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Amateur Wireless and Radiovision

Every Thursday 3d

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AUGUST 3, 1929 No. 373 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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Hard on Announcers!—For High-brows and others—Recorded "Noises Off"—Radio Show in Scotland—Doves, and a Recording—"Abominable" Wireless!

Hard on Announcers!—Apart from the unfortunate people concerned, the B.B.C. announcers will be very glad when the Russo-Chinese crisis abates! It must be very hard for an unwary announcer to have to tackle names such as Pogranichnaya, Chang Hsueh-Liang, and Suifen-Ho, three examples from a recent actual report! It is all very well talking about the correctness or otherwise of B.B.C. broadcast English, but one can't help but have pity on the unfortunates who have to teach England how to pronounce the words when speaking of the Russo-Chinese affair.

For Highbrows and Others—It is a mistake to think that the "Proms" series of concerts at the Queen's Hall, London, is for highbrows only. In point of fact, some of the best and most enjoyable music emanates from the one hundred-member "Proms" symphony orchestra under the direction of Sir Henry Wood. The first of the series is to be given on Saturday, August 10. The first programme has every promise of being not too strict and "uplifting," but should provide a very enjoyable evening's entertainment to lovers of good music.

Radio comes down! An enterprising American airman who took a wireless transmitter with him when he made a parachute descent from a great height over New York

Recorded "Noises Off"—The "effects" section of the B.B.C. at Savoy Hill has been responsible for a number of gramophone records which are being made of noises likely to prove useful in broadcast plays. This means that the wind machine and the "supers" necessary to create a crowd effect will no longer be required. It is a little difficult, though, to see how a spontaneous noise, such as the firing of a gun, can be reproduced by means of a gramophone just at the moment required. The idea is not new, having been in use at the Berlin station for some little while.

Radio Show in Scotland—A Scottish Wireless Exhibition is to be held in Edinburgh, from November 12 to 22. The Scottish Radio Retailers' Association is giving the Show its wholehearted support and, as it is being held at a most suitable time of the year, it should prove to be an excellent attraction.

Those School Broadcasts—Whatever is your opinion about the usefulness or otherwise of school broadcasts, it must be conceded that the B.B.C. is doing the job very thoroughly. The syllabus covering the period from September of this year till next June has just been issued. Not all of the subjects are of a "schooly" nature. For instance, for the benefit of secondary schools fortnightly talks on flying are to be given by Squadron-Leader Helmore, M.Sc., R.A.F., of Farnborough, who was one of the party heard at the R.A.F. Air Display.

Doves and a Recording!—In the recording of a love scene for a British talkie—being "shot" at Elstree—it was required to include the noise of cooing doves! Not trusting to an imitation of the B.B.C. "noises off," the producer had provided real doves for the cooing act. As the lovers—who were well-known stars—embraced, the doves started cooing vigorously. This was just what was wanted, but the effect was so startling that all the onlookers and cameramen burst out laughing! So the act had to be repeated, with the doves more *pianissimo*. Things like that don't happen at Savoy Hill!

"Abominable" Wireless!—Here is a gem of wisdom from the Bench! A man complained at the Marylebone Police Court recently of the annoyance caused by a loud-speaker at a wireless shop next door. "Remember," said Mr. Hay Halkett, the magistrate, "if you happen to live next door to a place where they sell wireless things there is bound to be a certain amount of noise. He must play this abominable thing—sometimes." Comment is unnecessary; but we hope Mr. Halkett was joking.

PRINCIPAL CONTENTS

THE HILVERSUM-HUIZEN "MIX-UP!"

JOTTINGS FROM MY LOG :: By JAY COOTE

The Huizen short-wave station

THE new decision regarding the allotment of wavelengths to and the use of the existing broadcasting stations by the numerous Dutch radio organisations responsible for the wireless programmes is so Gilbertian in its conception that the authorities in that country have become the subjects of humorous cartoons in a number of lay and technical journals.

The point is . *When is Huizen Hilversum, and when is it just Huizen?* If you tune in to the 1,875 metres wavelength are you receiving the Hilversum programme or what transmission do you hear? The answer is : Huizen—but I will explain, for the puzzle is one which has not yet been solved by all readers who still find it somewhat complicated.

Firstly, we have two transmitters in Holland, namely, at Huizen and at Hilversum, and there are at least five separate organisations "sharing time" at these stations. Up to the present, the A.V.R.O. —perhaps the most important of these concerns—has broadcast all its programmes for some considerable time on 1,070 metres. On certain days, another society (V.A.R.A.), also responsible for the specially sponsored programmes sent out on alternate Sundays for the benefit of British listeners, uses the same studio and wavelength. Huizen, on the other hand, a dual-wave station was fed by the K.R.O., the N.C.R.V., and the V.P.R.O. associations, and although including a fairly good percentage of music in its transmissions, appears to have specialised in sacred services, sermons, religious concerts and talks. Now, it has been decreed by the powers-that-be that a change-over is to be made for the next three months and, consequently, our old friend "Hilversum" with which we have associated the A.V.R.O. and V.A.R.A. concerns who have given us programmes which have become popular in Great Britain, although *using their own studio* are compelled to transmit *through the Huizen aerial* on 1,875 metres.

Times and Wavelengths

On the other hand, if you tune in to 298 metres during the day and to 1,070 metres after 5.40 p.m., where you heard Hilversum you now find Huizen. Is that clear? In October, and so far as can be foreseen, every three months later, a change-over will again be made. Why this was necessary nobody quite knows, but the arrangement is so fatuous that it is fully expected that it will be only a temporary one for the sake of everybody's peace of mind.

A Single-wavelength System

It has been suggested that Holland should adopt a "mono-wave" system, namely a single wavelength simultaneously used by a number of small relay stations dotted over the country and fed by a central studio. The question is being discussed at length in the Dutch press, but whether any agreement on the subject can be reached is a moot point, for it is considered impossible to satisfy the numerous political and religious bodies, all of which are anxious to disseminate their views *via* the microphone.

Anyhow, for the present, just bear in mind that when you think you have captured Hilversum, you are listening to Huizen, and that if you want the former—possessing the better entertainments—you must look for it, above Radio-Paris, on 1,875 metres, for it is transmitting over the Huizen aerial.

MARCONI ROYALTIES—An Agreement Reached

AT a meeting of members of the Radio Manufacturers' Association and other representatives of the wireless trade at the Hotel Cecil, on Wednesday, July 24, the chairman, Mr. Mould (Igranic Co.), the present chairman of the R.M.A., outlined an agreement which has been reached between the Marconi Co. on the one hand and the Radio Manufacturers' Association on the other. The chairman briefly reviewed the negotiations that had taken place between the two parties during the past two or three years and alluded to the action brought by the Brownie Company before the Comptroller of Patents and to that official's decision that the Marconi royalty of 12s. 6d. per valve holder was excessive. The Comptroller, it will be remembered, decided that a royalty of 10 per cent. of the manufacturer's price was equitable and the chairman contended that, as a result, there had been this year a record sale of manufactured sets. The Marconi Co. appealed to the High Court from the Comptroller's decision and, in restoring the prior position, the Judge said that there was no evidence before him that the scale of royalties charged by the Marconi Co. was injurious to the radio trade.

A Difficult Position

This was the position that had to be faced by the committee negotiating on behalf of the R.M.A. with the Marconi Co. In a sense, the vanquished had to meet the victors and get the best terms they could. The chairman paid a tribute to Mr. Kellaway, of the Marconi Co., who had received them with courtesy and who had agreed that two accountants, one representing the Marconi Co., and the other the R.M.A., should compare figures, the purpose being to discover whether the substitution of a lower royalty would be likely to bring the Marconi Company a larger aggregate sum. So hopeful was the comparison that the R.M.A. Committee, including such well-known members of the radio trade as Mr. Mould of the Igranic Co., Mr. Barber (Brownie), Mr Joseph (R.I.), Mr. Bowyer-Lowe, Mr. Weaver (G.E.C.), and Mr. Strachan (Secretary of the R.M.A.) had been facilitated in its effort to reach agreement with the Marconi Company and the meeting that morning had been called for the purpose of informing members of the main points of an arrangement which had just been made.

The New Agreement

We set out here, in as simple language as possible, the five main heads of this agreement, and are, not in all cases, quoting the official language.

(*a*) The agreement is for a period of five years, but dates back one year, that is to August, 1928.

(*b*) Licences to be granted under this agreement will cover the existing patents set out in the schedule to the A.2 licence, the licence now issued by the Marconi Co. to radio manufacturers; but in addition, it will cover all other present and future

(*Continued at foot of page* 116)

Do You Use a Pick-up?

SOME HINTS ON GETTING THE BEST RESULTS

By W. JAMES

THOSE who are interested in the electrical playing of gramophone records will be familiar with the ease with which small amplifiers are overloaded even when the volume seems not very great. This may be attributed, at least in part, to the characteristics of certain pick-ups which may have resonance points that tend to emphasise certain notes.

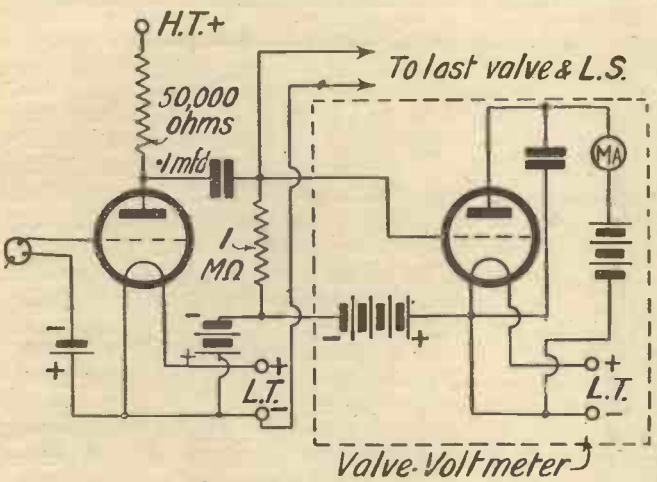


Fig. 1. Circuit for measuring pick-up voltages

Measuring Pick-up Voltages

An interesting half-hour can be spent in noting the variations in the output voltages from a pick-up, when playing different records. The voltmeter may be of the anode-bend type, connected as shown in Fig. 1, which shows a stage of magnification connected to the pick-up in order that reasonably large voltages may be obtained.

This stage is resistance coupled, and may be assumed not to distort, provided the values are suitable. Thus the anode resistance should not be too large, nor the coupling condenser too small. The values are not critical, however, and 50,000 ohms may be used in the anode circuit with a .1-microfarad grid condenser, and a 1-megohm grid leak.

For the valve voltmeter, a valve set to work as an anode rectifier, but having a low-reading milliammeter in its anode circuit with a large by-pass condenser may be used. The grid bias must be chosen in order that grid current shall not flow in this valve and the high tension be adjusted accordingly. One should remember that a very sensitive pick-up may provide voltages reaching as much as 1.5; when a valve having an amplification factor of, say, 10 is used in the resistance-coupled stage the output may, therefore, amount to nearly 15 volts.

It is necessary to bias the grid by much more than this, however, as the peaks of the output voltages must not be allowed to set up grid current. A pick-up that is not very sensitive may produce voltages of the order of only .1 or .2, so that a certain amount of care is required when first setting up the apparatus.

The effect of using different types of needles may quickly be noted. As one would expect, the largest voltages are produced when a "loud" needle is employed, and the smallest voltages when a "soft" needle is fitted. The output is generally lower still when a fibre needle is used.

As a record is played, the needle of the milliammeter connected to the rectifying valve will swing backwards and forwards. Strangely enough, one does not always notice that the volume is the maximum when the reading is greatest, and depending to a certain extent upon the characteristics of the pick-up being tried, one may notice how the higher notes, whilst perhaps not sounding very loud, sometimes send the needle across the scale. These higher notes, therefore, tend to overload the valves of an amplifier, with the result that the quality of the reproduction may be disappointing unless the average volume is reduced to below what one might consider less than normal in comparison with wireless reception.

It will be clear that if the pick-up is particularly sensitive about a certain frequency, then all notes in this region are likely to be emphasised and will, therefore, tend to overload the valves. It is partly because of this that the volume to be obtained from, say, a two-valve amplifier is less than that from the same amplifier used in a wireless receiver.

For good results, a gramophone amplifier should be so constructed and used that the margin of safety is considerable. The amount of magnification required is not very great, as a rule, but the output stage must comprise a large valve or valves supplied with high tension amounting to at least 180 volts and preferably to 350 or 400 volts.

Let us imagine that we have a pick-up giving 1 volt when playing an ordinary record, or, say, .2 volt when the record is a rather quiet one, and is played with a soft needle. We can join a volume control in the circuit in order to cut down the strength,

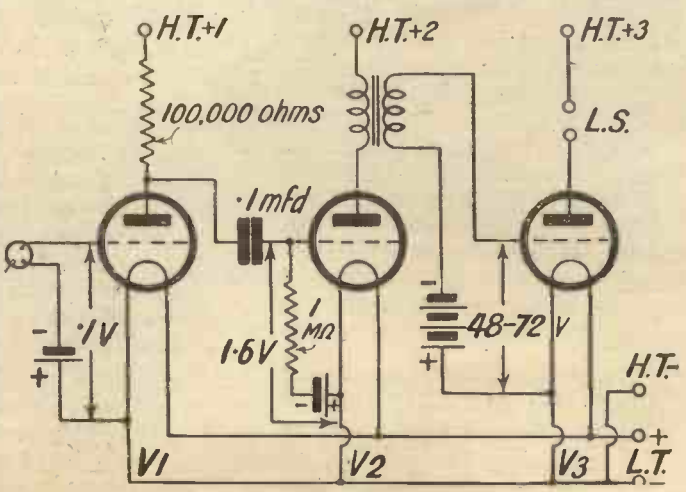


Fig. 2. A good representative 3-valve amplifier

but we must provide sufficient magnification for full volume under the most unfavourable conditions. Let us, therefore, assume that if the smallest voltage is .1 we can obtain full volume, which means that the volume control will nearly always have voltage will vary by that applied to the grid times the magnification factor, or a little less. For a transformer having a ratio of 3 to 1 the voltage set up across the secondary will be 1.6 multiplied by from nearly 30 to 45, depending upon the valve. be clear upon referring to Fig. 3, which shows push-pull input and output transformers.

When specially made transformers are not suitable, the arrangement of Fig. 4, may be adopted. An ordinary intervalve

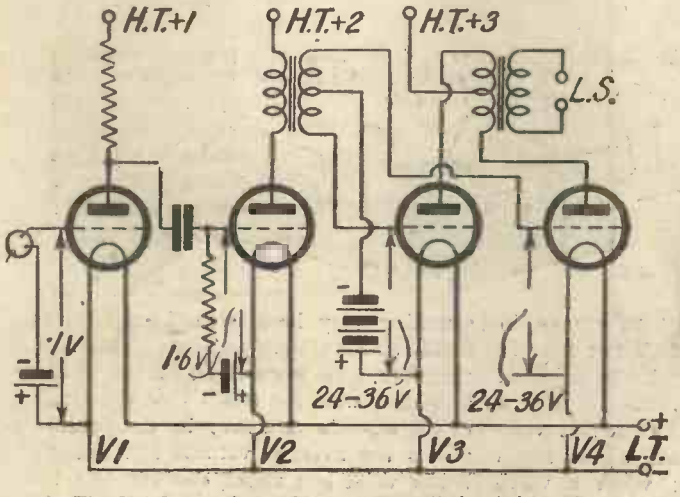


Fig. 3. Connections when a push-pull circuit is used

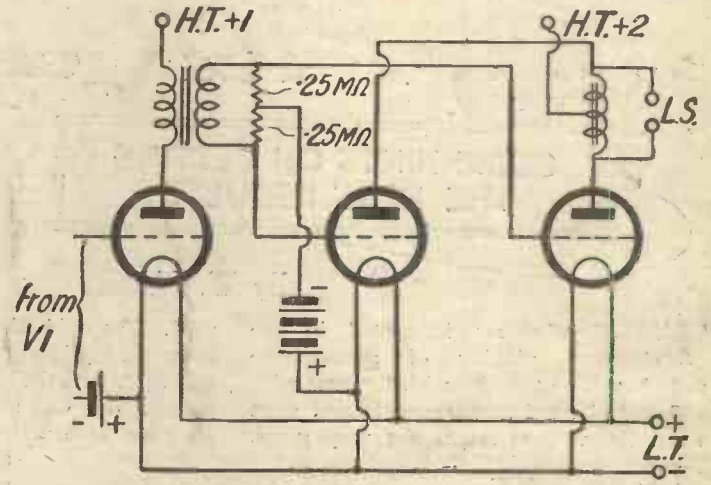


Fig. 4. Adapting an ordinary circuit for push-pull

to be used. This value of .1 we must assume to be a peak value, as it is peak values that are important in valve amplifiers.

A typical three-valve amplifier may be joined as in Fig. 2. Using a valve, V1, of 20,000 ohms and a magnification factor of 20, the stage will amplify about 16 times. Therefore the voltage applied to the second valve will be 16 multiplied by .1, or 1.6. This valve may, therefore, be given a bias of negative three volts or a little more if the anode voltage is rather high.

Valve V2 may have a magnification factor of 10 to 15, with the result that when a good transformer is used its anode This amounts to about 48 and 72 volts, which will be applied to the third valve, V3.

It is evident then, that this last valve must be given a grid bias amounting to a little more than these voltages. The type of valve and its high tension may be decided from this grid-bias value.

It is worth remembering that if it is not convenient to use one large output valve, two valves may be used in push-pull. Each valve in the push-pull stage will then deal with half the input voltages, which means that a little smaller valves and little lower high tension may be used. This will transformer is used with a pair of grid-leaks of one-quarter megohm each, and a centre-tapped output choke. When a suitable choking coil is not available, two having equal values may be used, although if their inductances are sufficiently high, they need not be exactly the same.

The volume control may be in the form of a tapped anode resistance or potentiometer-type grid leak, or a potentiometer may be joined across the pick-up itself. Whichever method be adopted, it is advisable to use a potentiometer of the special volume-control type, which generally gives a logarithmic variation instead of a straight-line one.

"MARCONI ROYALTIES"

(*Continued from page* 114)

patents relating to broadcast reception controlled by the Marconi Co. and their associates the Gramophone Co. (H.M.V.), the Radio Corporation of America, the General Electric Co. of America, and certain French and German associated companies. It will also cover the eliminator patent, No. 148129, at present the subject of the "D" licence.

(*c*) Manufacturers taking the new licence from the Marconi Co. will give in return the free use of any patents they may possess relating to broadcast reception. When the eliminator above referred to is embodied in a set, a royalty of five shillings shall be payable, and when not so included the royalty shall be 6 per cent. of the retail list price.

(*d*) The R.M.A. will call the Marconi Co.'s attention to any case of infringement of the patents and should the Marconi Co. not be prepared to prosecute, the question of prosecution shall be referred to arbitration.

(*e*) The future royalty paid by manufacturers to the Marconi Co. is to be five shillings for every valve holder embodied in a wireless receiver.

Manufacturers wishing to take a licence on these terms must apply to the Marconi Co. not later than August 24.

Minor Points

Following the chairman's statement, many questions were asked and elicited a little further information of which the chief points are as follows: The royalty on sets exported will be the same as above, except that in the case of Sweden and Australasia the royalty will be 2s. 6d. per valve holder. It is the intention that royalties shall be paid on kits of parts.

Licencees under the above agreement are precluded from importing apparatus from abroad.

Criticisms

In conversation with numerous manufacturers at the conclusion of the meeting, we gathered that there is general agreement with the new terms as a whole, but there was strong criticism of some of the details. It is realised, however, that the arrangement is the result of negotiations in which both sides have had to give and take, and it is felt that in view of the Judge's decision upholding the old Marconi royalty, the R.M.A. have done a little better than might generally have been expected. Criticism centred largely around the fact that two important Marconi patents, grid-leak detection and reaction, are about to expire and that licencees may expect some amount of competition from firms who will not take up the new licence but who, using the expired patents, may be able to manufacture sets and be free to import foreign apparatus without restriction.

As in the Plan de Prague, provision was not made for the North African broadcasting stations (Tunis, Rabat and Algiers), these studios have adopted arbitrary wavelengths which now cause interference with Spanish, Italian, and French transmissions. It is reported that the matter will be considered at the next Conference to take place at the Hague.

Two of the A.W. Staff see BELL COLOUR TELEVISION

An Eye-witness Account by ALAN S. HUNTER

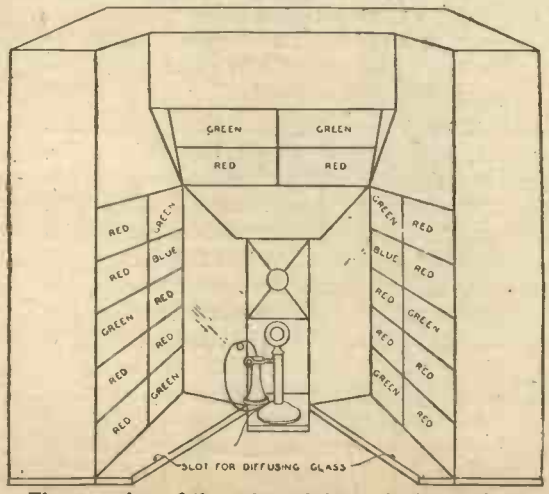
The sitter is almost surrounded by the large sheets of diffusing glass, behind which are the colour-sensitive photo-electric cells. Dr. H. E. Ives is seen seated in the left-hand picture

TELEVISION in America was first brought to our notice by the Bell Telephone Company, who invited us to witness a specially arranged demonstration of their latest development in colour television. Previous to this invitation we had just completed a fairly comprehensive tour of the Eastern and Middle West cities of the U.S.A., and no one connected with the many spheres of radio we investigated had a word of enthusiasm for the idea of television. Money talks in the U.S.A. like nothing else in the world, and we tacitly interpreted the silence of American radio men on the subject of television as indicating that, so far and in their opinion, there is no money in the proposition.

On the morning of July 3 we arrived at the Bell Telephone Laboratories, situated at 463 West Street, New York. Mr. Paul B. Findley, to whom we are indebted for arranging the demonstration, conducted us to the lecture theatre, where the television transmitter and receiver were arranged at opposite ends.

With the addition of special colour mechanisms, we were told, the apparatus we saw was the same as that used two years ago to demonstrate monochromatic television between Washington, D.C., and New York City.

My companion, J. Sieger, of the "A.W," Technical Staff, was the first to be led into a darkened closet for his "look in." I followed a few moments later, and then written impressions were compared before we spoke about what we had seen. Here is the combined viewpoint: A small spy-hole, to which the eye had to be closely applied, first revealed the smiling face of the vivacious young lady, shown by an accompanying photograph. Colours vivid and startling made a pretty if slightly unnatural picture. Very white teeth, black wavy hair, and red lips and cheeks, all stood out in remarkable contrast.



The grouping of the coloured filters in front of the colour-sensitive photo-electric cells is shown in this perspective sketch of the television transmitter

The lady modestly gave way to inanimate "subjects," the first being a child's play-ball having coloured sections that retained their individual colours as the ball was rotated between the lady's fingers.

The next subject almost made our mouths water—a luscious slice of water-melon of the type common in America, with thick green skin and red fruit. This looked quite natural.

Lastly, and in some ways most striking of all, appeared the Union Jack and the Stars and Stripes, both in the full glory of their colours; and the impression that these were just pictures immediately vanished as each banner was unfurled and gently waved before us.

In general, the images appeared perfectly steady, there being no perceptible swaying either sideways or up and down. The effect as viewed through the spy-hole was of looking through a pair of field glasses at the real thing. Now and then the fast-moving transverse lines formed by the rotating disc were just perceptible, but, owing perhaps to the highly coloured pictures, for the most part this effect was absent.

The images were all exceedingly pleasant to look upon and would cause no strain if viewed for a considerable period.

As Dr. H. E. Ives, of the technical staff of the Bell Telephone Laboratories expresses it, "One of the most significant features of this new achievement is that it does not require completely new apparatus. The same light sources, driving motors, scanning discs, synchronising systems, and the same type of circuit and method of amplification are used as in the monochromatic system."

In its present uncommercialised state I do not see where the great significance of this feature comes in, and I would say that a more significant feature is the development not only of suitable photo-electric cells for colour work, but also of suitable argon lamps for the receiving end.

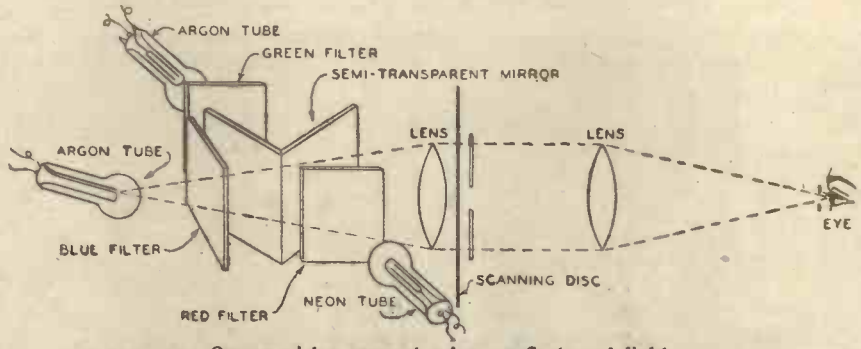
The Working Principle

Briefly stated, the Bell colour television system works as follows: The subject is rapidly scanned by a bright beam of light, at the same time being exposed to three distinct sets of photo-electric cells, the "electric eyes" of the machine. Each of these sets of cells is specially sensitive to one of the three primary colours—red, blue, and green. In all, twenty-four cells are used—two for blue, eight for green, and fourteen for red. This numerical relationship gives approximately equal photo-electric currents for all colours, and has been chosen to correct for the relative sensitivity of photo-cells to different colours.

Each of the three colour signals is separately treated in precisely the same way as in the monochromatic system, thus involving three sets of amplifiers, and three communicating channels. In parenthesis I might remark that these three channels are more easily available on a laboratory telephone line than in the already congested U.S. ether!

Reconstructing the Picture

Before these three image signals can be viewed at the receiving end they must be received in their appropriate colours, viewed simultaneously and in superposition To effect the first part of the process, one neon lamp and two argon lamps are used for red, green and blue light respectively.



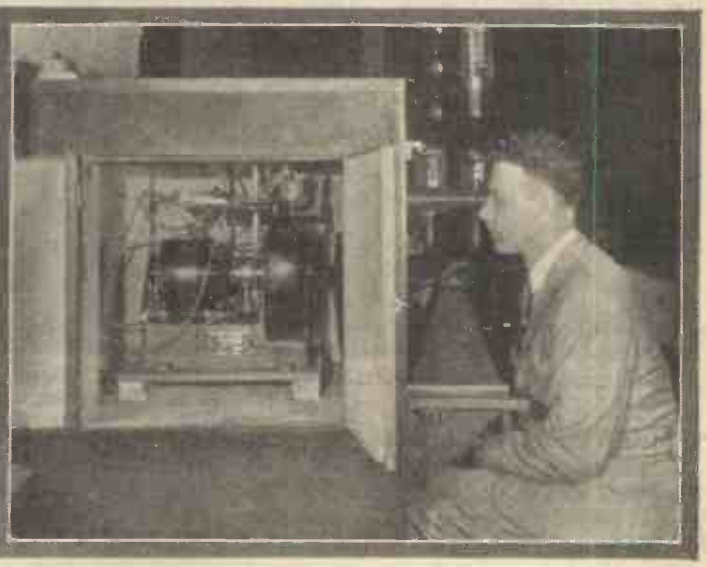
One semi-transparent mirror reflects red light from the neon tube; one reflects green light from the argon tube; and through both mirrors passes blue light from the other argon tube

These three lamps are arranged with a lens and mirror system behind a 16-in. scanning disc. The mirrors combine the lights from the three lamps, and the lens system focuses the combined light into a small aperture in front of the disc.

As we looked into the aperture we therefore received, through each hole of the disc as it passed by, light from the three lamps With the intensity of the three lamps properly adjusted we were thus able to see an image with the general appearance of a small coloured motion picture.

As a laboratory exhibition the demonstration we were privileged to witness can only be characterised as an unqualified success on which the Bell Telephone research workers are to be warmly congratulated. We shall be greatly interested to see what form the commercialisation of this achievement will take in America, where the radio public does not now consist of ardent experimenters, but of rather sophisticated "one-dial" listeners. In this country we hear periodic pleas for amateur participation in television experiments, because we still have, and probably will always have, a very considerable section of home constructors. This species seems to be defunct in the U.S.A., and for that reason I venture to suggest that television, when it does come in America, will come in a strictly commercial and practicable form.

The receiving apparatus with synchronising panel at left, amplifiers for three channels at right, and cabinet containing scanning disc, three lamps, and colour filters in the centre



Side view of receiving apparatus with doors of cabinet opened. All but the argon tubes and the box containing semi-transparent mirrors and filters are the same as used for monochromatic television

TUNING A PORTABLE SET

MANY portable receivers now comprise two frame aerials. One, used for the short-wave stations, is located in the main cabinet. The other, which is only switched into circuit for the longer waves, is usually mounted in the lid. When both frames are in use—for instance, on Hilversum or 5XX—an additional reaction control can be secured by swinging the lid about its hinges, so as to increase or diminish the distance between the two frame windings.

On the other hand even when tuning on the short-wave aerial alone, a sensitive setting can often be stabilized by similarly swinging the "open circuited" lid winding about its hinges. The effect is probably due to high-frequency currents flowing in the open-circuited aerial, either by capacity action across the windings or across the switch contacts. This gives a kind of spade tuning control of the main aerial which will often prove useful, particularly when bringing in a distant station. M. A. L.

On Your Wavelength!

What Next?

IF you were to ask me what I considered would be the next big step in radio I would not hesitate in my reply. It would be "The development and popular use of the photo-electric cell." Television and talking pictures are inventions which have caught the imagination of the public and directed it to the importance of the photo-electric cell. Formerly, selenium was used wherever it was found necessary to vary an electrical resistance by means of corresponding variations of light rays. But selenium was not quick enough in its response to the light rays, and it took its time about returning to its original resistance when the light rays ceased. And so the photo-electric cell, a new-fangled "valve" with a rapid response to light rays, came to the aid of television and talkers.

Light-ray Applications

The photo-electric cell, in its improved form, will perform a very wide range of useful work. Voice modulations can be super-imposed on beams of light and sent for miles, to be "rectified" into electric currents and speech by a photo-electric cell. Street lamps can be switched on automatically as dusk falls. Burglars can be detected. Numerous light measurements and tests can be made. All kinds of uses may be made of it in time of war by the army, navy, and air forces. Watch the photo-electric cell!

Mr. Ashbridge

There is no doubt that the appointment of Mr. Noel Ashbridge to the position of chief engineer of the B.B.C. a few weeks ago has been "well received" by the B.B.C. engineering staff. Mr. Ashbridge has been a tower of strength in the B.B.C. engineering department for some years, and possesses a conservative, judicial mind; in fact, he is the type of Englishman who does big things in a quiet way. If he wasn't a radio engineer I could imagine him designing bridges or railway systems in some far-away land. While he was assistant chief engineer Mr. Ashbridge was no "yes" man and was frequently in argument with Messrs. West and Kirke, research engineers, and even with P.P.E. himself, over developments which seemed to him to be just not quite reliable enough.

Mellow Tone

What with needle-scratch filters that cut out the "top" and multiple loud-speaker points, a good many radio outfits are suffering from a silly season of over-mellow tone. I read the Riot Act several weeks ago about the evils of "super" scratch filters. And now for the multiple loud-speaker points! In houses with many rooms, all of which have been wired up with twin lead-covered conductors to the loud-speaker points, there is quite an appreciable capacity to earth and to one another between the two conductors. The result is, actually, that a condenser is shunted across the output. And if the output impedance, which may be taken as being the same as the impedance of the output valve, is of the order of 10,000 ohms, there will be a loss of high notes and harmonics. The loss will not be so serious with lower output impedances, which is another argument in favour of the super-super-power valve!

The Condenser Microphone

Owing to the necessity for a silent background with the enormous amplification used in the reproduction of talking films, the condenser microphone has made great progress during the last few months. The B.B.C. have been using condenser microphones, "on and off," for several years, but not until three or four months ago were they considered to have advanced beyond the experimental stage. The greatest "snag" about the condenser microphone is the necessity for the first stage of amplification to be close up to the microphone itself. Captain West, late of the B.B.C. and now of H.M.V., designed an excellent instrument in which one stage of valve amplification was included in the same box as the microphone itself. And now the Radio Corporation of America has brought out a super condenser microphone, with three-stage amplifier, microphone and all—in a metal box seven inches cube! This new type of microphone is now being used in the production of talking films at the Islington studios of Gainsborough Pictures.

How Do You Find It?

For some little time past now it has seemed to me that 2LO's strength at all times of the day and evening is not so good as it was. This is not due to the normal summer-time effect, for the weakening that I have noticed began to be observable a good many months ago, and the volume obtained at the present time is, I am sure, not what it was this time last year. The crucial test is, of course, the crystal set, for in the valve receiver one may be using "toobs" and other components that are considerably more efficient than those of yesteryear. Where I live, reception with the unaided crystal detector used to be astonishingly good, providing excellent telephone strength. Now it seems to be distinctly less good. Unfortunately, I never thought of measuring in previous years the current in micro-amperes passed by the crystal, so that I cannot now make a comparative test of that kind. I wonder if other readers have noticed a similar small but distinct falling off in volume?

Other Instances

I have mentioned before in these notes examples of the way in which transmitting stations appear to suffer from a reduction in distance-getting powers when they have been in use for some time. The classic example was the now defunct Radio Iberica. When he first came on the air this station was one of the best received in this country of all those on the continent of Europe. For many months his programmes came through almost as strongly as those of one's local station. Then he went slowly down hill, becoming, before his end, quite difficult to tune in. No reduction in the power took place.

Langenberg provides another instance. Old hands will remember with what enormous strength he used to be received even in broad daylight. And where is he now? Other stars whose magnitude has steadily declined are Lyons Doua, Mont de Marsan, Frankfurt, Hoerby, Gothenburg, Vienna, Budapest, Milan, Ecole Supérieure, San Sebastian, Madrid Union Radio, Malmoe, and Motala. Motala has perhaps the most curious history of all. When the station first started to transmit he was received all over this country with almost incredible strength. With me he came in almost as well as 5XX, though the latter's distance is under fifty miles. Splendid reception continued in daylight or dark for well over a year. The decline which came was not gradual, but quite sudden. All over the country people began to ask one another: "What has happened to Motala?" Motala is still an excellent station, but he is no better than any one of half a dozen others on the upper band.

The best and most consistent record in the history of wireless belongs without a shadow of doubt to Radio-Paris. Years ago I used to receive his Sunday midday programmes at full volume and with all the purity that was then obtainable on a four-valve set, and to-day he is every bit as much of a certainty in daylight or in darkness.

Unexplained

No one, so far as I know, has offered any acceptable explanation of the reason why some stations fall off, some maintain their strength, and others, curiously enough, show an improvement as time goes on. There certainly are stations which improve without making any increase in their power. Nuremberg, Toulouse Midi, and Hamburg are good examples. Though I have often thought about it, I have no very definite idea why these things should

On Your Wavelength! (continued)

be. The only possible explanation seems to me to be that the insulating material used in transmitting sets deteriorates with the passing of time. The authorities at some stations fully realise this and insist upon frequent renewals. Their stations maintain their strength. Others do not make replacements so often, and a decline is noticeable. But this still makes it very difficult to account for the stations which apparently increase their efficiency without raising their power. Possibly experimental work goes on and improvements are made from time to time in the circuits and the components employed. Anyhow, it is a very curious business, and to my mind it is one of the most interesting problems in broadcasting to-day.

The Elusive Atmospheric

A friend of mine once said that DX work should really be written "d—— X work." I presume that the naughty fellow meant that even the most saintly of us do cuss the atmospheric at times. A year or so ago the National Physics Laboratory ran a series of tests in conjunction with observers in many different parts of Europe. All observers were asked to listen to certain definite topical talks broadcast from 5XX (I always think that 5XX is rather an ominous call-sign). Each was invited to underline or to mark in some other way any syllable or word that was marred by an atmospheric. When all the reports had been received it was easy to compare them to see whether the same atmospheric had been noticeable in, say, Stockholm, Warsaw, and Constantinople. Weather charts showed the point at which the crackle, fizz, and bang had originated.

A New Method

The scheme was a good one and served many useful purposes; but, unfortunately, it had to rely upon the human factor in estimating the strength of the interference experienced. Fresh tests of a very interesting kind are just about to take place. Instead of the human recorder the Fultograph will be used. The stylus of this instrument makes a mark upon the sensitised paper when an atmospheric occurs, the intensity and size of the mark depending directly upon the strength and duration of the interference. From 5XX, outside programme hours, special transmissions are to be made. In place of pictures, a network of straight lines will be sent out. By comparing the reproductions one with another it will be possible to ascertain with great accuracy the time at which an atmospheric occurred, how long it lasted, and just how severely its effects were felt in different places. This should lead to very valuable information about what the atmospheric is, where it comes from, and just what it does.

Television and the B.B.C.

Whatever one may think of the merits of television in its present state of development in this country, one can but regret that the B.B.C. has adopted such a stone-wall attitude towards it. They seem to take the view that until an invention has reached such a stage that it can appeal to the man in the street as a hobby only the most meagre facilities shall be given by them to those responsible for it. Television is bound to come. Everybody wants it to come, and everyone would like to see this country far ahead of all others in the race to obtain perfection. Would it not, then, be far better to adopt an encouraging and helpful attitude towards it? As it is, the Baird Company now have been compelled by the line which the B.B.C. has taken to break off negotiations and to make an appeal to the Postmaster-General. One is sorry that such a position has ever been reached, and one hopes that an amicable and reasonable settlement will be arrived at in the shortest possible time.

Stereoscopic Television

I fully believe that if you asked a number of persons why they have got two eyes, nine out of ten would be unable to give a correct answer. Look at an unfamiliar scene with one eye and then with the other, and what do you find is missing? Why, the impression of stereoscopic relief, depth or distance. Normal vision with both eyes shows us objects in relief, so that we can judge distances and sizes, and the effect is due primarily to the combination of images seen by the two eyes. I was prompted to discourse on this point through seeing a brief reference to stereoscopic television in a magazine recently. Mr. Baird must be given credit for first making this remarkable advance, for it was nearly a year ago—August, 1928—that he gave the first demonstration of television in stereoscopic relief.

How the Scheme Works

Briefly, the scheme consists in providing the transmitter with a disc having two separate spirals of holes, one near the periphery and the other about four and a half inches nearer the centre, this being the approximate distance separating the human eyes. There are two lenses to focus beams of light from two sources of light, so that the televised object can be traversed alternately by light rays projected first from the left-hand lens and then from the right-hand lens. As in the ordinary spotlight system, photo-electric cells pick up the reflected light, and the resulting electrical impulses are amplified and transmitted by wire or wireless to the receiving station.

At the Receiving End

In the receiving apparatus we have a disc geometrically similar to the transmitter disc, and when synchronised the two images appear on the screen side by side to correspond with the views from individual eyes. The observer in turn combines these slightly dissimilar images by looking at them through a stereoscope, and thus has imparted to him the impression of depth and relief. The scheme is equally applicable to colour television by splitting the original double spiral into two sets of triple spirals with their red, green, and blue filters, and duplicating this special disc at the receiving station. The successful accomplishment of stereoscopic colour television will produce an image on the screen which will be both entrancing and true to nature.

Rather Risky

I have come across one or two accumulator-charging stations recently which make use of the constant-potential system of charging and undertake to give a refill to any accumulator, no matter what its make or ampere-hour capacity, in eight hours. The principle is that the charging potential remains unchanged throughout the process, so that the charging rate gradually decreases as the E.M.F. of the accumulator rises. This is very sound, so far as it goes; but I rather doubt the wisdom of charging any secondary battery, irrespective of its make, capacity *or condition*, in eight hours. For an 80 actual ampere-hour battery this works out at an *average* rate of 10 amperes. In the early stages the rate will be a good deal higher; during the last two hours or so it will be a good deal less. Now, 10 amperes is, in my humble view, far too high a rate for even a big battery designed for wireless purposes.

An Old Stager

I wonder where is to be found the oldest wireless receiving set still in active use? The other day I came across what should be a candidate for the prize, if any were offered. It is a queer old three-valver, still using bright-emitters; for its owner doesn't believe in new fangled contraptions, and his stock is not yet exhausted. Hanging on to the panel is an excrescence which holds three plug-in coils, one fixed and two swingers. There is a rheostat for each of the three valves, and the panel bristles with all kinds of funny knobs and things. The high-frequency valve has a tuned plate, and the connection between the detector and the low-frequency valve is a queer little old transformer such as we used in pre-broadcasting days. You couldn't call it exactly efficient, viewed in the light of to-day, but it still carries on. Somebody really ought to organise an old crocks' demonstration on the lines of the old crocks' motor-car run.

THERMION.

MY WIRELESS DEN

By W. JAMES

Weekly Tips Constructional and Theoretical—

For the Wireless Amateur

S.G. Valves as L.F. Amplifiers!

I DO not remember having seen described in these pages a receiver incorporating a screen-grid valve as a low-frequency amplifier. The reason is probably that, owing to its peculiar characteristics, the screen-grid valve is only of service in a few circuits.

Owing to its high impedance a large choking coil must be included in its anode circuit, or, alternatively, a coupling resistance, when the question of the amount of the high tension crops up. Most S.G. valves pass a current in excess of one milliampere, with the result that when an anode resistance of, say, 100,000 ohms is used, the high-tension voltage must be of the order of 250.

It is possible that an S.G. valve may be used successfully in a low-frequency circuit when the power stage is supplied with current at 350 or 400 volts, for then ample voltage is available. The valve is only suitable for fairly small input voltages, but the magnification may be from 50 to 100 for the single stage. An anode resistance of more than about 250,000 ohms should not be used if the best quality of reproduction is desired, as there is a tendency for the higher notes to be weakened when high resistances are used.

Pentode Points

The pentode valves, introduced about twelve months ago, have not been greatly used by amateurs—partly, I imagine, because of their high price, and partly because various troubles were experienced with the early samples.

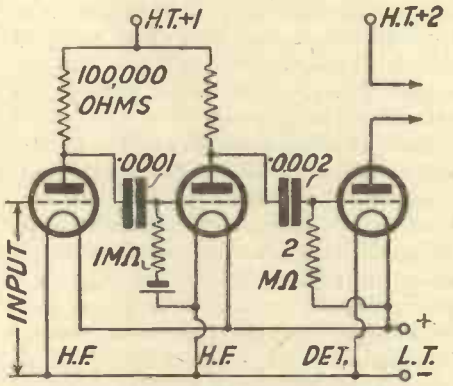
Some amateurs found the valves were very easily spoiled by a slight knock or jar which would not have affected an ordinary valve, whilst others were not satisfied with their performance. However, the latest pentode valves appear to be stronger and to have better characteristics than the early ones, and may therefore be used with greater confidence.

