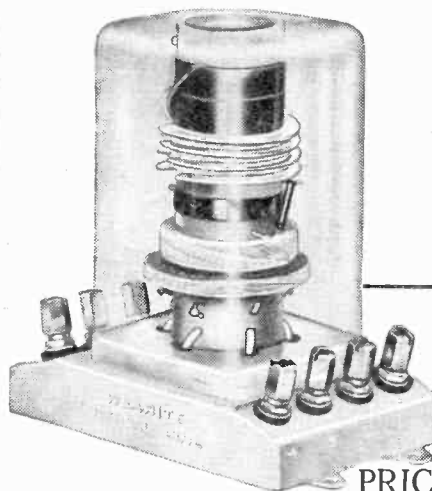


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Insist on a PIFCO and Save Trouble.

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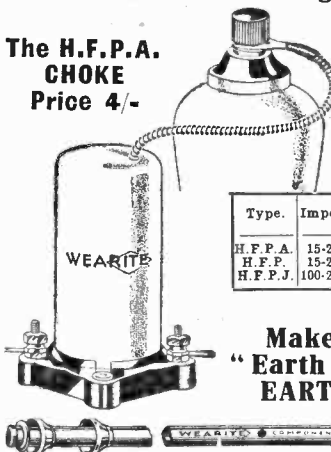
WEARITE UNIVERSAL COILS Specified for the EVERYBODY'S THREE

Of recent introduction, these Wearite Universal Coils have already proved themselves worthy additions to the famous Wearite range. Covering the new Lucerne Arrangement and permitting a wonderful degree of selectivity, these coils have been specially selected for the Everybody's Three. Remember, the "Universal" is equally suitable for Aerial, H.F., and Band-Pass tuning.

..... from a range of

The H.F.P.A.
CHOKE
Price 4/-

HIGH
EFFICIENCY
CHOKES



Type.	Impedance	Self Capacity	Induct.	D.C. Resist.	Price
H.F.P.A.	15-2,500m.	4.5mmfd.	250,000mh.	300 ohms.	4/-
H.F.P.	15-2,500m.	4.5mmfd.	250,000mh.	300 ohms.	3/6
H.F.P.J.	100-2,100m.	7mmfd.	220,000mh.	770 ohms.	2/-

Make sure of a good
"Earth"—Use a WEARITE
EARTH TUBE 3/6

COUPON To MESSRS. WRIGHT & WEAIRE, LTD., 740, High Road, Tottenham, London, N.17.

Please send me your new booklet, P.12, together with literature on the NEW Universal Coils and L.P. (Lucerne Plan) Circuits; also H.T. Power Packs, with circuits.

NAME

ADDRESS

Pop. W. 14.434.

TESTED AND FOUND?

Being Leaves from the Technical Editor's Notebook

THE LATEST WESTECTOR

THE introduction of the Westector by the Westinghouse Brake and Saxby Signal Co., Ltd., of 82, York Rd., King's Cross, London, N.1., was one of the most important radio events of recent times.

This inexpensive and practically everlasting little device has been styled the "cold valve," and that is hardly an exaggeration, for it does very efficiently take the place of a valve for many purposes.

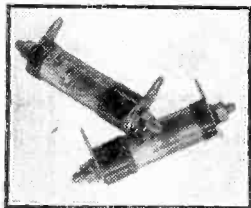
Recently a quite new Westector has been produced, and I do not think I can do better than quote the excellently descriptive words of the manufacturers themselves by way of an introduction. They say:

"The metal rectifier, as a means of rectifying alternating currents, has become well established during the past five years, but it has only been during the past year that the difficulties associated with the rectification of radio frequencies has been overcome.

Result of Research.

"The chief difficulty was one of capacity due to the large area of rectifying element, and until it was possible to prepare a rectifier of small dimensions nothing practical could be offered. In early 1933 it was found possible to prepare discs of sufficiently low effective capacity to render them a practical proposition when used at intermediate frequencies, and the now well-known Westector type W was placed on the market. Their merits as a second detector in a superheterodyne receiver were rapidly recognised, and during the season of 1933 the Westector, as a detector and asymmetric conductor, became very popular.

"It was, however, recognised that these units, though still functioning perfectly as rectifiers, failed to be practical at frequencies higher than 100-200 kilocycles, on account of the heavy damping thrown on the circuit. Work has therefore proceeded on the lines of making still smaller rectifiers with smaller effective capacity. This research has culminated in the production of a new type of Westector—type



The Westector, despite its varied uses, is no larger than an ordinary grid leak.

WX—which has a considerably smaller capacity, enabling it to be used satisfactorily up to frequencies of the order of 1,500 kilocycles.

Experience with the previous type of Westector has shown that the most satisfactory circuit in which to use the rectifier is the half-wave circuit.

"The WX rectifier has high impedance and is capable of passing 0.1 milliamperes mean forward current; a high load resistance of 250,000 or 500,000 ohms is therefore advised. The voltages which can be supplied will be 30-40 volts in the case of the WX6.

"The D.C. static characteristic is linear from 2 volts upwards. There is no upper limit to the characteristic; the only limitation is due to the risk of damage arising from sustained overload. Should the input to the rectifier be of very low value, then it may be preferable to bias the unit to a point of optimum rectification.

Has Many Applications.

"The self-capacity of a rectifier consists of a capacity acting during the reverse half-cycle. During this period it takes a charge, and during the forward half-cycle this charge is short-circuited. The result of this capacity is revealed as a detuning of the resonant circuit by some 5-6 micro-microfarads and a damping of the circuit due to losses. The value of this damping, due to the WX, operated at high frequencies, is sufficiently low to permit circuits of high input impedances to be designed."

Among the many applications of the new WX6 Westector, as it is styled, are those of detector in straight and reflex circuits, as first or second detector in superheterodyne arrangements, and, of course, for many and various A.V.C. and H.T. economy schemes.

The WX6 is no larger than the existing type: it is about the same size as a grid leak! There are no adjustments in it to be made; so even on that score, quite apart from its technical characteristics, it must not be compared with the crystal detector.

The Westector, as such, is a new development altogether, and it is rapidly finding for itself a very concrete position in modern radio technique.

We have already applied the new WX6 to various purposes and have found it efficient and reliable, each individual sample consistently maintaining the characteristics published by the manufacturers.

Those readers who desire to know more about this intriguing device should write to the above address for a copy of "The All-Metal Way," which will be sent free to those who mention POPULAR WIRELESS. This book is packed with interesting information and circuits.

NEW FERRANTI CONDENSERS

The name "Ferranti" has always been associated with high-class radio, and their components are designed and manufactured to that standard. But in many instances their productions are, to say the least of it, by no means cheap.