I, myself, have not described a receiver having a pentode output valve, because I have been aware of the various difficulties and disappointments experienced by comparative beginners who have expected greatly increased volume and not always obtained it. Those accustomed to experimenting will probably have tried the pentode valves and have formed their own opinions as to their merits. Meanwhile, I believe they are being more used by manufacturers.

Resistance H.F. Coupling

The resistance-capacity method of coupling as applied to high-frequency amplification is rarely used in these days in broadcast receivers, if we except those of the portable or small self-contained type, for the reason, I suppose, that the amount of the magnification provided is so small.

One should not lose sight of the fact, however, that the magnification, small as it may be, is often very useful and is obtained without tuning adjustments. There are other advantages of which cheapness,



How to arrange a single stage of resistance-coupled H.F. amplification

simplicity, reliability and economy of high-tension current are the chief.

I should therefore not be surprised to find this method used more in the future—not to any great extent perhaps, but on those occasions when the advantages I have mentioned are a sufficient attraction.

The mistake should not be made of using too high an anode resistance. A value of 100,000 ohms is often used in portable receivers, but from the point of view of magnification the value should be greatly reduced in order that more current may pass through the anode circuit. This will tend to lower the anode impedance of the amplifying valve.

The anode resistance may be of the grid-leak pattern; wire-wound types usually have a much greater self capacity and this reduces magnification. A single stage is connected as illustrated herewith, the coupling condenser being of .0001 microfarad and the grid leak of about 1 megohm.

Leaks and Resistances

Resistances of the grid-leak type are sometimes thought to be quite unsuitable for use as anode resistances, because of the amount of the current which passes. Experiments have convinced me, however, that provided they are not over-run, suitable resistances have a long life.

I know of many receivers that have been used continuously during the past two years, the anode resistances of which are as good to-day as when they were first fitted. Not all grid-leak pattern resistances are good, but those which comprise a deposit on a glass rod sealed in a tube are, in my experience, thoroughly reliable.

I wonder how many readers think nothing of adding, say, a new 60-volt dry battery to one whose voltage has fallen very considerably with the object of increasing the total voltage to the proper 120?

It is true that the volume and range of the receiver may be brought back to something approaching normal by this means, but the quality will probably be very poor. The practically discharged dry battery which is still used will have a high internal resistance with, the result that the circuits of the receiver may tend to oscillate and even when a squeal or howl is not heard, one group of frequencies may be emphasised or weakened relative to the others.

Some loud-speakers are more sensitive than others to faults of this description, and I can quite understand that users are reluctant to throw away a battery while there remain a few volts in it, but those having a good loud-speaker and a sensitive receiver are advised to do so in the interest of good quality.

Lyons, as the second largest city in France, is not satisfied with its broadcasting station and proposes to build a new 15-kilowatt transmitter to be completed in 1930. It is possible that the smaller Grenoble station may act as its relay, the two being linked up by a specially pupinized land line.

SECRETS OF THE TEST ROOM

This is one of a series of articles which have appeared from time to time from the pen of our Technical Editor, indicating some of the methods employed in the testing of manufacturers' components and apparatus. The subject of this article is the testing of high-frequency chokes in the laboratory

THE high-frequency choke is a component in which the British market leads the whole world. This is largely due to the fact that we have in Europe the double band of wavelengths, and it is therefore necessary to cover the very large frequency spectrum which can only be done by using really high-class material.

The function of the H.F. choke is to provide a barrier against high-frequency currents while permitting audio-frequency currents or direct currents to pass with as little hindrance as possible. The tests to be placed on any such component must necessarily determine the effectiveness with which it performs its duty.

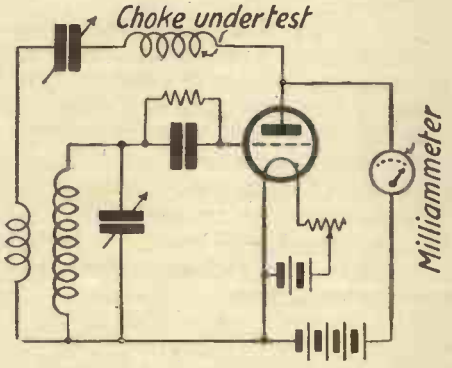


Fig. 1. **An early type of test circuit**

The earlier forms of test devised consisted in arranging a simple Reinartz reaction circuit as shown by Fig. 1. In series with the reaction condenser was placed the H.F. choke. As long as the choke was behaving satisfactorily, no reaction could be obtained, but when the choke ceased to function it allowed high-frequency currents to pass and reaction could be produced. This is admittedly a crude method, but in those days H.F. chokes were crude components and the method gave satisfactory results. The difference between the oscillating and non-oscillating condition was noted by observing the milliammeter, the circuit being so arranged that the anode current changed by a considerable amount when oscillation commenced.

The requirements in a high-frequency choke are high inductance and low self-capacity, and in order to obtain these two effects the choke is usually wound in a series of sections separated from one another. This has the disadvantage that if the choke is incorrectly designed trouble occurs, due to one or more sections resonating as a group. When this occurs the whole choke splits itself up into a series acceptor circuit instead of a rejector arrangement, and the choking action either becomes negligible or is seriously impaired.

Such points as this are usually known as "holes," and a bad choke may possess two or three holes of this nature in its choking range. The test just described shows up these holes, and is therefore quite a good rough-and-ready one.

It began to fail, however, when chokes became so good that they could be used down to very short wavelengths with satisfactory efficiency. Then the test became a little indefinite towards the bottom, and a different and slightly more elaborate method became necessary. In particular, the question of taking an actual impedance curve of the choke was discussed.

The Most Reliable Test

After a thorough examination, however, it was decided that the information obtained from such a test was not in the most suitable form. In the first place, the effective impedance of the choke in any particular circumstances depends very largely upon the circuit itself, owing to the presence of various stray capacities which are effectively shunted across the choke. Moreover, the actual impedance figures only give information to a trained mathematician, and some form of relative measurement is equally satisfactory in indicating the performance of the choke.

The method ultimately adopted, therefore, was to force H.F. current through the choke, which was placed in the grid lead to a Moullin voltmeter. A known high-frequency potential was applied across the whole circuit and the deflection on the Moullin voltmeter was noted. Obviously, the higher the choking effect of the component under test, the less will be the deflection on the voltmeter, while when the choke ceases to function the deflection on the voltmeter rises very rapidly. A reciprocal of the deflection obtained thus gives a very good indication of the performance of the choke.

A direct comparison is obtained of the choking effect over the required range so that two chokes, both of which are free from "holes," may yet be directly compared as one may give a definitely higher choking effect than the other. In addition, any holes or resonances are immediately shown up in a very definite manner, so that the method is at once a practical one, giving an indication of the performance of the choke in actual practice with the additional advantage of the provision of some direct comparison between two chokes which are otherwise apparently identical.

The circuit used is shown by Fig. 2. The source of known H.F. potential is obtained by passing current through a resistance. The current is measured by a sensitive thermal milliammeter. Provided that the current is kept constant, the voltage applied across the choke-testing circuit is also constant, irrespective of the frequency of the current.

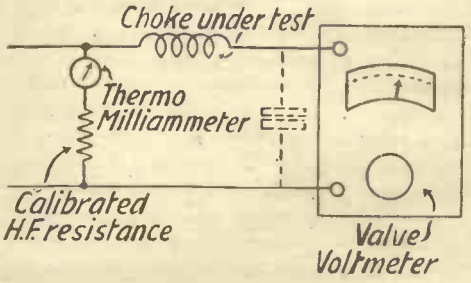


Fig. 2. **The actual circuit used for testing H.F. Chokes**

The resistance is specially designed to carry high-frequency currents. The wire is of 47 s.w.g., with which small diameter the skin effect is negligible and the whole of the wire is effective in carrying current. The H.F. resistance is thus the same as the

(*Continued on page* 136)

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

I KNOW we all can't be Pat McCormicks or "Dick" Sheppards, but some of us might try. Now, the last sermon to which I listened came over from Bournemouth, and was the type of dogmatic address about "the wrath of God" and "deep, dark, yawning pits" and so on—which is trite, uninteresting, and unimpressive. It would be a good experiment to have the same preacher every Sunday. While one knows that in so many churches one gets the same type of sermon, the big preacher who would be chosen to broadcast to us would understand that we expect something fresh and arresting each week. I wonder what we would say if our big newspapers served up the same literary pie every week?

◆ ◆ ◆

Don't let us, I beg, become blasé about the wonders of wireless. For instance, imagine the thrill of tens of thousands of aged subjects of Her Majesty the Queen when she broadcast the other day. What a memory it would be for some of us if we could say that we had heard Queen Victoria or King Edward.

◆ ◆ ◆

Of course, this sensation will be increased when we are able to *see* these persons. But that is another—*and how I could write about it.*

◆ ◆ ◆

It is certainly a full hour of music that Moschetto and his orchestra give us on Saturdays from the Mayfair Hotel. The orchestra is not so vigorous and "high-kicking" as Sandler's, de Groot's, and that class, which is possibly just as well. By the way, I notice that some of our national newspapers are following the example of AMATEUR WIRELESS in criticising the programmes, and curiously enough two points that I mentioned here in the last week or so were commented on by my confrères: (1) About the orchestral repertoire of some of the bands which broadcast and (2) that some of the great plays read well but do not broadcast well. You see, great critics sometimes think alike!

◆ ◆ ◆

Many thanks for the "Ballet Music of the 'Eighties." I blush for my ignorance, and so on, but I had not heard of the composer, Georges Jacobi. But he certainly had a pretty ear for melody.

◆ ◆ ◆

Perhaps it was the heat, but *Fifty-Fifty : or The Woman Pays* sounded pretty poor stuff. In fact, tripe. You see, despite the heat, one wants a little melting to accept transmissions of this sort.

◆ ◆ ◆

As regards *Electra*, here is another type of play that one ought to read in the study rather than listen to. It was wearisome—and, oh, heavings! the "bloodies" put Shaw to shame. As Aunt says, who has literary ambitions, it was difficult to follow, but beautiful

◆ ◆ ◆

Dorrie Dene appears to be a good type of comedienne, but her material is poor and her songs, such as "Oh, what a mess they made of me!" are not worthy of her. My advice to her is to speak up to the mike. Her asides and parentheses irritate the listener.

◆ ◆ ◆

It seems to me the only grouse these dog-days comes from those ex-stalwarts of the B.B.C. who see the error of their ways and leave in a huff—or in a brand new car (representing merely a fraction of their new rate of wages spent in advance). Who cares? These young, striving triers have become stars overnight. Good luck to them, says I.

◆ ◆ ◆

Yet I can't help a smile of satisfaction in reading in the Press criticism by some of these young men of the sort that has appeared in these notes over and over again. Seriously, the powers that be should ask themselves whether a certain, perhaps understandable, staleness is not creeping in generally at Savoy Hill. Perhaps the new edifice—when it is built—may infuse a new spirit into things. But isn't it a time to wait?

The new Broadcasting House—An actual start has been made of clearing the site for the new headquarters of the B.B.C.

The Talis 2

ONE of the BES

THREE-VALVERS have sprung into deserved popularity. Much has been written and said about them. Some very good "threes" have been described in AMATEUR WIRELESS—the "Broadcast Three" last week, the "Local or Continental Three," and the "Clarion Three," to take just a few examples.

There are, however, several purposes for which a two-valver is equally suited as a three, and when the additional expense involved by the third valve is hardly justified. A large number of people have to treat wireless as something of a luxury, which, indeed, it is; and they do not want to spend money on equipment which is too large for their needs. Not everybody wants to have a "super" set which will ensure a big bag of foreigners on almost any night; often the reception of one or two of the louder Continental stations and, of course, the more easily receivable three or four B.B.C. stations is sufficient. This a good two-valver will do with ease. Only when it comes to working a loud-speaker at full volume or putting on a good selection of foreign stations does the three-valver score.

Cheap to Build

The "Talisman Two" is a receiver which is capable of putting up such a performance and which fills the need of those who require a modest receiver, cheap to build and economical to maintain.

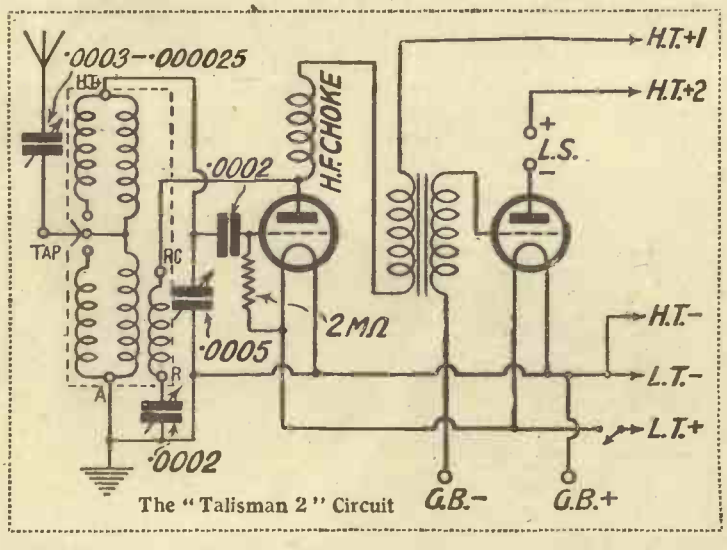
It is a "Talisman" dual-range coil which is used in this receiver and to which a deal of the good results obtainable with this set are due.

The coil is small and compact, and by careful choice of the other components it has been possible to make the whole receiver of very small dimensions.

The circuit is essentially a simple one, and this means, first, that the set is very easy to make up and, second, that it is easy to work and that there is very little chance of anything going wrong with it.

One of the advantages of a two-valver, as mentioned, is that the initial cost is low; appreciably lower, in fact, than that of a three-valver employing somewhat inferior components and giving no better results. The list of components given herewith should be adhered to, in order to get satisfactory results. Experimenting is never safe. In the case of each component in the list given the first-mentioned part is that actually used and illustrated in the set described. In some cases are given alternatives which have, as near as possible, the same electrical and mechanical values, and these may be substituted if required.

A blueprint has been prepared of this set, and can be obtained, price 1s., from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. Ask for blueprint No. 194. It is anticipated that a number of novices will make up this two-valver, for it is a receiver well suited to those making their first acquaintance with radio home construction. They, as well as the more experienced constructor, will find it a convenience to have the blueprint as a guide for assembling and wiring.



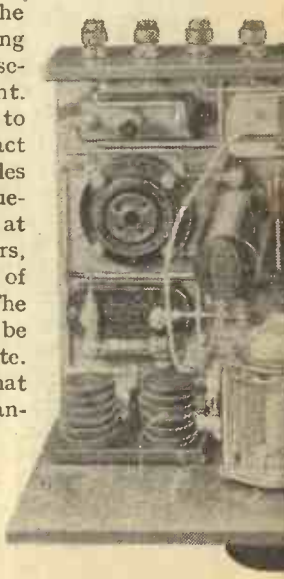
The "Talisman 2" Circuit

The chief feature of this receiver is, of course, the coil from which the set derives its name. AMATEUR WIRELESS readers will remember that Mr. L. A. Chapman, of the Technical Staff, designed a special coil for use with the "Talisman Portable," described in AMATEUR WIRELESS No. 361. This coil differs in the theory of its operation from other dual-range coils, and in practice has proved to be very efficient.

Construction is easy, and for the benefit of those who are tackling this as their first set this matter will be dealt with fully. The panel, as will be seen from the components list, has the dimensions 9 in. by 6 in. In it seven holes have to be drilled, these being for the main variable condenser, the reaction condenser, the coil-mounting and wave-change switch, the filament switch, and three holes through which wood screws are passed for mounting the panel to the baseboard. All the components carried on the panel are of the one-hole fixing type; that is to say, they have threaded necks which are simply passed through the panel, a nut being placed thereon to secure the component.

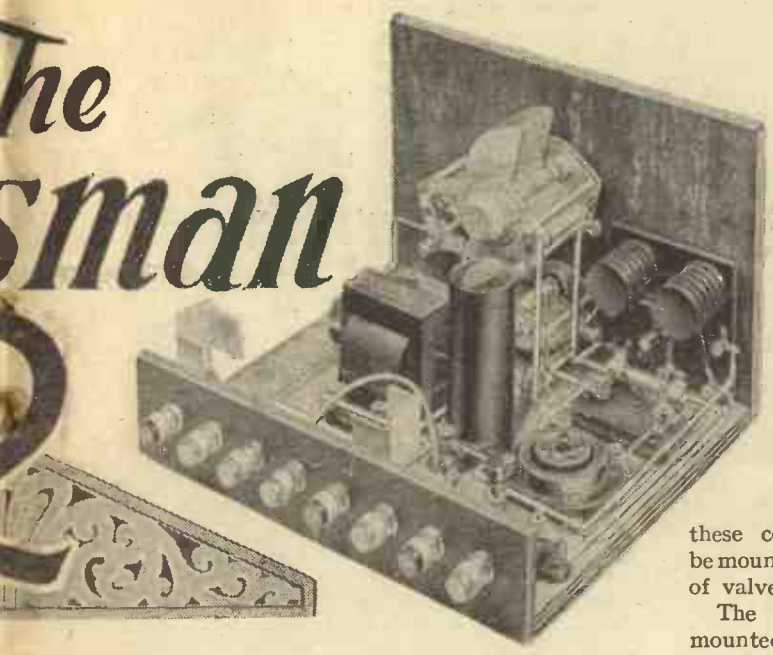
The easiest way to ascertain the exact positions of the holes is to attach the blueprint to the panel at the four corners, using just a spot of adhesive at each. The print can thus be used as a template.

To make sure that the drill starts cleanly and at the exact centre it is advisable to make small punch marks at each hole; indeed, the



This plan view shows how

The Listsman



T "TWOS" YET

punch marks may be made and the blueprint removed before drilling is commenced. When all the holes are drilled, mount the two variable condensers, the coil and the filament switch in any order, and make sure that they are firmly secured.

See that the coil is mounted the right way up—that is, with the terminal connections near the baseboard—because otherwise the wiring will be made more difficult.

Next there is the terminal strip to drill. This carries eight terminals, marked: Aerial, Earth, L.T.+, H.T.—, H.T.+1, H.T.+2, L.S.+, L.S.—. Also, the strip has to be drilled for three holes for fixing.

How simple is the construction

The blueprint can again be used as a template to show the positions of the terminals.

The terminals specified and used in the original receiver are those having non-rotatable lettered heads, and you should see, when mounting them, that the lettering is the right way up!

The panel, complete with its components, can now be screwed to the baseboard, but it is not advisable at this stage to add the terminal strip. Now for the components on the baseboard. These are the two valve holders, the grid condenser and leak, the low-frequency transformer, H.F. choke, the pre-set aerial condenser, and the clips for the grid-bias battery.

The blueprint shows just how these components should be mounted. Note positions of valve holders.

The detector valve is mounted so that a line passing between the grid and anode sockets lies diagonally across the baseboard. The low-frequency valve holder is mounted so that its grid socket is nearest to the reaction condenser. The transformer should be placed so that the two terminals G and GB are also near to the reaction condenser, the terminals P and HT being nearer to the back of the baseboard. It is, of course, quite immaterial which way round the H.F. choke, pre-set condenser, and grid-bias clips are mounted. The positions of the grid-bias clips are shown on the blueprint, but it would be advisable to insert a battery in the sockets before finally screwing one of them down. It is not wise to have the battery a too loose fit, for if the set is subject to vibration the wander plugs may "wander" and cause short circuits.

The panel is already mounted, and as all the baseboard components, with the exception of the grid leak, are *in situ*, wiring may be commenced. Stiff insulated wire is used for making connection, although in one or two instances, where the leads are only half an inch or so in length, the insulated covering is entirely removed. Each lead should be carefully cut to length and shaped with a pair of round-nosed pliers before soldering is attempted. Again, the blueprint is a help, because it shows each lead at full size and the positions of each are shown. Follow the layout as closely as possible, making use of the photographs reproduced herewith in conjunction with the blueprint, because then you will find that each connection is as short, direct, and easily soldered in place as possible.

There are no long leads to cause difficulty in soldering. The short leads already referred to, which have the insulation entirely removed, are those connecting the terminals L.S.+ and H.T.+2, the terminals L.T.— and earth, the detector anode socket to the H.F. choke, the G terminal on the transformer to the L.F. valve-holder grid socket, and one side of the reaction condenser to the terminal marked R on the coil.

Coil Connections

In case the constructor has any difficulty in following the wiring the coil connections are here given in full. Terminal A to the detector valve grid socket and to one side of the reaction condenser; RC to the anode socket and one side of the H.F. choke; HT.+ to the grid condenser and one side of the aerial condenser; finally, terminal R, as mentioned, to one side of the reaction condenser.

Two short lengths of rubber-covered flex are needed for the grid-bias connections. These should have wander plugs attached to the ends, a black plug being attached to the end of the lead connected to terminal G.B. on the transformer and a red plug to that flex lead connected to the filament wiring.

Owing to the compactness of the receiver there are several points at which the novice may not find it very easy to handle a soldering iron and here special care is necessary.

LIST OF COMPONENTS

Ebonite panel, 9 in. by 6 in., and strip 9 in. by 2 in. (Becol, Raymond, Ebonart, Paxolin).

.0005-mfd. variable condenser (Polar "Ideal," J.B., Lissen, Burndept, Formo, Igranic, Trix).

.0002-mfd. reaction condenser (Polar, type "Q J": Lissen, Peto-Scott, J.B.).

Two anti-microphonic valve holders (W.B., Wearite, Lissen, Benjamin, Trix).

.0002-mfd. fixed condenser, with series clip (Dubilier, Lissen, T.C.C., Graham-Farish, Mullard).

2-megohm grid leak (Dubilier, Lissen, Graham-Farish, Mullard).

Talisman coil (Wearite).

High-frequency choke (Lissen, Varley, Wearite, Burndept, R.I.).

Low-frequency transformer, ratio 4-1 (Lotus, Igranic, R.I., Mullard, Philip).

.000025-mfd. to .0003 pre-set condenser (Formodenser type J, Igranic).

Push-pull switch (Benjamin, Lissen, Trix, Wearite).

Grid-bias battery clips (Bulgin).

Baseboard, 9 in. by 6 in. (Pickett).

Connecting wire (Glazite).

Eight terminals marked: Aerial, Earth, L.T.+, H.T.—, H.T.+1, H.T.+2, L.S.+, L.S.— (Belling-Lee, Eclex, Igranic).

Two wander plugs marked: G.B.— and G.B.+ (Belling-Lee, Clix, Igranic).

"THE TALISMAN 2"—the Best Yet Two-valver *(Continued)*

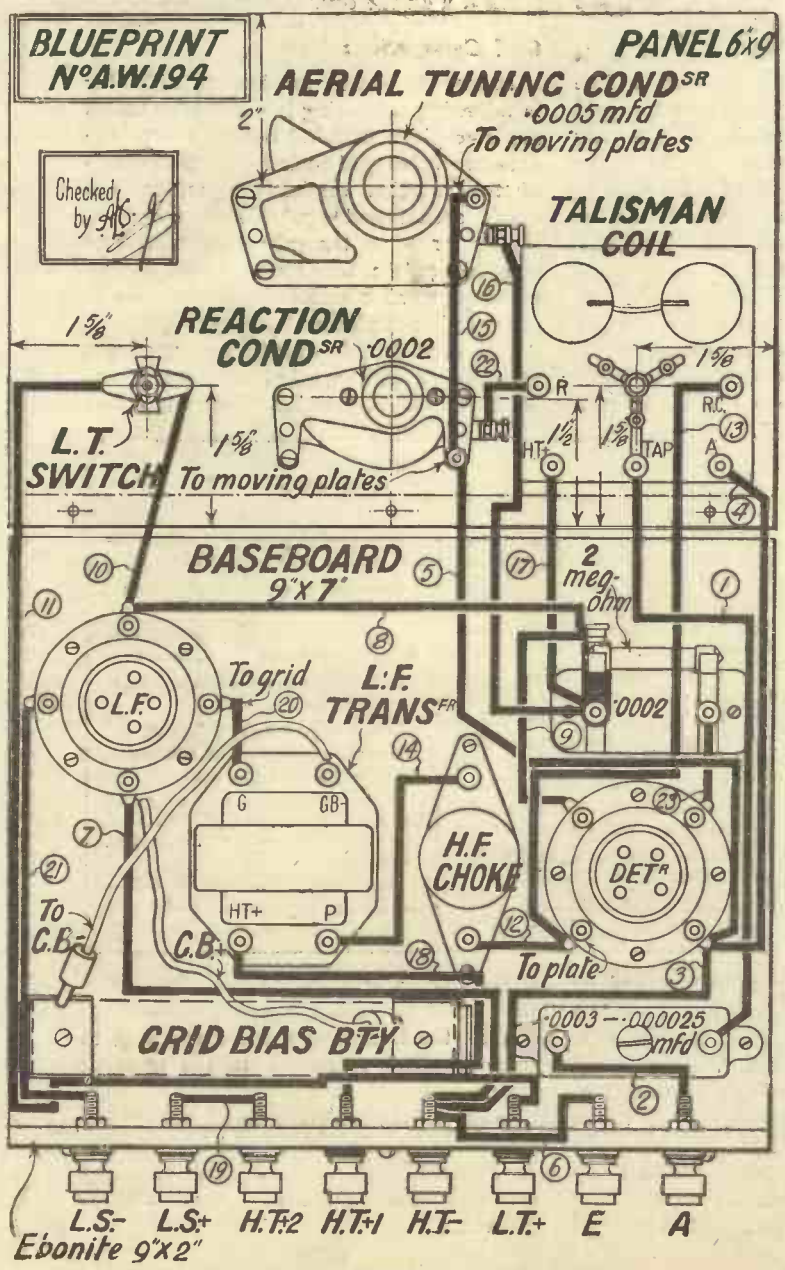
To take just one or two instances, the short leads to the reaction condenser, to the grid condenser and to the coil may present some difficulty. Nevertheless, soldered connections make a better mechanical job, owing to the fusion of the metal, than the imperfect contact obtained by twisting the wire round the terminal shanks.

Soldering tags are provided with the coil and the grid and reaction condensers, as with most other components, and these facilitate the job of making proper soldered connections. If each wire is accurately cut to shape and formed carefully with pliers, before soldering is attempted, then no difficulty should be experienced in effecting a workmanlike result.

The connections to the terminal shanks should be made at the extreme ends, for the sake of neatness. Moreover, it is not an easy matter to make a good soldered joint between a tinned wire and the threaded portion of the shank. As has already been mentioned, some of the wires are so short that it is necessary entirely to remove the insulation. These wires are best supported by a pair of pliers while being soldered in place.

It will be assumed, of course, that the usual soldering precautions are taken, namely, to have the surfaces perfectly clean, the iron well tinned and the temperature correct. So many really good home soldering outfits, such as the Junit, and Fluxite, are now on the market that there is really no excuse for making a poor success of soldering.

Fifteen stations at loud-speaker strength were received during the preliminary tests



The wiring diagram. Blueprint available, price 1/-

When all the wiring is complete, and despite the natural temptation to want to "get things going," the first operation should be to check over all the connections. This can be done, either by making a careful comparison between the actual set and the full-size blueprint, marking off on the print each wire as it is checked in the set, or by an electrical test with a battery and a pair of phones.

This latter is hardly necessary, unless there is reason to suppose that one or two of the connections are not satisfactorily soldered. The comparison check with the aid of the blueprint, however, is really a necessity if the set is to work well the first time it is tried out.

This completes the construction of the receiver itself.

This receiver is being exhibited in the Somerset Street windows of Messrs. Selfridge, where every week an AMATEUR WIRELESS set is on show. Readers in the London district should make a point of seeing the "Talisman 2" for themselves.

AERIAL MAST TIP

NOT a few readers at this time make the annual overhaul of aerial equipment, particularly halyards, pulleys, insulators, etc. If a new wooden aerial pole is being obtained, try capping the end with a tight-fitting tin lid, which will serve to protect it most effectively from the evil effects of our often very humid climate.

METAL PANELS

ON the score of cheapness and efficiency, the aluminium or copper sheet panel can certainly show many good points.

A hint for the prospective purchaser which may probably help him greatly in the building and wiring of the contemplated set is to specify an extra inch or two over the desired height of the panel and have this extra portion accurately bent over at right angles to the major portion of the width.

This small base may then be used for fixing the panel straight down on to the baseboard and incidentally form a much firmer structure for carrying the panel controls.

Additionally, this small metal strip may be conveniently utilised as an earthing base for almost all the "earth" connections met with along the length of the multi-valve set.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Burne-Jones Reaction Condenser

SMALL reaction condensers having a maximum capacity of approximately .0001 microfarad are regarded by set builders as most useful components, and indeed for a condenser of this capacity there appears little necessity for its physical dimensions to compare with those of an ordinary .0005 condenser.

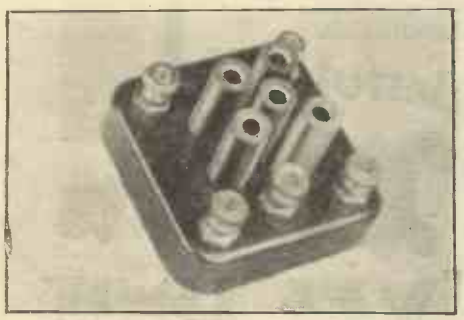
We have just tested a particularly neat .0001 reaction condenser marketed by Messrs. Burne-Jones & Co., Ltd., of Borough High Street, S.E. With the moving plates fully extended the dimensions occupied are only 2 in. square, whilst the depth behind the panel is less than 1½ in. On examining this component, one is impressed by its mechanical robustness; the plates being thick, are not liable to short-circuit—a fault one occasionally finds in small variable condensers. Connection from the terminal to the moving plates is made by a spring washer, sufficiently substantial to ensure good electrical contact.

A single hole only is necessary for mounting the component to the panel, whilst a small 1½-in. knob is fitted as standard. We found that the capacity of this component as measured on the laboratory bridge varied from 5 to 95 micro-microfarads. While this range is suitable for normal purposes, we should like to see the maximum increased by the addition of one or two more plates.

The price is certainly reasonable and the component may be recommended.

Trix A.C. Valve Holder

SO satisfactory have indirectly-heated valves become recently that their use in the near future is likely to be widespread, and in consequence the standardisation of five-pin valve holders is without doubt a boon to the wireless public in general.



A Trix valve-holder of the new type having a fifth socket so that the holder can accommodate the indirectly-heated A.C. valves

Those responsible for designing the new pattern holder have had a difficult problem to contend with, since it was felt that the inclusion of the fifth pin should not, if possible, cause an increase in the size of the holder. This pin was finally placed in the centre of the standard four pins.

Messrs. E. J. Lever, Ltd., of 8-9 Clerkenwell Green, E.C.1, the makers of Trix components, have submitted for test and report a sample of their new five-pin valve holder. The valve sockets are mounted on a small moulded base 1⅝ square, and are shrouded by black insulated material, save for the anode socket, which, to distinguish it from the rest, has a red covering. The centre and additional socket is connected to a fifth terminal placed between the filament and anode terminals.

A number of valves tried were found to be a comfortable fit in the holder. This is a well-made component and can be recommended.

Cameron Frame Aerial

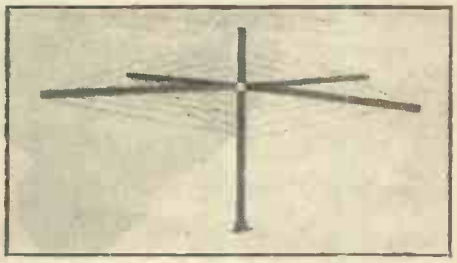
ALTHOUGH the standard type of single-wire aerial is not particularly directional, since its chief powers of reception are obtained by virtue of its height, there is one plane of direction along its length on which maximum reception is obtained, and it might occur that certain stations were not received at proper strength. One method of overcoming this possible difficulty is to erect a non-directional type of aerial, one that is electrically and often physically symmetrical.

This week we have tested a form of aerial called the Cameron Neutralised Antenna, manufactured by the Cameron Manufacturing Co., of Buffalo, N.Y., and marketed in this country by Messrs. S. A. Purser, of 9 Mincing Lane, London, E.C.3.

Briefly, this aerial consists of two frames wound in planes at right angles to each other for the purpose of eliminating directional properties. The device is intended to be mounted at least 20 ft. off the ground, and may conveniently be clamped to a mast or a part of the house.

It is interesting to note that there are approximately 50 feet of stranded copper wire in each coil, and the whole of the windings are weatherproofed so that the metal is not affected by exposure.

The frame arms are approximately 2½ ft. in length and are slotted in such a manner that an evenly spaced and permanent winding is possible. The complete outfit may be erected in a few minutes without difficulty. Although there is nothing particularly novel in this form of aerial, it functions quite satisfactorily and has the advantage of occupying little space. Mounted on the roof of the laboratory, approximately 20 ft. high, the aerial gave results which, although not as strong as obtained from a standard 60-ft. length aerial of a similar height, compared quite favourably.



The Cameron neutralised frame aerial, which has two frames wound at right angles to eliminate directional effects

Brown Vee Speaker

THE name Brown has long been associated with telephone reproducers of the finest class. Anything new which this company may issue is, therefore, certain to be of great interest, and we were not surprised at the good performance put up by the recently introduced direct-drive Vee unit, fitted, of course, to a Vee chassis. The unit comprises a permanent magnet having a pair of poles, with their windings, mounted at such an angle that their tops or faces are together as the two sides of the letter V, although they do not of course, actually touch.

A bridge piece is mounted across the case and carries at its centre an armature shaped to fit the air-gap. It also carries the driving rod which is short and stiff. The customary knob is provided in order that the length of the air-gap may be adjusted, and its movement is such that an accurate setting may be made. In the case of the unit itself, two holes are provided for screws to hold the chassis. This has outer and inner diameters of 13 in. and 12 in., to take a paper cone five inches deep. A ring of wood is used to clamp the edge of the cone to the framework.

We tested the reproducer with various receivers and found it very sensitive. It reproduces speech very clearly, and deals excellently with music. Tests with a low-frequency oscillator showed that it covers a wide range of frequencies; it may be recommended as a really first-class instrument.

The new Bangkok (Siam) short-wave station

The New Wireless Telephone Service between Germany and Siam

By Dr. ALFRED GRADENWITZ

THE first telephone conversation on short waves between Germany and Siam was recently conducted when the Siamese Minister of Traffic, Prince Purachatra of Kambaeng Bejra, when in Berlin, was afforded an opportunity of attending the tests now being made by the German Post Office in conjunction with Telefunken and the Transradio Company.

At the German end, the Nauen short-wave transmitter is used, while in Siam, there is the short-wave station recently installed at Bangkok. This comprises a 20-kilowatt short-wave transmitter supplemented with a standard 3-kilowatt telegraph and telephone transmitter of the marine type set apart for communication with both ship stations and near-by land stations.

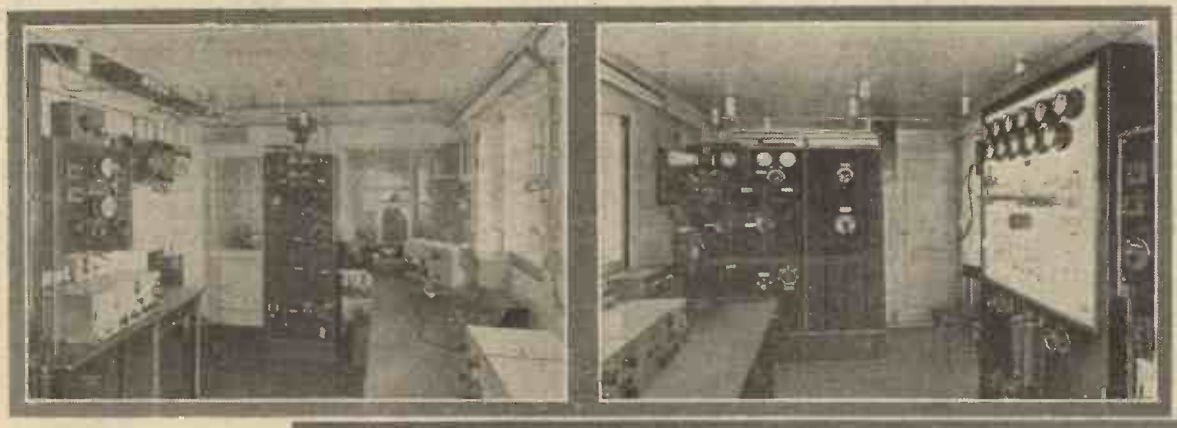
The two aerial masts are moored in concrete foundations, containing in small cavities, a liquid protecting them against termites. Another interesting feature is the provision of a safeguard in the shape of a contact manometer arrangement for the valves which, as the water supply in the tropical climate becomes exhausted, automatically cuts out the high tension. There are two beam aerials for wavelengths of 14.5 and 17 metres respectively.

A photograph shows the station building and masts.

Apart from the radio-telephone service, the Bangkok station is used for the transmission of wireless telegrams between Europe and Siam. When, a short while ago, the Japanese high-power radio station at Nagoya was inaugurated, reference was made to the probability of this being the last long-wave radio telegraph station ever to be built. In fact, the new Siamese station is a striking instance of this change in practice.

BROADCASTING FROM THE ATLANTIC

THE German transatlantic liner *Bremen* was designed specially for breaking the Atlantic-crossing time record, which it has successfully done. It has broken some radio records, too, as AMATEUR WIRELESS readers probably know, and these photographs of the wireless equipment on board this German giant liner are therefore of particular interest. The plant is very comprehensive, because on this maiden trip reliability of the transmitters and receivers was absolutely essential.



The chief transmitter is a 3-kilowatt job working on wavelengths between 500 and 3,000 metres. This is commercial Telefunken apparatus, and is similar to the routine transmitters on many other ships. There is a 250-watt dual-wavelength transmitter for fairly short-range working on either 175 metres or the 600- to 800-metres band. The whole of the tuning is pre-set, and the change-over from one wavelength to another is effected simply by the movement of a switch.

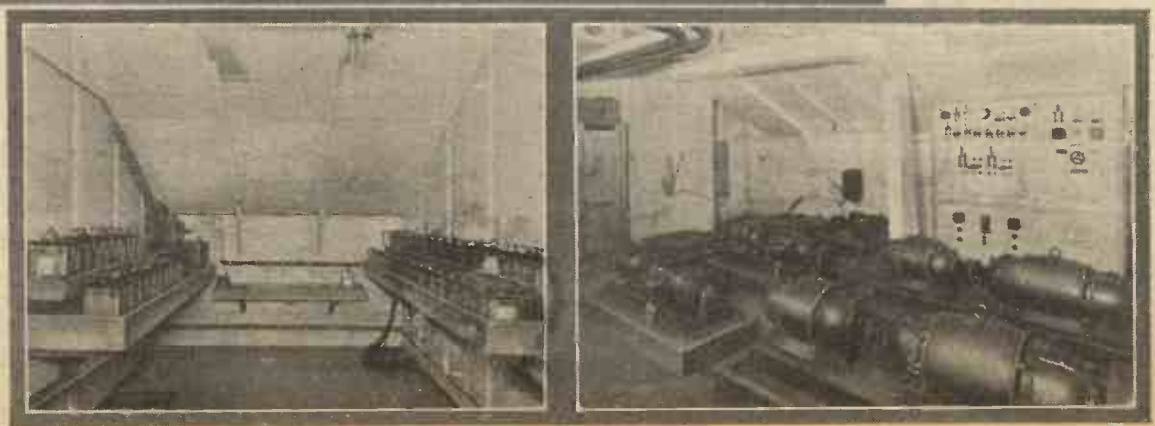
Then there is the short-wave apparatus, illustrated by one of the photographs on this page, capable of dealing with a power of 700 watts.

As usual, there is an emergency set, with special accumulator banks making it quite independent of the ordinary generators and power supply.

Now for the receiving side. Two short-wave receivers were carried, together with one receiver for speed telegraphy and one receiver permanently working on the 600-metre band to receive SOS and "M'aidez" signals.

Finally, there are three Telefunken receivers of the broadcast type, covering a wave-range of from 125 to 2,500 metres for general reception.

Some idea of the power plant necessary to supply the many transmitters can be gained from the photograph on this page illustrating the emergency battery bank and generators.



BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.2
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	17.0
*1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	5.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
230	1,300	Charleroy (LL)	0.25
246	1,218	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,071	Liége	0.5
*509	590	Brussels	10.0
CZECHO-SLOVAKIA			
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava (Feriby)	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	1.0
1,153	260	Kalundborg	7.5
ESTHONIA			
*247	1,010	Reval (Tallinn)	1.3
FINLAND			
*221	1,355	Helsingfors	0.8
*1,796	167	Lahti	20.0
FRANCE			
170	1,750	St. Quentin	0.25
220	1,364	Béziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
*255	1,175	Juan-les-Pins	0.4
*255	1,175	Toulouse (PTT)	1.0
*265	1,130	Lille (PTT)	0.8
*272	1,103	Rennes (PTT)	1.0
292	1,028	Radio Lyons	1.5
*293	1,022	Limoges (PTT)	0.5
*304	986	Bordeaux-Lafayette (PTT)	0.5
305	982	Agen	0.3
*316	950	Marseilles (PTT)	0.5
*329	914	Montpellier (PTT)	1.5
338	802	Petit Parisien	0.5
346	869	Strasbourg	0.3
*353	849	Agen	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	9.0
413	725	Radio Maroc Rabat)	2.0
429	698	Grenoble (PTT)	1.5
436	687	Radio Flandre (Lille)	0.5
*447	671	Paris (Ecole Sup. PTT)	0.7
*466	644	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
*1,444	207.5	Eiffel Tower	8.0
*1,725	174	Radio Paris	8.0
GERMANY			
*218	1,373	Flensburg	1.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	4.0
*239	1,256	Nurnberg	4.0
*246	1,220	Kiel	0.7
*246	1,220	Cassel	0.7
*253	1,184	Breslau	4.0
*259	1,157	Leipzig	4.0
*270	1,112	Kaiserslautern	1.5
*276	1,085	Koenigsberg	4.0
*283	1,058	Magdeburg	0.7
*283	1,058	Berlin (E.)	0.7
*283	1,058	Stettin	0.7
*319	941	Dresden	0.75
*325	923	Gleiwitz	6.0
*339	887	Bremen	0.75
*360	833	Stuttgart	4.0
*372	806	Hamburg	4.0
*390	770	Frankfurt	4.0
*418	716	Berlin	4.0
*453	662	Danzig	0.75
*453	666	Aachen	0.75
*473	635	Langenberg	25.0
*533	563	Munich	4.0
*560	536	Augsburg	0.5
*560	536	Hanover	0.7
*569.2	527	Freiburg	0.7
*1,635	183.5	Zeesen	20.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
1.283	234	Luxembourg	2
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
*298	1,004	Hilversum (until 6 0 p.m. B.S.T.)	5.0
*1,875	160	Huizen (ANRO)	5.0
*1,070	280	Hilversum (after 6:0 p.m. B.S.T.)	5.0
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 6.0 p.m. B.S.T.)	5.0
HUNGARY			
*550	545	Budapest	15.0
ICELAND			
*1,200	250	Reykjavik	1.0
IRISH FREE STATE			
*225	1,337	Cork (5CK)	1.5
*413	725	Dublin (2RN)	1.5
ITALY			
*274	1,094	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	3.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
*307	977	Zagreb (Agram)	1.25
*431	694	Belgrade	2.5
*566	530	Ljubljana	3.0
LATVIA			
*525	572	Riga	2.0
LITHUANIA			
*1,935	155	Kovno	15.0
NORWAY			
*283	1,058	Notodden	0.7
*364	824	Bergen	1.0
*394	761	Fredriksstad	1.0
450	666.5	Rjukan	1.0
473	662	Tromsoe	1.0
473	662	Aalesund	1.0
473	662	Porsgrund	1.0
*493	608	Oslo	1.5
POLAND			
*313	959	Cracow	1.5
*335	896	Posen	1.5
385	779	Wilno	1.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	10.0
ROUMANIA			
*394	761	Bucharest	4.0
RUSSIA			
*351	855.5	Leningrad	10.0
*427	702.5	Kharkov (NKO)	5.0
*483	621.5	Homel	2.0
*825	364	Moscow (PTT)	25.5
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	15.0
*1,481	202.5	Moscow	30.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
*268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	0.5
403	743	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	3.0
453	662	Salamanca (EAJ22)	0.55
SWEDEN			
231	1,301	Malmo	0.5
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.4
*322	932	Goeteborg	6.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	1.0
*770	389	Ostersund	2.0
1,200	250	Boden	2.0
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.6
680	442	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Aug. 4 Boy Scouts' Association World Jamboree, Thanksgiving Service from Arrowe Park, Birkenhead. Addresses by Archbishop of Canterbury and Sir Robert Baden-Powell.
„ 7 Sing-song relayed from Duke of York's Camp, New Romney.
„ 9 Vaudeville programme and variety item from London Palladium.
„ 10 Opening night of promenade season, Queen's Hall.

DAVENTRY EXPERIMENTAL (5GB)

Aug. 7 Military band concert from Leamington Spa.
„ 8 Vaudeville programme.
„ 10 Vaudeville programme.

MANCHESTER

Aug. 4 Boy Scouts' Association Thanksgiving Service.
„ 5 Running commentary on Yorkshire v. Lancashire County cricket match, by Mr. F. R. Stainton.

NEWCASTLE

Aug. 8 Band from North-East Coast Exhibition.

The Ravag Broadcasting Company at Vienna has decided to proceed immediately with the erection of a temporary relay station at Salzburg. Should it be found that the installation of the transmitter is warranted, a permanent station of a higher power would follow.

It is stated that the series of special talks for bee-keepers, which have been broadcast from all Scottish stations of the B.B.C. at regular intervals during the past few months, have encouraged many listeners to take up bee-keeping as a profitable hobby.

Howard Milholland, studio manager of KGO (San Francisco), announced his 10,000th programme recently. He has been with KGO five and a half years.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Correspondence should be brief and to the point and written on one side of the paper.

Empire Broadcasting

SIR,—Reading my AMATEUR WIRELESS for June 1, I see you refer to the good work being done by 5SW. No doubt you have had other letters telling of the appreciation of overseas dwellers, especially those in out-of-the-way places like myself. May I add my quota. At the same time, not forgetting the paper that puts out designs for the construction of sets to pick up this link with home. To tell you of the elation and the thrill of hearing even Big Ben alone passes words, to say nothing of the other items of 2LO through 5SW! And if on some occasions he is weak I can only say more power to his elbow! Knowing how hard it is to get folks overseas to speak or write their appreciation—I have heard him ask for reports myself yet have never sent one!—I cannot help but make this especial effort through you. At the same time, I hope the medium I adopt shows another appreciation to my weekly.

Y. B. (Port Harcourt, Nigeria).

A Lady's Appreciation

SIR,—I am a woman wireless enthusiast and a regular reader of your excellent paper, AMATEUR WIRELESS. As such, I am wondering whether the Editor of such an excellent paper would be interested in the following criticism.

The types of regular features are well chosen. Sydney Moseley is original in his views, but at times, as all good critics should be, over caustic. J. H. Reyner appears to me to be rather too technical; but, of course, I take it it is his job to be so. "On Your Wavelength" always makes interesting reading. W. James must prove very useful to amateur constructors of sets. "For the Newcomer to Wireless" strikes a new note, there being nothing like it in any other wireless journal. Jay Coote, with his log jottings, almost without exception talks of something out of the ordinary. "Radiograms" are, I think, the weakest link in the chain, and although, in their way, of interest to me, they rather resemble long columns of statistics. Some small items which I have read with great interest called "Have You Noticed?" looked rather hopeful. These, again, were original, and I wonder you don't publish them more frequently.

Generally, the whole policy and general appearance of your paper can be expressed in one word—originality—and I shall continue to read and enjoy it as heretofore.

I. G. (London, N.W.).

Trouble Tracking

SIR,—I am always most interested in "Thermion's" articles in AMATEUR WIRELESS, and I find them very helpful His invitation in a recent issue prompts me to mention an interesting personal experience.

I was called upon to advise a friend who wished to install wireless at his house. The new set was delivered at my house in order that I might try it out. It worked beautifully, and in due course I took the set over to him, connected up, switched on, and produced absolute silence!

I was puzzled for some time, until I thought of looking at the grid-bias battery—a well-known make—which I had purchased on my way to his house, having used my own grid-bias battery for the test.

As I had been using the same make of battery for years, the position of the sockets on the new battery soon showed me that the indicating label had been inadvertently reversed. A reversal of the grid-bias leads soon mended matters. The battery is still in use wrongly marked.

B. E. C. (Shepherd's Bush).

Middlemen and Factors

SIR,—Referring to "Thermion's" comments on factors and middlemen, under no circumstance can the public blame a factor for the non-delivery or wrong make of a component. The retailer has always the opportunity to order direct from the manufacturer. The factor upon accepting an order from the retailer invariably indicates whether in stock or how long before delivery. This gives the retailer an opportunity to order direct from the manufacturer if in a hurry.

A factor does not under any circumstance refuse an order for a definite component on the pretext that he has to order a gross or because he does not want to take the trouble to procure it.

Do you realise that if it were not for the factor the retailer would have to open nearly five hundred separate accounts with manufacturers or else pay cash for his goods, thereby tying up his capital?

Do you also realise that to order a special component from provincial firms postage has to be paid by the factor? If the retailer orders direct he will have to pay this postage himself or else charge his customer postage.

Who is responsible for cutting prices? The retailer, of course.

R. M. S. L. (London, W.).

MUSCULAR WIRELESS

HIGH-FREQUENCY electric fields have been proved to accompany muscular contractions in the human body. The effect has been detected by Manfred von Ardenne, using an ultra-sensitive detector, including a thermionic voltmeter capable of detecting frequencies up to 200,000 cycles per second.

No positive evidence could be obtained of the existence of ether waves due to brain action, as has been suggested by many writers. It is possible, of course, that the lack of corroboration in this respect is due to the fact that mental vibrations are of too high a frequency to be detected. Further research along these lines is now being carried out with the aid of more sensitive apparatus. B. A. R.

THE ELECTRO-MOTOGRAPH

THE electro-motograph, an ingenious instrument which is one of the earliest known forms of electro-mechanical loud-speaker, was invented more than fifty years ago by Edison. Its action depends upon a variable friction effect produced by the passage of an electric current through a thin film of electrolyte.

A metal friction disc bears against a chalk cylinder moistened with potassium iodide or caustic potash. The cylinder is continually rotated whilst the voice currents are passed from the disc across the film of electrolyte. The resulting electrolytic action varies the frictional drag between the rotating cylinder and the metal disc, and the fluctuating pull is then used to vibrate a mica disc and so reproduce the original speech. A similar principle is employed in a more modern form of loud-speaker known as the Frenophone. M. R.

Tunis-Kasbah, a military radio telegraphy transmitter has been adapted by the Shereefian authorities (Tunisia) for telephony and now broadcasts concerts and news bulletins daily on 1,350 metres. The power is stated to be 600 watts in the aerial.

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

WIRELESS IN PARLIAMENT

(By our own correspondent)

REPLYING to questions, Mr. Lees-Smith, the Postmaster-General, said he had received representations both from the Baird Television Development Company and from the British Broadcasting Corporation concerning the facilities offered for the use of a broadcasting station for experimental transmissions of television. He was considering these representations, but he was not yet in a position to state the result.

"SECRETS OF THE TEST ROOM"

(Continued from page 122)

D.C. resistance within 1 or 2 per cent. down to quite short wavelengths.

The voltage developed across this resistance is applied across a circuit which consists of the H.F. choke and the self-capacity of the Moullin voltmeter in series, this having a value which is comparable with the self-capacity usually associated with the choke in actual practice.

In the actual preparation of a performance curve the simple reciprocal is not taken, but the readings on the Moullin voltmeter are converted into relative impedance. This is done by comparison with the impedance of the voltmeter capacity, and by taking suitable precautions it is a simple matter to evaluate the actual scalar impedance of the choke in ohms. For ordinary purposes, however, this is not necessary, as a simple run over the scale of frequency with the apparatus, as already mentioned, gives an immediate indication of the satisfactory character of the choke or the reverse, and this is the method adopted in testing any chokes reported upon in the test columns in AMATEUR WIRELESS.

Choke Efficiency

The performance of some modern H.F. chokes is of a very high order indeed. Quite a number of H.F. chokes will function with every satisfaction down to wavelengths as low as 10 metres, while being perfectly satisfactory on the whole broadcast band covering 250 to 2,000 metres. Thus, their choking range is 10 to 2,000 metres and, what is more, their effectiveness on the very short waves is little, if anything, less than can be obtained by the use of a specially designed single-layer short-wave H.F. choke. Such a state of affairs is only brought about by a thorough understanding of the underlying principles, which is the culminating point of several years of gradual development.

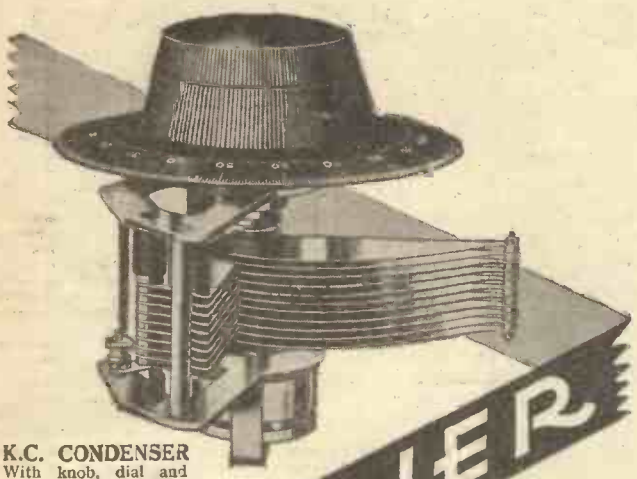
MORE RADIOGRAMS

Lieut. J. H. Manchester, of the British Royal Air Force, now touring the United States, told officials of KFI (Los Angeles) that he listened to that station daily at his home in Kimberley, South Africa.

The proposed law for the nationalisation of broadcasting in Belgium, passed by the Chamber of Deputies, was rejected by the Senate and no alteration is to be made in the system at present adopted in that country.

The United States Army Signal Corps is organising an amateur radio system to provide additional channels of communication in times of disaster. Amateur radio operators throughout the United States will be asked to co-operate with the Signal Corps in the building of a network of communications which can be used to augment or replace land lines which have been seriously damaged or destroyed by floods, fire, tornadoes, or earthquakes.

At a recent meeting of representatives of shipping companies at Hamburg it was stated that technical difficulties in the way of wireless telephone communication with ships at sea had been removed, but one of the obstacles in the way of fitting out all passenger vessels with the necessary telephone apparatus was the expense.



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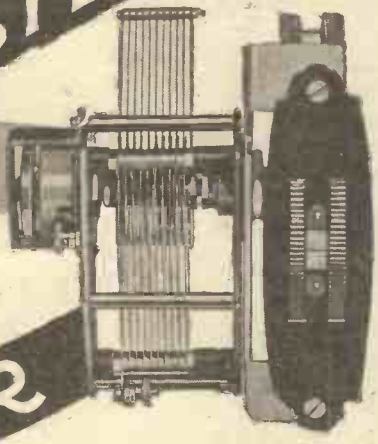

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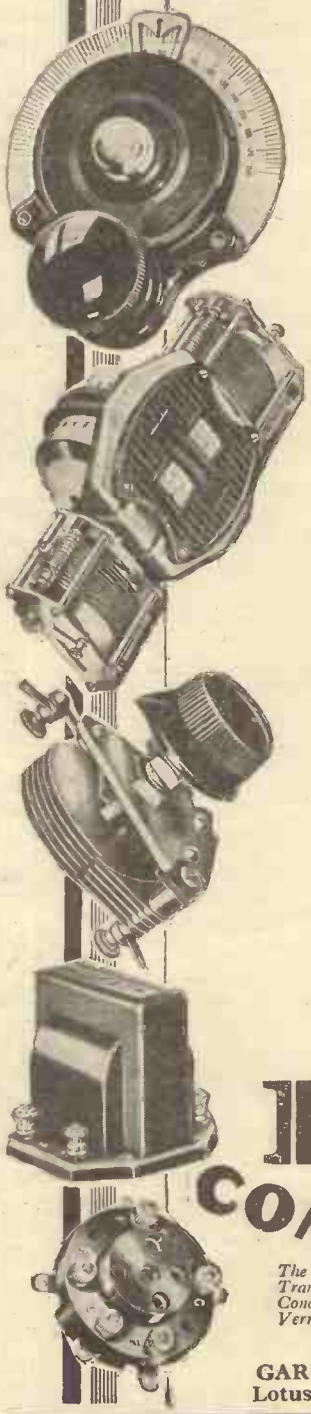

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MORE VOLUME—AND HOW TO GET IT

Amateur Wireless

and Radiovision

Every Thursday 3d

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AUGUST 10, 1929 No. 374 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

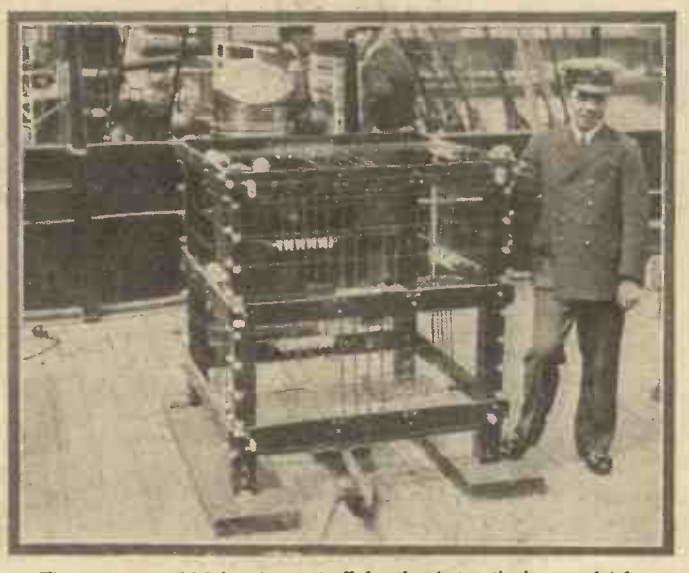
Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

By Air and "Mike"—A Fourth Tattoo—From Ostend—Fireproof!—Hello Buenos Aires—A Train Relay—In Search of Singers—A Radio College!

By Air—The T.T. race, one of the most important events in the motoring sporting calendar, is to be held at Ulster on Saturday, August 17, and owing to the nature of the event, it is rather important that listeners should get the news as soon as possible. So the B.B.C. is taking a novel step in inducing a competitor in the race—that well-known motorist, S. C. H. Davis—to broadcast an eye-witness account. This he will do from the Glasgow studio and the account will be relayed to all stations, except 5GB. This means *some* rush!

—and "Mike"—In order that he may reach the Glasgow station in time, the B.B.C. has arranged with the Scottish Flying Club for an aeroplane to fly him from Belfast to Renfrew aerodrome, whence a fast car will convey him to Glasgow. Mr. Davis, who will leave Belfast immediately after the race, will prepare his broadcast while flying across the Irish Sea.



The *Discovery* which has just set off for the Antarctic, is completely equipped with radio. Here is the Marconi D.F. aerial

A Fourth Tattoo—We have had the Aldershot Tattoo, the Knavesmine Tattoo and the Tidworth Tattoo; now we are to have the Scottish Command Tattoo, probably the last of the season, which will be relayed from Dreghorn Castle, Edinburgh. This will be given through 2LO and 5XX on September 4.

From Ostend—One of the best cross-Channel relays last year was that from the Kursaal at Ostend. This O.B. will be repeated on August 11, and again on August 25. The Ostend Kursaal, is one of the most famous Continental pleasure spots, and on both occasions an evening programme will be given.

Fireproof!—A Chelsea listener had a shock recently when he could not find his Marconi DE5—and a bigger shock when he found that the maid had accidentally dropped it into the heating furnace! However, he rescued it twelve hours later when the fire went out. The glass and pins were intact, although the base was charred and burnt off. And 2LO came in as well as ever!

"Hello Buenos Aires"—It is really rather wonderful when you come to think of it that you can lift up the 'phone and book a call straight through to Buenos Aires. The P.M.G. has now opened this service and, although it costs £6 9s. for a three-minute talk, it will become cheaper as the number of calls increases. Despite the technical difficulties, it certainly seems that *via* radio, we shall soon be able to 'phone all over the world.

A Train Relay—A special luxury train recently carried a number of prominent men from London to Lanark in record time. Speeches delivered at a banquet, while the train was travelling at 70 m.p.h., were relayed to seven Pullman cars. Loud-speaking at speed!

In Search of Singers—The B.B.C. is now looking out for amateur choristers to fill a few vacancies in the National Chorus and to provide a waiting list from which future vacancies can be filled. The chorus of 250 takes part in concerts of important works which are broadcast from London throughout the British Isles, and it is really a musical honour to be a member. Auditions are now being held and if you "fancy" your voice, get in touch with the hon. secretary of the National Chorus, c/o the B.B.C. at Savoy Hill.

A Radio College!—America is famed for being the home of the "correspondence course," and a new educational terror is promised in the "National College of the Air," being started by the President of a well-known New York electrical concern. A chain of radio stations is co-operating and for one period every evening, will broadcast part of an adult educational course. To have a college education is the ambition of every young American and so they are not so much averse to the highbrow microphone as we are.

PRINCIPAL CONTENTS

THOSE SURPRISE ITEMS!

We have had just over a year of those popular features, the Surprise Items. Here are some "inside" details of how the surprises were given.

"A control man . . . . kept a watchful eye on the three-valve amplifier"

ABOUT a year ago the B.B.C. was receiving a number of letters about the "sameness" of programmes, and it was felt that there was a general need for some type of entertainment which would not have to pass through the usual programme and selection committees and thus be "cut and dried" and perhaps not a little stale by the time it was given over the microphone.

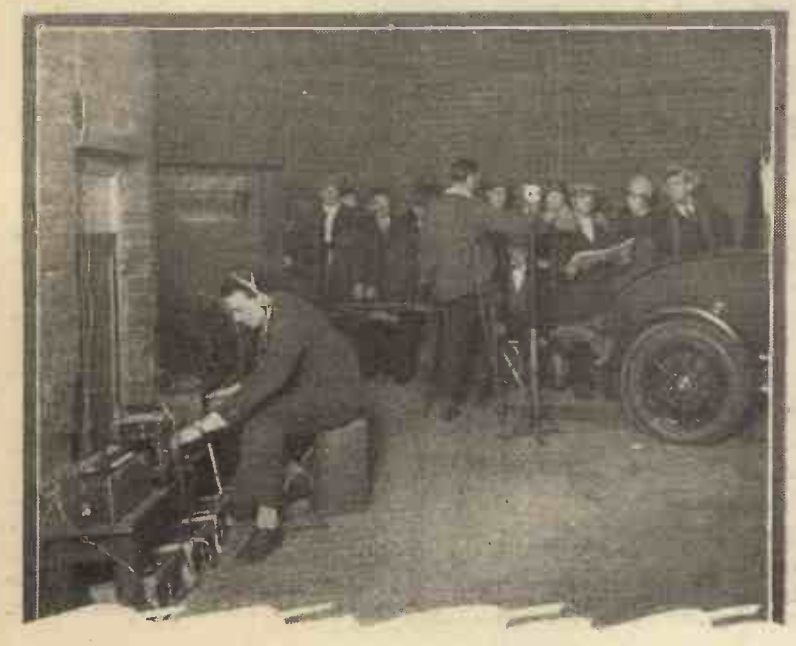
So, partly to obviate the difficulty, the Surprise Items were conceived, and these have been given now for just over a year. They are, almost without exception, the only broadcast items which do not have to pass through the usual "mill," and as they almost invariably have some element of topicality or news interest attached to them they are particularly welcomed.

B.B.C. officials welcome them, too, because very often the surprise item provides inspiration for other matter which subsequently can be put in the normal programmes; but the engineers do not welcome the Surprises, as a rule, because some of them have necessitated very complicated outside broadcast arrangements.

Generally a small space in the programme time on Friday evenings is allotted to the Surprises, but on some occasions the nature of the broadcast has compelled a different day to be fixed. Despite the superstitions surrounding such things, the first Surprise was given on *Friday*, July *13*. Perhaps this was part of the surprise!

The Surprises have proved a valuable outlet for novel ideas. One was the means of "Seamark's" introduction to the radio public on August 3, last year, when he presented a sketch about Zeebrugge. On August 10, microphones were installed inside and outside the main signal box at King's Cross station. The technical details of this and similar "O.B.'s" will be given later. On another night a red-hot criticism of a radio play, which had been performed the same night, formed the subject of the Surprise, while later Jack Hobbs, Sutcliffe, Duckworth, Hammond, and Leyland broadcast *au revoir* to listeners before the England cricket team's departure for Australia.

Some of London's street singers were heard on October 12, entertaining a theatre queue; and a week later Georges Carpentier, the French pugilist, took part in the "surprise." Then the microphone paid a visit to the film studios at Elstree. A tour of London theatres has been made, terminating with the curtain, cloak-room and traffic noises at the London Hippodrome.



(Left) "Some of London's street singers were heard . . . entertaining a theatre queue"

(Above) In the tour of the theatres—"one of the microphones was placed down by the footlights"

A scene in the fo'c'stle of a tramp steamer was broadcast early this year with sea shanties, and so on, arranged by Victor MacClure. Did you recognise the gramophone records played backwards, the conspirators being Christopher Stone and Compton Mackenzie.

A double Surprise was provided on May 24, namely, Tommy Handley on the General Election, followed by the "Saucer" burial from *Porgy*, for which the artistes

came direct from the stage of His Majesty's Theatre to a studio at Savoy Hill in their make-up. More recently, a "Roman" news bulletin was given in the form of a skit.

A night club, the "spirit of Piccadilly," theatrical stars, excerpts from plays and a high-speed tabloid revue have gone to the making of the feature on other occasions and its popularity after fifty-odd broadcasts appears to be undiminished.

As has been said, the technical details have not always been easy to arrange.

One of the accompanying photographs shows the scene outside a London theatre when the music of street singers entertaining the waiting queue was broadcast. This was not "faked" in any way. A Reisz "mike" was carried about on a stand like a music support, the amplifiers and other gear being put in a safe corner, and connected via Post Office lines (through a point near the theatre) to Savoy Hill.

'Phone Lines

There was a separate set of lines for an ordinary telephone so that the O.B. engineers could all the time be in touch with the control men at the station, and could warn them when the microphone's position was being changed and when the whole O.B. was being concluded. The "mike" faithfully picked up the strains of a barrel organ, a one-legged singer, the caustic remarks of the listeners and the chinking of pennies!

The tour of London theatres (from the inside, this time) was more difficult to organise, because a number of pick-up points was needed—one in each theatre.

Some of the accompanying photographs show scenes at the London Coliseum during such an O.B. One of the microphones was placed low down by the footlights, and an engineer is shown adjusting this just before the actual relay. The apparatus was placed at the back of the left wing of the stage, and there a control man operated the two switches for the dual microphones employed, and kept a watchful eye on the three-valve amplifier inserted between the microphone and the usual 'phone lines.

The engineering staff had, as is often the case, to carry out all the work without upsetting the subjects being relayed! The amplifier section was thus made in one unit, and was supplied with H.T. and L.T. from accumulators.

Very much the same kind of apparatus was employed when the King's Cross station signal box O.B. was successfully made. This was an easy broadcast, however, the sounds to be picked up being of a distinctive nature and no special efforts towards purity having to be made. Bells, whistles, shouts and "puffs" were heard.

It would have been very difficult to broadcast gramophone records played backwards if it were not for the fact that the B.B.C. always uses an electric pick-up. Records had accidentally been played backwards for a few grooves on one or two occasions, during tests with pick-ups on experimental arms, and it was realised that a continued broadcast of this nature would be something very much out of the ordinary; which, indeed, it was!

A B.B.C. gramo-radio outfit is shown in the photograph above. K. U.

"Did you recognise the gramophone records played backwards?" Here is a B.B.C. pick-up, turntable and pick-up "mike" switch

MR. FLEX IS SURE OF ONE THING—

—MRS. FLEX WOULD NOT TOLERATE SUCH A LIBERTY

MY WIRELESS DEN

By W. JAMES

Weekly Tips Constructional and Theoretical—

For the Wireless Amateur

Those Big Aerials

THE size of an aerial is all-important in these days when selectivity rather than magnification is the decisive factor in reception. A large lofty aerial is all very well for local station work with a one- or two-valve receiver, but when the object is to be able to receive a number of the more distant stations using, perhaps, a three-valve receiver having a high-frequency stage, a well-constructed aerial having a short top has its advantages.

It is, in fact, quite safe to say that in many instances better results will be obtained when the smaller aerial is used. An indoor aerial is often arranged so near walls or the roof that it has large losses and is not very effective, but a fairly short outdoor aerial has definite advantages. A good earth, too, is worth while with certain receivers, although with others it seems not to matter whether the earth has a high resistance or not.

Output Circuits

The relative merits of choke-condenser output as compared with transformer are frequently discussed, but I would emphasise one great advantage of the choke-condenser circuit.

It tends to prevent a feed-back which, in many instances, produces motor-boating.

This is because the current passing through the choke is substantially steady, while the fluctuating or speech currents pass through the fixed condenser and loud-speaker to the filament of the power valve. Consequently, the varying current which actuates the loud-speaker does not flow through the high-tension battery and so cannot tend to produce feed-back.

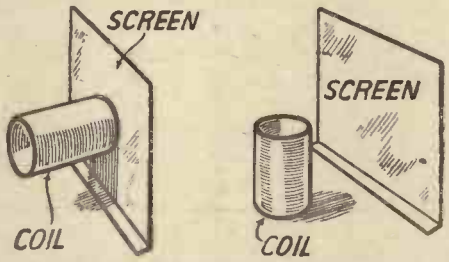
In the ordinary circuit where the loud-speaker is connected directly to the anode of the valve the fluctuating currents are forced to flow through the battery and are very liable to produce variations in voltage which are applied to the other valves of the set.

When motor-boating stoppers are not fitted and the battery has a fair internal resistance the variations in the voltage may be sufficient to spoil completely the quality of the reproduction.

Supposing the current flowing is .5 milli-ampere and the resistance is 200,000 ohms. The voltage drop across the resistance is 100, therefore, if the high tension is of 150 volts, the anode voltage is 50. It is, of course, much easier to connect a voltmeter and notice the reading, but the method outlined is so simple that the correct voltage may be determined in a few moments.

Screen Troubles

I find that the effect of a metal screen or shield upon the efficiency of a coil and the tuned circuit of which it forms part is not always fully appreciated by those who experiment with various circuit arrangements. Any damping effect is obviously the more serious the better the coil, and as it often happens that the best coils are of relatively large size, one must be particularly careful when placing them in a receiver.



Wrong and right ways of mounting a coil near a screen

Thus it would not do so to fit the coil that its axis is at right angles to the metal screen as shown above. Rather should it be placed in line and some inches away from it.

An effect of placing a coil very close to a metal screen or, for that matter, to any other component having an amount of metal in its construction, is to reduce the inductance of the coil as well as to increase its resistance.

This increase in resistance may by chance stabilise a receiver and therefore appear beneficial. It is bad practice to use a good coil and then to lower its efficiency by a material amount; stability should be obtained by attention to the circuit values.

Straying H.F.

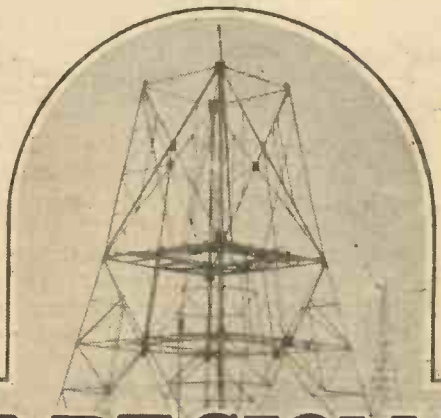
I have mentioned before in these notes how important it is to make certain that high-frequency currents shall not pass through the receiver and into the loud-speaker connecting cord, for the reason that instability and oscillation may be produced if the cord lies near the aerial wire or any coils in the receiver.

It is, of course, possible to connect a fixed condenser across the anode and filament terminals of the last valve to which the loud-speaker is connected, and this condenser will minimise the amount of the high-frequency current passing through the cord. But I would draw attention to the fact that when such a condenser is necessary the high-frequency stopper connected between the detector and the first valve is not thoroughly effective. If this is true the low-frequency valves may appear to overload, even though the output is not very great, for the reason that the valves are carrying both high- and low-frequency currents. When there are signs of high-frequency currents in the output circuit it is therefore advisable to improve the stopping circuit connected between the detector and the first valve. This may take the form of a grid leak which should be increased in value.

A FOG NAVIGATION COMPASS

A DEVICE which may greatly facilitate navigation at sea during foggy weather has just been the subject of exhaustive tests in the Great Western Railway Company's steamer *St. Julien*. The instrument, which is described as the H.J.B. fog navigation compass and sound-indicating unit, throws pin-points of light on to a screen in front of the man at the wheel. It picks up every sound within a large radius, and indicates the direction from which it comes, the distance which it has travelled, and its character. The tests showed that even the faintest whistle was picked up and screened. It is many thousand times more sensitive than the human ear, and its value in recording fog signals not otherwise audible and giving their relative positions can easily be imagined. The experts do not pretend that the apparatus is perfect, but the results on test were very promising. The exact location of distant gunfire and of sunken ships are other uses, it is stated, to which the device may be put.

While the Regional Scheme will not be in operation for some time it will nevertheless not be long before the new London transmitter commences work. In the near future, therefore, London listeners will have to make some changes to their receivers and in time listeners in other parts of the country will, of necessity, have to follow suit. In this article our Technical Editor reviews the points which will have to be taken into consideration.



HOW THE REGIONAL SCHEME WILL AFFECT YOU

PRECISE details about the Regional Scheme are not available yet, largely because the arrangements are still somewhat experimental and it cannot be stated in black and white just what the final arrangements are to be. It is a fairly easy matter, however, to make what one may consider reasonable assumptions and to analyse the results. In the present article I have made one or two such assumptions, and have deduced some information as to the probable conditions.

Overloading

Difficulties are bound to arise from overloading, principally on the detector valve in a receiver. This in itself will constitute quite a problem for the listener within ten miles of a regional station, even if he attempts to listen only to the one programme. It is not proposed, however, to deal with this point in the present article, but to consider more particularly the effect on the tuning of one's receiver. Although the regional scheme is primarily a measure for those who only wish to listen to the local programmes, a certain amount of selectivity will be essential in order to make one's choice of the alternative programmes provided. These will be operating at equal power and separated by something like 130 kilocycles. Even the local listener, therefore, must arrange his tuning circuits properly if he requires to obtain alternative programmes. The enthusiast who wishes to obtain occasional foreign programmes is in a much more difficult position, for he must have really good tuning circuits.

The question at once arises as to how we are to obtain the extra selectivity required. Is it to be done by scrapping one's coils and replacing them with exceedingly low-loss coils wound on highly efficient formers with Litz wire and so forth? The present article supplies the answer to this question by discussing the tuning properties of various circuits.

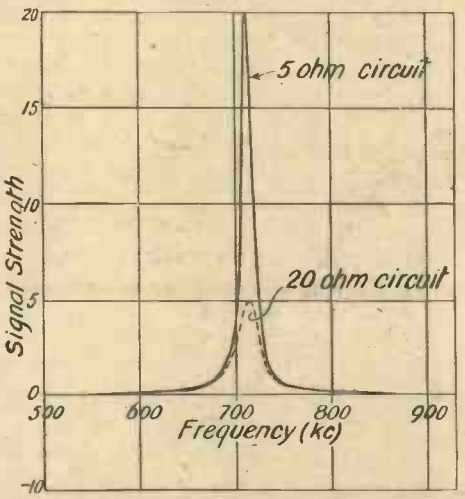


Fig. 1. Resonance curves of two circuits having different H.F resistances

Resonances

Fig. 1 shows resonance curves of two circuits, both having an inductance of 200 mics, tuned with a capacity of .00025-microfarad (as representing the middle of the scale), but having different H.F. resistances—one 5 ohms and the other 20 ohms. The latter coil is a fair average, for the effective H.F. resistance must include such factors as detector damping, aerial losses, etc., which mount up in the average circuit to 10 ohms or more by themselves. Twenty ohms is thus a fair figure, representing an ordinary circuit with a small amount of reaction. Five ohms is a figure which could only be attained with low-loss construction and special precautions to minimise external damping.

Comparative Selectivity

Yet the figure shows that from the point of view of selectivity, the 5-ohm circuit is worse. We require the signal strength a little way off the tuning point to be as small as we can make it, whereas with the 5-ohm coil the current is always greater than with the 20-ohm coil. The *relative* strengths on the other hand differ considerably, and if the maximum strengths were made the same in each case, then the 5-ohm circuit would be much more selective. The same remarks apply to any form of selective circuit; we have always to arrange the maximum strength to be the same. If we use a low-loss coil, then the aerial coupling should be reduced accordingly.

The curves that follow are all reduced to the same maximum for comparison. More-

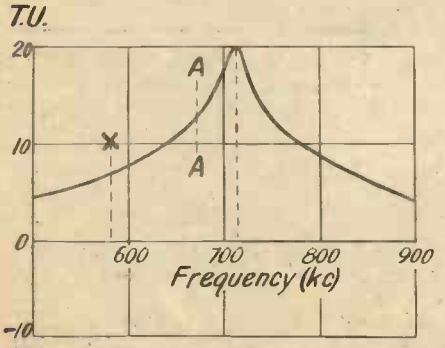


Fig. 2. Resonance curve of 20-ohm single circuit

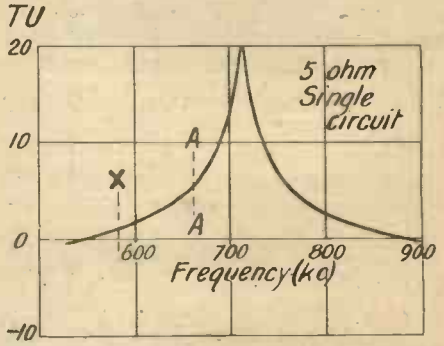


Fig. 3. Resonance curve of 5-ohm single circuit

For the Newcomer to Wireless: REACTION IMPROVEMENTS

I AM not quite satisfied with the reaction control of the new set that I have just made.

What exactly is the matter with it?

Well, first of all the set doesn't glide into oscillation; it falls into it with a plock, just as signal strength is building up nicely.

I can guess what your second point is going to be.

It doesn't go out of oscillation just at the point where it went in, if I turn back the reaction control dial.

I thought you would say that, for the two symptoms usually go hand in hand. What you are complaining of is fierce and floppy reaction. What sort of circuit are you using?

A modification of the Reinartz.

One of the best that there is, since reaction hardly affects the wavelength at all and it can be made perfectly smooth.

I wish you would tell me how to do it.

First of all, are you using a decoupling device in the plate circuit of the detector valve?

Yes, I have got a 20,000-ohm resistance and a one-microfarad condenser to earth.

This is about the only portion of the set in which the value of the shunt capacity is anything like critical. I think that you will find your results enormously improved if instead of the one-microfarad condenser you fit one of four microfarads.

What else can be causing the fierceness and floppiness?

Lack of proper screening is one very frequent cause. If yours is not good enough you should make it more complete. Again, the choke in your plate circuit may not be quite suitable for the work.

I didn't know that there was very much difference between one H.F. choke and another.

Oh, yes there is! Some of them show quite bad peaks on the medium band, with the result that the set is apt to oscillate even when the reaction condenser is at zero. Others have not a total inductance that is big enough for the job on the long waves, which means that the set may be very unstable on the upper band. You won't go far wrong if you purchase a choke of reputable make, especially one that has passed with flying colours through the tests in the AMATEUR WIRELESS laboratories.

Are there any other tips that you can give me about reaction?

I can give you one, an excellent one, which applies to grid-leak rectifiers.

What is that?

In the ordinary way the grid leak is connected either through the grid coil or directly to the low-tension positive busbar or to the positive leg of the valve.

Yes, I always connect mine that way.

It is purely a matter of luck whether this connection gives the valve a proper positive bias for the best reaction control. In the great majority of cases it does not.

What other way is there of connecting it?

Wire a 300-ohm potentiometer straight across the low-tension busbars and connect the grid-leak return to its slider, wiring a fixed condenser of about .002 microfarad between the slider and earth.

What does the potentiometer do?

A little thought will show you that it enables the positive potential on the grid or the detector valve to be adjusted to a nicety, the best voltage for smooth reaction being obtained.

HOW THE REGIONAL SCHEME WILL AFFECT *YOU*

(Continued from preceding page)

over, they are plotted slightly differently, for it is difficult to estimate large differences of strength on a curve such as Fig. 1. The signal strength is plotted in transmission units which is a form of logarithmic scale. We start with a standard strength of signal. Ten Transmission Units (T.U.) is 10 times the strength. Twenty T.U. is 100 times the strength, while —10 T.U. is one-tenth the strength. In this way we can easily discern differences of 100 or 1,000 to 1.

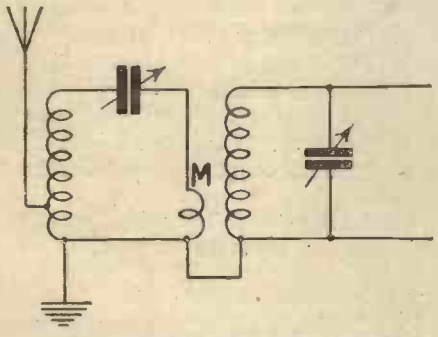


Fig. 4. Simple coupled aerial circuit

Let us assume that for adequate selectivity we require the signal from the near-by station to be reduced to one-hundredth of its value at resonance—i.e., fully tuned in. We will take this as our zero level and arrange all the resonance curves to give 100 times this strength (20 T.U.) at resonance—which is at 712.5 k.c. approximately.

Fig. 2 shows the 20-ohm circuit plotted on this basis and it is at once clear that 130 k.c. away from resonance (at the point X) the signal is well above the critical value, so that this current is not selective enough.

Fig. 3 shows the 5-ohm circuit which reduces the signal nearly to the required level, but not quite. On the other hand, the sharpness of tuning will cause serious distortion by cutting off the side bands. Four thousand cycles away from resonance, the strength is 6.5 T.U. (as marked at AA), which means that the upper frequencies will be reproduced at less than one-twentieth of their true strength! The 20-ohm curve on the other hand only reduces the 4,000 frequency side bands to 13 T.U., which is one-fifth of the full value.

The super-efficient single circuit, therefore, is *not* the solution, and the real remedy lies in the use of more than one tuned circuit. Fig. 4 shows a simple coupled aerial circuit and the curve in Fig. 5 shows the tuning properties of such a circuit when the mutual inductance M is assumed purely inductive and equal to 3.5 microhenries. It will be seen at once that the signal strength, 130 k.c., away from reasonance, is well below the required value—actually one two-hundredth of the resonant value—so that we have obtained adequate selectivity.

In addition, the side-band cut-off is not too severe, the strength at 4,000 cycles being 10 T.U., i.e. one-tenth of the full value. This will be noticeable, but not as serious as the reduction to one-twentieth with the single 5-ohm circuit. In other words, the double circuit having two average coils gives better results than one single super circuit both on the score of selectivity and quality. A receiver using a coupled circuit in this manner will be described

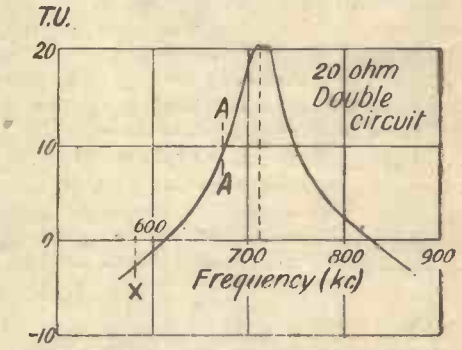


Fig. 5. Curve showing tuning properties of simple coupled circuit

in an early issue of AMATEUR WIRELESS.

The principal point to be remembered in a double circuit is that the coupling must be kept weak. There are always two tuning points in a double circuit and if the coupling is too light these two points occur at quite distinct intervals. With a weak coupling, however, the two are so close that they merely make the curve flat-topped—as can be seen in Fig. 5, which is an advantage rather than the reverse.

On Your Wavelength!

Wireless Orchestras

NOBODY will deny that modern valve amplifiers and loud-speakers reproduce broadcast music in a most "lifelike" manner. It is therefore not surprising that many proud owners and constructors of such receivers are taking quite an advanced interest in music and have long passed the stage of merely listening to the "tune." In the early days of broadcasting, musicians condemned loud-speakers because of the characteristic distortions which made it difficult to differentiate between a flute or a violin, piano or harpsichord. Now the loud-speaker has advanced farther than headphones in quality of reproduction, and the wireless man and musician alike take pleasure in distinguishing between the sounds of the oboe and flute, harp and harpsichord. There is no need for one to play an instrument to be musical; if one is capable of concentrating and deriving pleasure from the permutations and combinations of sound caused by the many instruments of an orchestra, one is entitled to be called "musical."