In the circumstances you would not expect them to be. You have to pay for quality just as you have to pay for quantity. And, in my view, money spent in this way is indeed money well spent.

You can purchase an L.F. transformer for a mere two or three shillings. There is a Ferranti L.F. transformer which retails at 17s. 6d. in a set that stands before me as I write. But it is worth that. It so happens that it replaced a very cheap transformer.

The difference in the results given by the set are by no means only theoretical. You can hear it plainly

IN broadcasting, "The 12th" has become a significant phrase. Isn't it slightly reminiscent of the old schooldays and of that end-of-term feeling? The big difference between the two, however, is that a broadcasting series allows no holidays, with the result that we get four "12ths" a year instead of three. I am not so sure about the wisdom of this. Holidays are good for us, and just as necessary to listeners as they are to schoolboys.

Unfortunately, if we take a holiday we miss the first of the new series, which we cannot afford to do, as broadcast series are entities. Moreover, these initial talks are often explanations of the series, designed to afford us a better understanding of them. So we have no alternative but to listen to them.

The "12th" is an occasion for joy and regret. It is an occasion for joy when we hear the last of a thing that has never been attractive to us, or when something, once attractive, has, by dint of repetition, forfeited some of its attraction.

On the other hand, we feel nothing but regret when an old friend passes.

Personally, I never allow a series of anything to offend me. An unattractive series I can afford to leave alone, as everyone else can. The only regret I have is that sometimes the time it utilises each week is wasted time to me as far as listening-in is concerned.

enough. Bass notes that simply were not there before are now present in a clean, full degree.

Now how does all this line up with the fact that Ferranti have just gone into production with a range of low-priced radio components? It would be justifiable to ask if this great firm was now prepared to jettison a proportion of its traditional high technical standards: was, in fact, building down to a price.

How the Price was Lowered.

Fortunately, no such thing has happened. The first of the new Ferranti "low-cost" components reveals the fact that the constructor is to be allowed to save money in another way and not at the expense of technical quality at all.

The components in question are fixed condensers, and there is a range of four paper types. That is, they have paper dielectrics. The range comprises an '04 mfd. tested at 750 volts for a working D.C. of 375 volts (250 A.C.) and '02 mfd., '015 mfd. and '01 mfd., all tested at no less than 1,500 volts for a D.C. working of 750 volts or an A.C. of 500 volts.

What are the prices of these Ferranti condensers? Perhaps you think 2s. 6d. is the "natural" price in these days of very keen competition. Well, they each retail at the quite surprising figure of 1s. 2d.!

The saving has been effected by the adoption of an ingenious method of construction. Instead of moulded bakelite cases, plated terminals and so on, each condenser is built into a short length of Pertinax tubing. The ends are sealed with a suitable material, and wires, long and pliable, are led out for connecting purposes.

Now, I have seen Ferranti wireless apparatus being made in the great Hollinwood factories, watched every minute process in whole chains of manufacture and assembly, and so I can vouch for the attention and care which are bestowed upon it.



Pertinax tubing acts as the casing for these Ferranti condensers, and long wire leads are provided for connecting.

Therefore I think you can take the reliability of these Ferranti condensers for granted. As for their working efficiency, my tests and uses of them amply confirm the specified figures, the capacities of my samples, for example, actually being well within a five per cent tolerance, which, in the conditions, may not be surprising, but is certainly a creditable achievement for any firm able to retail such components at so low a figure.

The address of Ferranti, Ltd., is Hollinwood, Lancashire.

Of the series just completed, the "Seven Days' Hard" will be missed most. I presume it will finish with the rest. I've enjoyed every talk, for every speaker has been brilliant, and the variety of topics dealt with as diverse as the speakers themselves. Besides, the manner of these talks has been unique.

Mr. Pewter has also been a great feature of the "term." He will be missed. These two series have certainly made Saturday evening a worth-while evening.

I hope the B.B.C. will continue to recognise that Saturday night occurs only once a week, and that there should be something special for it. Couldn't Mr. A. P. Herbert be induced again to supply the wherewithal for our Saturday night entertainment?

THE LISTENER'S NOTEBOOK

Comment and criticism on recent B.B.C. programmes.

The Saturday night Variety has made no less a contribution. One of the best features of last "term's" programmes was the Saturday night Variety show. Many listeners liked "In Town To-night." This was, in my opinion, the most promising of them all, but it did not come up to my expectations.

"Whither Britain?" too, has claimed a number of adherents. Here, again, the contributors have been men (and one woman) of distinction. Though it wasn't their primary purpose, these talks offered some striking contrasts in the manner of speaking. One noticed the tendency of the politicians among them to use platform oratory and not that of the microphone.

(Continued on page 124).

HIGH-FREQUENCY CLASS B

INCREASING
ECONOMY.

By
C. ROBINSON.

Some interesting suggestions are here made for the use of the well-known Class B valve in a high-frequency capacity. The saving in H.T. consumption, it is claimed, would be very great, and consequently the cost of running a set on these lines would be extremely low.

THE recently introduced H.F. pentode, Class B valve and the Westector offer some fascinating possibilities to the battery-set user.

It is obvious that the ideal battery-operated receiver would be one which is totally quiescent when a programme is not being reproduced, and this ideal can nearly be attained in a Class B set, so far as the driver and Class B valves are concerned.

The Class B output stage is actually a

these two valves flows through the resistance R. The voltage developed across R is applied to the control grid of V_1 , so providing negative grid bias.

Obviously, when a station is tuned in the Class B valve's anode current will rise, and in turn the voltage across R will increase. This will cause a higher negative bias to be applied to V_1 .

This will be recognised as providing the main essential of a "simple" A.V.C. system. The range of A.V.C. could be increased, if desired, by using an additional H.F. pentode preceding V_1 .

Applying Bias.

"Delayed" A.V.C. could be obtained by applying a small negative bias to the Class B H.F. valve. The only shortcoming of this part of the circuit is that it necessitates the use of a separate L.T. supply.

High selectivity is assured by the tuned primary tuned secondary "Siamese" H.F. transformers in the Class B H.F. push-pull valve's grid and anode circuits. The inductive coupling between the primary and secondary of each H.F. transformer could be varied to give the required degree of selectivity.

If it were desired to gang the tuning the gang condenser would need to be of a type with separate rotors and stators. There is no reason why the Class B H.F. stage should not be the intermediate frequency stage of a superheterodyne.

In this case the A.V.C. could be applied to a variable- μ H.F. pentode preceding the first detector, or additionally to a pentagrid frequency changer, if desired.