Harmonics

Quite apart from the additional musical pleasure one can obtain by knowing something of the instruments which create the sounds, such technical knowledge is highly valuable in making estimations of the "goodness" of a loud-speaker or receiver. Thus, a bad loud-speaker will not reproduce any frequency below 250 per second. The fundamental tones of 'cello, double bass, lower register of the piano and drums are all in the lower audible frequency region, between 50 and 250 cycles per second. On a bad loud-speaker only the harmonics of these instruments will be heard, and not the full richness of the real bass. Many listeners are under the impression that their receivers are reproducing the bass instruments faithfully when in reality they are only reproducing the harmonics. The listener with some slight knowledge of music, the composition of orchestras, and the sounds of individual instruments is at an advantage over his colleague who has not made such progress.

Musical Engineers

It certainly is a fact that the modern and enterprising radio, talking film, or gramophone engineer has to be a musician as well as a technician. And he finds that this knowledge is easily and pleasantly acquired. A few visits to the Queen's Hall will change the musical horizon of the most unmusical student, and concentration on orchestral items broadcast will do the rest. This sounds like propaganda for the B.B.C. Educational Department and Sir Walford Davies, doesn't it? But I can assure you that it is as essential for the final perfection of musical reproduction as is the knowledge of the characteristics of your output power valve.

Radio Gramophones

The gramophone pick-up has progressed from the accessory stage and has become a permanent institution. And so this year's "posh" outfits will, for the most part, be radio-gramophones, complete with electrically driven turntable and moving-coil loud-speaker. And then, with one-dial tuning and one-switch wavelength change (for the high waves), we shall have got pretty well as far as possible with ordinary radio. Television next, please!

Overhaul

Unfortunately, a very small percentage of receivers will have progressed to the radio-gramophone-super class. One has not to go far to hear a terrible raucous noise reminiscent of the radio year 1923. And, dollars to doughnuts, a further investigation of the source of the sound will reveal a receiver, vintage 1923, roaring its head off. There are too many obsolete sets still being used. I have a friend who talks to me about the marvellous musical quality of his horn loud-speaker, dated 1924. Well, I have long since given up trying to make him buy an up-to-date instrument. He is so drugged with listening to his own loud-speaker that he thinks *it* is right and my beautiful moving-coil loud-speaker reproduction is all wrong! If the B.B.C. would broadcast "squeak" calibrations, as I suggested some months ago, this poor man would have been disillusioned long ago and that decrepit loud-speaker would now be in the dustbin.

The Squeak

Talking about the "squeak," I notice that the Parlophone Company are issuing a set of note-frequency records which may be used for comparing the frequency ranges of loud-speakers, using a gramophone pick-up. The records are being put out in a book, complete with instructions and diagrams for making measurements, etc. Of course, these calibration signals would be better sent out by the B.B.C., for gramophone pick-ups are still far from perfect and will tend to make observations only approximate. But until the B.B.C. wakes up to the importance of listeners' low-frequency calibration signals you and I will have to do the best we can with records.

Tele-cinematography in Germany

I had occasion to go to Victoria Station the other day, and quite by accident ran into Mr. Baird. A naturally busy man, one seldom has the opportunity of indulging in personal discussions with him, but as his train was not due to start for a quarter of an hour I made the most of the minutes available. He was just off on a lightning trip to Germany, Berlin being the final destination. I gathered that television matters in that country were proceeding apace on a sound commercial basis. The three allied firms, Zeiss Ikon, Loewe Radio, and the Bosch Co. were amalgamating their resources in the efficient manner one associates with German enterprise.

By all accounts the Germans at the moment are more particularly interested in the transmission and reception of cinema films, and special ones have been made for the purpose. This will simplify matters somewhat compared with the transmission and reception of the living subject, for the beam of light which explores each picture penetrates the film and operates directly the photo-electric cell. The cell in consequence need not be so sensitive as when responding to light reflected from a televised subject and, furthermore, only one cell is required.

Mr. Baird Travels Light

Cinema projectors fitted with the necessary exploring disc optical system, cell, and amplifiers are constructed and excellent pictures are received, even with small frequency side-bands, well within that scheduled for ordinary broadcasting. While the appeal of cinema film transmissions is sure to be wide, with the initial transmissions and receptions promised to the German public, it is quite obvious that later on the living subject will be called for. To my mind, it is akin to the transmission of gramophone records in the early days of wireless.

I must record an item of passing interest which occurred as we were finishing our conversation prior to the inventor boarding the train. I looked around for his luggage, and, seeing none, remarked that no doubt his travelling case was already on the carriage rack or in the guard's van. Imagine my surprise and amusement when Mr. Baird calmly produced a clean collar from his pocket and said, "There's my luggage!" He certainly believes in travelling light, and, I gathered, always makes a point of purchasing other necessities when at his journey's end.

I Meet Dr. Gradenwitz

Another interesting personage with whom I had a most enjoyable chat recently was Dr. Gradenwitz, who needs no introduction to readers of this journal. Curiously enough, he bore out Mr. Baird's comments on the keenness of the Germans for televising films and lantern slides. Both the

On Your Wavelength! (continued)

Reichspostzentralamt (General Post Office) and Mihaly have concentrated on this line of development, and particularly in the case of the former reasonably good detail has been shown. While in no way detracting from the achievement of Mihaly the worthy doctor was most emphatic in his views that the true television as demonstrated daily by Mr. Baird at his company's offices in Long Acre is far and away the best he has ever seen. This, coming from an independent observer, bears out my own view that Britain leads in this new science.

The Amateur Again

Often have I had occasion to point out the remarkable services rendered by amateurs in the development of wireless. I have just received news of another very big step forward, due entirely to one of this indefatigable band. For a long time past expert chemists have been specialising in an endeavour to discover some means of rendering permanent still pictures received by the Fultograph on starch-iodide dressed paper. All kinds of schemes have been tried, but none was found simple enough or sufficiently economical for ordinary use. It was left for an amateur, Dr. A. J. H. Iles, of Taunton, who has had a picture receiver for some months, to make the discovery for which we have all been waiting. The process that he has evolved is so ridiculously simple that research workers will be kicking themselves good and hard as soon as they read about it. You just receive your picture in the ordinary way. Then you place it face downwards for a short time in a dish containing ordinary alum in solution in still more ordinary tap water. Then you take it out, and when it has been dried there is a fixed picture as permanent as a photographic print. The strength of the solution, by the way, is one teaspoonful of alum to a pint of water. Astonishing, isn't it, how these simple things elude discovery? The very greatest credit is due to Dr. Iles for having shown the way.

My "Grouse"

It won't be far off the twelfth of August when this paragraph appears, but I am not referring to the dickey bird which comes into season on that welcome date. But I want to get off my chest just a word or two about programmes as they are at the moment. I am not, as you know, a habitual grouser, for I think that, taking them all round, our programmes are the best in the world. But just now we do seem to have struck an astonishingly bad patch. Night after night I have wanted to sit down to listen to something really good in the way of music from 2LO, 5XX, or 5GB, and there simply hasn't been anything that I cared about on perhaps four evenings out of the seven during the week. I don't think that I am hard to please or that my tastes are widely different from those of the man in the street. I don't care about vocalists or plays; I don't like nasal songs about "my cutie" or "my baby," and I don't like dance music when the performers sing. Who was it who once said :—

"Swans sing before they die.
Ah, me, t'were no bad thing
Could some folks die before they sing."

I do like orchestral music, military band music, and good violin, 'cello, or other instrumental solos. Perhaps the heat wave has been responsible for a certain amount of brain fag in programme organisation quarters. As I write the drought appears to have broken; it is cooler and a gentle rain is falling. Possibly it will lubricate the brains of those responsible and induce them to give us what I think we are all wanting—better and brighter programmes.

Price Cutting

Every component manufactured by reputable firms has a fixed and definite retail price, below which it should not be sold if the trade in general—and therefore also the public who are served by the trade—is not to suffer. Readers may have noticed that it is often possible to buy goods of known make at prices less than is normally charged for them. It may seem, at first sight, very attractive to be able to buy a valve or something of the kind for a shilling or two less than one ought to pay for it, but one should not indulge in the practice without a little thought. Much of the stuff sold in this way comes from bankrupt stocks, and there is absolutely no guarantee that it has not been considerably misused before it is sold. I know a fellow who bought the other day at a sale a dozen valves for an old song. He wasn't too pleased, though, when he got home to find that nine of them were dummies issued by the makers for window display.

'Ware Cheap Batteries!

Whatever you do, beware of high-tension and other dry batteries offered at cut prices. The cutting usually takes place because they have been so long in stock that they are of little, if any, further use. I know of one rather astonishing example of what can be done in this way. One good firm had a batch of batteries with which something had gone wrong in the process of manufacture. They could not possibly be put on to the market, so they were disposed of as scrap. They were bought up by an enterprising merchant, who removed the labels and had others of a specially gaudy design printed for them. They then went out to the unfortunate public as "The ——, the world's best battery. Hundred per cent. more working life than any other make," and so on, and so on. Actually, there was not more than an hour or two's service life in any of them. And yet I happen to know that the British public bought them like hot cakes!

The Pendulum Swings

I notice a very distinct movement nowadays away from the low-loss idea which has held us so long and towards what, to my mind, is the more sensible system of using a greater number of valves to do the work. Comparing the position in this country with that in the United States a year or so ago, an American wrote: "No such economy in the use of tubes is sought in America as in Europe, where it is important to squeeze the last bit of energy out of each. The British radio press chronicles with awestruck surprise that the *average* set exhibited at New York last fall had seven tubes; and wonders what in the name of Croesus the maximum could have been. If the American manufacturer finds that a couple of extra tubes which add no amplification will make it easier for the lady of the house to operate the receiver by the snap of a switch alone he incorporates them in the design." He goes on to point out that the increasing use of the mains for current supply purposes makes it possible to run a big set economically and provide its plates with all the voltage that they need.

I never have liked the idea of running valves all out. I don't believe in making your set too high loss, but at the same time I find myself that if you use more valves, and are content to get less out of each individually, you can make a receiving set which is extremely pleasant to operate and attain wonderful fidelity in reproduction.

THERMION.

Do You Use a Screen-Grid Valve? If so—

Remember that the anode and screen-grid H.T. voltages specified by the maker should be carefully adhered to for best results.

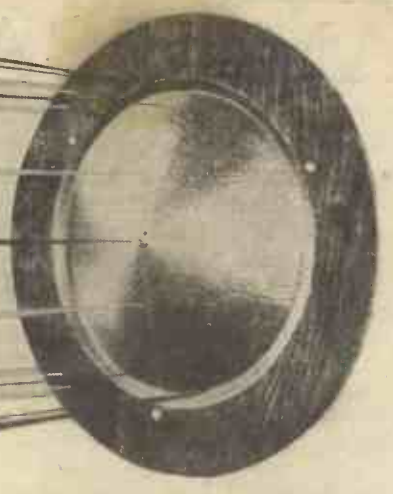
Remember that a biasing voltage of 1½ negative applied to the control, or inner, grid will reduce the H.T. consumption of the valve without detracting from its performance.

Remember the connecting wires to the screen-grid and plate should be kept well away from other leads in the set.

Remember that any metal screening used round the valve should be earthed.

Remember that as metal screens are at zero potential, any wires connected to H.T. positive or L.T. positive which happen to come into contact with the screen will short-circuit the battery.

HOW TO GET MORE VOLUME



In this article W. James points out the advantages of using a push-pull system when large volume is required

AMATEURS who employ a high-resistance type of moving-coil loud-speaker or, for that matter, any high-resistance instrument, are often disappointed with the gain in volume when they try two valves in parallel in the power stage instead of a single valve, or when they try a push-pull arrangement. It can easily be shown that when the loud-speaker is so designed that it effectively "matches" the impedance of a single output valve that very little extra strength is to be obtained by employing a

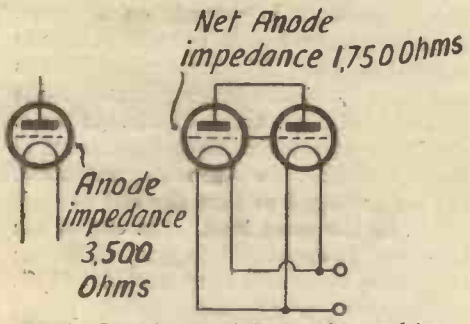


Fig. 1. Impedances of single valve, and two valves in parallel

further valve of the same type in parallel or in push-pull.

This is because when two similar valves are employed in parallel the resultant anode impedance of the pair is half that of the single valve. Similarly, the effective anode impedance of a pair of valves employed in a push-pull circuit is twice that of a single valve. These points are shown in Fig. 1.

It therefore follows that if the loud-speaker were designed to give the desired results with a single valve, no great improvement is to be gained by employing the parallel or the push-pull arrangement. Of course, in practice, one often notices improved results when a further valve is used in parallel or when the push-pull circuit is employed, for the reason that the loud-speaker was not properly suited to the single valve. Thus, for example, if the impedance of the loud-speaker happened to be rather low as compared with the anode impedance of a single valve there would undoubtedly be an improvement in the volume and probably in the quality of the reproduction, if a second valve were added in parallel.

This is because the impedance of the two valves would be half that of one and, as a result, the characteristics of the loud-speaker would more nearly match those of the valves. In these circumstances there would be improved bass and probably the treble notes would be strengthened.

But in many instances the impedance of the loud-speaker is such that the addition of a further output valve tends to spoil the balance of the reproduction by producing too prominent bass notes. If, therefore, you are dissatisfied with the improvement effected by an additional output valve connected in parallel you may be certain the fault lies in the matching of the impedances.

Effect of Transformer in Anode Circuit

Now it is possible to effect a correction by coupling the loud-speaker to the anode circuit of the valve through a transformer. It is generally recognised that the best circuit conditions are those in which the impedance connected in the anode circuit approximates to twice the impedance of the valve or valves. A difficulty which has to be met is the varying impedance of the average loud-speaker. At what frequency shall we determine its impedance? Practical experience indicates a moderately low one such as 500 cycles, but then there is the further snag that we do not always know the impedance. Further, many loud-speakers are not very sensitive to changes in the impedance of the output stage. All one can do is to remember that a transformer may be used to correct a circuit, and it does so in the following manner.

Let us suppose a transformer having a ratio of two to one is employed, the secondary being the smaller winding. Then, a resistance R connected across the secondary winding is in effect equivalent to a resistance 4R joined in the primary circuit. In other words, the effect of a resistance connected to the secondary is as though a resistance were connected to the primary, which is equivalent to the value multiplied by the turns-ratio squared.

Thus, when the turns ratio is two, the resistance connected to the secondary must be multiplied by four in order to arrive at the resultant effect in the primary.

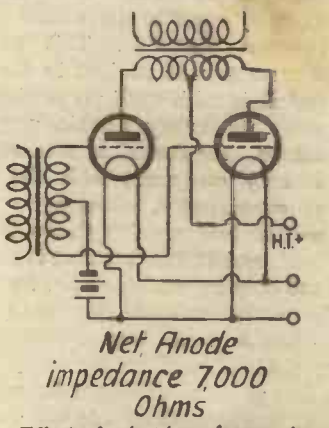


Fig. 2. Effect of using transformer to couple loud-speaker in anode circuit

If the turns ratio had been 25, the secondary resistance would be multiplied by 625 to give the equivalent primary resistance. Now the equivalent primary resistance should approximate to twice the impedance of a valve or valves, and it is, therefore, obvious that the best ratio varies with the impedance of the valve and the number included in the last stage.

It is usually not worth while employing a transformer for the purpose of matching impedances when the difference is of the order of only about two-to-one unless tone effects are important. The power output will not be very different, but there may be an improvement in the quality of the reproduction by matching.

Loud-speakers vary so much that no definite rules can be given. The point it is desired to emphasise is that when a decided improvement is not effected by adding a further parallel connected valve, the

(*Continued at foot of next page*)

AMERICA DISCOVERS THE "Q" COIL

By J. H. REYNER, B.Sc., A.M.I.E.E.

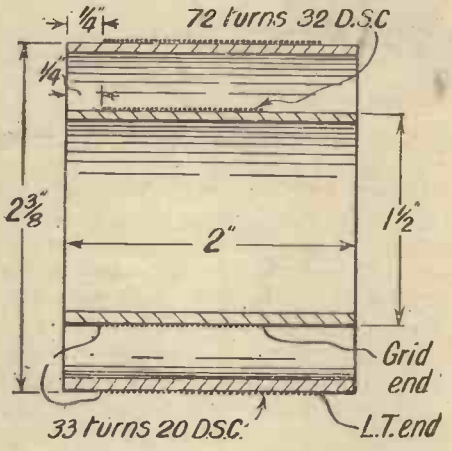
A RECENT issue of *Radio Broadcast* (an American publication) gave a description of a form of coil arranged to possess astatic properties in much the same way as this feature is obtained with the "Q" coil. The coil in question is termed a "self-shielded radio inductance" and has obviously been evolved from a series of experiments similar to those which were undertaken at the Furzehill Laboratories nearly two years ago.

The American Idea

This American version consists of two coils arranged in concentric formation so that we have the familiar arrangement of two secondary sections, one outside the other. The inner coil is arranged to be in the opposite direction so that the magnetic fields oppose one another.

In addition, by correct proportioning of the inner and outer sections, the electrostatic field may be reduced in intensity. In obtaining the astatic properties the inductance of the outer coil is made approximately equal to the mutual inductance between the coils. This was the original arrangement utilised in the "Q" coils, and it is with such proportion that the most satisfactory astatic properties are obtained. The American market, however, is only concerned with the single band of wavelengths, whereas over here there are the two wavelength bands to be considered, and it was felt that if this coil could not only be made astatic, but could also be made suitable for both wave bands, then it would have a considerably greater field of usefulness.

The first point of difference between the original experimental models and the final coil lay in the adoption of the parallel connection on the short waves. It was found that the astatic properties of the coil were largely maintained independent of whether the coil sections were connected in series or in parallel. In the latter case, of course, it was necessary to increase the number of turns on the sections themselves, so that the final inductance should be of the right order. Where the coils are in parallel, each section has to be larger than the final inductance required, whereas where the coils are in series each has to be smaller.



American self-shielded inductance

Having established that the parallel connection was satisfactory, it was then possible to arrange for the coils to be placed in series for the long-waveband, which was the object in view. The first attempts were made to keep the coils still in opposition, so that the same astatic properties were retained in the long-wave position. Unfortunately, under such conditions the ratio of series-parallel inductance can only be made 4 to 1, which meant that the maximum wavelength of the coil in the long-wave position would be only twice what it was in the short-wave position.

Somewhat reluctantly, therefore, this idea had to be abandoned, and it was decided to make the coil non-astatic on the long waves. Switching, therefore, was arranged to place the coil sections in series with a positive mutual inductance and in parallel with the negative mutual inductance. Then, by a correct proportioning of the windings, it was possible to obtain satisfactory tuning over both long- and short-wavebands without any dead-end losses and with the additional advantage of a relatively small external field in the short-wave position. In order to obtain the best dual-wave results some of the astatic properties had to be sacrificed so that the coil sections are not quite correctly proportioned from the point of view of external field. The coil, however, has given good practical results.

As a matter of interest, I am giving the figures of the American version of the "Q" coil so that any reader who cares to try the arrangement for himself may do so. The outer coil is wound on a 2⅜-in. diameter former having 33 turns of No. 20 gauge d.s.c. wire. The inner coil section is wound on a 1½-in. diameter former and is provided with 72 turns of No. 32 d.s.c. wire. The coils are connected as shown in the figure. They are thus not symmetrical, but are arranged so that one end of each coil is on the same level. The end of the inner coil is connected to grid, while the end of the outer coil is connected to L.T. The two bottom ends of the coil are joined together as shown.

"HOW TO GET MORE VOLUME"

(*Continued from preceding page*)

expected results may be obtained by fitting a transformer.

When valves are employed in push-pull, the impedances have to be added in order to arrive at the correct circuit impedance. Thus, if a certain loud-speaker is suited to a valve having an impedance of 3,500 ohms, the quality will not be as good when the loud-speaker is connected to a push-pull circuit including a pair of these valves, because now the impedance of the valves is 7,000 ohms.

Greater Grid Swing

To obtain an equivalent impedance to the single valve, a total of four would have to be used. Two of them would be connected in parallel in each side of the push-pull circuit. With this combination, the equivalent impedance of each side separately would be 1,750 ohms and the nett impedance of the circuit would be 3,500 ohms, which is equal to that of a single valve by itself.

The push-pull circuit would, of course, handle much more power than the single valve because, for one thing, the possible grid swing is increased. But the high-tension current is so greatly increased that few amateurs would employ two valves on each side of the push-pull.

Transformer Ratios

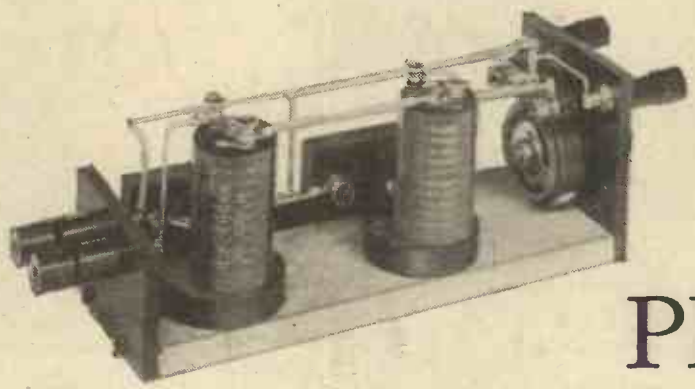
A transformer suitably designed to match the anode impedance of the valves and the working impedance of the loud-speaker may be employed to give the desired results. As an example, let us suppose we have a pair of 3,500-ohm valves connected in push-pull and we have a low-resistance moving-coil loud-speaker of which the impedance is 20 ohms.

The effective valve impedance is, therefore, 7,000 ohms and for the maximum volume the equivalent impedance of the loud-speaker should be 14,000 ohms. A transformer having a ratio of approximately 25 to 1 may therefore be used, because with this transformer the effective anode impedance will be 625 times 20, or 12,500 ohms. The matching is not quite correct, but a 25-to-1 transformer was chosen as this type is available and the matching is close enough for practical purposes.

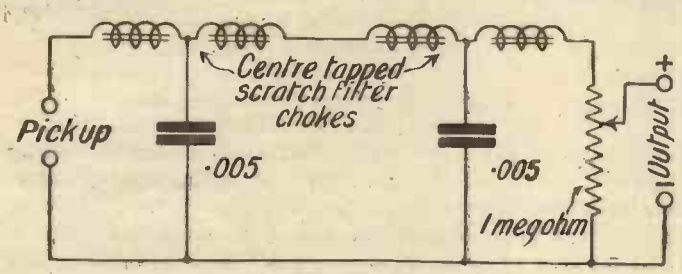
By way of contrast, let us imagine the two 3,500-ohm valves connected in parallel. The effective anode impedance is 1,750 ohms and for the best results an equivalent loud-speaker impedance of 3,500 ohms is desired. The transformer should therefore have a ratio of about 13 to 1 for the 20-ohm loud-speaker winding.

A SCRATCH FILTER FOR YOUR PICK-UP

Does your pick-up scratch and hiss? This trouble can be cured by the use of the filter described below. Cheap and simple to make up.



LAST week Mr. W. James had some very interesting things to say about the correct use of a gramophone pick-up. This will doubtless have induced a number of listeners to experiment with gramo-radio. Of course, it is not necessary for amateur purposes to design a special amplifier for the job; usually the L.F. side of one's receiver is well capable of dealing with a pick-up.



The circuit diagram

In some cases, however, it is not wise to connect the pick-up directly to the input terminals of the amplifier through a transformer or straight into the grid circuit. There are two reasons for this objection. First, a volume control is necessary in some part of the pick-up—amplifier—loud-speaker chain, and this can conveniently be at the pick-up end. Second, some types of pick-up necessitate a scratch filter in order to give a reasonably silent background.

This little scratch-filter unit, illustrated by the accompanying photographs, includes a choke-and-condenser arrangement for minimising record noises, and a volume control which is wired in such a position that regulation of the volume does not effect any tonal change or other note scale distortion. It can easily be made up on a small strip of wood from the few components mentioned in the following list, and will be found helpful with many types of pick-up :—

Baseboard 6½ in. by 2½ in.

Ebonite terminal strips 2½ in. by 1½ in. and 2½ in. by 2½ in. (Becol, Resiston).

Two scratch-filter chokes (Wearite).

Two .005 microfarad fixed condensers (Lissen, T.C.C., Dubilier).

One 1-megohm potentiometer (Igranic, Rotor Electric).

Four insulated plugs and sockets marked "pick-up" and + and — (Belling-Lee).

The connections are shown by the circuit diagram on this page. It will be noticed that the filter incorporates two special centre-tapped iron-core filter chokes, the centre tappings of which are connected through two .005-microfarad fixed condensers to the other side of the circuit. These two chokes are connected with the windings in series. The pick-up is connected directly to one end of the whole circuit and the winding of a 1-megohm volume control is connected across the other end. One end of the volume-control winding and the slider constitute the output to the amplifier.

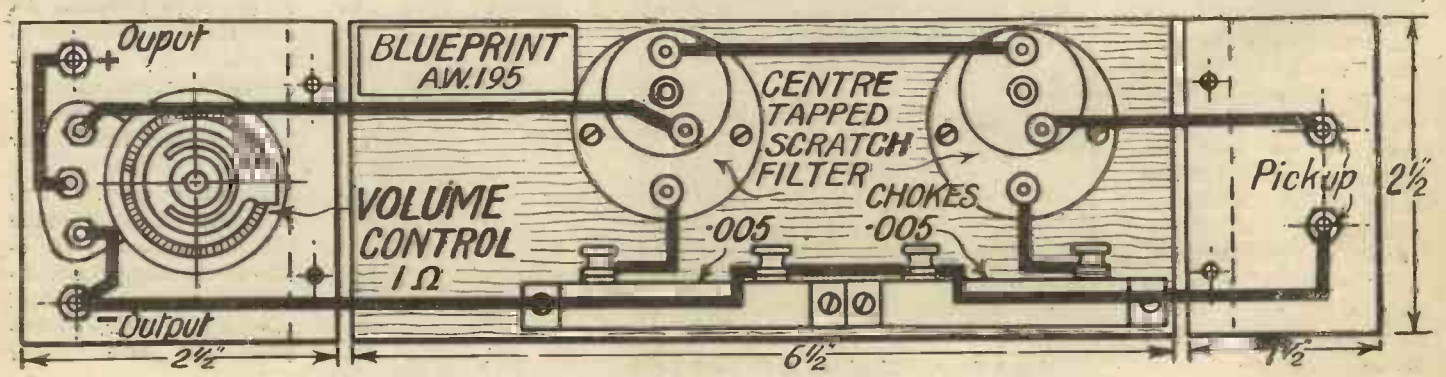
It is possible to make up the filter in almost any form. Indeed, it can, if desired, be built in with the amplifier if space permits.

However, the design shown herewith is very compact and the unit can generally be accommodated by the side of the gramophone turntable. It should of course always be remembered that the pick-up leads must be kept reasonably short.

The components on the "baseboard" of the little unit are arranged so that the wiring is very straightforward. Indeed, the parts are arranged almost exactly as in the circuit diagram.

The .005-microfarad fixed condensers are arranged end-on, the two chokes being placed opposite them. Insulated plugs and sockets are used to make a neat job of connecting up the pick-up to the filter and the filter to the amplifier. It should be noted that the output socket marked positive is connected to the grid side of the amplifier if a direct connection is made.

When using the filter in conjunction with a pick-up it will be found that a great deal of the degree of scratch elimination depends on the needles used and, obviously, on the surface condition of the records played. The values and chokes and condensers included in this unit will be found to give a suitable cut-off value for the elimination of surface noises without cutting out the higher notes to a too noticeable extent.



This is the lay-out and wiring diagram A full-size blueprint is available, price 6d

Is the Pentode Worth While?

There are many reasons why the pentode is not popular, and some of these are due to misconceptions. Read what "Thermion" has to say on the subject.

FOR more than a year now I have been experimenting with the pentode valve in a large variety of circuits and of receiving sets. Previously I used to have quite a number of note-magnifiers, for I always build the note-magnifier as a separate unit, and not as part and parcel of any receiving set. There was one with low-impedance valves in parallel, especially designed for quality reception of the local and high-power stations. Another, with two low-frequency valves in series, was so arranged that the overall magnification could be varied from about 20 to over 500. This had a low-impedance output valve and was intended for loud-speaker reception of distant stations. The third was designed purely for telephone use, and was generally employed in conjunction with the short-wave set or that made particularly for bringing in medium-wave stations at long range. Nowadays I have only one note-magnifier in general use with a single pentode stage.

Apparent Disadvantages

Popular as the pentode is, it is not perhaps nearly so widely used as it deserves to be. There are many reasons which have made amateurs fight rather shy of the pentode. To begin with, there is the question of its initial cost, which is greater than that of the ordinary low-impedance valve. Secondly, there is a belief that it must necessarily use a great deal of plate current, which means, of course, that it is hard upon high-tension batteries, unless one has apparatus for running direct off the mains or facilities for home charging of accumulator H.T. batteries. Thirdly, in its early days, when manufacturing difficulties had not been completely overcome, this type of valve was certainly a component which required rather delicate handling, for an internal short-circuit could easily result from a very slight amount of unintentional ill usage. Fourthly, many of those who tried out the pentode did not realise that a loud-speaker, unless specially wound for the purpose, could not be wired directly into the plate circuit; they therefore complained that the quality and the amplification were not nearly so good as they had been led to believe.

Recent Improvements

Every single one of these apparent disadvantages has ceased to exist to-day if the valve is properly used. Let us take them in the order in which they have been mentioned. The price of the pentode is admittedly greater than that of a power valve; but do not forget that it is considerably less than the price of a "first-stage" L.F. valve *plus* that of a power valve—the combination needed to supply the same magnification. Further, if two stages are used in the note-magnifier two sets of intervalve couplings are required. With the pentode only one is needed, and the saving here alone more than offsets the additional cost of the five-electrode valve.

With two note-magnifying stages, again, it is essential for quality to adopt elaborate anti-motor-boating or decoupling devices; quite simple arrangements suffice to stabilise pentode circuits—another saving of expense. There is also far less labour when one is constructing a set, since the number of connections required for a single pentode stage is much smaller than when two valves in series are used.

Curiously enough, the makers' figures for control grid, priming grid, and plate voltages are not always those which make for the most economical working as regards high-tension current consumption. There are three ways in which H.T. current can be reduced. The first, which is thoroughly bad, is to starve the pentode by applying only 100 volts or so. The other two are both excellent in practice. Give the pentode its full plate voltage of 150, but do not accept the control grid or priming grid voltage figures until you have done a little experimenting.

If, as is very frequently done, you connect the priming grid straight to the H.T. busbar, from which plate supplies are taken, you are actually applying a higher voltage to the priming grid than to the plate. But, surely, the reader says, since both are connected to the same tapping of the H.T. battery the two voltages must be the same. Not a bit of it. In the plate circuit there is a resistance in the form of the filter-circuit choke, output transformer, or loud-speaker windings, and across any resistance there must be a D.C. voltage drop. There is no such resistance in the priming grid circuit. Therefore the priming grid voltage is higher than that of the plate. Now, experiment will show that a

Aix-la-Chapelle (Aachen), as the photograph shows, is one of the most picturesque broadcasting stations

(*Continued on page* 164)

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THE "biggest wash-out ever" in debates was the amazing turn between one Beverley Nichols and Compton Mackenzie.

I used to say that some of the young men at Savoy Hill didn't take their job seriously and that—because so very

Miss Gladdy Sewell as Lissenden sees her

modern—they imagined the thing to be a great lark.

I am told that this note of criticism was taken to heart, and, to be candid, a more businesslike note has been apparent of late. This debate, however, smacked of the old order of things. In fact, the debate was about everything else but the subject announced. Now and again one obtained a glimmer of more sober things from Mr. Mackenzie but the whole attempt was in deplorable taste, and I hope somebody was asked for an explanation.

◆ ◆ ◆

Since writing the above I hear from a good source that during the discussion Savoy Hill was inundated with phone calls imploring that the debate be brought to an end. And no wonder! In order to get away from the usual rehearsed debate, I understand that the whole thing was unrehearsed. It sounded like it!

◆ ◆ ◆

The ending of Mabel's revue was better than the beginning. Stanford Robinson's music was bright, but rather all of the same *tempo*, and this quick-time music makes it almost impossible to hear what the words are about. As a matter of fact, with the exception of one song, sung by a man about a woman, I could hardly understand a word.

◆ ◆ ◆

The two Olives—Olive Groves and Olive Sturgess—both sing delightfully. The latter, singing the old-time "Il Bacio," made it sound refreshingly sweet.

◆ ◆ ◆

I have not heard many of the series, but Mr Gerald Barry's Week in London is good stuff, particularly for those of a serious turn of mind. For instance, the analysis of the Lord Mayor's Fund figures gave us furiously to think.

◆ ◆ ◆

The news business remains unsatisfactory. First of all, the majority of listeners buy a newspaper. Then, for some reason or other, the names of casualties are read over twice. Why, heaven knows. It is depressing enough to hear it the first time

◆ ◆ ◆

Wales continues to go on strong with her singing and music. So long as we are spared purely Welsh programmes, let us have these Welsh efforts, by all means.

◆ ◆ ◆

The Four New Yorkers are certainly among the best of their class. Their harmony is worth listening to, and some of the songs are even catchy.

◆ ◆ ◆

The other evening I had an illuminating insight into the other side of announcing, which showed clearly that there is, after all, something intensely human behind the announcer's formal and stereotyped "Good night."

It was 5GB, I believe, and the announcer had just told us that the studio concert was over and we should be going over to some hotel or other for dance music. The usual double "Good night!" was said and the strains of the dance band became audible. The man at the controls, however, must have been a few seconds late in fading-out the studio, as I heard the announcer say to some unknown person in a weary voice: "Oh, I *am* tired!" I wonder if any other listeners noticed it?

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Considering Marie Burke's beautiful voice and expressive powers, I wonder she does not sing better songs when broadcasting. "Can't help lovin' dat man" was, of course, understood not only because of its *Show Boat* origin, but because it is out of the rut. But to hear Marie Burke wasting her talents on that inanity, "In the Heart of the Sunset," was as gall and wormwood to me.

◆ ◆ ◆

Sutherland Felce—raconteur—is another of those artistes who dig up a lot of ancient jokes and hope to get away with them. I've a good mind to start a Society for the Prevention of the Exhumation of Buried

Ronald Frankau—an impression

Chestnuts. Then the poor over-worked gags might get a well-earned rest.

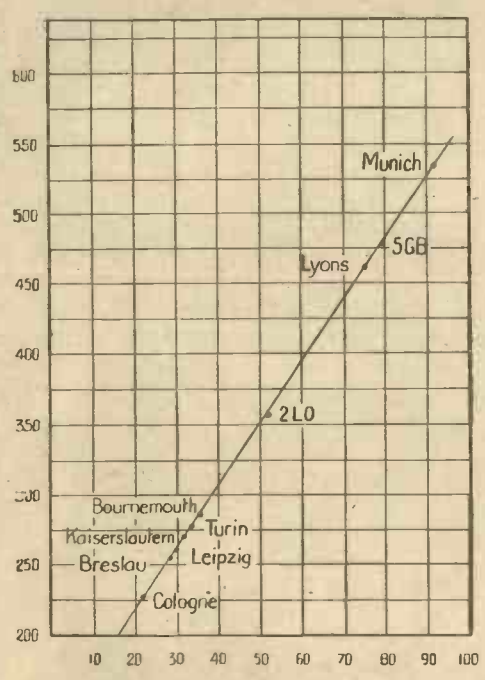
◆ ◆ ◆

Reg Palmer overdoes the stammering stunt. We have enough of it from Clapham and Dwyer.

A POINT was made at the end of the constructional particulars given last week on the "Talisman 2" that all the wiring should be carefully checked before the set is first operated. This is really important with any receiver, and it is an economy taking only a few minutes and perhaps saving valves and batteries should a faulty connection have been made.

Checking the Wiring

It was explained that the best way to check is to use the blueprint as a guide. Take each wire in turn (the numbering of the wires on the print is a great help in this respect) and, having ascertained that it is in its correct position, mark it off as "O.K." This ensures that the whole of the wiring is dealt with. It is so easy, otherwise, to miss a wire—and it is generally the wire which is missed, because it is not connected in its right place, that causes damage.



Tuning graph for medium waves

And now, when the construction of the set is safely completed, attention may be turned to the types of batteries and valves to employ.

It may be said at once that a three-valver, having a margin usually in hand for ordinary working, can tolerate a certain amount of inefficiency in the components included in it. If the valves are beginning to lose their emission, or the H.T. battery is not quite up to the mark, then the falling off in results may not be quite obvious at first. There is something in hand.

But with a two-valver there is found not to be such a great reserve, and it must be impressed upon constructors of the "Talisman" that to justify our slogan, "One of the Best 'Twos' Yet," the very best accessories must be employed.

The Accessories

Valves and batteries should match, for large power valves necessitate large-capacity high-tension batteries; and in any case an ample supply of H.T. is a benefit. There is, however, the comforting thought that the owner of a two-valver does not, of necessity, need to have an H.T. battery of so large a capacity as is needed for a three- or four-valver. And, if high-tension is to be derived from a mains eliminator, then a big saving will be effected.

The price of an eliminator capable of supplying H.T. for a three-valver is bound to be more than that for a two-valver. The H.T. consumption of the "Talisman" will be less than that of a normal three-valver by the amount of the H.T. current taken by the additional valve.

This may sound obvious, but two things must be remembered. First, the extra valve is most likely to be an L.F. valve, which will take anything in the nature of two or three milliamps. Second, the power valve used with a three-valver has often to be of the "super-super" variety in order to deal adequately with the final grid swing, and these big fellows, though giving the results required, are wasteful of H.T.

Choosing Impedances

So far as valves for the "Talisman" are concerned, the detector should be of the general purpose or medium-impedance H.F type, and the power valve need not have a lower impedance than 5,000 ohms or so This means that the total H.T. consumption will be under 10 milliamps if the G.B. is properly adjusted—a figure which is well within the capabilities of most medium-capacity H.T. batteries. A voltage of at least 120 is required for good working, and H.T. up to 150 or so can be used on the power valve anode with advantage. The detector should not be given more than about 60 to 80 volts.

There is space in the set for a grid-bias battery of the normal 9-volt size, and probably not the whole potential will be required if the H.T. is not more than 120 volts.

The G.B. tapping should be varied, of course, in accordance with the valve manufacturer's rating.

HOW TO WO

Tuning

It will now be assumed that the set is connected up and is ready for working.

The coil switch is "out for short and in for long waves." A trial should be made on the short waves first of all. Switch the set on, put the aerial tuning condenser to zero (with the plates "out" and away from each other) and screw right in the knob of the small pre-set condenser on the baseboard.

Then test reaction, and afterwards tune in the local station.

Adjust the H.T. and grid-bias values until the

SMAN 2

RK THE SET

degree of purity is satisfactory. Tune in 5GB or another medium-wave local station, and when, after a little practice, one becomes accustomed to the "feel" of the set, advantage may be taken of the pre-set condenser for getting selectivity in picking foreigners free from local-station interference. It is quite probable that the H.T. on the detector valve (tapping H.T.+1) will need to be altered for the purpose of obtaining the greatest selectivity for DX working.

The graphs on this page will be found a useful aid when tuning, for they show the dial readings corresponding to a number of easily receivable stations.

est 'Twos' Yet

When the "Talisman 2" had been given its preliminary test in the AMATEUR WIRELESS laboratories at Fetter Lane, it was decided to give it a final try-out in more favourable conditions, the metal work in the construction of the AMATEUR WIRELESS building being not very kind to reception. A test was made at a point in the south-west of London, approximately six miles from the 2LO aerial in Oxford Street.

An attempt was made, first of all, to receive London, and the utmost satisfaction resulted. On a first trial no instability or motor-boating was experienced, but it is probable that if the battery values are not correct, and the conditions are otherwise abnormal, then either H.F. or L.F. trouble may be experienced.

This will manifest itself, in the first case, as ploppy reaction or reaction overlap (that is, reaction does not stop and start at the same point on the reaction control): in the second case, motor-boating or howling, not usually varying with the tuning controls, may be the trouble. There is so little in the set that can go wrong—apart perhaps from the presence of a faulty component—that battery values are the only points which can be adjusted.

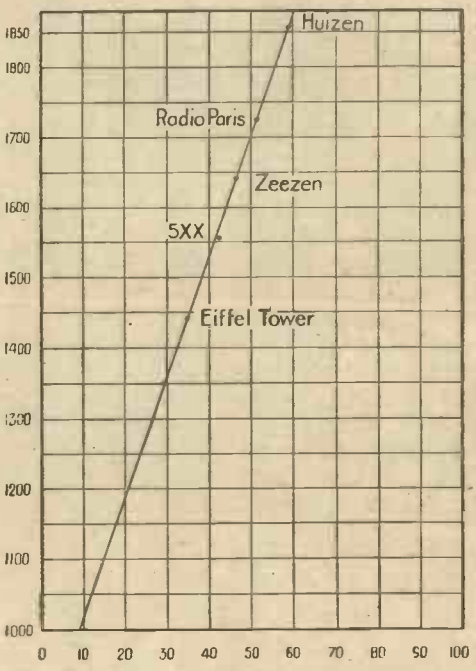
Reaction is very smooth over the entire wave-range of the coil, due to its efficient design, in fact, on the lower wave-range reaction is apt to be excessive if the voltage on the anode and detector is high The cure for this is obvious, but it must be emphasised that if the receiver is to be used for the reception of foreign stations, the best use must be made of the H.T. battery tappings or the voltage control of an eliminator. The same critical control of voltages does not apply to the L.F. valve, which, as mentioned, provided it has at least 120 volts, will work efficiently.

The detector anode voltage will need to be adjusted, as has been said, according to whether local or distant station reception is desired, because the characteristics and operating point of a detector are altered mainly and most readily by the H.T. voltage. Variation of the grid-leak value has a similar result, that it will not generally be found necessary to substitute another leak for the 2-megohm leak incorporated in the original design.

Selectivity is a point upon which many readers like to be satisfied before they make up a set and the test of the "Talisman" proves convincingly that it is well above the average of direct-aerial-coupled "twos" in this respect. At this distance from London, six miles, it was found, roughly speaking, possible to cut London out at 10 degrees either way of a maximum point. This, it will be conceded, is good going: in practice this degree of selectivity is entirely satisfactory and allows of the reception of a goodly number of other stations, while the local one is working.

Selectivity

When first tuning in the main and nearest station it will be advisable to screw right in the knob of the pre-set condenser; this gives the least degree of selectivity and, of course, the greatest coupling for the aerial coupling is tightest. Then, if it is desired to increase the selectivity for the reception of stations other than the nearest, the knob of the pre-set condenser should be slackened off. It will not be found necessary to turn it back by more than about two or three turns.



Tuning graph for long waves

At this setting, a very satisfactory degree of selectivity is obtained, and if the knob is turned back a further few turns the selectivity will be so great that it will be such as to cause the more distant stations to be missed as the dials are "twiddled."

It should be noted that terminal A on the "Talisman" coil is connected to one filament socket of the detector valve and to one side of the reaction condenser; and not as stated last week to the grid socket.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

Reliance H.T. Battery

THE life of a high-tension battery depends on so many factors that, in making a test on any particular make, it is hardly possible to obtain all the information required to give a true indication of the actual merit of the battery. We have generally found, however, that the electrical efficiency of the cells can be fairly judged by a continuous discharge test, subjecting them to a severer strain than would be enforced under normal working conditions.

This week we are reporting on a Reliance high-tension battery marketed by Messrs. Emaree Ltd., 24 High Street, S.W.4.

The actual unit tested has an overall voltage of 66 and is tapped at every 6 volts, the values at each tapping point being engraved on the black sealing compound. The standard size cells are housed in a cardboard container having overall dimensions of 9 in. by 3½ in. by 3 in. high. The test imposed occupied a time of approximately 200 hours during which the battery was subjected to a continuous discharge varying from 7 milliamps to 3½ milliamps. At the end of the period the voltage had fallen from 66 to 33, but the discharge from the battery exceeded 1,000 milliampere hours, showing that the cells will provide under such conditions, their full rated capacity. The battery may therefore be recommended for general use.

S.R.S. Ultra-short-wave Coils

A NUMBER of receivers fitted with plug-in coil holders may be used for the reception of short-wavelength signals provided suitable plug-in coils are used. A typical receiver is the Cossor Melody Maker which, although it was originally designed for the medium and long wavelength bands, is suitable for the reception of short wavelength signals when the correct coils are fitted.

A sample pair of typical coils has been received from the Stonehouse Radio Supplies, of 54 Union Street, Plymouth, Devon. The coils comprise a ribbed ebonite former wound with tinned copper wire suitably connected to the pins for this receiver. A flexible connection having a clip is also provided on each coil in order that the wavelength of the circuits may be readily adjusted.

An S.R.S. short-wave coil

The coils submitted cover the whole short waveband. They are nicely made, and functioned very well when tried in a standard Cossor Melody Maker. The first valve in this receiver is, of course, of the shielded type and there is no doubt that a certain amount of high frequency amplification is obtained even on the shorter wavelengths.

To Increase Selectivity

THE frequent changes in the wavelengths of our broadcasting stations and the promised advent of the regional scheme have made many listeners, who rely on receiving alternative programmes, doubtful as to the ability of their sets to cut out the stronger and receive the weaker stations without interference. With a suitable number of tuned circuits and special methods of coupling, it is possible to obtain the required selectivity without distortion, but the listener who has an unselective receiver does not always wish to add additional tuning stages.

The use of a wavetrap as a practical means of increasing selectivity can be recommended particularly in cases where the owners of sets do not feel disposed to make any alteration to their tuning systems. Such a device may be connected in the aerial lead or placed across the aerial and earth terminals.

A neat wavetrap termed a "selectivity unit" is marketed by Ready Radio, Ltd., of 159 Borough High Street, S.E. It comprises essentially a form of absorption circuit and when connected in parallel with the aerial and earth circuits absorbs at the particular frequency to which it is tuned. The terminals are mounted on a small insulated panel measuring 4½ in. by 3 in. by 1¾ in. The control moving over an engraved scale tunes the circuit to wavelengths extending from below 200 metres up to approximately 500 metres. The second control serves to disconnect the device from the set or earth the aerial.

On actual trial we found that the device behaved in a satisfactory manner. It was possible at a distance of approximately twelve miles from 2LO to cut out this station sufficiently to receive distant stations on near-by wavelengths. The tuning of the absorption circuit appeared to be fairly sharp, providing an effective cut-out of the local station without seriously decreasing the volume of stations on slightly different wavelengths.

This instrument should prove of use to readers.

THE MULTIVIBRATOR

IN ordinary practice, a thermionic oscillator is adjusted to produce waves of one definite frequency. Under certain conditions, however, it is useful to be able to generate an output which is rich in harmonics, i.e., which contains a great number of different frequencies. The multivibrator is an instance in point.

It consists of two valves coupled together in rather an unusual way. The plate of one valve is connected through a resistance and variable condenser to the grid of the other. At the same time, the plate of the second is similarly "cross-coupled" to the grid of the first. By adjusting the values of the coupling condensers, the fundamental frequency of the output can be controlled in definite harmonic steps, although there is no inductance present in the external circuits, only resistance and capacity. In practice the multivibrator is used to produce a low fundamental frequency which is then stepped up or used as a master control for broadcast transmission.

M. B.

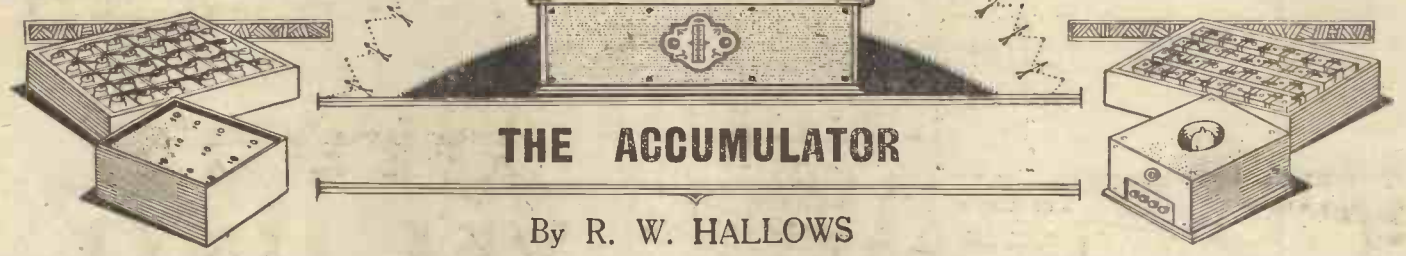
TWO-INCH WAVES!

A JAPANESE scientist has recently succeeded in generating wireless waves approximately two inches long. It is not possible to use ordinary methods of back-coupling to produce ultra-short wave energy of this order, because the actual time taken by the electrons to pass from the filament to plate inside the tube is too great.

In order to get waves shorter than one metre the Barkhausen-Kurz method is adopted. Here the grid is given a high positive potential and the plate is kept negative. Owing to the resultant distribution of electric force inside the valve, the electron stream from the filament first shoots past the positive grid and is then immediately repelled backwards by the negative plate. A violent to-and-fro motion of the electrons is thus maintained about the grid, the energy of which is drawn off by Lecher wires in the form of very short waves.

B. A. R.

SOURCES OF H.T. SUPPLY



THE ACCUMULATOR

By R. W. HALLOWS

IT must be admitted that I was somewhat prejudiced against the high-tension accumulator as the result of rather unsatisfactory experiences with it in the early days of wireless. The first H.T. secondary batteries left a good deal to be desired in many ways. Many of them failed to hold their charge satisfactorily, whilst others developed bent plates or the plates shed their paste without any apparent provocation. It was a difficult matter to get them charged properly, as often as not a minute charging rate was specified by the makers and this was in many cases vastly exceeded by miscreants who undertook the job of giving the battery a refill.

Large H.T. Currents

I had therefore no very great expectations when I came recently to make a series of rather exacting tests upon up-to-date secondary high-tension batteries. The particular make put through its paces for the purpose of these tests was the Oldham and there are, no doubt, several other batteries of first-rate make which would give equally good results.

So long as the total high-tension current drain does not exceed from 10 to 15 milliamperes the dry-cell battery, if of good quality and ample capacity, will do all that is needed quite economically. In modern sets, however, much bigger outputs than this are frequently called for and after tests which have covered more than five hundred dry and wet Leclanché batteries of all kinds of qualities, makes and capacities I am quite convinced that when 15 milliamperes is exceeded, some other form of high-tension supply is indicated when both first-rate quality and economical running are looked for.

Take, for example, a set consisting of such an excellent combination as a screen-grid H.F. valve, an anode-bend rectifier and either a pentode or a very low impedance valve in the last holder. The current drain here will average from 16 to 20 milliamperes and it may be a good deal more if a very high plate voltage is used for the last valve. Where two low-impedance valves are used in parallel a total load of over 30 milliamperes may be imposed on the source of H.T. supply.

If we attempted to use dry batteries in such circumstances we should find with even those of the largest capacity that there was a heavy fall in E.M.F. between the beginning and end of a four hours' evening run. The pick-up that takes place during a period of rest is succeeded by a very rapid drop in the E.M.F. as soon as a dry battery is placed under heavy load and experiments have shown that a 30-milliampere drain for four hours on the largest capacity batteries may result in a ten per cent. decline in voltage. This, of course, means that "end-of-the-evening," distortion is liable to creep in owing to the shortening of the straight portion of the last valve's characteristic and the fact that the grid bias remains unaltered whilst the plate voltage falls.

Capacity and Output

Now let us see what an accumulator battery will do. That tested had a rated capacity of 5.5 ampere hours. As soon as it had been given its first charge it was placed on closed circuit through a fixed resistance of 100 ohms per cell, giving a nominal discharge rate of 20 milliamperes, though actually it was rather more since the initial terminal voltage was almost 2.2 per cell.

The discharge continued unceasingly night and day until the battery had reached a voltage of 1.85 per cell. This is a pretty exacting trial, for the battery was given no rest and no opportunity of recuperating—even accumulators pick up a little when rested. Under these conditions the life of the battery was 263 hours, which gives an ampere-hour capacity, even at the first charge, that is very near the makers' figures.

On being recharged the battery showed an average E.M.F. of 2.25 per cell. This fell during the first twelve hours to 2.15, at which figure it continued steady for a long time. This time the continuous test at 20 milliamperes showed 282 service hours or slightly more than 5.6 ampere hours.

One distinctly important feature of the tests was the very small fall in the total E.M.F. which took place each day—remember that the load was *continuously* 20 milliamperes, or as much as would be imposed upon the battery by a set with rather heavy current requirements. Consisting as it did of fifty cells the nominal E.M.F. of the battery was 100 volts, though actually the initial terminal voltage was 107.5 for the first test and 112.5 for the second. Leaving out of account the first twelve hours in which the battery settled down to its work after being charged, the fall in voltage never exceeded .7 per cent., or something under 1 volt all told, in any twenty-four hours.

The third test was one which would have broken the heart of most H.T. accumulators a few years ago. It consisted in drawing no less than 50 milliamperes from the battery for four hours on end every day. The initial terminal voltage was again 112.5 and at the end of the first four-hour period it had fallen to 107.5. On the following day it was found that the battery had not picked up but began as it had left off at 107.5 and finished four hours later at 106.25. This performance was exactly repeated on the third day. From that point onwards the falls were quite small, the total daily drop averaging about .5 volt. The service life of the battery under these very strenuous conditions was found to be 5.1 ampere hours, an astonishingly high figure.

(*Continued on page 156*)

A scene in Richmond Park, London: P.O. Engineers making short-wave experiments

RADIOGRAMS

DURING August, including the opening night on August 10, promenade concerts will be relayed from Queen's Hall to 2LO and 5XX on August 13, 15, 16, 19, 22, 23, 28, and 31, and from 5GB they will be broadcast on August 12, 14, 17, 20, 21, 24, 26, 27, and 30.

Holt Marvell, well known to listeners as the author of several broadcast plays, has written a satirical revue with sketches burlesquing some social absurdities of the times; it will be produced on August 10 and transmitted through 2LO and 5XX.

Listeners to many of the B.B.C. stations are again to hear a concert from the Kursaal, Ostend, on August 21 and 25, when a portion of the programme from this famous Continental resort will be relayed from 9.5 to 10.30 p.m.

The last of the season's military tattoos —namely, one to be performed at Dreghorn Castle, Edinburgh—will be relayed to 2LO and 5XX on September 4.

As customary during the holiday season, the B.B.C. has made arrangements to give listeners some of the entertainments nightly performed at seaside resorts; the first will be the Gaieties Concert Party from the Princes Hall Aquarium, Brighton, on August 15.

An amalgamation having been made of the two competing broadcasting companies at Barcelona, since August 4, EAJ1 and EAJ13 have been transmitting on alternate days.

It is stated in France that the Bordeaux-Lafayette P.T.T. broadcasting station is to be reconstructed and that from next October it will work with a power of some 4 kilowatts in the aerial.

The station testing on 339 metres with the call "Station Experimentale 21401" is the high-power transmitter to be brought into operation by Radio Belgique towards the end of this year.

When, on August 22, the Belfast studio offers its listeners a performance of the opera *Faust* the title part will be taken by Parry Jones and that of Mephistopheles by Joseph Farrington. Marguerite will be sung by May Blyth, the wife of the well-known conductor, Aylmer Buesst. Edith Cruickshank (contralto) is also in the star cast.

According to the last statistics, Turkey now possesses 58,000 registered listeners.

During the month of August special night concerts from 12.30 to 1.30 a.m. will be given by German stations on the following dates: Langenberg, 9; Munich, 14; Breslau, 17; Konigsberg, 21; Frankfurt, 26; Stuttgart, 29; and Leipzig, 31.

In addition to the long-wave transmitters already in operation, two new short-wave wireless-telegraphy stations are stated to be under construction at Bamako (French W. Africa) and Brazzaville (French Equatorial Africa). Both will work on C.W., the former on 14.7, 19.5, 30.7, and 70.9 metres with the call sign FZH, and the latter, using the call sign FZI, on 16.2, 25, 29.8, and 72.9 metres. A "spacing wave" will be employed in each instance.

A new microphone of the condenser type adopted by the National Broadcasting Company in America is so sensitive that it will pick up the sound of a pin dropping 70 feet away.

Seven television stations in the U.S.A. are broadcasting on a regular schedule, according to a survey made recently in America. Eight other stations are operating on an irregular experimental schedule or are under construction.

A radio-telephone service between Germany and Siam was inaugurated on April 26. The service is conducted from the Nauen wireless station on a wavelength of 16.9 metres; the distance is about 5,300 miles.

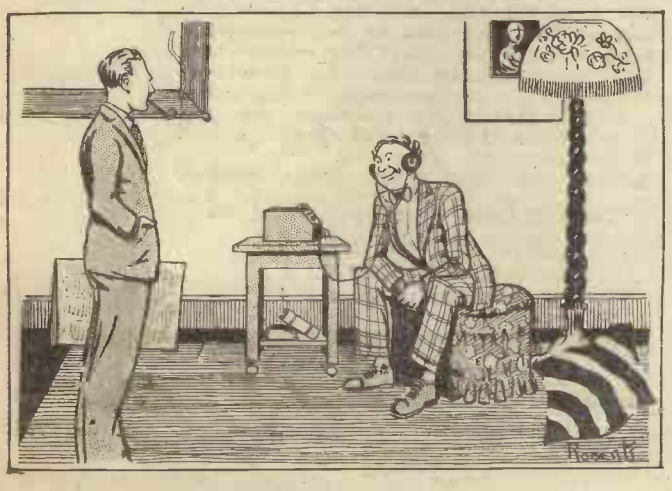
From August 4 Berlin listeners have been nightly given alternative broadcast programmes from Witzleben and from the Kœnigswusterhausen high-power transmitter, the latter station, according to a rota, relaying an entertainment from every German main station in turn.

Radio fans in Japan do not enjoy so complete a liberty as that granted to their colleagues in Europe, for before building a receiver a special permit must be obtained from the authorities and no alteration later may be made to the set without further permission.

Radio-Wallonie, a small private station at Liége, after a series of interruptions has now resumed its bi-weekly broadcasts on 280 metres. Concerts are transmitted on Sundays, Tuesdays and Thursdays from 9.10 to 11.40 p.m. B.S.T.

The new 10-kilowatt Moravska-Ostrava (Czecho-Slovakia) station now regularly works throughout the day, taking most of its entertainments from either Brunn (Brno) or Prague (Praha). The call is *Radio Ostrava*.

The Swiss Telegraph Authorities in co-operation with the *Société Romande de Radiophonie* have selected the village of Sottens as the site of the projected high-power broadcasting station destined to serve the French-speaking districts of Switzerland. As work on this transmitter is to be started in the early autumn it is hoped to bring it into operation by the summer of 1930. The existing studios at Lausanne and Geneva will be retained.



"Receivin' somethin' humorous, Andrew?"
"Aye, Donald. T' church service; an' they have just annoonced t' collection."

"SOURCES OF H.T. SUPPLY"

(*Continued from page* 154)

In choosing a secondary high-tension battery, remember that quality tells. The essential points are good solid plates and first-rate insulation at the tops of the cells. Weak plates spell short life, whilst bad insulation means poor service owing to the continual tiny leakages that take place across it. It is a sound idea to have an air spacing between individual cells.

Not the least of the advantages of the accumulator is the extraordinary steadiness of the current which it delivers. In a good one there are none of those tiny fluctuations which cause "battery-spherics" from the dry battery when it is nearing the end of its days. Last, but by no means least important, the internal resistance of the accumulator battery is exceedingly low and does not increase very much during discharge. Its use, therefore, minimises back-coupling effects, though these may be brought out by a dry-cell battery with a high internal resistance.

The Sunday Alternatives

Jottings From My Log

By JAY COOTE

A FEW days ago I was able to demonstrate to a neighbour of mine the advantages of a wireless receiver capable of picking up Continental transmissions. It was purely a question of the Sunday programmes; my friend desired a lighter and pleasanter diet and wished to know where alternatives could be found.

Wet Weather!

As it happened, on a recent Sunday wet weather cancelled many outings, and after a spell of idleness due to a long series of fine days many radio sets were called upon to provide entertainment. What did the B.B.C. stations offer? My neighbour showed me the programmes; the outstanding fact was that from 5.30 to 8 p.m. 5GB was doing—nothing. At 3.30 p.m. we tuned in to Hilversum, from which an excellent orchestral programme was being broadcast; 2LO contented itself with a quintet and two vocalists; 5GB, on the other hand, was indulging in a poetry reading.

From 4 to 5.30 p.m. the lesser Daventry gave a Wagner concert, and as an alternative we travelled to Berlin via Kœnigswusterhausen for a relay of a performance —some sixty musicians—given at Luna Park, the Earls Court of the German metropolis. For some time we held this transmission; then, desiring a change, tuned in to Langenberg and immediately afterwards to Cologne for a light and popular orchestral concert broadcast from the Elberfeld Zoological Gardens.

Highbrow London

Casually returning to London we found a pianoforte recital—too highbrow for my neighbour—so we passed the time between Berlin and the Rhineland. Half an hour later, whilst 2LO revelled in a Parliamentary speech dating back to 1898, we visited Hilversum, which on this date supplied a special entertainment for British listeners. It was sponsored by a commercial concern, it is true, but it was a "worthwhile" transmission. The average "smallholder" in wireless sets was compelled to fall back on a Bach cantata, at the conclusion of which, towards 6.30 p.m., the Savoy studios rested until 8 p.m.

From just before that hour the Continent offered a number of good programmes, many of them well within the grasp of a modest three-valver. From Huizen, at 7.50 p.m., we were able to hear a concert which included an English vocalist; from Hilversum a relay of an orchestral performance at the Scheveningen Kurhaus. Berlin again at 8 p.m. provided somewhat more serious items played by a full symphony orchestra in its studio; Langenberg gave us Verdi's opera *Don Juan*, and both Milan and Turin—easy stations to receive—another brilliant work by the same composer.

England Again

Meanwhile, both London and 5GB had come on the air with their entertainments, timed to while away some eighty minutes.

At 10 p.m. my neighbour and I found at Copenhagen (via Kalundborg) a medley of favourite light operettas, and these, with dips into a number of dance-music transmissions from many sources, carried us on until he left me at 11.30 p.m. From roughly 10.45 p.m. not a whisper could be heard from our home transmitters.

On Sundays there are many gaps in the British programmes which can be pleasantly filled by visits abroad, and there is no lack of alternative radio entertainments.

The Swiss Post and Telegraph Authorities have been granted the sum of 1,700,000 francs (roughly £68,000) for the reorganisation of the broadcasting system in that country. Some 760,000 francs will be expended on the construction of a main transmitter destined to feed the German-speaking districts, another sum of 58,000 francs for the erection of a station in French Switzerland and the balance of the money is to be utilised in installing a number of smaller regional relays. Work is to be started without delay and it is hoped to complete the new system within the next two years.

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.2
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	17.0
*1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	5.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
230	1,300	Charleroy (LL)	0.25
236	1,218	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,071	Liége	0.5
*509	590	Brussels	1.0
CZECHO-SLOVAKIA			
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava (Feriby)	12.5
*293	1,028	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	1.0
1,153	260	Kalundborg	7.5
ESTHONIA			
*247	1,010	Reval (Tallinn)	1.3
FINLAND			
*221	1,355	Helsingfors	0.8
*1,796	167	Lahti	4.0
FRANCE			
170	1,750	St. Quentin	0.25
220	1,364	Béziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
*255	1,175	Juan-les-Pins	0.4
*255	1,175	Toulouse (PTT)	1.0
*265	1,130	Lille (PTT)	0.8
*272	1,103	Rennes (PTT)	1.0
292	1,028	Radio Lyons	1.5
*294	1,020	Limoges (PTT)	0.5
*304	980	Bordeaux-Lafayette (PTT)	0.5
305	982	Agen	0.3
*316	950	Marseilles (PTT)	0.5
326	918.9	Grenoble (PTT)	1.5
*329	914	Montpellier (PTT)	1.5
336	802	Petit Parisien	0.5
346	869	Strasbourg	0.3
*353	849	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	9.0
411	7.9	Radio Maroc Rabat)	2.0
436	687	Radio Flandre (Lille)	0.5
*445	674	Paris (Ecole Sup. PTT)	0.7
*466	644	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
*1,460	205.4	Eiffel Tower	8.0
*1,725	174	Radio Paris	8.0
GERMANY			
*218	1,373	Flensburg	1.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	4.0
*239	1,256	Nurnberg	4.0
*246	1,220	Kiel	0.7
*246	1,220	Cassel	0.7
*253	1,184	Breslau	4.0
*259	1,157	Leipzig	4.0
*270	1,112	Kaiserslautern	1.5
*276	1,085	Koenigsberg	4.0
*283	1,058	Magdeburg	0.7
*283	1,058	Berlin (E.)	0.7
*283	1,058	Stettin	0.7
*319	941	Dresden	0.75
*325	923	Gleiwitz	6.0
*339	887	Bremen	0.75
*360	833	Stuttgart	4.0
*372	806	Hamburg	4.0
*390	770	Frankfurt	4.0
*418	716	Berlin	4.0
*453	662	Danzig	0.75
*453	666	Aachen	0.75
*473	635	Langenberg	25.0
*533	563	Munich	4.0
*560	536	Augsburg	0.5
*560	536	Hanover	0.7
*569.2	527	Freiburg	0.7
*1,035	283.5	Zeesen	20.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
1.283	234	Luxembourg	2
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
*300	1,000	Huizen via Hilversum aerial (until 5.40 p.m. B.S.T.)	5.0
*1,875	160	Hilversum via Huizen aerial (ANRO)	5.0
*1,070	280	Huizen via Hilversum aerial (after 5.40 p.m. B.S.T.)	5.0
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
HUNGARY			
*550	545	Budapest	15.0
ICELAND			
*1,200	250	Reykjavik	1.0
IRISH FREE STATE			
*225	1,337	Cork (5CK)	1.5
*413	725	Dublin (2RN)	1.5
ITALY			
*274	1,094	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	3.0
*441	680	Rome (Roma)	3.0
453	662	Bolzanc (IBZ)	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
*368	815	Zagreb (Agram)	1.25
*431	694	Belgrade	2.5
*566	530	Ljubljana	3.0
LATVIA			
*525	572	Riga	2.0
LITHUANIA			
*1,935	155	Kovno	7.0
NORWAY			
*283	1,058	Notodden	0.7
*364	824	Bergen	1.0
*394	761	Fredriksstad	1.0
450	666.5	Rjukan	1.0
453	662	Tromsoe	1.0
453	662	Aalesund	1.0
453	662	Porsgrund	1.0
*493	608	Oslo	1.5
POLAND			
*313	959	Cracow	1.5
*335	896	Posen	1.5
385	779	Wilno	1.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	10.0
ROUMANIA			
*394	761	Bucharest	2.0
RUSSIA			
*351	855.5	Leningrad	10.0
*427	702.5	Kharkov (NKO)	5.0
*483	621.5	Homel	2.0
*825	364	Moscow (PTT)	25.5
1,000	283	Tiflis	1.0
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	5.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
*268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	0.5
402	746	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	3.0
453	662	Salamanca (EAJ22)	0.55
SWEDEN			
231	1,301	Malmo	0.5
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.4
*322	932	Goeteborg	6.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	1.0
*770	389	Ostersund	2.0
1,200	250	Boden	2.0
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.6
680	442	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Aug. 11. A Concert from the Kursaal, Ostend.
" 13. Promenade Concert from the Queen's Hall.
" 15. Cabaret from the Riviera Club.
" 16. Promenade Concert from the Queen's Hall.
" 17. A Vaudeville Programme.

DAVENTRY EXPERIMENTAL (5GB)

Aug. 12. Promenade Concert from the Queen's Hall.
" 14. Promenade Concert from the Queen's Hall.
" 17. Promenade Concert from the Queen's Hall.

MANCHESTER

Aug. 11. Special Scouts' Service in connection with the Boy Scouts' Association World Jamboree, 1929, relayed from Liverpool Cathedral.

ABERDEEN

Aug. 17. A Variety Programme.

BELFAST

Aug. 17. Running Commentary on Royal Automobile Club Tourist Trophy Motor Race from Ards Circuit, near Belfast.

An idea of the growth of the radio broadcasting industry in America is shown in the comparison of the number of stations eight years ago with the number to-day. Eight years ago KDKA (Pittsburgh) was the only broadcasting station in the United States. To-day there are about 630.

The makers of Celestion loud-speakers announce substantial price reductions of all the Celestion models. In some cases these are nearly 25 per cent.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Safety Fuses

SIR,—In reviewing some new H.T. fuses of the flashlamp bulb type, Mr. Reyner rightly emphasised the necessity for a bulb of fairly low consumption so that the fuse may blow readily. It is perhaps worth while reminding readers that this precaution should not be carried too far. Many of the low-consumption bulbs on the market take .06 amp. at 6 volts, and thus have a resistance of 100 ohms, which, in a common H.T. lead, is sufficient to cause back-coupling with many sets (not AMATEUR WIRELESS design, of course). Perhaps the best kind of bulb to use is that intended for ordinary 3-volt flashlamps and taking .25 amp. at 2.5 volts (resistance only 10 ohms).

P. R. L. (London, W.).

Trouble Tracking

SIR,—Having read "Thermion's" reminiscences of trouble tracking in a recent issue of AMATEUR WIRELESS, I enclose details of one or two troubles I have come across, and which may have a general interest.

High-pitched whistle from loud-speaker. This was caused by a stray wire in the flex lead to the loud-speaker, making contact with the metal base of the L.S. The fault was discovered after receiving a shock on touching the L.S.

Distortion and reduction in volume of sound from "Mullard Master 3" (original design). I have come across three instances of this, and in all cases the cause has been the burning out of the anode resistance. This trouble is rather puzzling unless one knows where to look for it.

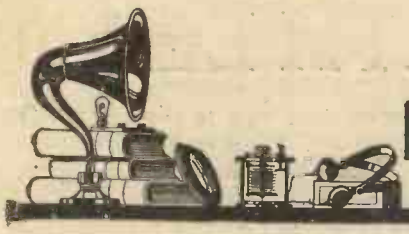
Low-pitched whistle (generally started after the set had been running two or three minutes). Caused by the first L.F. valve making bad contact in its holder.

Whilst writing to you, I would like to mention that in this neighbourhood (near Chingford, Essex) reception from London is sometimes spoilt by what I believe is an amateur telephony transmitter. I have not been able to get his call-sign, but his signals appear to cover a very wide wave band.

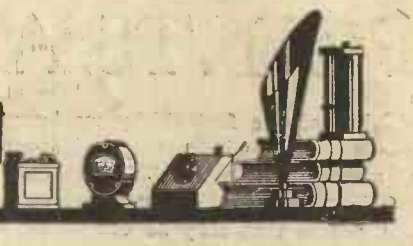
R. E. I. (Highams Park).

The next two important events in the radio industry in America are the Radio World's Fair at New York and Chicago. The former will be held from September 23 to 28 and the latter from October 21 to 27.

Owing to the demands upon our space in this issue it has been necessary to hold over a number of letters.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Choke Output and Milliammeter Position.

Q.—*It has been a practice of mine to use a milliammeter in the anode circuit of the last L.F. valve in all my previous sets, but my latest set has a choke-filter output circuit incorporated. Can you advise me where I shall fit the milliammeter in this? Should it be connected in series with the loud-speaker or in series with the choke?*—*G. H.* (*Purley*).

A.—The meter should be connected in series between the choke in the filter circuit and the positive H.T. terminal supplying anode current to the last valve. In making this addition see that this H.T. tapping does not supply anode current to other valves, because if it does it will be necessary to take care to see that the meter is not connected in circuit with the H.T. supply to the other valves. It must only be in circuit with the H.T. supply to the last amplifying valve.—C. L.

Quality and Power Valves.

Q.—*I am working an amplifier, the output stage of which consists of two super-power valves in parallel. I certainly receive the bass notes, but it seems to me that these predominate and spoil my general reproduction. Can you account for this trouble?*—*J. D.* (*Birmingham*).

A.—It is due to the use of the two super-power valves. The impedance of the last stage is so low that amplification of the very low notes is rather excessive. It would be better to use only a single valve in the last stage or, failing this, two ordinary power valves in parallel.—L. C.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Static and Atmospherics

Q.—*Just lately I have been troubled with cracklings and have been told that this is due to my aerial becoming statically charged with electricity. It has also been pointed out that if I remove the fixed condenser in series with the aerial lead-in wire this crackling will be eliminated. I have tried out this suggestion and the results are the same as before, the crackling still being experienced. Can you advise me how I can overcome the trouble?*—*G. H.* (*Andover*).

A.—The interference experienced is known as atmospheric interference and the removal of the series fixed condenser will not reduce or eliminate it. It is due to the fact that lightning is occurring somewhere within the receiving range of the set. Cutting out the series fixed condenser will not even remedy static interference. Normally this form of disturbance will not damage the receiver or aerial tuning circuit in any way but if the lightning disturbances in the receiver become very violent then it would be very advisable either to switch off the receiver, connecting the aerial to earth, or to place a lightning arrestor across the aerial and earth terminals of the set to reduce the strain on the tuning circuit.—C. L.

POINTS ABOUT THE EARTH LEAD

ONE of the first things we learnt on taking up wireless was the importance of a "short earth lead," and the point is still being stressed. Nevertheless, there are still points that may be overlooked even by old hands.

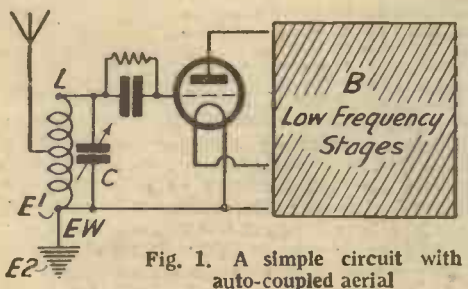


Fig. 1. A simple circuit with auto-coupled aerial

When we are told to keep the resistance of the earth lead low, a better word would be impedance, for the earth lead, like the aerial or any other wire, has inductance. So, the longer the earth lead, the higher the impedance, the impedance being made up of resistance plus inductance.

How will this affect the working of a set?

To some extent this will depend on the circuit, but more on the wavelength of the signals being received.

A long earth tends to produce instability, more particularly on the medium and short waves, and, of course, more instability on a sharply tuned—or undamped—aerial-grid circuit.

We will take a simple circuit as in Fig. 1, where we have an aerial auto-coupled to the grid coil L, tuned by condenser C. B represents the low-frequency side and the batteries. It will be seen that, since the earth wire (EW) is of appropriate length, there will be sufficient inductance between E^1, the earth terminal (and moving plate of condenser C), and the real earth E^2 to place all the "earthed parts" of the set at a higher (H.F.) potential than the real earth. This will be independent of and in addition to the resistance of the earth wire. The higher the frequency, the greater the relative inductance of EW—i.e., the greater its impedance.

There is also one other point. The set itself plus the batteries will have a certain capacity to the earth, which we will show as C2 in Fig. 2, which is Fig. 1 simplified.

You will see that the earth wire EW has been replaced by its equivalent inductance L2 in conventional sign. And C2 is the fixed capacity across this inductance. But this capacity is no longer a fixed quantity if we move about near to any part of the set or batteries. It can easily be seen that this will cause instability, particularly on the short waves.

There is just one other aspect which is easily overlooked—viz., that on the shorter

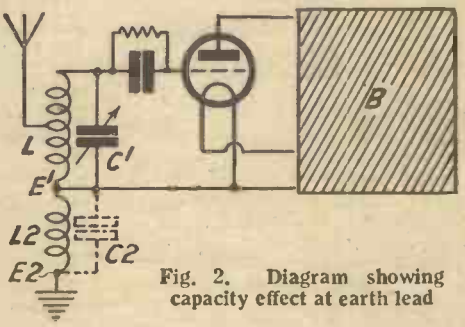


Fig. 2. Diagram showing capacity effect at earth lead

or very short waves the circuit L2 C2 may tune to that particular wavelength, when one of two things would happen :—

(1) It would act as a rejector circuit and the signal would fall off considerably or (2) it might act in conjunction with the reaction circuit to cause the set suddenly to burst into oscillation on one particular waveband.

It can be seen now why a set sometimes,

(*Continued on next page*)

"POINTS ABOUT THE EARTH LEAD"

(Continued from preceding page)

particularly on the short waves, will work better without an earth connection. Without an earth connection we still have the capacity of set to earth which would react to our body capacity, but we have got rid of the inductance L2.

The morals are obvious: (1) Use as short an earth lead as possible; (2) use multi-strand wire or wire of greater superficial area than the aerial wire; (3) where possible, solder the earth wire to water pipe or the buried earth; (4) if the choice is between a short earth wire and an inefficient earth or a long earth wire and an efficient earth, select the latter. At the same time, a temporary or indoor counterpoise earth is worthy of consideration.

A DIRECTION-FINDING FIELD DAY

RECENTLY the Golders Green and Hendon Radio Society and Scientific Society in co-operation with four radio societies carried out a most interesting direction-finding scheme near South Mimms—the last of this year's series.

The club's transmitter was concealed in a barn about 20 yards away from the road, but visible from the path. The station was staffed by four amateur transmitters who worked the key in relays. Nine groups in cars assembled near Watford at 10.30 a.m., after which hour they were allowed to move in any direction. Transmissions began at 11 a.m. on a wavelength of 153 metres.

The first arrivals were a group from the Western District Radio Society, who arrived at 12.55 p.m. The second were from the Golders Green and Hendon Radio Society, who arrived at 2.5 p.m. The third party represented a group from the North Middlesex and Golders Green and Hendon Radio Society, and arrived at 2.15 p.m. The fourth represented a group from the Muswell Hill Radio Society, and arrived at 2.44 p.m. The fifth represented a group from the Western Postal Radio Society, which arrived at 4.4 p.m.

Due to certain conditions of the scheme not having been carried out, and technical faults, the second group to arrive was placed after the third, and the fourth group after the fifth. A special point was made that preference was given for accurate and neat work.

The Spanish National Telephone Company has received official permission to inaugurate a direct wireless telephone service between Spain and the Argentine. The main stations will be at Madrid and Buenos Aires. The company is also permitted to extend wireless telephone services to other American and European countries.

"IS THE PENTODE WORTH WHILE?"

(*Continued from page* 148)

very much lower priming grid voltage can be used without in any way impairing the valve's performances. By reducing this voltage we can cut down H.T. to a surprisingly great extent.

Considerably more grid bias than the makers recommend can also be used with beneficial results. The surest way of determining the amount of grid bias which combines economy with pure reproduction is to connect a milliammeter into the plate circuit of the valve and to tune in the local station to the strength required for ordinary reception. The ideal grid bias is that which enables the milliammeter to remain absolutely steady. Generally it will be found that this can be accomplished by something considerably greater than the conventional 9 volts negative.

Early Troubles

In their early days one had a certain amount of trouble with pentodes, since a satisfactory method of supporting the numerous bits and pieces within the bulb had not been evolved. This problem seems now to have been happily solved, and the pentode, if one handles it carefully, appears to be as robust as any other valve in the set. Still, I would strongly advise the reader before he places a new pentode valve in its holder to test it out thoroughly in order to make sure that no internal short exists—and remember that there are many places where it can happen. The possibilities are: (1) Filament touching control grid, (2) control grid touching priming grid, (3) priming grid touching third grid, (4) third grid touching plate. It is easy to ascertain that none of these undesirable contacts exists with the help of a voltmeter and a flash-lamp battery.

To obtain the full magnification and the quality of which the pentode is capable it is essential to use with a cone or horn-type loud-speaker an output transformer of which the primary is designed to match the impedance of the valve. The secondary also must suit the loud-speaker with which it is employed. Since good transformers are now available, the pentode can do itself ample justice with loud-speakers of these kinds. Where the moving-coil loud-speaker is used it must be specially wound for the pentode.

Ample Volume

The pentode, to my mind, has solved one of the most difficult problems in wireless. Prior to its coming it was always a hard business to obtain ample volume with first-rate quality. Two stages of low-frequency magnification were needed, and with such an arrangement there is always the danger of introducing distortion of various kinds. For the quality set, the long-distance set, or the short-waver the pentode is ideal. The volume control can be used to tone down powerful transmissions, whilst those which require big magnification can be brought up to ample strength with surprising purity and a welcome absence of background noises.

At Rotterdam, on the Koningshaven Bridge spanning one arm of the Meuse River and connecting Noordereiland to Feyenoord, loud-speakers have been installed to give public warnings when the bridge is to be opened for the passage of ships. The cabins at both ends occupied by the engineers are equipped with microphones and amplifiers and connected by cable.

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58–61 Fetter Lane, London, E.C.4.

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Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XV. No. 375 Saturday, August 17, 1929

The JAMES DUAL-WAVE 3

A FINE GENERAL-PURPOSE SET NO COIL-CHANGING

Registered at the G.P.O. as a Newspaper

AUGUST 17, 1929 No. 375 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

5SW's Utility—The Kent Experiment—New Talkie Plans—In Mid-Atlantic—Tracing Static—Preventing Poisoning—A Good Three

5SW's Utility The question of Empire broadcasting has cropped up again in our correspondence columns and 5SW has gone through yet more "slating" on account of the incomplete service it gives to the Dominions. But it must be conceded that the B.B.C.'s possession of a world-wide station, such as 5SW, is, on occasions, a thing to be very proud of. One of these occasions was when the speeches of the Prince of Wales and Sir Robert Baden-Powell (who has now had conferred on him a peerage) were given out through the Chelmsford station and thus brother scouts the world over had the opportunity to hear the greetings of their leaders. On that day 5SW certainly did its "good turn."

One of the control desks at the N.B.C. "H.Q." in America. B.B.C. Style!

The Kent Experiment—The Grand Jury room at the Sessions House, Maidstone, was recently the scene of a busy meeting when the subject of experiment in radio adult education in Kent was discussed. The Carnegie trustees have made a grant of £400 for the adult education scheme and some forty centres in the county are co-operating. Of course, the whole success just depends on whether or not you are keen on the "highbrow mike," or whether you switch off immediately an educational talk of any kind is announced.

New Talkie Plans—Some big mergers are still going ahead in the talkie world, and it is inevitable that these will result in technical developments of interest to radio "fans." It is well known by now that the Gramophone Co. (H.M.V.) and the British and Dominions Film Corporation have amalgamated. An official of the B.D.F.C. has announced that Mr. C. B. Cochran, Mr. Tom Walls and that personality well known to the microphone, Mr. Albert de Courville, have been brought into alliance. De Courville is producing a review "Hallo Talkies," the recording part of which will be done in the H.M.V. studios by ex-B.B.C. engineers.

In Mid-Atlantic—And talking of talkies, passengers on the *Majestic* were recently able to see a talkie-film programme while in mid-Atlantic. The experiment was such a success that plans are now being made for film performances to be given in such well-known boats as the *Olympic*, *Homeric*, and *Adriatic*. It is suggested that American firms should show their films on the trips from New York to Europe and British producers should provide the programme on the return journey. Ordinary films are shown to first- and second-class passengers, but experiments are going ahead with small-size films on tiny screens for tourists and third-class passengers.

Tracing Static—Atmospheric disturbances are being traced to their lair by means of the Fultograph. The Royal Meteorological Society has arranged with the B.B.C. for special Fultograph transmissions after the normal picture programmes, and these will be picked up by stations in various parts of Europe. A series of straight lines will be given, both horizontal and vertical, and when static arrives it will make its presence obvious by distortion of the lines. As the drums of each of the receivers are in synchronism it will be possible, by comparing the results obtained in different places to determine the range at which the static can cause interference and the intensity of this interference in different localities.

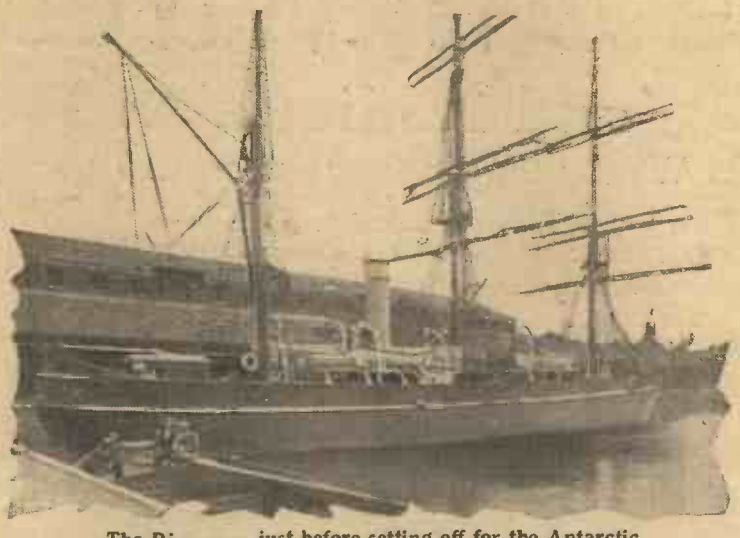
Preventing Poisoning.—It is really wonderful to see the precautions which have to be taken to prevent the risk of lead poisoning to workers in accumulator factories. The Exide people, for example, have special ventilation systems to take away all fumes, they have a resident doctor who devotes the whole of his time to the study of the disease and they have a scheme whereby blood examinations are conducted periodically.