The Westector detector stage is the usual rectifier arrangement, and requires no comment. The driver stage (V_3) is quite normal, except for the automatic quiescence control provided by a Westector. Briefly, this enables a very high negative grid bias

to be applied to the driver valve, so reducing the standing, or quiescent, anode current to a fraction of a milliamp.

The Westector in effect applies a positive voltage in opposition to this negative bias in accordance with the L.F. voltage applied to the driver-valve grid. This causes the driver-valve anode current to vary in sympathy with the output volume in a similar manner to a Class B output stage.

A Further Development.

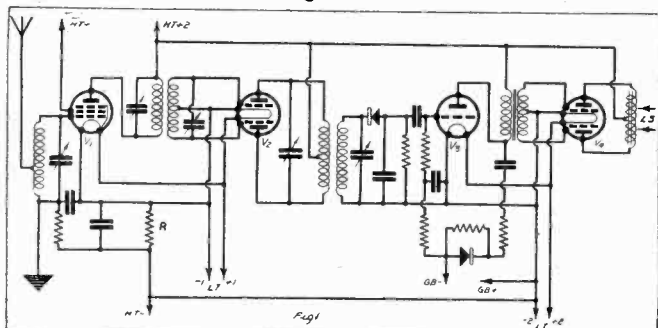
The Class B output valve (V_4) and its associated components are arranged in the conventional manner. A further development might possibly be to eliminate the driver stage, the Westector output being fed directly into the Class B input transformer.

This would involve matching difficulties, but the design of a suitable transformer should be possible. Alternatively, the Westector output could feed a high-efficiency pentode output valve. This would be provided with an H.T. economiser circuit using a Westector.

A circuit on these lines is shown in Fig. 2. So far as the A.V.C. action is concerned, this would possibly be the preferable arrangement. This is because, to give equivalent overall amplification to the first circuit (Fig. 1), it would be necessary to use two H.F. pentodes preceding the Class B H.F. push-pull stage.

This would naturally provide a wider

USING THREE QUIESCENT VALVES



A basic circuit showing the use of a Class B valve as H.F. amplifier following a pentode and also an "economised" Driver feeding into a Class B output.

form of quiescent push-pull, and a Westector can be arranged to control the quiescence of the driver valve.

But it must not be forgotten that the Westector is a very satisfactory diode detector, provided it can be adequately loaded. The trouble is that it is difficult to arrange an entirely satisfactory stage to precede the Westector unless an H.F. pentode is used. This brings us again to the Class B valve, for this also, used as a push-pull H.F. amplifier, would be an excellent way out of this difficulty.

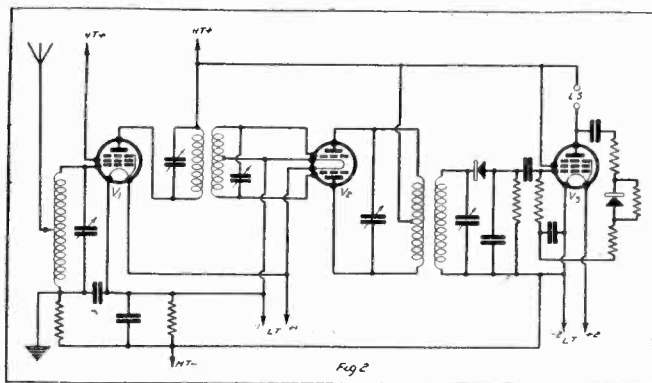
In addition to fully loading the Westector without any risk of the push-pull stage overloading, a very satisfying degree of H.F. amplification could be obtained. Also the anode current of the Class B H.F. valve would be low when no carrier was tuned in.

Automatic Volume Control.

If a signal input were applied to the grids of the Class B H.F. valve the anode current would increase. This increase would depend upon the strength of the carrier. The change of anode current could be utilised to provide automatic volume control, if desired.

A basic circuit incorporating these conceptions is shown in Fig. 1. It will be seen that a variable- μ H.F. pentode (V_1) precedes the Class B push-pull H.F. valve (V_2). The combined anode current of

VERY LOW H.T. CURRENT CONSUMPTION



Another circuit where a Class B H.F. stage is followed by a Westector rectifier and a quiescent pentode output valve.

range of A.V.C. action, and also the addition of a tuned circuit would increase selectivity.

At the moment it is difficult to conceive a receiver more closely approaching the completely quiescent set desired nowadays than one incorporating these suggestions.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but 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 Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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

WHY IT WAS NECESSARY TO RETRIM.

E. R. H. (Winchester, Hants).—"The fitting of the gramophone switch was a great success, but after a time I had the feeling that the set was not then quite so good on radio as it had been before."

"Concentrating on this, I came to the conclusion that all the distant foreigners were affected to some extent, and then I came across the explanation. The set needed retrimming."

"I am certain I had not moved the trimmers, because they lock; but I found that when one of them had been slackened off a little the set came back to its full distance-smashing performance again."

"Is it usual for the fitting of a gramophone switch to affect trimming? It is certainly a new one on me."

Ideally, the effect should not occur; but in practice some unwanted extra capacity is often thrown across the preceding tuned circuit, due to the self-capacity of the wiring or switch.

In such cases the slackening off of the trimmer for this circuit will often restore the balance. Theoretically, it is better not to have unwanted self-capacity present in stray wiring, but in your case there appears to be no reason why it should not be compensated for in the trimming adjustment as you now have it.

ILLUMINATING THE DIAL.

S. J. I. (London, S.W.3).—"I have recently obtained possession of a two-valve set of amateur make which belonged to an acquaintance who has left this neighbourhood. It is what he called a 'detector-pentode' arrangement, running from the mains (A.C.)."

"With this I get excellent reception on an indoor (three-wire) aerial in the roof of the block of flats, of which mine is the top. (In fact, the quality, tone and strength are above anything I have heard in the two-valve class, and a good 50 per cent better than many of the three-valve sets which appear to be the most popular in this district.)"

"There is only one small superiority which these sets have over mine, and that is in the matter of an illuminated scale. Although mine, like these others, has a white, transparent dial-face moving behind a kind of window, it is not lit from behind."

"It happens to be placed in a somewhat dark corner of the room, so illumination would be very welcome; and now I have been told that such illumination is obtainable merely by fitting a bulb of the kind used in flash-lamps to the terminals marked 'F' on the nearest valve holder."

"Please advise me as to whether this is practicable, and how the job should be tackled if you think a novice is capable of making a success of it."

As a general rule, we do not advise a novice to attempt any wiring alterations to a mains set, because any mistakes in this class of receiver are liable to have more serious consequences than similar mistakes in a battery-driven set.

But the mere fitting of a dial-lamp is one of the easiest things possible, so it would be but the work of a few minutes to anyone accustomed to wiring. A dealer would charge very little for doing the job, or if you have a home-constructor acquaintance who would overlook it for you there is no reason why you should not do it for yourself.

You must, however, have a very clear idea of exactly what has to be done and—just as important—what must not be done, so do not attempt it without expert supervision.

This is the procedure: Disconnect the set from the mains by removing the plug from its wall-socket or lamp-fitting. (Do not rely on the switch to disconnect, because a fault or a momentary forgetfulness may result in an unexpected connection.)

Carefully remove the valves and decide where and how the little lamp-holder can be fixed in place, remembering, of course, that movement of



It is often a good plan to support the G.B. battery under the lid of the cabinet, as shown.

retained when its voltage is unreliable, or distortion and noises are likely to result.

Leads to the battery should be kept as short as possible, and the plugs must fit securely and firmly into the sockets. Always switch off the L.T. before altering bias voltages.

If there is doubt as to whether or not the G.B. battery is O.K., renew it, as, if it is not functioning properly, your H.T. battery will run down rapidly, and your output valve may lose its emission.

the condenser vanes when the set is in action must be allowed for. If you are sure it is possible to fix the lamp-holder in a satisfactory position, decide how the wiring to it must be carried out.

The actual wire to use is of the twin-flex type, but it should preferably be of the shielded kind, which has a metallic braiding as its outer covering. (The internal wires are to be kept entirely insulated from this metal covering, which is generally best connected to the earth via the nearest screen, metal baseboard, chassis or other earthed surface.)

It is particularly necessary to use the shielded type of wire if the lead has to be more than, say, a couple of inches long; and even the shortest lead must be spaced well away from any of the wires to the tuning coils, condensers, etc., or you may get trouble from hum.

One end of this new flex lead must be carefully bared and its two enclosed wires taken to the respective terminals of the new lamp-holder. The other end, also very carefully bared, must have its two leads connected across the appropriate L.T. supply wires.

Often the best place to tap the L.T. supply is across the two 'F' terminals of a valve holder, as you suggest, and the lamp used will then need to be of the same voltage as the valve which is inserted in that holder—probably 4 or 6 volts.

But sometimes it is preferable to tap across the transformer, and the marking on this is apt to be confusing.

Probably you would not find '4 volts' marked anywhere on it, but there might be three terminals marked '2—0—2.' So it is imperative to have the job done by a qualified man or under the guidance of an expert, especially as the actual wiring must be flawless and must not interfere with the rather delicate surroundings in which it will find itself.

With expert guidance it is likely to prove a very easy and satisfactory alteration.

"I CANNOT GET ANYTHING AT ALL."

T. S. (Elmers End, Kent).—"When I bought it the set was supposed to be perfect, but I cannot get anything at all out of it."

"Except for B.B.C. too weak to hear words properly, it has got nothing, and as the chap has shut up shop I cannot take it back."

"Batteries are all in order, because they work on my mate's set. Valves are new. If you can't help I am over two pounds down the drain."

The cause of such a trouble can only be decided by a test, and you do not give us enough details for us to help you with suggestions for this. What the set really needs is an expert overhaul, and any good radio mechanic or service man would probably spot the fault right away when he got his testing instruments to work on it.

The valves ought to be tested, preferably by the makers, to ensure that they are still in good condition. Because they are new they are not necessarily up to standard, since there is always the possibility of damage having occurred after they left the makers.

Another very likely fault is a faulty switch, so the spring contacts of any wavechange or on-off control should be examined with care to ensure that its action is what it is supposed to be. Incidentally, dirty contacts are quite sufficient to account for loss of programmes, as any little scrap of insulating material, such as paper, will have just as bad an effect as a break in the wiring.

Another important point is the valve-holder wiring. Sometimes the internal connections fail or the valve-holder sockets fail to grip the valve pins firmly. (It may be possible to overcome this by opening the valve pins with a penknife.)

Perhaps the valve-holder terminal is not making contact with the valve-holder socket owing to a break underneath the component; this is the sort of fault that is very difficult to find until testing instruments are brought to bear on the set.

And you should be suspicious of any terminals that may have needed to be tightened. When this is done it sometimes happens that the bottom (fixing nut) is turned by the pliers, as well as the top one, which may break the wire internally, thus disconnecting the component from its own terminal.

So, you see, there are many places at which a simple fault may stop the whole set from working, and unless the owner knows a bit about the method of checking faulty apparatus he stands a poor chance of finding the fault by himself.

To anyone of experience with testing instruments the location of such a fault is a mere detail in the day's work, so we should certainly not regard the set as a bad investment until it has had a good overhaul.

THOSE MEDIUM-WAVE AMERICANS ARE STILL COMING OVER!

Our recent reference to the fall-off in transatlantic results was no sooner penned than we began to receive reports that indicated that better conditions were setting in again.

Several multi-valve-set owners have been surprised at the strength obtainable, but one particularly interesting report concerned a 'P.W.' two-valver.

It was from Mr. John A. Sabell, of 23, Leighton Road, Moseley, Birmingham, 13, who said, in a letter to the Editor:

"I built the 'Vol-Pen 2,' as directed in your issue of December 16th. I am more than delighted with the results."

"I am using a Marconiphone P.M. loudspeaker, and may I say that the quality is far better than any radiogram I have heard? I am supported here by all who have heard it."

"This morning, at two a.m., I actually received, at loudspeaker strength, two medium- (Continued on next page.)"

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

wave American stations. (One of these was giving an hour's variety directed by Fred Allen.)

This is extremely good going, and it indicates that there is still a chance for the bagging of programmes direct from the other side of the Atlantic if one is lucky enough to choose a good period for listening, and provided, of course, that the set is well handled.

Incidentally, this set, "The Vol-Pen," has proved extremely popular, and a great many readers will be interested in a technical point raised by Mr. Sabell, which concerns the method of fitting an independent volume control to this two-valve receiver.

Quite an Easy Operation.

It is quite easy to do so in a manner that will permit the control to be effective upon radio and gramophone.

First, the existing lead which runs from the lower terminal of the radiogram switch to the pentode valve holder should be removed. The new wiring procedure is then as follows:

A 5-megohm potentiometer-type volume control should be used, and can be mounted on the panel just above the radiogram switch. Its centre terminal—viz., that which connects to the slider—is first joined to the now vacant terminal on the pentode valve holder.

One of the new volume control's outer terminals must be joined to the vacant lower terminal of the radiogram switch; this places any desired proportion of the new resistance in circuit, according to the slider position.

The final connection is from the remaining (vacant) terminal of the new volume control to the metallised baseboard.

(If the makers of the pick-up should recommend some value for this which is different from the 5 megohm (500,000 ohms) that is recommended for general use above it may be used exactly as described, the connections being the same whatever the resistance value chosen for the volume control.)