A Good Three—This week is described a special three-valver, designed by our Research Consultant, Mr. W. James. This is a dual-wave "three," which . . . but turn to page 178 and read all about it for yourself. In our next week's issue very full operating details will be given.

PRINCIPAL CONTENTS

RADIO AT THE SOUTH POLE

THE Byrd Expedition demonstrated the advisability of taking a very comprehensive radio equipment on any expedition involving the risk of many lives. Quite apart from the safety factor, too, upon which radio has such a bearing, is the possibility of radio experiments being carried out during the course of the trip, and which, owing to the great distance (in the case of Arctic and Antarctic explorations) often show some very useful results in the way of proving the correctness or otherwise of radio formulæ such as the Austin-Cohen.



The *Discovery* just before setting off for the Antarctic

Moreover, there are many thrills to be had out of such long-distance radio working. Many cinema "fans" in this country probably had the opportunity of seeing and hearing a talkie film showing the reception in America of signals from the Byrd expedition. The operator showed on the screen how the set was worked; then by putting the 'phones over the talkie microphone, he made a sound-film record of the Byrd signals.

It is quite probable that these and similar thrills and utilities will result when the barque *Discovery*, which left the Thames on Thursday last, for a new voyage of Antarctic exploration, approaches the southern regions.

No risks have been taken, and the *Discovery* has been fitted up by Marconi's with the most complete radio installation, partly for the purpose of safety and partly in the hope that some useful results will be obtained from a technical point of view.

Survey Work

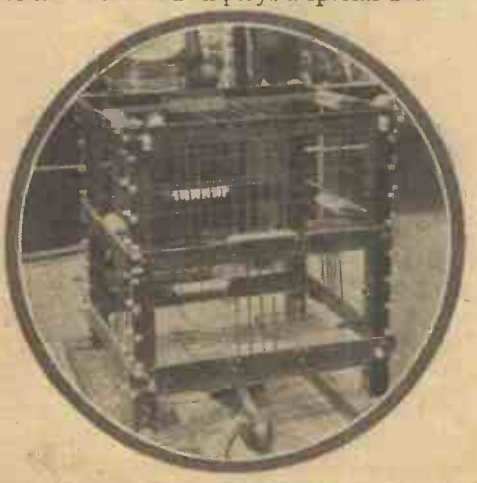
In addition, the expedition—which is under the leadership of Sir Douglas Mawson, the famous Australian explorer—is carrying out some important scientific and survey work to the south of Australia and it is important that the ship should be in close touch all the time with other scientists.

For ordinary ship-to-ship and ship-to-shore working a quenched spark transmitter is to be used. This ensures the utmost reliability. It will work on the normal ship and commercial wavelengths, while there is a special short-wave transmitter, working, of course, in code for long-distance work. With this set, it will be possible to keep in touch with co-operators in Australia and England.

It is just as important that those on board ship should be in touch with civilization during the whole of the trip; the engineers have put their faith in short-wave working, and the *Discovery* is fitted with one of the latest Marconi short-wavers.

The D.F. Plant

A part of the equipment which is primarily for the safety of the ship is the direction finder. The actual apparatus employed is very similar to that which has been thoroughly tested in the Arctic and Antarctic on whalers and other shipping vessels. The D.F. apparatus is fitted as part of the navigational equipment of the vessel and employs a special double-frame aerial, which is shown by the above photograph.



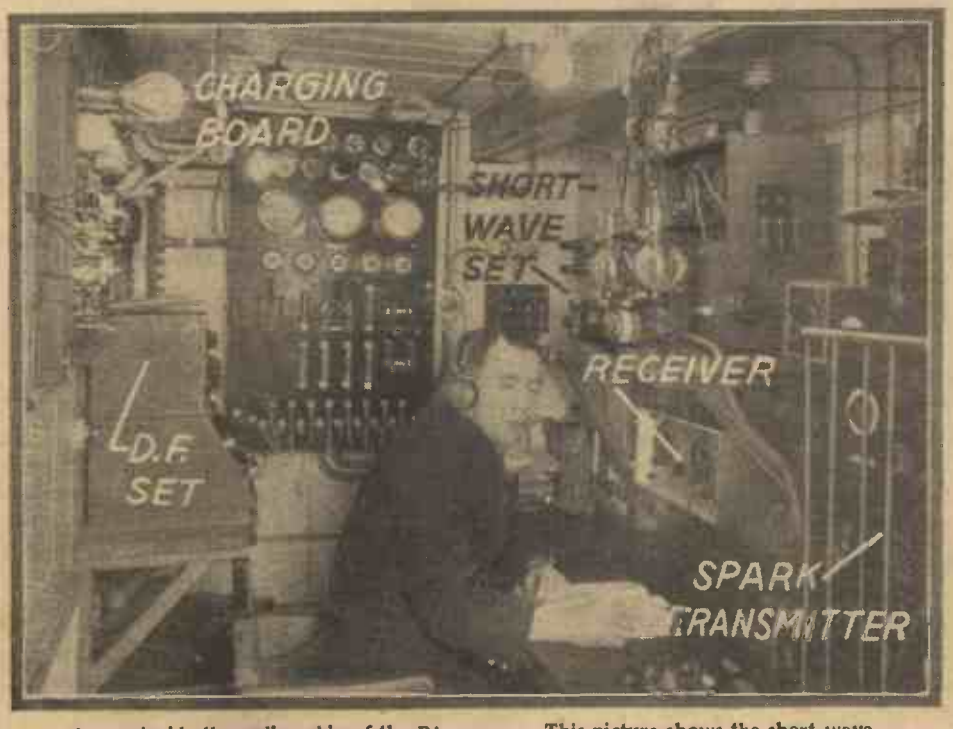
The rectangular direction-finding aerial near the bridge

It seems almost impossible that with the long-range apparatus fitted, and the comprehensive emergency plant, that the crew of the *Discovery* need ever be out of touch with the rest of the world while in uninhabited regions.

Ice floes may make it impossible for the *Discovery* to investigate all parts of the coast and so a Moth aeroplane is being taken which will be used for making short trips from the mother ship, within 100 miles or so. This is provided with a radio transmitter and receiver of a new type which has been specially designed for use on light aeroplanes.

The complete transmitter and receiver are contained in a compact wooden box, measuring only 16 in. by 9 in. by 7 in. It

(*Continued on page* 168)



A peep inside the radio cabin of the *Discovery*. This picture shows the short-wave equipment

THE REASON FOR THAT DISTORTION

Little troubles may crop up and cause poor reception which is difficult to cure

Some of the more obscure of these troubles are here explained by Mr. W. James

PROBABLY the most widely-used receivers are those having three valves. One of them may be for high-frequency amplification, the second for detection, and the third for low-frequency or power work.

When such a set is first installed with new batteries and valves, and a reasonably good loud-speaker, the results are, no doubt, excellent as regards both range and quality of reproduction. Indeed, there is no reason why a three-valve receiver of this type should not provide clear reception of a number of stations when an outdoor aerial is used.

Even when a smaller and much less effective collector is employed there should be no difficulty in receiving with ease an average of perhaps four or five stations, depending upon where the set is used. But a wireless receiver is like other instruments. It must be maintained if it is to continue working correctly, and I therefore propose to explain why distortion occurs when the circuits fall out of adjustment.

Let us consider the circuit of Fig. 1 first. This has an ordinary valve for high-frequency amplification, which must therefore be balanced. Distortion will occur if this

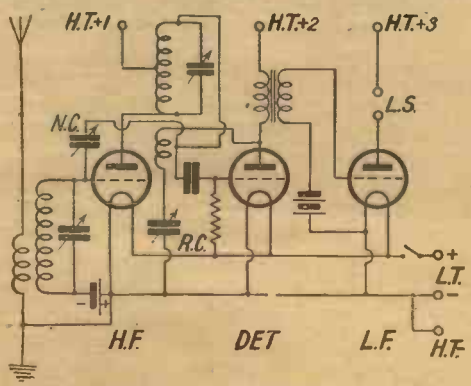


Fig. 1. This is an ordinary one-H.F.-stage set in which distortion will result if the H.F. stage is unstable

stage is so adjusted that it is unstable. A strong signal may set it oscillating, when squeals will be heard as the tuning dials are turned.

Perhaps the balancing condenser is so set that whilst the stage does not oscillate by itself it does oscillate when reaction is applied to the anode circuit. This is a bad state of affairs, and should be remedied by resetting the balancing condenser. It will be clear that if the high-frequency circuits are very nearly oscillating they will distort, and although the circuit is most sensitive when they are in this condition the quality suffers.

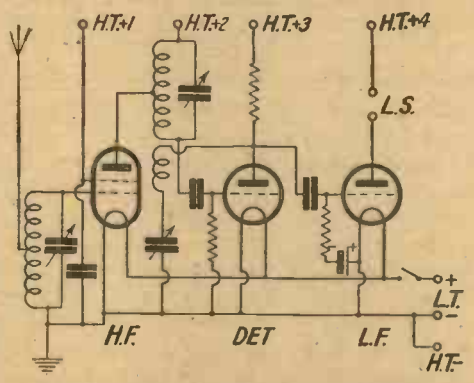


Fig. 2. Screen-grid H.F. amplification may give trouble, particularly if the detector is overloaded

In the high-frequency stage of the circuit of Fig. 2, which includes a shielded valve, distortion is likely to occur if the circuits are unstable, but as we must assume the design is such that the receiver was satisfactory to begin with, we are not likely to be troubled with instability, excepting that produced by a high-resistance anode-circuit supply.

As the high-tension battery discharges the circuit may become less stable, and a point will, of course, be reached when distortion is introduced because the first valve tends to rectify rather than amplify. This remark also applies to the high-frequency stage shown in Fig. 1.

A point to remember, therefore, is that the high-frequency circuits may give trouble as the high-tension battery discharges.

The two circuits show leaky-grid rectifiers; that is, a grid condenser and leak resistance are used They will distort—and distort badly, too—when overloaded or when the amount of the high tension is not sufficient. Unfortunately, a detector of this type is sometimes more sensitive when its high tension is fairly low, such as 30 or 40 volts, and is particularly liable to distort with such low voltages.

Here again, then, one may expect distortion to be introduced as the high tension discharges. The anode-bend detector, such as used in the circuit of Fig. 3, is not so liable to distort, provided the input is sufficient. It must not be too great, however, or grid current will flow and lead to distortion. In this type of set the volume control must be carefully used.

If the high-tension voltage of the detector is accurately adjusted when the battery is a new one it is clear that as the voltage falls the rectifying action will not be so good, and bad distortion may be introduced at this point. The grid-bias battery will probably maintain its voltage for a much longer period than the high tension, with the result that high tension must be adjusted from time to time.

It is not wise to reduce the value of the grid bias to maintain the correct operating

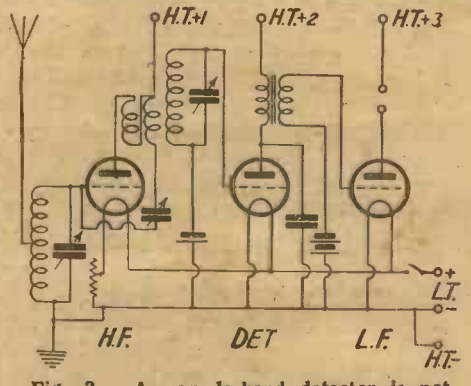


Fig. 3. An anode-bend detector is not liable to distort if the input is sufficient

point as the high tension falls off, as this would have the effect of reducing the signal strength that the detector can handle without overloading. Rather should the high tension be kept at its initial voltage. Grid batteries do run down in

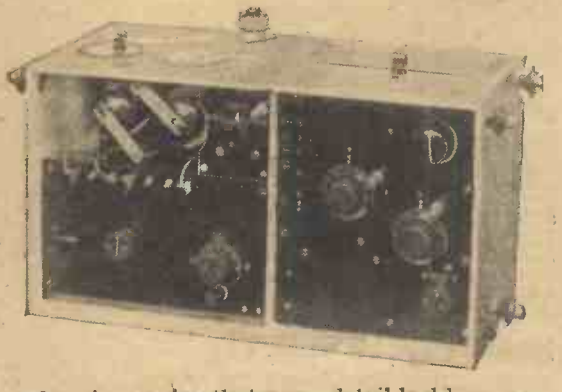
(*Continued at foot of next page*)

works with a power of 75 watts and is easily capable of covering the distance required. Power is obtained from a wind-driven generator across which an accumulator can be "floated." The high-tension output is 1,000 volts, 75 milliamps. and the L.T. "juice" 7 volts, 4 amps. For normal working, the wave range of the transmitter is 850—950 metres, this being the International Aircraft waveband, but a quick-change switch is provided to enable the ship's wavelength of 600 metres to be employed in emergencies.

Morse Working

As standard, this little unit, the AD22, is fitted with a choke control modulator for telephony work, but it has been modified, for the *Discovery* expedition, for Morse working. This is because the effective range, with code, is greater than the telephony range and if the 'plane were to fly outside its "safety" circle, then it might, on telephony alone, be unable to be in radio touch with the ship.

By means of the D.F. aerial the ship can locate the direction of the aeroplane and can guide it on its course during the exploration. If, for any reason, the Moth should have to make a forced landing (when normally the air-screw driven generator would be out of action) a hand-winding device can be brought into operation so that the 'plane can still transmit and receive while on the ground. Thus, even in this plight it can still be in touch with the *Discovery*, and the operator on board can log the 'plane's position exactly.



This is the special aeroplane set designed by Marconi's and modified for the *Discovery* venture. In this one small box is the complete transmitter and receiver with a range of over a hundred miles

There is a special automatic code sender enabling messages to be sent from the 'plane to the ship, so that if the pilot should fall ill while in flight he can switch on the automatic sender so that help can swiftly arrive. This is likely to prove a very useful "safety-first" fitment because, owing to the intense cold which will be encountered in the Antartic, there is always the possibility of the pilot not having full control of the plane while in the cockpit.

A brief inspection of the apparatus on board the barque, made just before the *Discovery* left its Thames dock, gave the impression that every detail had been very thoroughly attended to, and if the adversities of fate should prevent the expedition from succeeding in every respect, then it will not be the fault of the radio apparatus. Tragedy such as has been known in some Polar expeditions is being banished owing to the safety given by radio. K. U.

"THE REASON FOR THAT DISTORTION."

(*Continued from preceding page*)

time, however, and it is therefore wise to test with a voltmeter occasionally.

More distortion is introduced by overloading than any other cause. It is the last valve, as a rule, which is overloaded. This valve is often provided with about 120 volts and a grid bias according to the type. Generally 9 volts negative is suitable for an ordinary power valve, but a super-power type will have to be provided with a little more for the best results.

Now, a valve having a high tension of 120 volts and a grid bias of about 9 volts negative cannot be expected to handle powerful signals, although it will deal with signals of moderate strength suitable for an ordinary room. But the mistake of forcing the set is often made, with the result that the last valve overloads and the quality of the reproduction suffers.

The extent to which the distortion is noticeable is dependent upon the type of loud-speaker. Some of them are poor reproducers and do not have to be supplied with practically undistorted signals. Other loud-speakers, on the other hand, seem to show up distortion very easily, and it is then necessary not to overload, and to maintain the batteries.

Thus a grid bias of 9 volts negative may be satisfactory when the high tension is 120. As the high-tension voltage falls the working point moves farther down towards the curved part and rectification commences. The signal is therefore distorted, and becomes more badly distorted as the high tension falls.

It is a good plan to reduce the value of the grid bias from time to time during the life of the high-tension battery, for then, if one is satisfied with less volume, the distortion may not be troublesome.

Motor-boating and low-frequency oscillation, which so often shows itself in the form of a squeal or a howl, may commence as the high-tension battery ages. The usual anode circuit filters may be relied upon to prevent this trouble, but a point may be reached where even the ordinary type of filter is not satisfactory. Much depends upon the type of high-tension battery. Some are much better than others. When one remembers the various troubles that are brought about by batteries it is not surprising that mains high-tension units are coming more and more to be used.

THE "BREMEN" RECORD

DURING the last two days of the *Bremen's* Atlantic crossing it carried on simultaneous communication with three wireless stations on the American coast, two-way exchange of messages being effected. Heretofore, it had been considered impracticable to communicate with more than one station in two-way exchange of wireless traffic at one time.

The *Bremen* carried six operators, and during the last five hours of its trip the wireless station handled 270 messages. During the trans-Atlantic passage 50,000 words were handled, which included 1,725 commercial messages in addition to Press and weather reports received on the ship from Germany and America. The ship received 1,200 words of Press from Berlin and 1,200 words from America. Wireless traffic has been so heavy that in future the *Bremen* will carry two additional wireless operators. When equipment for picture transmission is added, two further operators will be employed.

An interesting feature of the voyage was the transmission of the *Bremen's* news by means of wireless telephone to Berlin, which was re-broadcast from the local broadcasting station of that capital.

The chief wireless operator, Officer Schuch, has had an interesting wireless career which goes back to the war days. In November, 1916, he left Germany as the wireless operator of the German raider *Wolf*, from which he was transferred a year later to the British steamer *Turritilla*, which the *Wolf* captured near Colombo in the Indian Ocean. The British steamer was re-christened the *Iltis* by the captain of the *Wolf*, who sent Schuch and a crew of twenty-eight aboard the captured vessel to take charge of the ship and its Chinese crew. The *Iltis* proceeded to the harbour of Aden, where it spent several days laying mines outside the harbour. The British cruiser *H.M.S. Odin*, however, came across the *Iltis* and gave it chase, eventually catching it and ordered the German commander to surrender. Before abandoning the *Iltis* bombs were put in the hold.

Schuch was previously the chief operator of the German steamer *Berlin* which proceeded to the rescue of the unfortunate liner *Vestris*, which has figured lately so much in the Press, and picked up twenty-three survivors. H. A.

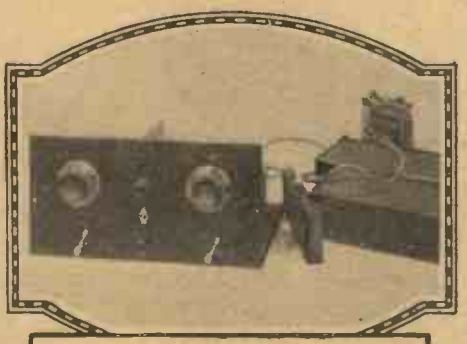
What You Should Do

The terminals of an accumulator are very liable to corrosion due to the acid solution spraying. A little vaseline or petroleum jelly smeared over the metal parts after wiping them dry will prevent the acid attacking the terminals

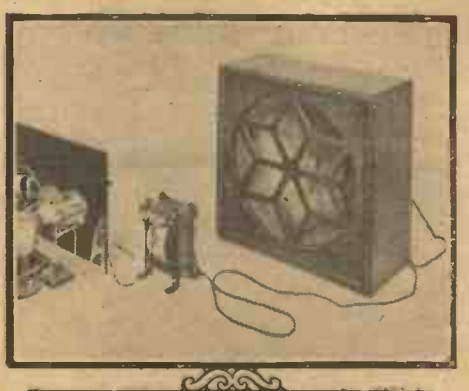
H.T. batteries should always be tested with a good-quality high-resistance voltmeter. Some of the cheap foreign voltmeters on the market take a large amount of current from a battery and, therefore, shorten its useful life

By using an hydrometer one can determine the exact condition of the charge, as well as any incorrect increase or decrease in the density of the acid in the accumulator. Deviation from the density recommended by the makers can then be corrected before faults occur

Always switch off the filament current before removing or altering grid-bias tappings. If this is not done, a heavy load will be placed on the filaments of L.F and power valves, and H.T. current will be wasted

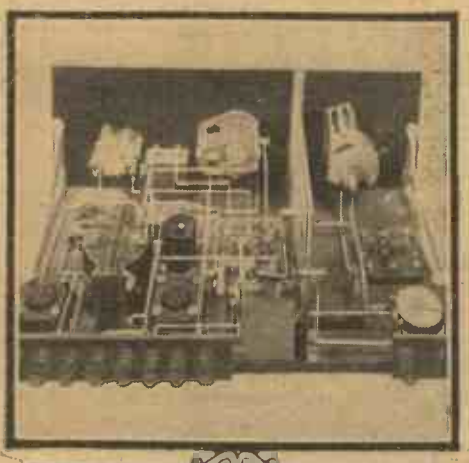


It is economical to use a large-capacity H.T. battery with a set fitted with large power or super-power valves. If small batteries are employed, their voltage soon drops and results are never satisfactory for any length of time



An output transformer or choke for the output system should be connected between the loud-speaker and the last valve in the set when the valve is of the super-power or pentode type. For best results with the last mentioned valve one of the special pentode output transformers may be utilised

The topping-up of an accumulator is a small job, but if neglected may lead to bad sulphation of the upper portion of the plates. Therefore make a point of bringing up the solution level whenever it falls below the indicating line on the accumulator case



Time spent in making a neat and workmanlike job of the wiring of a set will be well repaid in accessibility and ease in repairing and testing the receiver should it go wrong at any time. Careful arranging of the various leads will also lead to better results in reception

Oxidation is liable to cause high resistance paths between metal contacts: it is therefore advisable to clean such parts as valve and coil legs and their sockets periodically with emery cloth. Switch contacts should also be cleaned if dirty

MY WIRELESS DEN

By W. JAMES

Weekly Tips Constructional and Theoretical — For the Wireless Amateur

Test for Safety

WHEN a new receiver is ready to be tried and the constructor has gone through the circuit to make certain there are no wiring mistakes which might have the effect of damaging the valves were they inserted and the usual batteries connected, it is advisable to make one further test before inserting the valves.

Connect and switch on the batteries and then temporarily join a flash lamp bulb across one of the filament contacts of a valve holder. If this lamp burns as brightly as when it is connected across the accumulator, one may be reasonably certain the high tension is not in contact with the low tension. Many flash-lamp bulbs have four-volt filaments and will, therefore, not glow very brightly when joined to a two-volt source.

Some experimenters keep a bright emitter valve for testing purposes and always plug it into the various sockets of a new receiver before finally switching it on.

Beware of 2.5!

The voltage of an ordinary lead accumulator is generally reckoned as two volts per cell. Many users employ a trickle charger however, and connect it to the battery either every time the receiver is switched off, or at fairly regular intervals.

The result is that the accumulator never discharges and, depending upon its type and make, the voltage may greatly exceed the normal two volts per cell. A voltage of 2.5 is not unusual and what is more, the cell may maintain this voltage during the whole of an evening's reception.

Now many receivers using two-volt valves are not fitted with a filament resistance, and the question, therefore, arises as to whether the valves are likely to be short-lived, because of the relatively high filament voltage. Experiments indicate that much depends upon the type and it would seem desirable in one or two instances to fit an adjustable filament resistance of low value, although some valves do not suffer at all.

Selectivity

If we have the apparatus for measuring the response or tuning curve of a receiver, we should find that the one having the best selectivity would have a roughly square-topped curve, whilst a poor one would have a much more pointed curve.

The rectangular-shaped tuning curve is, of course, ideal, as it means the receiver will pass a certain band of frequencies and exclude others. When the curve is pointed, one of two things may be happening. First, the high-frequency circuits may be distorting very badly by cutting the side bands, and secondly, the selectivity may be poor.

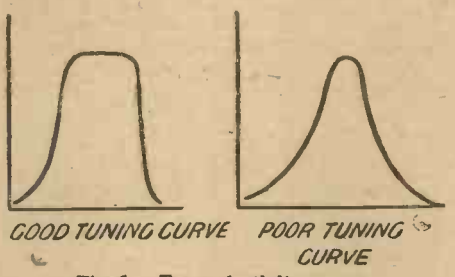


Fig. 1. Two selectivity curves

An effect of reaction is, as a rule, to make a tuning curve rather pointed, and reaction does not, therefore, really improve the tuning. Neither does reaction truly compensate for the losses of a circuit. The two curves are shown by Fig. 1.

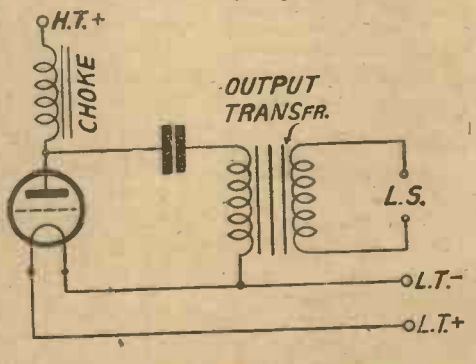


Fig. 2. A useful loud-speaker output circuit

Exit to the Loud-speaker!

The question often arises as to whether it is better to employ an output transformer or filter circuit. Price hardly enters into the question, as both output circuits cost the same, or nearly so. There are those who prefer the transformer on the grounds that by adapting its ratio to suit the characteristics of the loud-speaker the maximum of volume may be obtained, but others prefer to employ a filter circuit because it tends to assist stability.

I myself prefer the ordinary choke-condenser filter output circuit when the loud-speaker is an ordinary one, the impedance being fairly well suited to that of the power valve. This is because the low-frequency currents tend to flow through the loud-speaker circuit only and not through the high-tension supply, where they may produce undesirable effects.

There are occasions, however, when a transformer must be employed, such as, for example, when the loud-speaker is a low-resistance moving coil. This transformer may be connected in the ordinary manner, or as in Fig. 2, where it is used to replace the high-resistance loud-speaker employed with an ordinary filter circuit. It is possible that the tone may be affected by the size of the coupling condenser, but a few experiments will soon put this right.

I do not remember having seen this output circuit used in any of the receivers described in this paper. As a rule an ordinary output transformer or filter circuit is fitted, but there are times when the combined arrangement could be used to advantage.

Accumulator Connections

A mistake that is very easily made is wrongly to connect the filament-heating accumulator. I have, as a matter of fact, met one or two amateurs who had discovered that it seemed not to matter very much which way round this battery was joined.

They were, of course, judging results simply by the quality of the reproduction and, if they had joined a milliammeter in the high-tension circuit, they would have found quite a difference in the amount of the current passing. The effect of reversing the low tension is, in effect, to alter the grid bias of the valves. Thus, the power valve, which might have had a grid bias of 9 volts negative, is now biased by only 7 volts. Consequently, the amount of the high-tension current is greater and the high-tension batteries will not last so long.

With some sets and loud-speakers used mainly for listening to the local station, the quality of the reproduction may appear not to be affected by reversing the low tension.

On Your Wavelength!

"Glim Lamps" for Television

I could not help being amused and yet perturbed by something which was brought to my notice this week. It is well known that in Germany, broadcasts of telecinematography by both the Post Office authorities and Mihaly are taking place while the Baird Company, through the medium of the German Company recently formed, namely, Fernscher A.G., have been transmitting television via the Witzleben-station.

That being the case, it is only to be expected that amateurs in that country are vying with one another to get the best reception of what "the eye can see." There is therefore a market for television apparatus, a fact of which one or two firms have taken full advantage.

As in the early days of wireless broadcasting, however, cases arise frequently where the public are lured by glowing advertisements into purchasing apparatus and components which are either wholly unsuitable for the purpose desired or alternatively prices are charged which obviously represent sheer profiteering.

It is in connection with the latter that I wish to quote an instance which bears out my remarks. There was an advertisement in a German paper extolling the virtues of a "glim" lamp (neon lamp) for television purposes.

A friend of mine who is intensely interested in this new science decided to purchase one and see how it functioned. When duly delivered, the carton resembled very much those used for our own valves and, on opening it and examining the contents, he had rather a rude shock.

What the Carton Contained

The glim lamp was about the size of a large valve and the glass bulb was blackened on the outside with a substance resembling Chatterton's compound. A section of the bulb, about 1 in. by ¾ in., had been left clear of this substance, however, and the glass frosted.

However, there was a thin slit of clear class between the frosted and blackened covering, and, looking through this, one could discern the spiral "filament" of an ordinary neon lamp such as are popular over here for use as night lights.

The neon glow was to be observed through the frosted aperture and, of course, the scanning disc, but whereas, in that country, one can purchase a neon lamp identical to the television glim lamp secured by my friend for about two shillings, except for the bulb blackening and frosted aperture, he had paid nearly three times that price.

The additional work entailed by the preparing of the glass bulb had cost him twice as much as the neon lamp itself, which to my mind is gross profiteering.

One Man's Meat

The rain which eventually broke the great drought continues to pour down as I write, to the disgust of holiday makers and those who like to spend a day in the open air, but, besides enabling us to take nice big baths, and to wash our cars again with a clear conscience, it has made a heap of difference to wireless reception. Dried-up earth connections have become moist once more with phenomenal results, but best of all from the wireless point of view, the whole surface of the ground is now damp and this makes all the difference to our little friends the wireless waves. Experiments made some time ago show that they travel best over water and worst over parched desert country.

After the long weeks of hot, dry weather, not in this country alone, but over the greater part of Europe, the soil was absolutely dried up for a considerable distance below the surface. The result was that we had to depend more and more upon the reflected waves from the Heaviside Layer, so that naturally reception during the early part of the evening became more and more affected, for the Heaviside Layer does not really get going until darkness comes along.

The improvement has been very marked, especially in the case of the nearer foreign stations. Not a few of these who have respectable power behind them are now receivable long before darkness falls. Stations that have been silent for months are now coming along again and there are many newcomers to add to the log, since the Prague Plan has made it possible to hear stations that were previously blotted out by big neighbours or ruined by heterodynes.

What is the Cause?

During the first month of the present wavelength scheme, very few heterodynes were noticeable and such as did occur were generally only temporary, affecting one station or another for an odd hour or so. On several evenings, I did my best to find a real honest-to-goodness heterodyne but failed to do so. With the coming of August, there appears to have been for some reason or other a noticeable increase in mutual interference. On some nights, in fact, station after station has been found suffering from an accompanying whistle and occasionally I have found some transmission with a wavelength of its own practially jammed by another.

Personally, I don't quite understand the cause of this state of affairs. In some instances I am pretty sure that it is due to slight wavelength wandering, for it doesn't need very much of that kind of thing to cause heterodynes when stations are so closely packed as they are now. Is the Brussels Laboratory which was appointed official ether policeman, slackening off its vigilance owing to that holiday feeling, or have stations, similarly affected, been going in for a few little light-hearted caperings?

Heterodynes

I don't believe that the trouble is to any great extent due to increased wipe-out caused by rather bigger signal strength, for as a matter of fact heterodynes have been noticed lately between certain stations whose strength is less than it was a little time ago. One only hopes that the slight amount of confusion which exists in parts of the broadcast band just now is not due to any slackening off by stations or the authorities responsible for groups of them.

The Prague Plan has every hope of being a success so long as its provisions are strictly carried out. It will be a hopeless and ghastly failure if slackness creeps in and stations grow gradually less and less particular about the accuracy of their wavelengths. Under previous plans, there were certain vacant spaces in the broadcast band and stations which decided to wander in search of more suitable wavelengths could often find places where they more or less fitted in. Under the Prague Plan, every available channel is occupied and if any station starts to wander, disaster is certain.

H.F. Proves its Worth

I have always been an upholder of genuine high-frequency amplification as opposed to the spurious magnification obtained by the use of a great deal of reaction. The trouble in the old days was that it was a matter of extreme difficulty to obtain enough H.F. amplification for long-distance work by the use of tuned stages alone, without employing reaction to ginger things up. Nowadays, the S.G. valve and even certain very efficient triode circuits do enable amplification to be obtained up to the very limit that can be used. Why should there be a limit? Well, because there must always be a certain amount of very small interfering noise, atmospheric or otherwise, coming from great distances and if you use too much H.F. you bring these up to an undue extent. Shortly after the drought broke, I had an excellent opportunity of comparing the results obtainable with two sets, each of which would give about the same volume from a foreign station, though the circuits employed were quite different.

Set number one consisted of an early-

On Your Wavelength! (continued)

pattern S.G. valve coupled to the rectifier by means of a parallel-feed circuit and a pentode note-magnifier. Reaction was arranged from plate to grid of the rectifier on Reinartz lines. The second set had two modern S.G. valves, both transformer-coupled and was also provided with a pentode note-mag. It had no reaction arrangements.

On the night when the comparative tests were made, atmospherics were of the continuous type, coming apparently from a great distance, and caused no interference with the transmissions of the local station. It was found that, when loud-speaker volume from stations such as Hamburg, Frankfurt, Budapest, and Cologne was obtained with the three-valve-plus-reaction set, atmospherics formed a very distinct and most annoying background. The four-valver easily provided the same volume of signal strength but atmospherics were much less in evidence upon the weaker transmissions and, on the stronger, they could not be heard at all except during the intervals in the programme. The moral is fairly obvious—if you want good long-distance results rely upon genuine H.F. rather than upon any form of reaction.

A Strong Point

One has to remember that when reaction is used upon a weak and distant transmission the set must always be worked in a very sensitive condition in order to bring up signal strength. Now this very sensitive condition means that the valve is quite close to its oscillating point should much reaction be applied. I think that much of the atmospheric interference, which is nearly always noticeable when a valve is close to oscillation, is due to direct pick-up of tiny local disturbances, of which nothing would otherwise be heard. When there is plenty of H.F. amplification and no reaction all the valves of the set are in a perfectly stable condition, each being a long way off oscillation. This means that less is heard of atmospheric noises.

It also means something else equally important. Almost any receiving set has tiny inherent background noises which may be due to any one of a vast number of causes. Almost infinitesimal variations of filament current due to a gassing accumulator may give rise to them and they may be produced by any kind of H.T. supply. Other sources of minute noises are little faults in insulation, dirty condenser vanes, imperfect contacts and dust upon valve holders or other places where insulation is of high importance. Unless oscillation is present or imminent, we hear nothing whatever of these little noises; for they are not amplified sufficiently to become audible. When, though, reaction is pressed hard, up they come at once.

New Possibilities

I wonder how many readers have realized the enormous improvements that have been made during the year in screen-grid valves? The whole purpose of the screen-grid valve, as most people know at this time of day, is to eliminate plate-grid capacity and the feed-back effects for which it is responsible, by introducing a screen between these two electrodes. Actually it is impossible to reduce the capacity to zero, for to do so would necessitate the use of a screen without any holes in it so that no electrons could pass through the valve. The capacity of early screen-grid valves, though far less than that of triodes, was still considerable. Everyone who has used them knows that they will oscillate if both plate and grid are tuned by low-loss circuits. The newest patterns have a plate-grid capacity some twenty times less and this at once opens up big possibilities. Much more efficient circuits can be used and, therefore, a far greater amount of amplification can be got out of the valve. Though the amplification factor of the original screen-grid valve was about 150, only about a fifth of this amount was actually obtained on broadcast wavelengths. With the newer patterns, a magnification of the order of 80 or more becomes possible. I have no doubt that in years to come a magnification of a thousand or more will be obtainable from a single H.F. valve.

Wireless in Australia

Australia has always been one of the most go-ahead parts of the Empire in matters wireless. Despite her comparatively small population she takes from us, as the trade returns show, an astonishingly large amount of valves and other wireless gear every month. Her broadcasting system is excellent and she has done some splendid pioneer work upon the short waves. It is sad to notice that one of the Australian short-wave stations has closed down, temporarily at any rate. The other, however, continues to work. Long may he do so.

I hear now that Australia is to be the first portion of the Empire outside the Mother Country to go in for still-picture broadcasting. Several sets of transmitting gear have been purchased and one of the Fultograph engineers has been retained to supervise. Let us hope that this autumn and winter Australia will be sending us pictures over the short waves.

New Life for Old Cones

Not a few cone-type loud-speakers must have suffered, I imagine, at one time or another during the spring-cleaning or even the daily dusting hour. Their big diaphragms are sometimes very fragile and once badly dented they may be unable to function properly. An old friend that I have had for some years had a rough time a week or two ago. It was knocked over (*not* by me, dear reader), landing squarely on its nose, by which I mean the nipple through which the connecting rod passes. When I got home it was a sad sight, its countenance reminding one of that of a heavyweight boxer during the fifteenth round! I took out the mechanism and carefully straightened the bent connecting rod. On replacing it I found that reproduction was small in volume and perfectly foul in quality.

The Remedy

One can easily understand why the diaphragm all round the nipple, though not broken right through, was very badly cracked and creased. Vibrations communicated by the connecting rod could not therefore travel properly over the surface of the cone. Since the full force of the drive was not communicated to all parts of the diaphragm, volume was reduced and the distortion of the diaphragm produced distortion of the sound waves. The only thing to do when this kind of thing happens is to fit a new diaphragm. These are generally obtainable at quite small cost from the makers—mine came to only 4s. 6d.—and it is by no means a difficult job to remove the wreck of the old one and to fit a new one. If you possess a cone loud-speaker which is dented, cracked, or creased, you will probably find that you can restore all its old perfection if you treat it in the same way. Just make sure though, that the magnets are still up to the mark and, if they aren't, have them "gingered up," a business which costs very little indeed.

Experimenter's Fashions

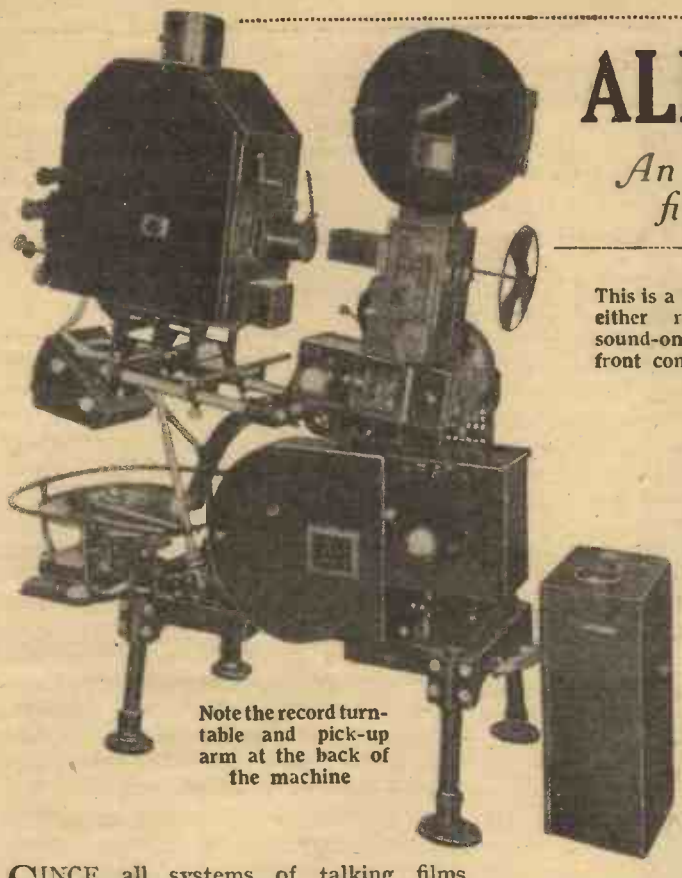
The whims and fancies of wireless experimenters and constructors are as changeable as our weather. The craze for all-mains-operated super-quality receivers seems to be subsiding somewhat and the H.T. accumulator is returning into favour. In the great quest for super-quality the more sophisticated experimenters are finding that the common impedance in the H.T. supply, introduced by smoothing systems and rectifiers, introduces a slight "hump" in the musical frequency curve of their amplifiers.

Dry batteries have the same effect, too, especially when they are getting old and the internal resistance is increasing. But the internal resistance of accumulators is extremely low and, for this reason, they are the ideal form of power supply for anode consumption. On the other hand, there is the trouble of maintenance, charging or having them charged, and the unpleasantness of sulphuric acid to contend with.

THERMION.

ALL ABOUT "TALKIES"

An interesting account of the side of talking films which concerns wireless enthusiasts



Note the record turntable and pick-up arm at the back of the machine

This is a film projector for using either record-synchronized or sound-on-edge films. The box in front contains the speed-control mechanism

SINCE all systems of talking films employ amplifiers, loud-speakers, and other components well known to the radio enthusiast, an appreciation of the difficulties of providing sound entertainment to large numbers of people will interest the wireless listener, who has only to amuse his own family circle.

"Shooting"

The first problem of the talking films is to provide a means of picking up the sounds in the studio when the film is "shot" and recording them in some way so that they may be reproduced in exact synchronism with the picture film itself.

In the sound studios of the film-producing companies everything not in the view of the camera is covered with felt matting to suppress any echo, which would add a false timbre to the sounds and voices. Matting lies on the floors and hangs on the walls, and all air openings and ventilating fans are stopped to exclude noises. Dead silence is absolutely necessary, and great care and many trials are required for each scene to ensure that the acoustic effect of the recording tallies with the scene being "shot." One would hardly expect, for example, a cottage interior to have the echo of a large theatre stage.

B.B.C. Practice!

Following broadcasting practice, red signal lamps are placed everywhere near the studio where a noise is likely to be made, so that when the red lamps are alight in and around the studio everyone ceases work and remains silent.

The spluttering arc lamps and mercury vapour floods, so characteristic of the cinema industry, have to be replaced by incandescent lamps, which do not produce mush for the microphones and amplifiers to pick up, and finally the cameras, cameramen, and producers are shut up in glass sound-proof boxes.

Strange as it may seem, the producer must be silent. He listens on headphones from the interior of his cabinet and directs by holding up cards bearing suitable pithy comments and instructions. As soon as the technicians supervising the recording are finished the red lamps go out and the producer is switched through to a loud-speaker in the studio, so that he may address his remarks to the artistes.

Records

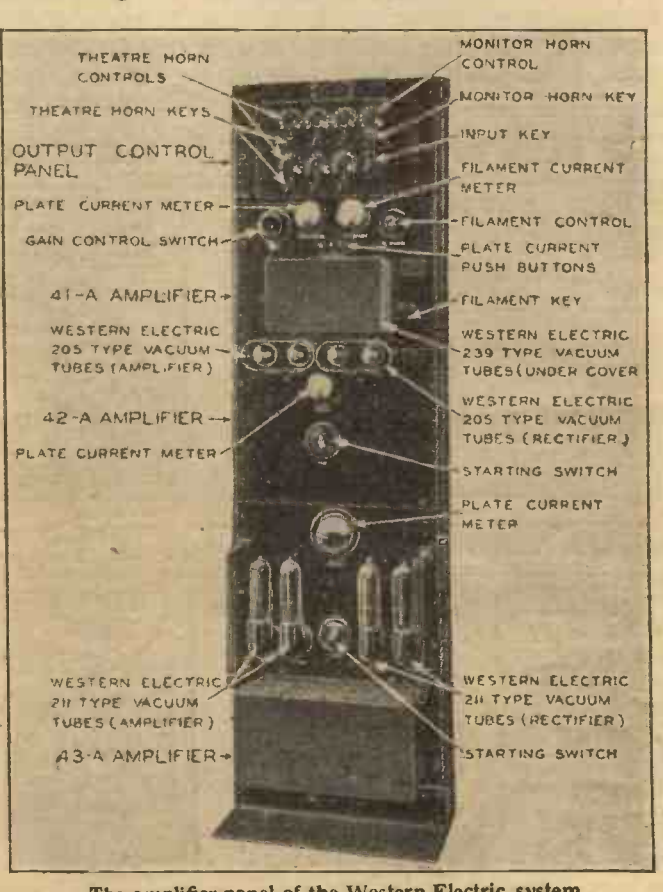
When the demand for a sound accompaniment for a film became very urgent the engineers of the Bell Telephone Laboratories, remembering their experience gained in electric gramophone recording, explored the possibilities of having records running synchronously with the film. Edison had tried this idea many years ago, but did not succeed because he could not obtain good clear-cut records to produce sufficiently loud results.