H.T. RUNS DOWN TOO QUICKLY.

J. G. (Market Drayton) — "I used to reckon an average of three months for the H.T. battery, but I have only run the new valve for fifteen weeks and have already had two new batteries. It can't go on like this.

STATION IDENTIFICATION VIENNA

The Viennese programmes have always been popular in this country, and now that the station works on high power (120 kw.) they are easily received.

The wavelength is 506.8 metres, and the dial reading just below Stuttgart's, near the top of the dial. Vienna is some 767 miles from London, but has been coming over very strongly of late.

The announcer closes down with the words "Gute Nacht" (Good-night) and pronounces the station's name as "Radio Veen."

"Would the change from a power to a super-power cause all that difference? (The other valves are the same as before.)"

"I have always bought the same batteries from the same shop, so I think it must be the set that is at fault, especially as I always get the battery tested before bringing it away from the shop."

A change from power to super-power valves usually means that a larger H.T. battery will be needed. And if you are using one of the "double" type, and over-running it, a change to the triple-capacity type would be a real economy.

There are several ways by which you can ascertain what class of battery should be used. The easiest is to borrow a suitable milliammeter and insert it in the H.T. negative lead, when all voltages are correctly set.

This will give you the total number of H.T. milliamps. And you can then buy an H.T. battery which is intended to deliver a current of that amount. Alternatively, the number of milliamps can be calculated from the valve-makers' literature.

A Double Check.

An additional advantage of making a milliammeter test is that it enables you to make sure that your trouble is not due, to some extent, to leakage owing to a faulty component in the set.

To test for this, all you have to do is to have the milliammeter connected, as explained, in the H.T. negative lead; and after having noted exactly how much current the set takes when "On," turn the L.T. switch to the "Off" position.

When this is done the milliammeter should read 0. But if there is a fault in the set you may find that the needle does not fall right back to zero, but still shows a slight current flow, although the set is off.

Such a fault, generally traceable to a broken-down condenser or faulty insulation of one of the H.T. carrying leads, is quite enough to account for the excessively quick running down of the batteries.

And with the milliammeter connected as above you can soon find in which part of the set the fault lies, because the disconnection of the various H.T. leads in turn will enable you to get the unwanted reading with only the H.T.—and one H.T.—lead in circuit, and with some of the valves pulled out.

But unless you have had some experience in fault-finding and wiring, etc., we advise you to get someone of experience to do the job for you, or you may make an expensive slip and connect up something wrongly.

Your First Two Volumes Now Ready

PRACTICAL KNOWLEDGE FOR ALL

Your first two volumes are waiting. This week gift token No. 7 appears and readers who started collecting gift tokens from No. 2 will be able to complete their First Gift Vouchers which, together with cash remittance, should be sent in immediately.

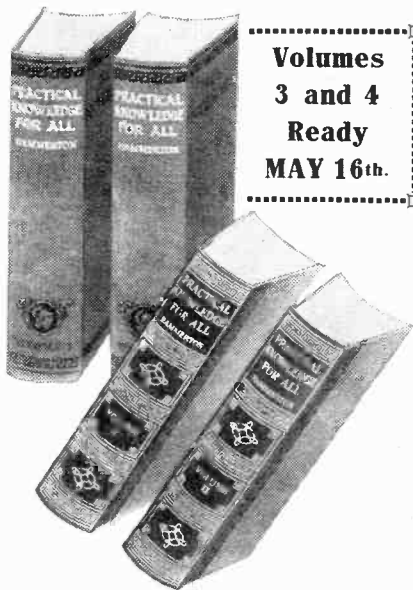
Readers who started with token No. 3 must wait one more week until they have collected six consecutive tokens in all.

Do not delay! Volumes will be sent out in strict rotation, and if you want yours quickly, complete Gift Voucher No. 1 and send it in the moment it is ready.

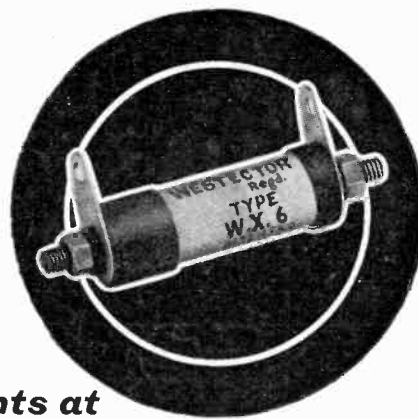
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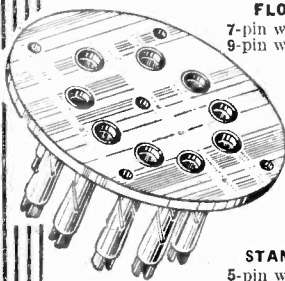
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HELPING THE ELECTRON

(Continued from page 109.)

Fig. 2 shows the circuit used for an oscillator. The coils are only one-eighth of an inch in diameter! The shortest wavelength at which oscillation has been obtained is 30 centimetres, using only one turn.

But the valves are more useful at two or three times this wavelength, and tiny receivers have been built which show quite a useful H.F. amplification as low as 75 centimetres. Even a multi-valve all-screened set produces a barely perceptible bulge in one's pocket. And the size of the aerial is definitely of the drawing-room-table variety.

It is obvious that unfortunately this miniature valve idea can't be applied very usefully to transmitters unless one is content with a correspondingly miniature power and range. The electron-path oscillators still look the best at that end. But the midget valves may well find very extensive use at the receiving end.

THE LISTENER'S NOTEBOOK

(Continued from page 120.)

Clearly the two are not the same; neither is it immaterial which of the two is used in broadcasting. Broadcasting demands one style and one style only.

Lady Rhondda reached a very high standard of broadcast eloquence. In fact, her talk left on my mind the most lasting impression of the lot. Lloyd George left the impression that he is still the politician.

That Wednesday evening feature, "Some British Institutions," offered rather a mixed bag. Some of the talks I found quite interesting. Others were a bit stodgy. The talks on the City of London appealed to me most.

"Industrial Britain," taken irregularly, wasn't altogether unpalatable. These questions have been so long in the air now that they haven't the freshness of a new topic. Yet the manner of the talks was stimulating.

The Short Story.

I notice a reference to a "revival of interest" in the short story. On whose part, if not the B.B.C.'s? The public has always been interested in the short story. Its absence from broadcast programmes has always perplexed me. I've always thought this form of entertainment such an obvious one, and with the hundreds of short stories all there for the asking. Ye gods! It doth amaze me!