The advantages of these arrangements were that the technique of wax recording was very complete, and good frequency characteristics could be obtained when played back through an ordinary pick-up. Secondly, the turntable drive in the cinema, although connected to the projector itself, could be placed some distance away from the electric arc lamp and motor, both of which generate mush.

The great disadvantage, of course, is the large delicate wax discs, which, in spite of the fact that they are run only at 30 revolutions a minute, have to be 20 inches in diameter, so that they will play for 12 minutes without a change.

The pick-up needle on these peculiar records plays from the inside of the disc to the outside, which is contrary to the usual gramophone practice, the reason being that the length of time for which they have to play is not known, so that the master record is made over-large and trimmed down to size after the scene is taken. With record playing towards the centre there is no latitude.

Synchronisation is easy because the same motor driving the film projector rotates the turntable through a magnetic clutch, which starts the record rotating at the right instant by means of a switch contact on the edge of the picture film.

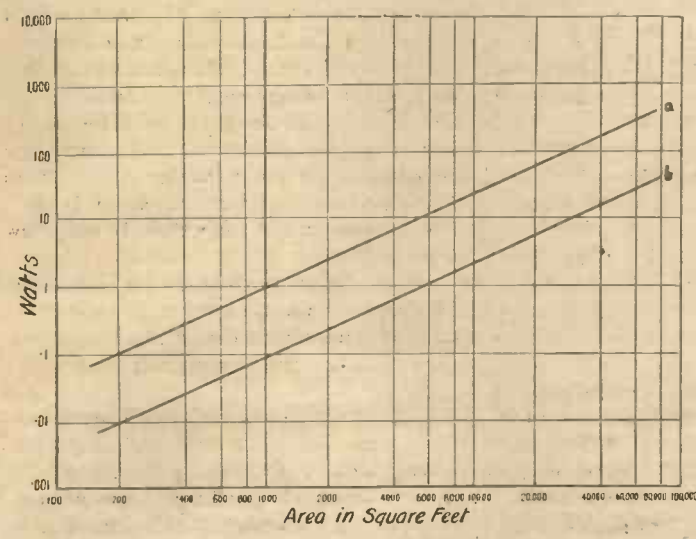


The amplifier panel of the Western Electric system

Unfortunately, if it becomes necessary to cut or join a film after it has been made, the sound accompaniment cannot be altered to fit, and so slight time errors come in.

British Acoustics

The next arrangement, after the synchronised gramophone record, was to have the sound recording on a separate celluloid film run through the cinema projector at the same speed as the picture film and operating the talking gear by a light-sensitive device. The use of two films got over a great difficulty of all early talking films—namely, that the picture film has to pass through the projector in a series of jerks (16 a second), which would completely nullify any attempt to pick up a sound record from it.



Two curves showing the power required to fill halls (a) with a few people, and (b) with a large audience as in a cinema

So with the British acoustic system one film—with the pictures—passes through the picture gate in jerks, while the other—with the sound—passes through the sound gate at the same average speed.

The sound is recorded on the film photographically by means of an oscillograph (which varies the amount of light falling on the emulsion at any instant in proportion to the sound currents in the microphone amplifier) and is reproduced by the current changes in a light-sensitive device through which the sound film passes.

The system has the advantages that the sound accompaniment may be added to a silent film, may be edited and altered after the scene has been made, and can take advantage of the whole width of the film for loud sounds. The gramophone fails on this point because it is so limited by the distance between the grooves.

The disadvantage is that two films are required and have to be threaded through the projector together, and after showing must be re-spooled or run back, which means more work for the operator.

The next system, due to de Forest and used by the British Talking Films and Movietone, records the sound directly on the picture film, a portion of the latter being reserved for the sound track. Thus, there is only one film to carry from one cinema to another and no records. Also, if the film breaks it is possible to join the ends and still keep the sound and picture in their correct relationship.

Neon Printing Lamp

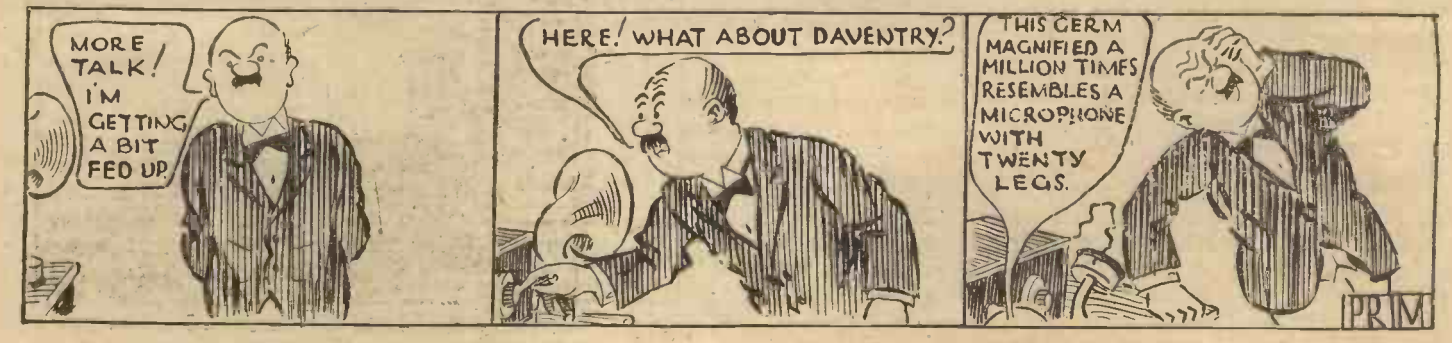
The voices and noises in the studio are picked up on a microphone, amplified, and made to operate a tiny neon glow lamp inside the camera taking the scene. As the glow from a neon lamp varies in brightness with the voltage applied, if it is connected in the amplifier circuit the light will follow the changes in speech current. The sound track then consists of a strip of film, the density of which varies in accordance with the sound. In the projector the sound piece of the film passes between a narrow slit of light and a photo-electric cell so that currents are obtained which are a faithful reproduction of the microphone currents. Selenium cells have been used for the purpose, but, of course, their time-lag reduces the response on the important high frequencies. Photo-cells have no time-lag and last indefinitely.

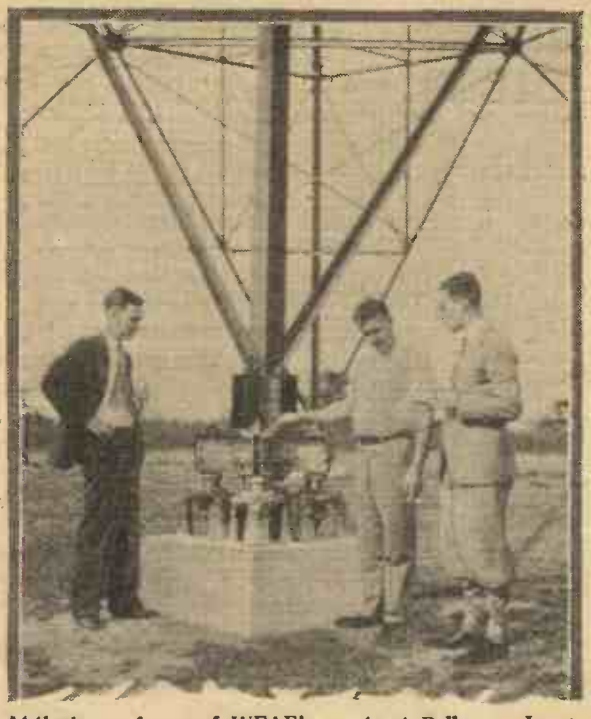
The sound is recorded 14½ in. ahead of its corresponding picture to give a large piece of slack film time to take up the jerky action previously referred to. The film thus runs steadily through the sound gate and jerkily through the picture gate, the difference at any instant being taken up by the slack portion.

(To be continued next week)

MR. FLEX IS IN A MOOD FOR LIGHT ENTERTAINMENT—

—BUT OTHERS TALK HIM OUT OF IT





At the base of one of WEAF's masts at Bellmore, Long Island; J. Sieger, on the extreme right, is watching the station engineer drawing a high-frequency arc with a key

Two of the "A.W." Staff Visit the States

More About U.S.A. Radio

By ALAN S. HUNTER

ONE of the "big noises" of New York radio is N.B.C., the initials standing for the National Broadcasting Company. This organisation has its headquarters at 711 Fifth Avenue, where I spent many interesting hours comparing the studio regime with our own. I remember the first time Mr. Sieger and I entered the building, which has only recently been erected, we were ushered into Studio A, where a performance of "Real Folks" was in progress. We were unable to make out what it was all about, though we did eventually grasp that vaseline was being advertised!

A later visit revealed four large studios for coast-to-coast programmes and four small studios for local outlets. These were especially interesting for their cleverly-conceived indirect lighting arrangements—a good way ahead in this respect of B.B.C. studios.

The WEAF Trio were radiating some jazzy stuff as I looked into one studio. "Do you do this sort of thing *all* the time?" I was unable to refrain from asking an official.

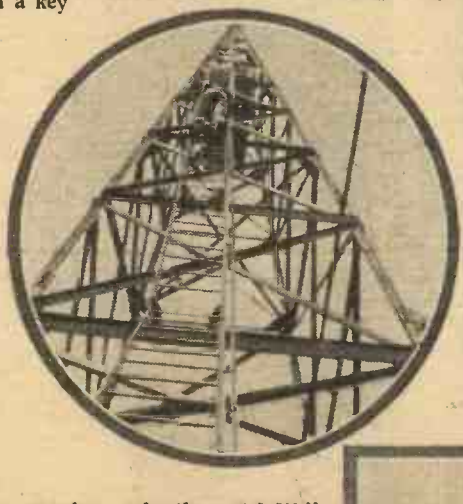
"Certainly not," he replied. "Have you never heard our 'Slumber Hour' from WJZ? That hour is famous for its classical music broadcasts. It never gives anything else."

One studio was especially interesting for its microphone arrangement. Here a Western Electric condenser microphone was fixed behind a baffle board—a unique system of pick-up that has proved very effective.

We heard Harold Sandford conducting the Sixteen Singers in this studio; the "balance" seemed perfect. Studios are generally uninteresting places to talk about, but the pride of the N.B.C.—the Cathedral Studio—is an exception. The Palm Olive hour and other big national programmes are given from here; all we saw there was a jazz band rehearsing, so we passed through into the planning board room, where representatives from each department meet to discuss big programmes.

On the top story of N.B.C. they have a set permanently tuned to 5SW, Chelmsford. "Now for a big kick, boys!" exclaimed an N.B.C. official, as he fingered the volume control. "Here's your home town calling."

I furtively glanced at the clock, saw that it was 4.20 p.m. New York time, and sighed. Yes, we *did* butt in on the 9.15 talk—how interminable it seemed that stifling hot afternoon. It's a terrible experience, believe me, to listen to an evening talk in the afternoon! Although there was an appreciable undercurrent of static, the signal strength of 5SW maintained a surprisingly constant level.



A member of the "A.W." Technical Staff is seen here climbing to the top of one of the 120 ft. masts of WHK, on the 20th story of the Engineer's National Bank, Cleveland, Ohio

I find that 5SW is mostly in popular demand when excerpts from the Palladium and when other vaudeville turns are being broadcast. Americans are keen on the idea of exchanging programmes with England—hence the great interest in 5SW.

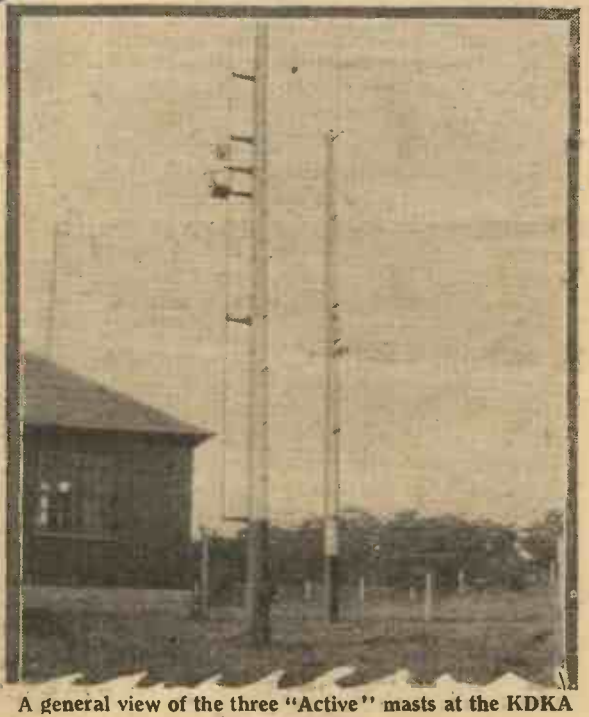
Station equipment, like studios, does not readily lend itself to description. WEAF, the 50-kilowatt station out at Bellmore, Long Island, consists of R.C.A. equipment feeding an aerial 300 ft. high, supported by two masts 600 ft. apart. The chief point of interest to us was the crystal-control system. The crystal is kept at a constant temperature of 46 degrees centigrade by means of a thermostat. In spite of the enormous input power of 150 kilowatts, the 50 kilowatts of aerial energy is kept dead on its frequency—a very necessary stipulation, in view of the congested state of New York's ether.

One morning in Philadelphia, I had the privilege of talking with the President of the William Penn Broadcasting Co., and the subject of advertising in radio was mentioned.

"The American public," said Mr. Hawkins, "just hates to pay dollars to the Government. It will spend money in business much more willingly. You probably regard advertisements over the radio as a necessary evil. John Smith selling furniture irates you, but he is probably interesting hundreds of housewives in Philadelphia."

Asked whether this "small-time" advertising really was worth while, Mr. Hawkins was non-committal, but over the elaborate "sponsored" programmes he got very definite. "'Lucky Strike' cigarettes increased sales by 47 per cent. as the result of a sixty-day series of these sponsored programmes. An American will pay for a 'Lucky Strike' radio programme by buying 'Lucky Strike' cigarettes, but he would

(*Continued at foot of next page*)



A general view of the three "Active" masts at the KDKA short-wave plant

For the Newcomer to Wireless: "DUSTOPHERICS"

HAVE you noticed that atmospherics have been awfully bad just lately?

Honestly, I can't say that I have, in fact, of late I have been struck by the extraordinary freedom from this kind of interference that we have experienced!

That's rather curious.

Why?

Because I have found just the reverse—atmospherics day in and day out, at no matter what time one listened.

Then you can be pretty certain that they were not atmospherics at all, or I would have heard them too.

Then what did I hear?

The crackles and fizzles that you complain of were undoubtedly due to something inside your set. How is the high-tension battery?

Nothing wrong there; I put in a new one only a few days ago and it is right up to the mark.

When did you last clean your condenser vanes?

Condenser vanes?

Yes. I think that if you have a good look at them on your return you will find that there is quite a collection between them of fluffy pieces of dust.

How can these cause noises?

They provide short-circuit paths of varying resistance (since the degree of contact varies) between the two sets of vanes. The effects of dirty vanes are most noticeable when any variable condenser has a big D.C. potential difference across it.

That is, the case in my set as a matter of fact, for the reaction control condenser is connected to earth on one side and to the plate of the valve on the other so that it does get, at any rate, most of the H.T.B. voltage across it.

Then you can be pretty sure that that is the condenser which is causing the greater part of the trouble.

What do you advise?

First of all, clean the vanes thoroughly—you can do it with a feather or a pipe-cleaner.

What next?

Avoid having a big D.C. potential difference across the vanes of this condenser.

How?

Wire a fixed condenser with a capacity of about .001 microfarad in series with it. This condenser should come between the variable and the plate. Since it acts as a D.C. stopper there is thus no direct current potential difference across the condenser which controls reaction. It serves another useful purpose too.

What is that?

If you haven't a fixed condenser in this position you can cause a pretty bad short-circuit if the plates of the variable get out of line or become wobbly. The fixed condenser acts as an effective safeguard.

I suppose from what you have told me that dust in other parts of the set may cause noisiness?

It certainly can. You see, dust is very hygroscopic; that is, it absorbs moisture readily and there is always plenty of moisture in the air of the living-room.

And damp dust is not a good insulator I suppose?

Far from it. And the worst of it is that dust which has collected moisture forms in time a cement-like coating on ebonite surfaces which takes quite a lot of rubbing to remove it.

And this coating provides leakage paths?

Yes, and therefore it may cause noisiness if it is allowed to collect in certain important places.

What are these?

The points that should receive particular attention are the valve-holders, the coil-holders and the tops of the cases of small fixed condensers. Give these a periodical cleaning. Better still don't give dust a chance of collecting inside the set.

"MORE ABOUT U.S.A. RADIO"

(*Continued from preceding page*)

sooner die than pay the Government for an identical programme!''

So there you have a sidelight on the American point of view. Rather typical, I believe.

In a suburb of Philadelphia I had half an hour at the dial of an R.C.A. 17 Radiola, six-valve set. Stations came in at full blast at seven points round the dial. This was in the full glare of the summer's sun. The set can be assumed to be up to the average family installation. It had three stages of H.F. amplification, ganged tuning, an on-off switch, and a volume control. The quality was remarkably good.

KDKA is a call sign known to every short-wave listener. For me KDKA has always been a favourite standby, and having now seen the plant and staff at Pittsburg, I can understand why this pioneer station is so reliable. On the twenty-first floor of the William Penn Hotel, on 9th Street, Pittsburgh, we found the genial Mr. Dare Fleck in the main KDKA studio. From a loud-speaker in the control room PHI, of Huizen, Holland, was "telling the world." Little fading was perceptible, but considerable static marred what would otherwise have been a fine reception.

Leaving the studios and control room, we motored out through the beautiful Shenley Park to the KDKA short-wave plant, some fifteen miles distant. Out there they are plodding away with television; we saw the 63.5-metre transmitter used for television transmissions. Mondays, Wednesdays, and Fridays, from 10 to 11 p.m. Pittsburgh time, are devoted to this work. The scanning disc has 60 holes and does 1,200 revolutions per minute.

"Are your amateurs participating in these television experiments?" was a natural-enough question that I put to Mr. Kenny, the station engineer.

"Not much," he replied. "For the reason, just look at the receiver an amateur would require." We saw the usual disc, synchronous motor, rheostat controls, and magnifying glass such as most amateurs could arrange without much difficulty. Then we were shown the lamps required to form the picture—passing 15 amperes! That seems to be the general bar to television reception—the comparatively large amount of "juice" required.

NOISES OFF!

ONE of the greatest problems which the dramatic producer of a broadcasting station has to solve is the correct reproduction of noises and sounds required by a play or sketch to act as a scenic background. At Breslau, the studio engineers have installed microphones in various parts of the city, and have connected them to the producer's control room. By this means, at any moment, he can superimpose on the outgoing transmission such sounds as those emanating from crowded thoroughfares, noises from a busy railway terminus, the cries of wild animals from the local zoo, or lively melodies from a dance hall.

Added to these, he can also fall back on a series of gramophone records specially registered at motor races, boxing matches, political meetings, and other events in which large crowds abound. All noises can be intensified or weakened at will and are broadcast in the studio in order to create the right atmosphere for the artists taking part in the performance.

It will be remembered that it was recently announced in "A.W." that the B.B.C. "noises-off" officials are having a series of sound-effect gramophone records made for broadcast plays and so on.

GRIDDA.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

I CANNOT say that the special broadcasts from the variety halls have been successful. The latest, for instance, the Houston Sisters, was a sore puzzle. Being somewhat an original turn, Billie and her colleague have made good, but the material they put over has nothing to it. Why don't they throw their money about a bit and get somebody to write some good stuff for them?

◆ ◆ ◆

Fred Harker, of Exeter, as "an interested reader of 'Without Fear or Favour'" thinks it might be of interest to send me a copy of a letter recently sent to the B.B.C. Apparently he bemoans the loss of so many members of the staff of the B.B.C. whom listeners have looked upon as friends. He thinks that if they cleared out the people who "make the appalling noise" which is inflicted on listeners under the heading of Modern Music it would be far better.

My correspondent compares the music written by such composers as Hindemith, Bartok, Stravinsky, etc., with the Epstein statuary or the poems of Miss Edith Sitwell! "If these freaks want their works performed," he concludes, "let the cranks who wish to hear them do so privately, and in the same way that they have to hear banned plays that would not be tolerated by any rightly-minded person."

But surely dear old Epstein is no freak. Is he not regarded as a genius by those who *know?*

◆ ◆ ◆

Nancy Lovatt's voice is a welcome item in variety hours. She sings pleasant light stuff and reaches high notes without strain or wobble. I had rather she were accompanied by piano only. The last time I listened to her, the orchestral accompaniment was much too loud for her.

◆ ◆ ◆

I have written before on the subject of whistling solos. I can never "see" anything in them. I listened to Avis a little while ago and found him to be another whistler whom I do not feel merits inclusion in the broadcast programme. Like the other whistlers he was very, very ordinary and when trying catchy tunes he slurred over the staccato passages. His impersonations were ineffective.

◆ ◆ ◆

Stainless Stephen was again in good form when I heard him the other night. His rambling talk has a charm of his own, and I like his husky voice—not forgetting his flair for punctuation. His song about television was funny.

◆ ◆ ◆

Some of the music of the orchestral concert at which Mrs. O'Neill played was appropriate for a Sunday; but the music which was announced as being "dedicated to Mrs. O'Neill" was—well, hardly a compliment to her.

The concert in the afternoon, however, was one which nine listeners out of ten must have appreciated, especially those two delightful folk songs sung by Miss Megan Foster: "Beautiful Nancy" and "As I was going to Banbury." May we have more of these gems.

◆ ◆ ◆

A clever young pianist is Sidney Harrison. His work with the Wireless Orchestra was most enjoyable. Mr. Harrison's programme was not perhaps as interesting as it might have been—I understand that the music is chosen for him—but his technique was brilliant. A bouquet also to Lenghi Cellini who combines with his splendid voice a perfect microphone manner.

◆ ◆ ◆

Oh! lucky Bournemouthites! They've got Reginald Foort. We are given a chance, however, of hearing him through 2LO. With the excellent new organ of the Regent Kinema under his fingers, he is irresistible.

◆

Miss Dorrie Dene as seen through Lissenden's eyes

Did you hear him play "Light Cavalry" and "Tales of Hoffman"?

◆ ◆ ◆

Feeble revues continue to come and go, but I noticed a slight improvement when listening to "X-Radiants" from Birmingham. Jack Venables at the piano had pep and go, and yet did not sound like a pianola. There was a sketch, too, quite a clever one, which was supposed to be taking place in 1940. But these refreshing touches were overshadowed by a string of inanities and silly songs.

◆ ◆ ◆

Voila an appeal to jazz pianists, dance bands, nasal singers, etc.: Please give "Mean to Me" a rest!

◆ ◆ ◆

Reg. Palmer overdoes the stammering stunt. Have not we had enough of this sort of thing from Clapham and Dwyer?

◆ ◆ ◆

Our expert on saxophonical matters "Harold," states his opinion of Sid. Phillips' saxophone solos. Thus: "Phillips has beautiful tone and rhythm and, if only certain other saxophonists played like him, there would be less prejudice against the instrument."

There was one item of Phillips' turn which I noticed as outstanding; that was his imitation of a Hawaiian guitar. It was extremely clever and, I am told, that it is a very difficult thing to do. No? Well—"can Lloyd George do it?"

◆ ◆ ◆

I had thought that we had buried the hatchet in regard to the Grand Controversy on the dance bands. But I was surprised to find a group in the waiting-room at Savoy Hill discussing the AMATEUR WIRELESS correspondence of some time ago. One of those present simply hurled criticism at Jack Payne's orchestra. He declared that, as an ordinary dance band, it was mediocre, and that having added legitimate instruments to the collection of noises that they made they were trying to excuse jazz by describing it with more flourish of trumpets—in fact, this man was so vehement that he became somewhat involved. He said they were trying to imitate a decent orchestra but only succeeded in achieving a "raucous noise." What else he was going to say was lost, for the rehearsals in the studio nearby began!

The JAMES

A FINE GENERAL-PUR

THOSE who build a new receiver or who alter an existing one during the next few weeks should remember that very soon selectivity is bound to be of even greater importance than in the past.

The constructor is therefore advised to see that a design he may follow is likely to be satisfactory in this respect. This set cuts London cut at three miles. This will be dealt with in next week's test report.

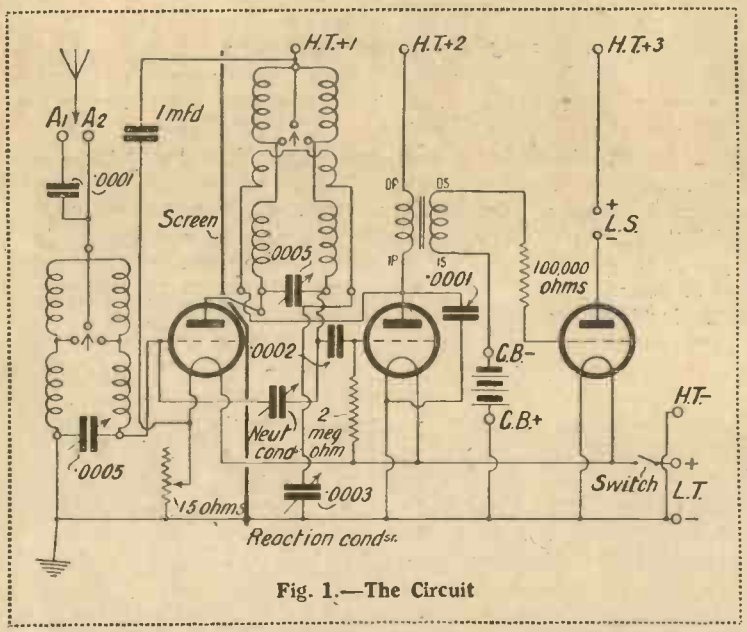


Fig. 1.—The Circuit

Users of three-valve sets having a single high-frequency stage will know that the two tuning circuits combine to provide better selectivity than is possible with only a single circuit. But there are various ways of connecting the two tuned circuits according to whether the maximum volume and reasonable selectivity are required or the maximum of selectivity with reasonable volume.

Controlling Selectivity

It is also possible to include an adjustment by means of which the volume and selectivity may be varied. It is, I think, not generally realised that one of the advantages of a certain type of control is that the selectivity may be varied as well as the volume. Thus, when an adjustable resistance is included in the filament circuit of a high-frequency amplifying valve these two factors may be varied.

Such a resistance is included in the set illustrated here, as will be seen upon referring to Fig. 1. The resistance is of 15 ohms. When it is turned off the anode circuit is disconnected from the aerial circuit and nothing at all will be heard, provided, of course, the high-frequency amplifying valve is properly balanced and there are no stray couplings.

By turning the resistance a little so that the filament of the valve is just lit, signals will be heard, as the valve will magnify, but an important point to notice is that the selectivity will be the maximum. The tuning of the aerial circuit does not alter, but that of the anode circuit does.

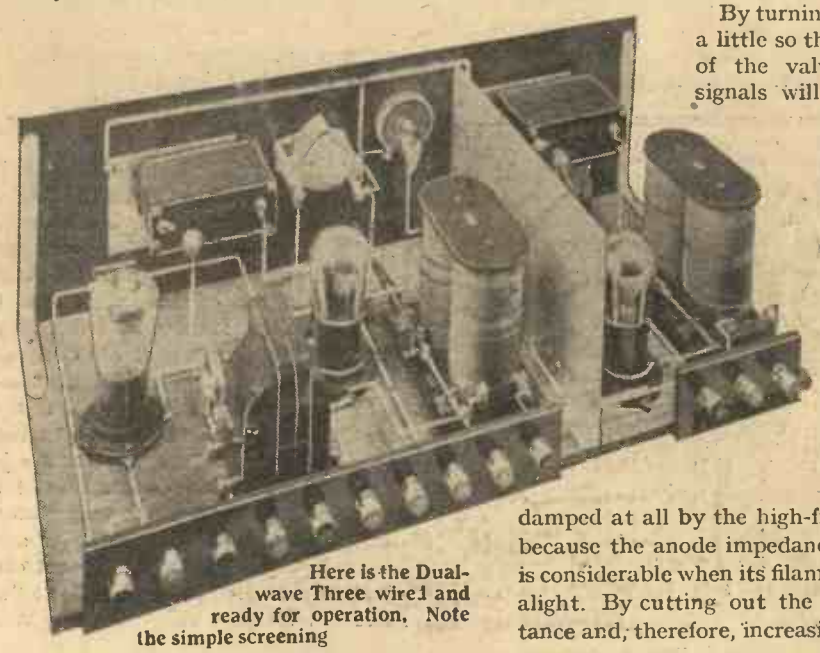
It is hardly damped at all by the high-frequency valve because the anode impedance of the valve is considerable when its filament is only just alight. By cutting out the filament resistance and, therefore, increasing the amount of the filament current, the anode impedance of the valve falls off, and it effectually broadens the tuning of the anode circuit.

The volume is also varied by adjustment of the filament resistance, but one should not forget its effect upon the tuning and therefore upon selectivity.

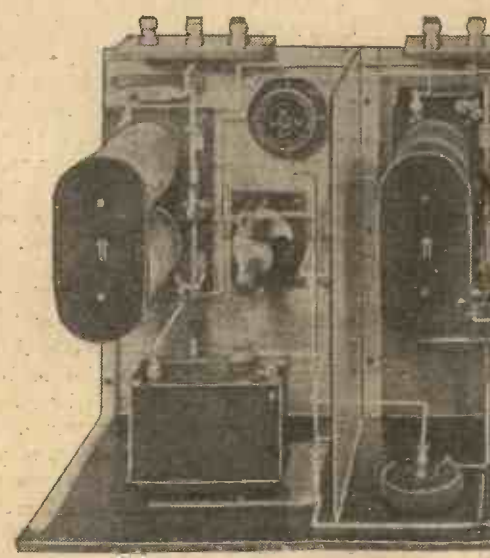
By carefully using this resistance one may separate two powerful stations, provided, of course, they are not working upon wavelengths which render separation impossible. The correct procedure is to turn down the filament resistance and to increase the amount of the reaction.

Proper "Knob-turning"

When interference is troublesome one



Here is the Dual-wave Three wired and ready for operation. Note the simple screening



This plan view shows the positions

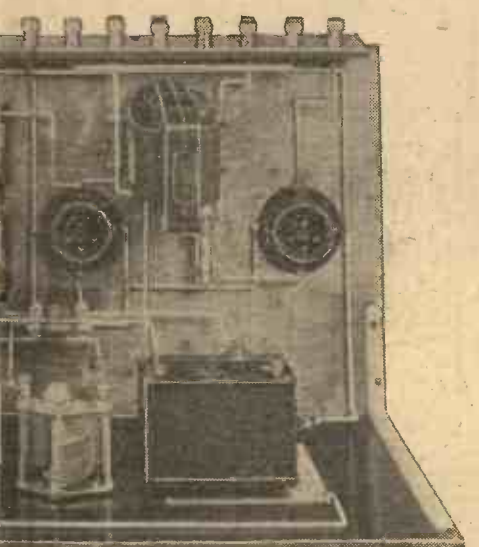
S DUAL-WAVE 3

POSE SET NO COIL-CHANGING

should always adjust the filament resistance in order, first of all, to weaken the powerful interfering station, for then one may usually bring up the strength of the desired station with a little reaction.

To put the matter briefly, although the adjustable resistance is usually referred to as a volume control, it should be employed to help the selectivity when necessary. I know of numerous instances where the selectivity of a certain popular "Kit" set was thought to be not very selective until the correct operating procedure was explained.

Most three-valve sets having a high-frequency amplifying stage employ a shielded valve, but the set illustrated here is fitted with an ordinary valve. Arrangements are, of course, provided for neutralising or balancing this stage in order that stable working may be obtained. The circuit is also arranged so that it is very selective.



of the components on the baseboard

In the aerial circuit, Fig. 1, is included a Binowave dual-range coil for covering the medium and long-wave bands. This coil is tuned with a .0005 microfarad condenser, and the aerial may be connected to it either directly or through a .0001-microfarad fixed condenser. Notice that the aerial connection is made with the centre point of the coil when it is set for medium or long wavelengths.

The filament resistance connected to the high-frequency amplifying valve is on the negative side, with the result the valve is provided with a negative grid-bias of a fraction of a volt, according to its setting.

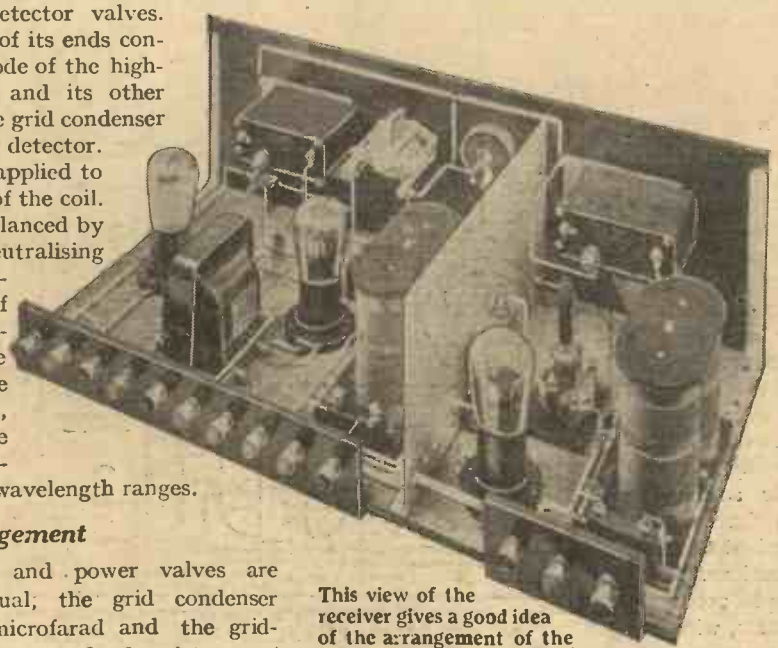
A further Binowave coil having a reaction winding is employed to couple the high-frequency and detector valves. This coil has one of its ends connected to the anode of the high-frequency valve and its other end joined to the grid condenser and leak of the detector. High tension is applied to the centre point of the coil. This circuit is balanced by connecting a neutralising condenser between the grid of the high-frequency valve and the grid end of the coil as indicated, and should be uniformly effective over both wavelength ranges.

General Arrangement

The detector and power valves are arranged as usual, the grid condenser being of .0002-microfarad and the grid-leak of 2 megohms. A fixed resistance of 100,000 ohms is included in the grid circuit of the power valve in order to stop high-frequency currents passing through this valve.

The anode circuit tuning coil is so connected that it is less damped than in the original Binowave receiver, which had a shielded valve, with the result less reaction is needed. Those who may have a standard Binowave anode coil by them should, therefore, remove one half of the reaction winding from each tube. The half removed should be that next the short-wave section of the coil.

It is an easy matter to cut off the unwanted turns and to join the ends together again, but the windings must be stuck



This view of the receiver gives a good idea of the arrangement of the components on the H.F. side

LIST OF COMPONENTS

Ebonite or bakelite panel, 21 in. by 7 in. (Becol, Raymond, Ebonart, Paxolin).

Ebonite strip, 12 in. by 2 in., and one 4 in. by 2 in. (Becol, Raymond, Ebonart, Paxolin).

Baseboard, 21 in. by 10 in. (Pickett, Camco, Clarion).

Two .0005-microfarad variable condensers (Burndept, J.B., Polar, Lissen, Trix, Igranic).

.0003-microfarad reaction condenser (Polar type "Q.J.," Lissen, Burndept, J.B., Trix, Igranic).

15-ohm rheostat (Lissen, G.E.C., Igranic).

Push-pull switch (Bulgin, Lissen, Trix, Wearite).

One Binowave aerial coil and one Binowave anode coil (Wearite, Varley).

Three anti-microphonic valve holders (Lotus, Lissen, W.B., Wearite).

Baseboard-mounting neutralising condenser (Peto-Scott, J.B., Igranic, Lissen, Gambrell).

.0001-microfarad fixed condenser (T.C.C., Lissen, Dubilier, Mullard).

.0002-microfarad fixed condenser with series clip (T.C.C., Lissen, Dubilier, Mullard).

1-microfarad fixed condenser (T.C.C., Lissen, Dubilier, Mullard).

2-megohm grid-leak (Dubilier, Lissen, T.C.C., Mullard).

100,000-ohm resistance (Ediswan, Ready Radio, Varley, Mullard, Graham-Farish).

Holder for resistance (Bulgin).

Low-frequency transformer (Lissen Super, Varley, Brown, Igranic, R.I., Philips, Mullard).

13 terminals marked Aerial 1, Aerial 2, Earth, H.T.—, H.T.+1, H.T.+2, H.T.+3, L.T.+, L.T.—, G.B.+, G.B.—, L.S.+, L.S.— (Belling-Lee, Eelex, Igranic).

Panel brackets (Bulgin).

Partition screen, 10 in. by 6 in. (Ready Radio, Parex, Peto-Scott).

Connecting wire (Glazite).

"THE JAMES DUAL-WAVE THREE" (Continued from preceding page)

down or else the top of the coil must be removed so that the ends of the coils may be threaded through holes in the formers.

Those who buy new coils will not have to alter them, but those with an old anode coil will have to make certain there are not too many turns of wire in the reaction circuit. The reaction winding is the centre one and if it has too many turns the reaction will not be smooth and easily controlled.

Owing to the fact that the anode tuning condenser is connected across the whole of the anode coil, both its sets of plates are at a high frequency potential to earth and it is therefore necessary to use a condenser having a spindle composed of an insulating material, or else to use a dial or knob having little metal in its construction.

Hand effects are not noticeable when an ordinary moulded knob is used, but they might be were a slow-motion dial having an amount of metal used for tuning.

The two .0005-microfarad tuning condensers, the 15 ohms adjustable resistance and .0003-microfarad reaction condenser are mounted on the ebonite front panel and there are, of course, two small knobs attached to the switches of the coils and a filament switch.

Screening

A simple metal screen is used between the aerial and anode circuits. Looking at the back of the set one sees on the right-hand side a small terminal strip having an earth and two aerial terminals, also the aerial coil with its tuning condenser, the high frequency valve-holder, balancing condenser and one microfarad by-pass condenser.

On the left-hand side of the screen is the anode coil, low-frequency transformer and other parts that will be recognised from the illustrations. There is ample room for the parts, with the result the wiring is easy. One or two wires pass through the screen and should, therefore, be carefully insulated either by covering them with systoflex or by using a covered wire such as Glazite.

Care should be taken with the series parallel-type grid condenser, although if the wiring diagram is followed everything will be satisfactory. I should commence wiring with a number of lengths of wire already prepared and follow out the wiring diagram very carefully. It is hardly possible to make a mistake when wiring the coils, as their terminals are well spaced and clearly indicated. The metal shields of the tuning condensers are, of course, connected to earth and to negative low tension, the filament switch being in the positive side.

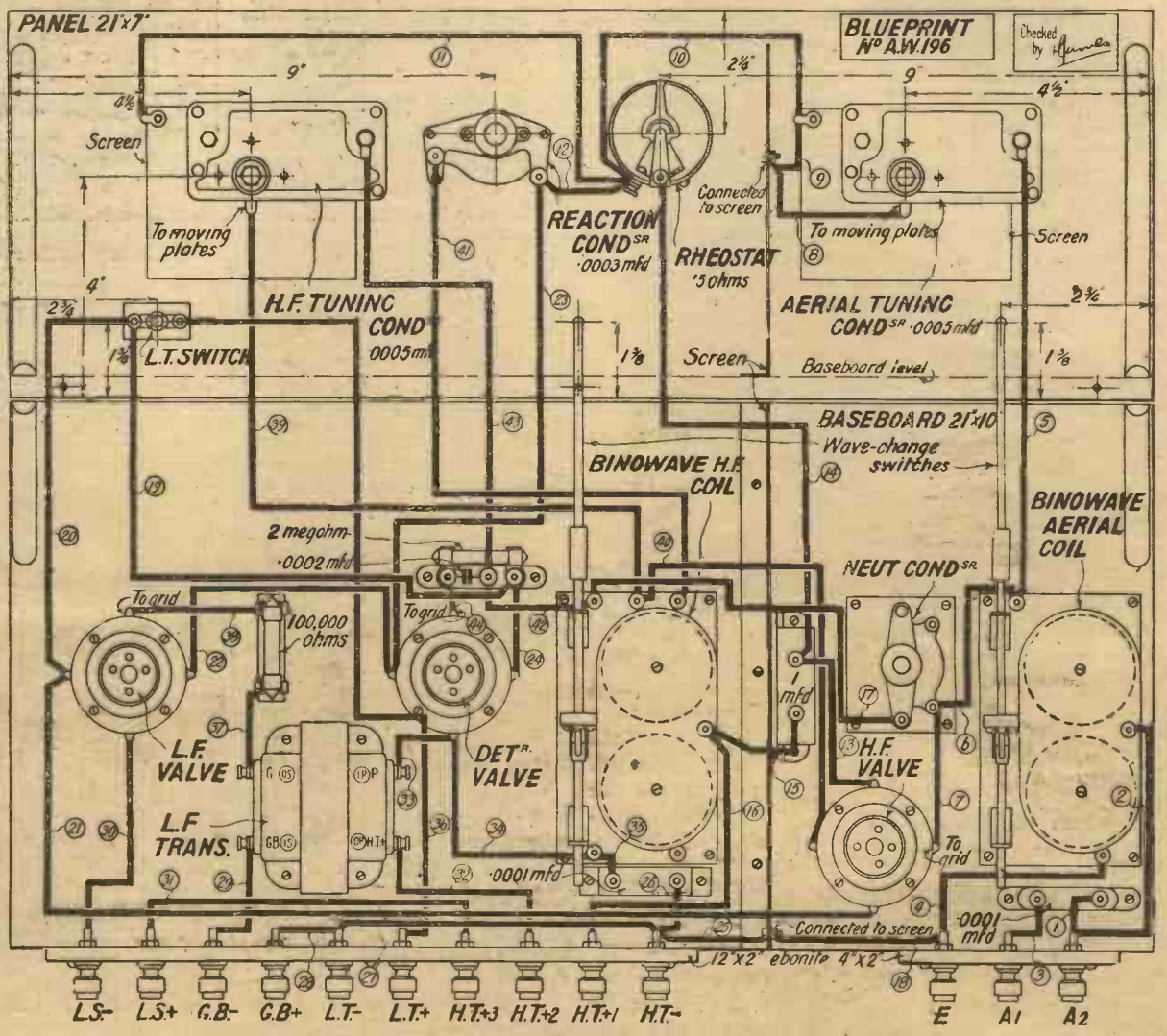
Valves and H.T.