However, there is a revival of interest, and a list of well-known writers has already been drawn up. I wouldn't discourage the idea for worlds, but it seems a bit odd that this revival of interest should coincide with the return of the lighter evenings.

It is still possible for Sunday evening fare to be bad. I say emphatically that chamber music shouldn't be allowed to monopolise 105 minutes of programme space at a time. It just upsets one for the rest of the night.

The Lyra Quartet would have left pleasanter memories behind them recently if they had packed up after their third item—Beethoven's Serenade. But they went on to do two more things which couldn't have been written for entertainment purposes.

Performing and listening to chamber music do not afford identical pleasures.

Those choral recitals of Church music, broadcast monthly, will probably run for a year without opposition. To those who are fond of sacred music—and their numbers can hardly be over estimated—these "half-hours of quiet loveliness," to quote Sir Walford Davies, are a source of real pleasure.

The Wireless Singers have now an established reputation, and need fear no frown or court any favour. With "The Pilgrim's Way," two

Sundays a month have at least one item to commend them.

If I were to say that Van Phillips and his All-Star Orchestra were the very best thing we have ever listened to in the way of popular music would anyone contradict it? I don't think so. I cannot recall anything better since broadcasting began. C. B.

MAKE A NOTE OF THESE IDEAS

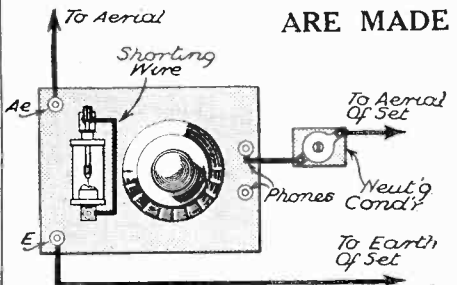
Two tips which are worth while remembering.

IMPROVING SELECTIVITY.

A TUNED circuit can often be added in front of a set which does not give very sharp tuning, to improve selectivity. Where an old crystal set happens to be on hand, this can usually be employed quite effectively, providing the circuit arrangement of the crystal set is fairly straightforward.

Connect the aerial to the A terminal of the crystal set, and join the E terminal of the crystal set to the E terminal on the main receiver. Next, connect the aerial

HOW THE CONNECTIONS ARE MADE



A scheme for improving selectivity with the aid of a crystal set.

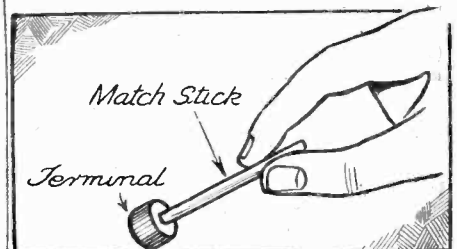
terminal of the main set through a "neut" type condenser to one of the phone terminals on the crystal set.

The correct phone terminal can best be found by trial. Finally, short the crystal detector by a small piece of bare wire.

FIXING TERMINALS.

SCREWING terminals in awkward positions is by no means an easy task, and even the most experienced constructor encounters difficulty in fixing a nut under such circumstances.

FOR EASY STARTING



Illustrating a good method of dealing with awkwardly situated terminals.

A good remedy to overcome this is by the use of a match stick, as shown in the diagram. It will be found that the dead end of a match is of a size sufficient to enable the constructor to gain a firm hold, and in this way the terminal can be easily manipulated into position.

THE NEW "EVERYBODY'S THREE"

(Continued from page 116.)

by the coils, and using transformer coupling between the screen-grid and detector valves.

A single three-point wavechange switch enables both bands of wavelength to be covered with the greatest of ease, and the screening of the coils obviates the need for any inter-valve shielding in the set.

Separate tuning control is provided for each coil. This is an important feature, not only where cheapness is concerned, but also from the point of view of accuracy of tuning. Although the coils are matched by the makers, and can therefore be used in gang-tuned circuits, everyone will agree that to get the very last iota of selectivity in a circuit of this simple description it is essential to use separate tuning controls.

The Part Played by Reaction.

The aerial loading on the one hand and variations in tuning caused by reaction alterations in the detector circuit, though small, would be sufficient just to take the edge off the sharpness of the set if a ganged condenser were used.

It must be remembered that reaction can play a very great part in the degree of selectivity achieved by a set, and that, though the coils of the New "Everybody's Three" are particularly sharp in tuning, the addition of reaction increases even this sharpness, so that the capabilities of the set to concentrate on one wavelength to the exclusion of others, even though they are occupied by powerful stations, are immense.

When great selectivity is desired one has to look out for quality, lest it should suffer, so that the choice of a good coupling system between the detector and the output stages is one of great importance. In this receiver we have again considered price as well as technical excellence, with the result that we decided to use a Bulgin "Senator" transformer, employed in a shunt-fed circuit between detector and output valves.

The transformer has a surprisingly high primary inductance when used in this manner, and it will look after the full range of musical frequencies in a very satisfying manner.

Simple to Construct.

We achieved an inexpensive and selective receiver by the means described above; it only remained to make the design simple to construct. That simplicity is obtained (1) by using a large baseboard, so that there is plenty of room for everything, and (2) employing a metallised baseboard, so that a number of the earth-return wires may be omitted, the metal covering of the wood taking their place. This greatly simplifies the wiring.

The diagram of the layout and wiring is self-explanatory. It shows not only the layout, but also the back-of-panel drilling dimensions, while the number of places marked "M.B." shows the degree of wiring saved by using the baseboard surface as a metal link between various parts of the set.

The operation of the New "Everybody's Three" is perfectly novel. There are no preliminary settings to do; it is merely a matter of connecting up the batteries,

aerial and earth and loudspeaker (an Amplion in the case of our tests) and switching on.

The batteries required are 120-volt H.T. and a grid bias to suit the output valve—probably you will use a "small" valve here, like the L.P.2 or P.220, in which case a 4½-volt battery will be ample. If a "larger" valve is employed the grid-bias battery should go up to 9 volts. The L.T. is, of course, 2 volts.

Place H.T.+1 into 75-80 volts on the H.T. battery and H.T.+2 in the full 120 volts (a mains unit giving these voltages can be used, if desired). Pull out the wave-change switch for medium waves and push it in for long waves.

The tuning will be found to be sharp, so care must be taken that the tuning controls are moved slowly and in step,

otherwise it will be easy to overrun stations without hearing them. You will require a little practice on the set before you will be able to get the full use out of it, because, as we said before, reaction will play a considerable part in aiding station selection on a set with the selective powers of the New "Everybody's Three."

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THE LINK BETWEEN

(Continued from page 110.)

A descriptive leaflet of this comprehensive circuit tester is available to "P.W." readers through the medium of our postcard literature service. (No. 82)

H.M.V.'s Latest.

Even radio folk have to eat! And for that very reason I feel that I may be forgiven for breaking away from radio for a sentence or two in order to tell you something of H.M.V.'s latest activities.

Their very latest product is a streamline refrigerator, and judging from the photographs I have seen it worthily upholds the company's reputation for high quality workmanship. It's certainly an interesting departure, but what I am particularly interested to know is whether it is of the interference-free variety! You see, my next door neighbour has a refrigerator, and unlike my own, I can't get at it. Result: noise, noise, and then more noise.

However, I have no doubt that H.M.V. have given due consideration in the design of their new refrigerator to the question of interference with radio reception, and as soon as I have obtained confirmation on the point, I intend to slip one of the descriptive leaflets through my neighbour's letter-box. There's hope even now that one of these days I shall be able to enjoy a radio programme free from both cold storage and hot air!

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Application for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey, at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way — just quote the number or numbers.

TELEVISION—A PROBLEM OF PROGRESS

(Continued from page 103.)

any kind of new transmission, whatever the change in scanning lines or picture frequency.

It will be properly in step, too, with no makeshift of any kind, so that we shall be able to take the fullest advantage of the picture. This, by the way, does not apply to all the suggested methods which one sees for the modification of drum and disc apparatus.

As to the exact methods to be adopted in resetting the time-base circuits, I cannot give practical instructions at this point, for the obvious reason that nothing is yet known as to the probable nature of the hypothetical new transmission, but no doubt the correct procedure will be described in due course for the benefit of users of the "P.W." cathode-ray receiver.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Signal Strength.

IS the strength of the incoming signals really important in relation to the volume of the output from the set? Many people seem to have the idea that the incoming signal strength on the aerial, for instance, is "neither here nor there," since anything can be made up by amplification.

This, however, is really a mistaken notion. Don't forget that although there is an enormous multiplication of the signal energy taking place in the set, nevertheless that signal energy is the first factor in the multiplication series, and that, if any one factor is doubled, the whole result is doubled. This, in passing, assumes that the amplification remains the same for different signal inputs and volume outputs. The amplification may not remain quite the same, but it is near enough for us to say that any increase in the signal input has a corresponding effect in increasing the volume output.

If you think about it for a moment, this must be so, otherwise how would you get the variations of loudness in a band, a singer's voice and so on? It is simply by variations in the strength of the input.

Aerial and Pick-up Efficiency.

Now, all this sounds very obvious, but yet it is surprising how many people do not trouble to use an efficient aerial (or pick-up), because they regard the initial energy as of no importance. Remember that the initial energy, whether from aerial or pick-up, is all you have to work on, and if you have twice as much initial energy, so you have twice as much material to work on.

Therefore it is worth while to use an efficient aerial and a sensitive pick-up, and not to rely too much on amplification. There is far less likelihood of distortion if you start with a reasonable amount of signal energy than if you start with a very small signal energy and have to use enormous amplification.

Constructors' Sets.

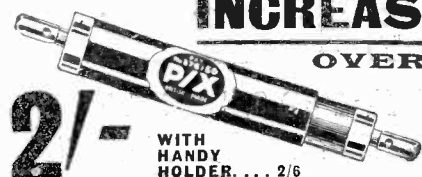
I don't know what is the proportion of people who construct their own sets as compared with those who buy commercial sets. There are lots of people who construct their own who could, of course, well afford to buy a commercial set. And the reason so commonly given—namely, that they enjoy the making of them—is not the only reason.

Another important consideration is that the constructor can so design his set that

(Continued on next page.)

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to separate those stations that overlap each other. Get rid of that annoying muzziness that spoils local reception. Just **FIX A PIX** in your aerial lead. You will be surprised how sharply your set tunes, and delighted at the number of new stations you can hear clearly. Try one to-day. Send us 2/-. If you are not completely satisfied, return it to us within 7 days for full refund.

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TECHNICAL NOTES

(Continued from previous page.)

he can adapt and modify it from time to time as new components or ideas come along.

In this way he is able to keep the set up to date all along the line, as it were, and is in no fear of his set becoming obsolete. Incidentally, I have often noticed that people put off buying a wireless set because they are afraid that—since radio progresses so rapidly—the set will be out of date before they've had time to turn round.

Improvements in Set Design.

This is putting too fine a point on things, because wireless sets are so good to-day that they cannot improve by leaps and bounds—I mean, so far as the results are concerned. It is true that improvements are constantly being made, but they are in the means by which the results are obtained rather than in the results themselves.

A New Use for Sound Waves.

An interesting bit of news from America says that sound waves are being used for sterilisation of milk and beer. I seem to remember something about this some time ago, very high-sound frequencies being used. It appears that these frequencies kill bacteria very quickly, and without

Simplicity of Operation.

I think there is a good deal of truth in this, and it means that people probably go to a great deal more outlay than is necessary. After all, if you only want the local stations a 2- or 3-valve set will be ample, which will be much cheaper in cost and upkeep, not to mention simplicity of operation and possibly quality of reproduction. So the point is worth bearing in mind when considering the purchase of a set for yourself or when advising a friend on his probable needs.

Of course, there are cases where a larger set is absolutely necessary. For example, if you are "under the shadow" of the local station and want to reach out for foreigners, then you want a really selective set, and a superhet may be practically a necessity.

Again, if conditions are not so drastic, but you are content with half a dozen to a dozen stations, you will probably get all you want with a 3-valve receiver of the conventional screen-grid, detector and pentode variety. A good deal, in such a case, naturally depends upon the efficiency of the aerial system.

The Importance of Selectivity.

As regards getting foreign stations, selectivity is, of course, a very important factor, and this again depends a good deal upon local conditions, such as the proximity

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affecting the taste of the liquid, which is one of the drawbacks to heating methods. The new method is called—rather characteristically, I think—"shock pasteurisation." A good American sound about that, don't you think?

Radio Receiver Requirements.

I was talking to a man a day or two ago about the choice of radio sets, and he made a remark which struck me as very true, although I had not really thought about it in quite the same light before. He said that he thought most people—or, at any rate, many people—overestimated their requirements in the matter of radio, just as in other things.

By this he meant, as he went on to explain, that they must have a multi-valve set (perhaps even a superhet) able to get everything under the sun, whereas in actual practice, having got such a set, they would tune to a couple of B.B.C. stations (generally the National and Regional).

The same sort of thing applies to motor-cars. A man feels quite at a loss if his car will only do 55 or 60 miles per hour when the other fellow's is capable of 80, whereas in point of fact probably neither of them ever goes more than 45-50, anyhow.

of the local station. For good selectivity it is an advantage to use a set having at least three tuned circuits. You may have one H.F. with band-pass input and a single tuned interval coupling, or two H.F. stages with three single-tuned circuits. As you will gather, the first method is applicable to a set such as a 3-valve set using one H.F. stage, whilst the second method applies to a set with 2 H.F. stages, such as a 4-valve set with detector and 1 L.F. The three circuits should, of course, be ganged.

The Benefit of Iron-Core Coils.

Iron-core coils will make for increased selectivity, so that their use with the above-mentioned circuit arrangements should enable you to get pretty well all the selectivity you require. On the other hand, the characteristics of the iron-core coils necessitate extra care in the ganging arrangements and in the wiring. It is hardly necessary to mention that "unbalanced" wiring may completely preclude the obtaining of accurate ganging.

I have spoken of the selectivity to be obtained with three tuned circuits, but for special cases you may have to go to four tuned circuits or a superhet.

(Continued on next page.)

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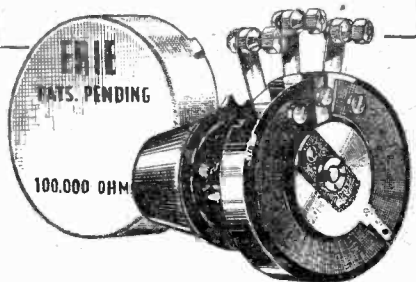
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TECHNICAL NOTES

(Continued from previous page.)

Local Interference.

Here is something about local interference, which is still one of the important drawbacks of modern sensitive sets, especially mains sets. The clicking, sizzling, pulsating and other noises which are picked up often mar reception very seriously.

This is especially the case in blocks of flats or such-like buildings where there is certain to be a variety of electrical machines of different kinds (including electric lifts—amongst the worst offenders), and where the electric lights are being continually switched on or off somewhere or other in the building.

Employing Filters.

As I mentioned before, there are now all sorts of devices and dodges for cutting out this type of interference: generally such devices take the form of what might be called "filters," consisting of different arrangements of chokes and condensers.

It is more difficult to cure the trouble if the device is used in proximity to the set, although, of course, this is the most convenient and indeed the obvious place for it. The simplest way to attack the problem is to place a filter or absorbing device in immediate association with the offending machine—say an electric motor or whatever it may be.

How Clicks Come In.

As regards mains sets, it is always rather tricky to decide whether the interference—especially the "clicks" when lights are switched on and off—come in on the aerial or on the mains leads. I have made a large number of tests on this point, and have come to the conclusion that, in the majority of cases, it comes in on the aerial. This makes it harder, because, although we can shield the leads and other parts of the set, clearly we cannot shield the aerial, otherwise we should receive no signals.

Shielding the Aerial.

It has been found, however, that this kind of interference is generally a very "local"—that is to say, its influence does not spread very far. This gives us a clue to the aerial-shielding question, for it means that we can shield the part of the aerial nearest to the source of disturbance (the lead-in, as a rule) whilst leaving the aerial itself unshielded.

An American radio engineer, Mr. H. J. Adler, has done a lot of work on this, and has found that shielding the lead-in (with proper circuit arrangements) can be made to give enormous improvements in the results. For the shielded lead-in a pair of twisted wires is used; one of these is connected to the aerial, the other being a free end.

Using a Special Transformer.

The lower ends of the two wires are connected, each through a condenser, to the primary of a special transformer, a tapping of this primary (not necessarily a centre tapping) going to earth. A shield of tinfoil is introduced between the primary

and secondary, the terminals of the secondary going to the aerial and earth terminals of the set.

As a general idea of values, the two halves of the primary may be 100 microhenries each, whilst the secondary may be 3,000 microhenries. Of the two condensers the one in the shielding lead should be about 0.1 mfd. fixed, whilst that in the aerial lead should be variable, maximum value about 0.1 mfd. The idea is that the "noises" on the two wires cancel out in the transformer, leaving the signals tuneable.

The Results That Are Claimed.

According to tests made with such a shielded lead-in (and, of course, a carefully shielded receiver, for it is no use shielding the one without the other), it is claimed that no interference was caused when a one-inch sparking coil was worked a few inches away. Vacuum cleaners, electric motors and lifts caused absolutely no interference.

This sounds very good, and I thought at any rate it would be interesting to those of you who are very much troubled with "man-made static," as our American friends call it.

The Question of Maintenance Costs.

My remarks on the question of battery costs have brought me many letters from readers, and I have been struck by the

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number who methodically keep records of such things. Of course, it is a very good plan to keep a check, and the information thereby obtained is most useful.

One very businesslike letter (after some very kind remarks about Technical Notes, which I much appreciate) goes on to give precise details for the four years 1930-1933. The writer says:

"Mine is a 2-valve set, 2 volt (Det. and S. Power). Average voltage 120. Average daily use 8 hours. All wet accumulators of 5,000 m.a.-hour capacity. Cost of charging H.T. and L.T. for last four years: 1930, £1 16s., average 3s. per month; 1931, £2 2s. 6d., average 3s. 6d. per month; 1932, £1 18s., average 3s. 2d. per month; 1933, 18s., average 1s. 6d. per month. In September, 1933, I added a Westector coupled to anode of power valve. The value of this is evident in the reduced cost of charging."

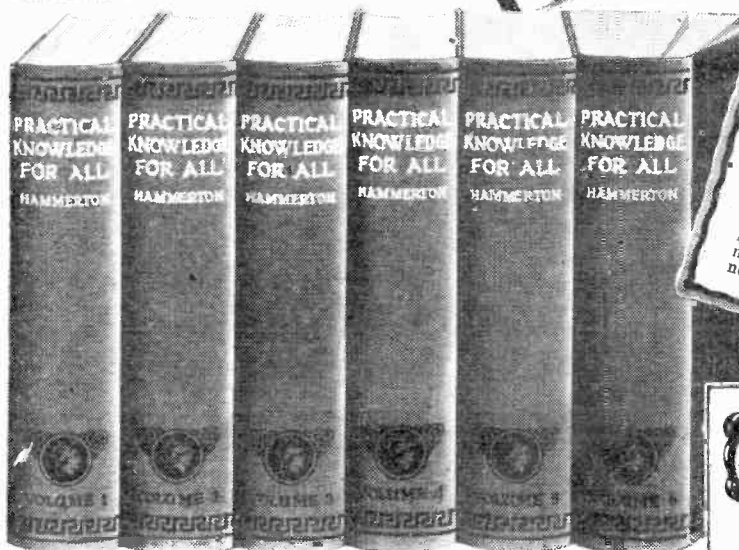
I think my readers will regard the foregoing extract as very useful. The reduction in the last figure is most striking, and one wonders whether it can all be due to the cause suggested by the author.

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