The high-frequency amplifying valve should be of the type having a moderate impedance such as from 20,000 to 30,000 ohms, and a similar type will be suitable for detection. In the third stage a small power valve should be fitted.

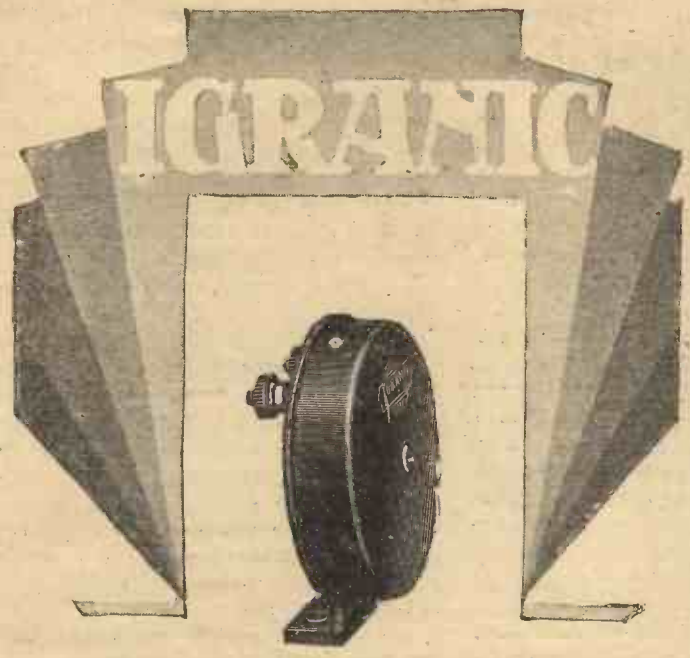
A high tension of from 60 to 90 volts will be suitable for the high-frequency valve and a similar voltage will also be satisfactory for the detector. But a high tension of at least 120 volts should be applied to the third valve and a grid bias of about nine volts negative or according to the valve makers' recommendation.

Tuning

It is not difficult to tune the receiver, as there are only the two main tuning condensers. But before distant stations are sought the high-frequency stage must be balanced. This may be effected by tuning in the local station, turning off the filament resistance which disconnects the first valve, and then adjusting the balancing condenser. It will probably be found that the local station is heard quite well when the filament resistance is turned to its off position, but the circuit is not balanced. The balancing condenser must be so adjusted that the station is not heard at all or only very faintly. Next week I will describe the operation of the set in greater detail.



This is the layout and wiring diagram. Blueprint available, price 1s. 0d.



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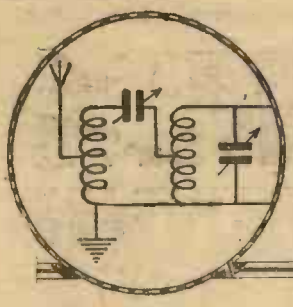
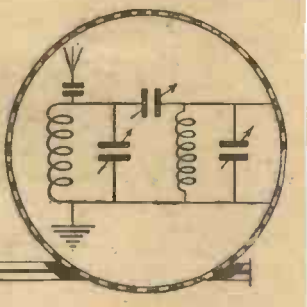


Is the Coupled Aerial Circuit Efficient?



In the attempt to get selectivity, signal strength may be lost. Here our Technical Editor investigates the question of the efficiency of certain selective arrangements.

IN a recent article I discussed the improvements obtained in tuning if two cascade-coupled circuits were used. The aerial circuit is connected to the first tuned circuit in the usual manner, but the voltage across this circuit is not applied directly to the first valve in the receiver. Instead, the circuit is coupled in some suitable manner to another tuned circuit and it is the voltage across this second circuit of which we make use.

Such a system has a distinctly better tuning characteristic, but a question which will at once occur to most readers is: will the signal strength suffer? Perhaps most people will put it in a slightly different form. Will not the signal strength, they will say, be so poor as to prevent the scheme from having practical utility?

The extent to which the losses are increased depends upon the coupling between the two circuits. Let us assume that we have started off by setting up currents in one circuit. Then it might appear that the stronger we make the coupling between this circuit and the next circuit, the larger will be the currents set up in the second circuit. This, however, does not prove to be the case in practice, owing to the unfortunate fact that the two circuits affect one another. The resistance

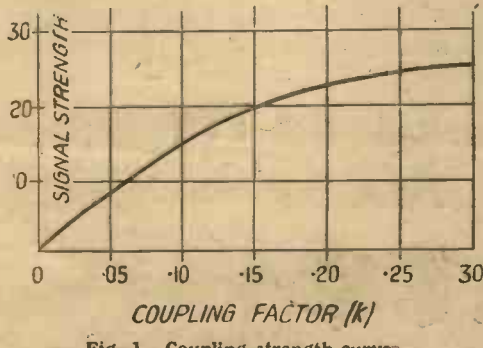


Fig. 1. Coupling-strength curve

of the second circuit is transferred in some measure to the first, so that the damping in the first circuit is increased. The seriousness of this increased damping depends upon the coupling between the circuits.

Consequently, the more closely we couple the circuits the greater the voltage we transfer, but the greater the damping we introduce, and after a certain point the two effects cancel out. It is quite easy to show mathematically that as the coupling is gradually increased so the current in the secondary circuit increases up to a point.

As a matter of interest, some experiments were conducted to show the effects. A dummy aerial circuit was constructed in which a small high-frequency voltage was

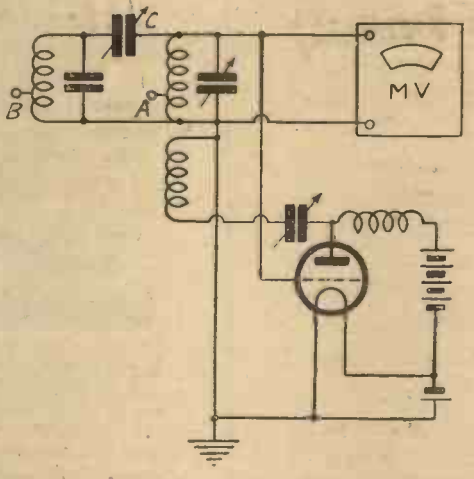


Fig. 2. The test circuit

introduced from a screened local oscillator. This dummy aerial circuit was coupled to the first tuned circuit in the same way as we normally adopt in practice. The voltage developed in the first place was transferred through a small coupling capacity to a second tuned circuit, and across this secondary circuit was connected a valve voltmeter measuring the voltage output.

The input from the aerial was kept constant and the value of the coupling capacity was varied from a very small value up to a suitable maximum point. It will be remembered that as the coupling is increased beyond a certain value, double-hump effects are introduced, the circuit tuning at two definite points. It is not desirable to increase the coupling factor above about 0.2, and in consequence this was taken as the limit in the particular experiment. Fig. 1 shows that the output from the secondary increases rapidly as the coupling is increased.

It will be seen that the maximum strength obtained in the curve is 25 units. A test on a single circuit alone showed that the strength here with the same input was 41 units. At first sight this does not look encouraging, for there is quite a considerable discrepancy between the two. Actually, however, the resistance of the two circuits was fairly high—20 ohms each.

A second test was, therefore, carried out under practical conditions. A separate reactor valve was added in parallel with the Moullin valve voltmeter, and so arranged that it introduced a certain amount of reaction on to the secondary circuit. First of all, the dummy aerial system was connected to the point A in Fig. 2. The previous part of the circuit was disconnected and the coils actually removed to avoid any absorption effect. The reactor valve was adjusted to give a small amount of reaction and the resonance curve of the circuit was taken. This is shown in Fig. 3.

The aerial was then connected to the point B, in which case we have the coupled circuit originally adopted, and the reaction was slightly increased until at the tuning point the deflection was exactly the same as with the single circuit. It may be observed that the increased reaction was very small indeed. The resonance curve of the circuit was then taken, and is also plotted in Fig. 3. The advantage of the coupled circuit is now immediately seen, for tuning is very much sharper.

We may conclude, therefore, that the use of a coupled circuit without any reaction will result in a certain loss in signal strength

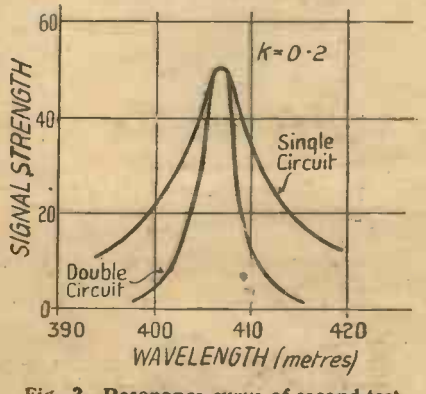


Fig. 3. Resonance curve of second test

but that if a small amount of reaction is applied, as is nearly always the case in practice, there is very little to choose between the two circuits in point of view of signal strength. On the other hand, the selectivity is distinctly improved and becomes increasingly good as the coupling is reduced.

"A.W." TESTS OF APPARATUS

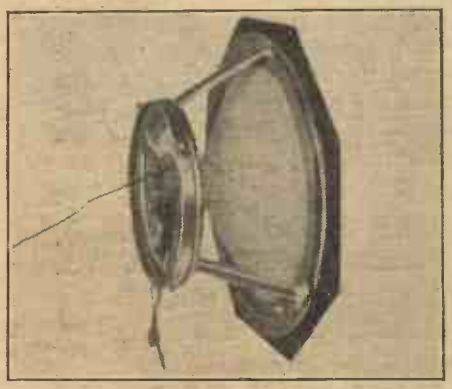
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

New Squire Loud-speaker

THE use of two cones, one having a relatively large diameter and the other a small diameter has become popular of late. The idea is that the large diameter cone will reproduce the bass notes while the smaller diameter cone will look after the upper frequencies.

We have received from the Squire Manufacturing Co., of 24 Leswin Road, London, N., one of their Duplex cone loud-speakers which is made in this manner. The larger cone is 15 in. in diameter, while the corresponding dimensions for the smaller cone is 8 in. The whole is mounted in a rigid aluminium framework attractively finished in the usual Squire style, and the unit is mounted in the concavity formed by the smaller cone.

The reproduction obtained on this instrument was good and very pleasing without woolliness. The sensitivity, of course, and to some extent the quality, depends upon the unit employed, but with that actually supplied with the instrument was about the average.



New Squire loud-speaker, having double stretched diaphragms joined at the apex

Wates Duplex L.S. Unit

THE Wates Duplex loud-speaker unit which we have received for test contains certain novel features which should make an appeal to radio users. This unit is of the balanced-armature type, but instead of only one magnet, two horseshoe magnets are employed. One of these is fixed, while the other is capable of being rocked about a fulcrum in such a way that the actual length of the air gap can be varied from about $^3/_{32}$ in. up to $^1/_8$ in. The reed is also capable of being moved from side to side so that the correct centring can be obtained.

The sensitivity can thus be controlled to suit differing requirements. For weak signals, the gap may be adjusted towards the smaller value while on loud signals where the travel of the armature is likely to be considerably more, the gap may be opened to avoid any possibility of touching the pole pieces.

The instrument was tested by being fitted with a fabric cone and gave quite good results. The sensitivity was about the average and the quality also was good. This depends very largely on the type of cone system employed.

The unit is somewhat higher in price than the average, but it should nevertheless make a ready appeal. The makers, of course, are the Shaftesbury Radio Co., of 184-188 Shaftesbury Avenue, W.C.2.

An Aid to Selectivity

SELECTIVITY is the cry of the day and, with the coming of the Regional Scheme, many people will find it necessary to improve the selectivity of their sets. One relatively simple way in which this may be done is by the use of a wave-trap or filter connected in the aerial circuit. This is tuned to the local station and absorbs energy at or around the particular frequency to which it is tuned.

For the greatest efficiency, both the tuning coil and the condenser must have a very low loss. The sharper the tuning of the absorbing circuit, the more efficient the absorption on the required wavelength and the less the spreading of the effect to neighbouring wavelengths where it is not required. It is possible, however, to design filters which are effective under average conditions without taking extreme precautions and in the interests of compactness a certain amount of efficiency is often sacrificed.

The Burne-Jones Magna-filter which we have received for test from Messrs. Burne-Jones & Co., Ltd., of Magnum House, 288 Borough High Street, S.E.1, contains a fairly efficient tuning circuit which is coupled to the aerial by a primary winding having two tappings. These tappings are brought out to terminals on the baseboard marked A1 and A2, the better position being chosen by actual trial. The base of the instrument is circular and measures 4¼ in. in diameter, while the height is a little over 3 in. The whole unit is neat in appearance and can be screwed into any convenient position where it may be left permanently in circuit. Readers experiencing trouble, due to inadequate selectivity, will find this a useful accessory.

Useful Test Prods

IT is often desired to test the voltages on a set while it is actually in operation. Indeed, with the modern method of series feed to the anode circuits of valves, it is not possible to obtain a satisfactory indication of the voltage unless the set is actually running under its operating conditions. Under such circumstances, it is neither convenient nor desirable to use the ordinary wire which is held to the required points by means of the fingers. For one thing the voltage may be unduly high in which case

A metal prod, with a coloured handle, which is very useful for testing

an unpleasant shock will result, while alternatively, there is always a risk of the wire accidentally causing a short circuit.

In such circumstances, a relatively long insulated handle with a spike at the end is of particular value and we have received from the Elbetto Manufacturing Co. of 4 Market Place, Buxton, two test prods intended for use in this manner. They consist of an insulated barrel 3 in. long and $^5/_{16}$ in. diameter, having a 1-in. spike at one end, the other end being fitted with an insulated terminal. The voltmeter leads are connected to the terminal and the prods are then probed about inside the set to the required points. It is possible by this means to reach points which are otherwise difficult of access.

The prods are coloured red and black respectively and constitute one of the handiest gadgets which we have tested for some time.

A HIGH VACUUM

THE efficiency of the modern "hard" valve is largely due to the development of high-speed pumps and similar means for producing a high degree of evacuation. In a recent lecture on molecular motions in rarefied gases, Sir Ernest Rutherford stated that it is now possible to produce a vacuum in which a molecule can travel for a total distance of more than 100 metres without coming into collision with another molecule, and this in spite of the fact that there may still be present as many as forty thousand million molecules per cubic centimetre.

B. A. R.

MUSICAL SENSE

WHEN we listen to music, classical or otherwise, emanating from the loud-speaker, it is not sufficient to say, "Oh, that was a pretty piece," or, "What a delightful melody that is"; in other words, it is not only our sense of hearing but our sense of *understanding* which should be brought into play.

Composers don't write at random; if they do, they shouldn't. There ought always to be a definite picture, story, scene, poem, etc., told in music and we should be able to appreciate this.

On one occasion, while practising for an organ recital, I was going over the great St. Anne's fugue of Bach when a friend happened to enter the large church. He sat for a while and when I had finished, he remarked: "Chuck that stuff, old man, and give us some music now."

This fellow had a nice tenor voice, quite untrained, and though knowing little music sang a ballad quite decently.

I asked him to come to the organ stool, explained how Bach made a short passage of a few bars his main tune. This was given out in the treble, then the tenor, alto and lastly the bass; it was twisted and turned about, improvised on and so forth, and from this very small melody a great musical work was built.

I marked out the main tune as it occurred throughout the fugue, and to cut the story short we very soon had that self-same man actually *whistling* the motif at the correct places where it occurred in the music . . . he had acquired musical sense, he had begun to understand what the composer was about and what he wanted to tell everyone.

Where in this country could one see a sight similar to the following?

In a Bier Halle not a hundred miles from the Unter Den Linden, Berlin, there was a symphony orchestra of over fifty performers who played the best of good music to which one could listen for hours for the price of a stein of lager . . . about "tuppence."

Directly the conductor rose and tapped his baton on his desk, dead silence prevailed. Not a soul moved or spoke, till the number was finished. The Germans were wise in giving opportunity even to their working men to acquire the musical sense which, of course, is uplifting and educative, and those same working men could discuss the most intricate problems connected with the performance.

Already we see the good work of wireless; message boys now whistle on their rounds "Your Tiny Hand is Frozen," from *La Boheme*, and Cavaradossi's big song from *La Tosca*, instead of such commonplace ditties like "Where Did You Get That Hat?" and "I Lub ma Lubely Loo Ah Doo!"

So let the good work proceed; the day is past and gone when British composers were ashamed to place their own names on their compositions, and when all music came from the Continent.

Doc Page.

RADIOGRAMS

THE ice-cutter *Sedov* sailed recently for Franz Josef Land, east of Spitzbergen Archipelago, where the Soviet Government will build the northern-most radio and hydro-meteorological station in the world. Russian scientists assert it will benefit the entire world in forecasting weather with greater precision than similar stations less distant.

The Icelandic Parliament has authorized the Government to endeavour to raise a loan of £624,000 for the establishment of a powerful radio broadcasting station, and other developments.

Something out of the usual run of broadcast programmes has been devised at Glasgow, with an entertainment provided mainly by soloists. These consist of none of the accustomed vocalists, pianists or violinists. Instead, zither-banjo, trombone, and xylophone players are "featured."

The International Safety of Life at Sea Convention, recently concluded in London, adopted a provision requiring all passenger ships of 5,000 tons and over to be equipped with radio compasses. The London Convention of which the above matter forms a section, becomes effective in 1931 upon ratification by five of the contracting Governments.

Under the Federal Radio Commission's rules, no station in America may rebroadcast the programmes of another without first obtaining the originating station's permission.

Westinghouse has secured permission to move the transmitters of KDKA and KYW. KDKA will soon be located 26 miles north-east of Pittsburg and KYW will be moved 22 miles out of Chicago. Both new locations have been selected with a view to giving improved distant reception.

It is stated in Berlin that the German Reichsfunk has guaranteed the expenses of running the 1930 Wagner Festival at Bayreuth (Bavaria) in exchange for a concession to relay the operatic performances through the German broadcasting system.

On his return to the United States, Mr. C. W. Horn, General Engineer of the National Broadcasting Company of America, in an interview stated that if he made any criticism of European radio programmes it was their monotony. He said: "They have solid hours of heavy musical programmes, heavy lectures or educational talks. Monotony, in my opinion is the enemy of radio."

One Day More, one of the only two plays written by Joseph Conrad, will be broadcast for the first time by 5GB on August 19. It is likely to prove as popular as the same author's *Lord Jim* produced some two years ago.

By special request, *Squirrel's Cage*, an arresting drama of suburban life, is to be revived at the 2LO studio on September 12.

Two short plays will be found in the programme arranged for 2LO and 5XX on August 29. *The Pierrot of the Minute* is a dramatic fantasy by Ernest Dowson with music specially composed by Stanford Robinson who will conduct the performance. It is to be followed by *The Man with a Flower in His Mouth*, by Luigi Piandello, a duologue in the Italian author's best style.

On August 29, from 5GB, we are promised a new revue entitled *Too-ral-i-oo-ral-i-ray*, from the pen of Ernest Longstaffe, the organiser of Blackpool's musical shows last summer. A strong cast includes Tommy Handley, his wife, Jean Allistone, Alma Vane, Foster Richardson, Stanley Vilven with the revue chorus and orchestra. For the benefit of London listeners it will again be broadcast on August 31.

According to Italian wireless journals the wireless telegraphy transmitter which is to be built at the Vatican, Rome, will possess a nominal power of 20 kilowatts. Short-wave transmissions only are to be used, namely, telegraphy on 33 metres and telephony on a wavelength between 15 and 45 metres. There is no question of any attempt to use the broadcast band.

Special transmissions are being carried out by W2XAF (Schenectady) in the afternoon for the benefit of European listeners on two wavelengths as under: Sundays, 19.56m. (15,340 kc.) 19.30—22.30 B.S.T.; Mondays, 21.96 m. (13,660 kc.) 19.00—21.00; Tuesdays, 19.56 m. (15,340 kc.) 19.00—20.00; Thursdays, 21.96 m. (13,660 kc.) 19.00—21.00; Fridays, 19.56 m. (15,340 kc.) 19.00—20.00.

For the reorganisation of the Russian broadcasting system, the Soviet Posts and Telegraphs Administration has earmarked a sum of seventy-five million roubles to be expended on developments over the next five years. The scheme includes the construction of a 75-kilowatt broadcasting transmitter on a site some twenty-five miles distant from Moscow.

Alterations are to be made to the plant of the Riga broadcasting station in order to increase its power to 6 kilowatts; up to the present it has been working on half this power.

For the first time in the history of German broadcasting, a relay was carried out on August 7 of the start from a Paris aerodrome of the Around Europe Aeroplane Race in which German aviators were competing.

It is rumoured in French wireless circles that the Bordeaux-Lafayette broadcasting station is to emerge from its re-construction as a 30-kilowatter in order to secure an adequate radio service for all districts in Western France.

Owing to a breakdown at Radio-Catalana (EAJ13), its advertised programmes will be broadcast by Radio-Barcelona (EAJ1). Since the amalgamation both transmitters belong to the *Union Radio* Madrid group.

If an agreement is reached between Barcelona (EAJ1) and the *Ecole Supérieure*, Paris, French listeners will be given on the second Monday in each month a relay of an operatic performance from the Teatro del Liceo in the Spanish city. These entertainments will also be broadcast by the Eiffel Tower.

This is the studio of Nurnberg, one of the best known of German stations. The wavelength is 239 metres, and very favourable reception is reported at the present time

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.2
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	17.0
*1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	5.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
230	1,300	Charleroy (LL)	0.25
250.9	1,196.6	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,071	Liége	0.5
*509	590	Brussels	1.0
CZECHO-SLOVAKIA			
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava (Feriby)	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	1.0
1,153	260	Kalundborg	7.5
ESTHONIA			
*297	1,010	Reval (Tallinn)	2.0
FINLAND			
*221	1,355	Helsingfors	0.8
*1,796	167	Lahti	40.0
FRANCE			
170	1,750	St. Quentin	0.25
220	1,364	Béziers	0.1
237	1,265	Juan-les-Pins	0.4
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
*255	1,175	Toulouse (PTT)	1.0
*265	1,130	Lille (PTT)	0.8
*272	1,103	Rennes (PTT)	1.0
292	1,028	Radio Lyons	1.5
*294	1,020	Limoges (PTT)	0.5
*302	990	Bordeaux-Lafayette (PTT)	0.5
305	982	Agen	0.3
*316	950	Marseilles (PTT)	0.5
326	918.9	Grenoble (PTT)	1.5
*329	914	Montpelier (PTT)	1.5
336	892	Petit Parisien	0.5
346	869	Strasbourg	0.3
351	855.5	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	9.0
411	729	Radio Maroc Rabat)	2.0
436	687	Radio Flandre (Lille)	0.5
447	671	Paris (Ecole Sup. PTT)	0.7
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
*1,460	205.4	Eiffel Tower	8.0
*1,725	174	Radio Paris	8.0
GERMANY			
*218	1,373	Flensburg	1.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	4.0
*239	1,256	Nurnberg	4.0
*246	1,220	Kiel	0.7
*246	1,220	Cassel	0.7
*253	1,184	Breslau	4.0
*259	1,157	Leipzig	4.0
*270	1,112	Kaiserslautern	1.5
*276	1,085	Koenigsberg	4.0
*283	1,058	Magdeburg	0.7
*283	1,058	Berlin (E.)	0.7
*283	1,058	Stettin	0.7
*319	941	Dresden	0.75
*325	923	Gleiwitz	0.0
*339	887	Bremen	0.75
*360	833	Stuttgart	4.0
*372	806	Hamburg	4.0
*390	770	Frankfurt	4.0
*418	716	Berlin	4.0
*453	662	Danzig	0.75
*456	657	Aachen	0.75
*473	635	Langenberg	25.0
*533	563	Munich	4.0
*560	536	Augsburg	0.5
*560	536	Hanover	0.7
*569.2	527	Freiburg	0.7
*1,635	183.5	Zeesen	20.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
1,283	234	Luxembourg	2
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
*300	1,000	Huizen via Hilversum aerial (until 5.40 p.m. B.S.T.)	5.0
*1,070	280	Huizen via Hilversum aerial (after 5.40 p.m. B.S.T.)	5.0
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Hilversum via Huizen aerial (AVRO)	5.0
HUNGARY			
*550	545	Budapest	15.0
ICELAND			
*1,200	250	Reykjavik	1.0
IRISH FREE STATE			
*225	1,337	Cork (1FS)	1.5
*413	725	Dublin (2RN)	1.5
ITALY			
*274	1,094	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	3.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano(IBZ)	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
*368	813	Zagreb (Agram)	1.25
*431	694	Belgrade	2.5
*566	530	Ljubljana	3.0
LATVIA			
*525	572	Riga	4.0
LITHUANIA			
*1,935	155	Kovno	7.0
NORWAY			
*283	1,058	Notodden	0.7
*365	820	Bergen	1.0
*394	761	Frederiksstad	1.0
450	666.5	Rjukan	1.0
453	662	Tromsoe	1.0
453	662	Aalesund	1.0
453	662	Porsgrund	1.0
*493	608	Oslo	1.5
POLAND			
*313	959	Cracow	1.5
*335	896	Posen	1.5
385	779	Wilno	1.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	10.0
ROUMANIA			
*394	761	Bucharest	2.0
RUSSIA			
*351	855.5	Leningrad	10.0
*427	702.5	Kharkov (NKO)	5.0
*483	621.5	Homel	2.0
*825	364	Moscow (PTT)	25.5
1,060	283	Tiflis	1.0
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	5.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
*268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	0.5
442	7.6	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	3.0
453	662	Salamanca (EAJ22)	0.5
SWEDEN			
231	1,301	Malmo	0.5
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.4
*322	932	Goeteborg	6.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	1.0
*770	389	Ostersund	2.0
1,200	250	Boden	2.0
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.6
680	442	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Aug. 19. Queen's Hall Promenade Concert.
" 20. Famous Northern Resorts Programme from Blackpool.
" 21. Vaudeville Programme.
" 22. Feature Programme.
" 24. *The Mulligatawny Medallion.*

DAVENTRY EXPERIMENTAL (5GB)

Aug. 18. An Orchestral Concert.
" 19. Chamber Music.
" 20. A Programme of Popular Chorus Songs.
" 21. Queen's Hall Promenade Concert.
" 22. A Vaudeville Programme.

CARDIFF

Aug. 18. Coleridge-Taylor Programme.
" 19. Flights of Fancy.
" 24. Concert Party Entertainment.

MANCHESTER

Aug. 20. Blackpool Programme.
" 21. Commentary on the Rydal Sheep Dog Trials
" 24. *Northern Notions.*

GLASGOW

Aug. 18. A Military Band Concert.
" 24. "*What Ho ! America.*"

ABERDEEN

Aug. 19. An Instrumental and Vocal Concert.
" 21. Scottish Concert.
" 23. Popular Light Programme.

Following those at Geneva, Brussels, and Prague, further radio conferences are to be held at The Hague, Barcelona, and at Madrid.

In Germany, where the wireless receiving licence is paid for monthly, the advent of summer and the holiday season somewhat influences the income received by the broadcasting stations. Recent figures show that whereas, in April, 2,837,894 listeners had paid their instalments some 11,000 refrained from doing so on July 1

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Those Old Sets

SIR,—I wonder why it is that nowadays we do not hear anything of types of receiver which were very popular some years ago. I have a reflex set which was made in 1924 and which has worked quite well since then. The quality of reproduction compares favourably with that given by many modern sets I have heard, though I admit that it is easily overloaded. At present it is working with a valve I bought in 1928; so there is no truth in the rumour which I have often heard that reflexes do not work well with modern valves. Just think of the saving I get with my two-valve and crystal combination, which gives results, in my opinion, equal to a four-valver. Why does not the AMATEUR WIRELESS Technical Staff devise a modern reflex? I find that the use of a crystal detector does not introduce any snag; my detector is of the permanent type. In any case, it is possible to use a valve detector with a reflex, if one does not mind the little extra filament "juice" and higher H.T. consumption.

Then what about other "old stagers," such as the "Armstrong Super," the "Flewelling," the "Cockaday," and even the ordinary super-het. about which one hears little nowadays. I worked an "Armstrong Super" receiver (one-valver) when the design was first published and found it quite O.K., except, of course, for the annoying whistle. This whistle, I believe, can be cut out with a simple filter circuit. The "Armstrong Super" was a good set, but I don't suppose many modern listeners have even heard of it.

G. R. (Windsor).

Empire Service—and £.S.D.

SIR,—"Patriot" made in AMATEUR WIRELESS No. 372 an oft-repeated plea for Empire broadcasts. It certainly does seem that now the B.B.C. is more or less a Government concern it should provide an adequate service for the Dominions. It is all very well to talk about expense, but surely the additional expense involved is a mere nothing in comparison with the present expense of running a broadcast service. It would mean simply that 5SW (which from the technical viewpoint seems to function satisfactorily all over the globe) would have to be kept going for twenty-four hours of the day. During the normal programme time the London programme could be relayed, while at intervals during the rest of the day it would be easy to relay present items, such as the morning service, lunch-time programmes, school broadcasts, and so on. Really, the whole of our broadcast day seems filled, and it should not be difficult to give an almost complete twenty-four hours' service through 5SW. If we did this we, as pioneers, should have something about which to boast. Great Britain seems strangely indifferent about her wide Dominions so far as broadcasting is concerned, when it comes to £.s.d.

H. K. (London).

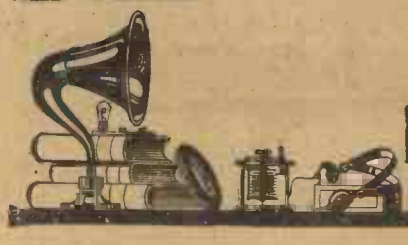
Other People's Views

SIR,—Your correspondent P.K. (Aston), who describes listeners who write to the B.B.C. as cranks—I have usually heard it as "old maids and cranks"—may or may not be right in describing them as such; but these so-called cranks often express the views of other listeners as well as their own, and may include the views of what your correspondent calls "typical listeners." What exactly is a typical listener? Does P.K. (Aston) know?

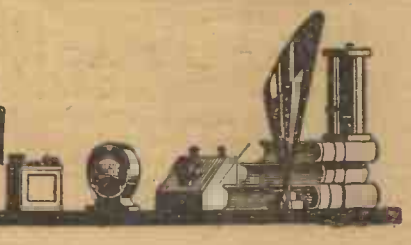
I think P.K.'s letter rather reminds one of the old saying, "All the world's queer save thee and me, and even thee's a little queer!"

Because some broadcasts do not appeal to certain listeners it does not necessarily follow that they are *unintelligible* broadcasts; but each listener is entitled to his view.

A. M. H. (Coventry).



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

The Pentode Valve

Q.—*I have purchased a pentode after reading such good reports concerning working ability. I am not dissatisfied with my purchase, but maybe the old adage that "a little knowledge is a curse" is repeating itself in my case. What I cannot understand is this. I have a screen-grid valve which, I understand, has four electrodes. This valve has the usual four pins in its base and an extra terminal on top which accounts for all of the electrodes. The pentode valve has exactly the same number of pins and terminal and yet is supposed to have five electrodes "penta" being Greek for "five." If my assumption is correct where is the fifth electrode connected ?—K. R. (Walthamstow).*

A.—Apparently you have not read the various explanatory notes relating to the internal design and construction of pentode valves. The extra electrode in the case of the pentode valve is arranged between the control grid and the anode of the valve and is connected to the centre point of the filament. The reason for this may not, of once, be apparent, but when it is considered that one of the three grids is connected to the same H.T. positive potential as that supplying anode current to the valve it follows that when the phones or loud-speaker is connected in circuit with the anode of the valve the actual potential applied to the anode of the valve will be slightly less than that applied to the auxiliary grid. This means that on occasion there is a possibility of a secondary electron current flowing from the anode to the auxiliary grid. The interposition of the extra grid between the anode and the auxiliary grid and connected to the filament of the valve introduces a negative potential which prevents the rise of this secondary electron emission. This grid has no external terminal.—L.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Transformer Cores.

Q.—*Why are not solid iron cores used in transformers? Why should it be necessary to build up the cores from thin stampings?—B. A. B. (Nottingham).*

A.—When a varying current is flowing through any conductor a varying magnetic field is set up around that conductor, and varying currents are induced in any other conductors which the varying field may happen to cut. This is, of course, the principle by which currents are induced in the secondary winding. The core, however, is also composed of conducting material, and if precautions are not taken, a considerable loss of energy may occur through currents being induced in the core, where they are not wanted and where they can do no useful work. Making the cores of thin laminations and insulating each lamination from its neighbour greatly restricts the "eddy currents," as these stray currents in the core are called.—W. S.

ODDS AND ENDS—Jottings from my Log.

By JAY COOTE

THE Czecho-Slovak authorities are anxious that their broadcasting system should rank among the foremost in Europe and to this effect are hurrying on their new constructional programme. Many listeners during the last week or so, will have picked up on a wavelength of 263 metres a relay of the Prague programmes by the new 10-kilowatt Moravska-Ostrava transmitter.

As a matter of fact, for the time being, its addition to Feriby (Bratislava) provides us with "two strings to our bow" when we wish to capture the main Czecho-Slovak entertainments. Apparently these new stations have put Prague in the shade and the *Radio-Journal* considers that the capital should be endowed with a transmitter permitting its programmes to be heard throughout Europe.

Tests were recently made to find a suitable site for the newly planned 60-kilowatt giant and a decision has been taken to erect it at Czesky-Brod, a spot lying at a reasonable distance from the Czecho-Slovak capital. The original plan to install it at Strasnice, in the immediate neighbourhood of Prague was defeated as it was considered that in that position it would prevent the reception of foreign transmissions by the majority of listeners living within a radius of some 20 miles.

It is good to read that some authorities consider the feelings of the radio amateur by showing their desire to take such a factor into consideration when deciding the site of a high-power station. At present if you pick up the Prague call through any of the stations taking the relay it may puzzle you for the announcer reels it out somewhat rapidly thus : *Allo, Praha, Brno, Bratislava, Ostrava*, all native names which may still be unfamiliar to you. On the stations closing down, from Prague you will hear the hour struck on a gong.

Munich's Move

With its move to a new studio, Munich has discarded its old interval signal and from what I can hear is still experimenting with other methods for on some nights I have picked up sounds which differed from those heard on previous evenings. For your guidance, however, the latest is a series of five notes repeated *ad lib.* They might be produced by a musical box as they are in the form of chimes; they are followed by a long blast of a syren of the conventional steamship variety. Its *who-o-o-o* recalls the mournful wail of a coastal tramp in a Channel fog.

I take it that you are all acquainted with the Birthday Greetings to the kiddies during the Children's Hour. Well, how would it suit you to receive a personal message from Poland in this manner? You may easily accomplish this as all you need do is to write a letter to the Director of the Kattowice (Poland) broadcasting station (Mr. Tymienicki) telling him what you think of the programmes. If you care to make any suggestions as to their improvement, he is willing to consider it and all such letters are personally answered by him or by his lady announcer *via* the microphone. Tune in to this station on 408 metres on any Friday night at 11.0 p.m. and you will hear the studio staff dispose of its voluminous foreign correspondence. According to the country of origin the replies are broadcast in English, French, German, or Italian. So far as I know this is the only station which has adopted this feature, but it is a popular one as you may prove for yourselves by listening to the transmission. In view of the size of the mail-bag, on certain Fridays nights the studio will be on the air until past midnight, and then, on occasion, apologies will be tendered in various languages for the postponement of replies to a later date.

CHEAP CABINETS

TO the amateur constructor who takes a pride in making his set himself the question of a cabinet is always a troublesome one. Non-technical people are inclined to judge a set by its appearance, and to make a neat cabinet and french polish it is a job that requires skill not usually within the scope of the amateur set maker, and the cost of the professional models is rather high; while if the outlay of the set demands a special cabinet the cost is correspondingly greater, and it was for this reason that the following methods were devised:

The case can be built of any wood, but preferably plywood to minimise warping, cracking, etc., and is covered with Rexine or similar leather cloths to harmonise with the surroundings. These cloths can be obtained quite cheaply at any upholsterers' in a variety of colours and widths, and if a little care is taken it is surprising what handsome results can be obtained even without any previous experience in this type of work.

The best method is to make the frame of the cabinet—that is, the top, bottom, and the two sides—first, and these may be jointed with a simple tongue joint and pinned and glued. When the glue has set it is covered with the Rexine by cutting a strip of the cloth ½ in. longer than the combined length of the top, bottom, and the two sides, and of a sufficient width to turn over each edge and leave about ½ in. overlap on the inside.

If the wood is fairly smooth this strip can be glued on, but the better method is only to glue the beginning of the strip to the middle of the bottom, so as to have the overlap underneath and, when the glue is dry, stretch the cloth all round the frame and glue the overlap, temporarily fixing it with some drawing pins. The overlap at the edge is then cut at the corners and turned in and glued on the inside of the case.

The back is covered seperately, the overlap coming on the inside of the cabinet, and the back is fastened on by pushing up against four small blocks, one in each corner; or, if it is to be a hinged back, then it must, of course, be covered on both sides.

If ordinary care is taken to avoid creases and glue spots on the materials, a cabinet can be turned out which will give a set a professional appearance and turn it into a really handsome piece of furniture.

E. O. W.

SHORT-WAVE PERILS!

A NOTE of warning is given in a paper recently published by the New York Electrotherapeutical Society relating to the effects of short-wave energy on the human body. Ordinary high-frequency currents are of course frequently administered with beneficial results in the case of various diseases. Such treatment is known as diathermy.

It is now pointed out that radiant energy can and does act on the human body in different ways according to its wavelength. Wavelengths between 3 and 7½ metres especially are stated to increase the temperature of the blood to a much greater extent than can be accounted for by ordinary heat absorption. In addition, individual cells and small molecular structures tend to fall into resonance and so produce electronic disassociation. This no doubt explains why some of our short-wave DX friends get so hot and bothered at times!

M. A. L.

A CENTENARY

IN order to attract the attention of European countries to the programme of fêtes organised in 1930 to celebrate the hundredth anniversary of the French colonisation of Algeria, in conjunction with the P.T.T., the local authorities have instructed the *Societe Francaise Radio Electrique* to erect, in the neighbourhood of Algiers, a high-power broadcasting transmitter.

An augmented committee, to include the present Radio-Algre Programme Company, will provide the daily radio entertainments, the necessary financial assistance having been guaranteed by the Algerian Post and Telegraph Administration. As the transmissions are to be radiated with a power of at least 12 kilowatts in the aerial, it is expected that good reception will be assured over the greater part of Northern Africa as well as over most of the central districts of the European Continent.

Special broadcasts at favourable hours of the evening will also be made for the benefit of Great Britain and France.

GRIDDA.

The air-liners operated by the German Luft Hansa, which hitherto have been using wireless call-signs consisting of the letter D (for Deutschland) followed by numerals, have now been allotted five-letter call-signs commencing with DAN. The air-liner D1000, for example, will in future be known for wireless purposes as DANAI. These alterations will bring the German call-signs into line with those used by the aircraft of most other countries, where five-letter combinations are already in force.

The first commentary ever broadcast in this country on a dirt-track race was carried out in Scotland, and now this sport has reached the dignity of a special talk for all Scottish stations on Saturday evening. The speaker is Mr. Alex. M. McLeod, from the Glasgow studio.

The co-operation of municipal authorities is being readily obtained by the B.B.C. in arranging its new series of talks on "Some Ancient and Royal Burghs of Scotland." Many of the officials thus approached have been able to make valuable suggestions as to the selection of speakers and the method of treatment.

Radio Telegraphy and Telephony (published in this country by Messrs. Chapman & Hall) is a very complete text-book, written co-jointly by Rudolph L. Duncan, Director of the Radio Institute of America and Charles E. Drew. It is impossible, in a few lines, to précis a complete work of 950 pages, but some idea of the contents may be gained from the fact that the first chapter deals with elementary principles, such as the magnetic circuit and Ohm's law, and the final chapter deals with a design of a complete 1 kilowatt broadcast transmitter. It is a useful book for the amateur and there is a wealth of information of interest to "fans." It has the great merit, unlike some text books, of being thoroughly up to date and deals with the latest phases of broadcasting. The price is 37s. 6d. net.

Watmel Loud-speakers—Readers will be interested to know that a folder has just been issued by Messrs. Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, describing the new Watmel loud-speaker units and cone chassis. Copies of this interesting descriptive folder may be obtained on application.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

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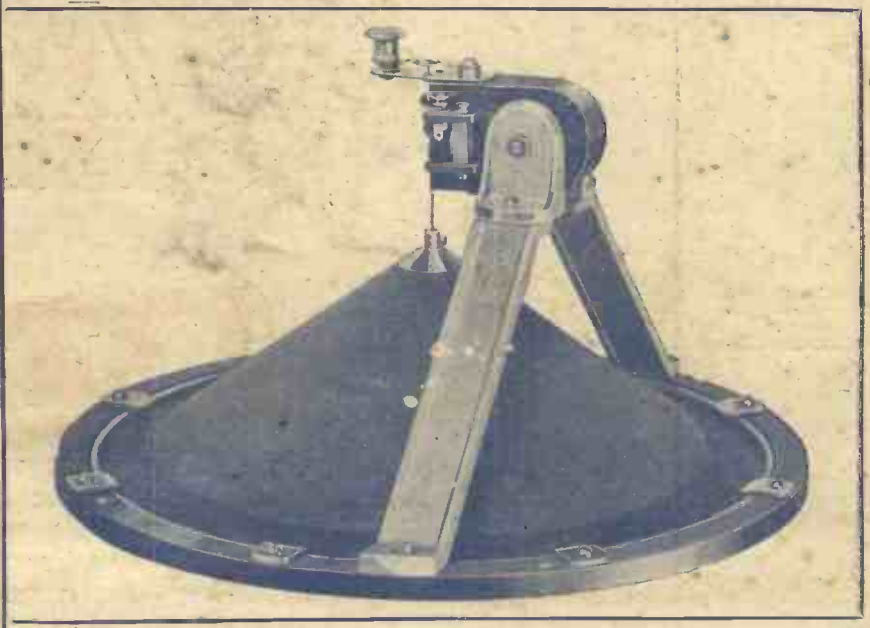

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Of all good Dealers. Communicate with us in case of difficulty and we will see you are supplied.

Now the Watmel Cone and Chassis for it

FOLLOWING hard on the heels of the Watmel Balanced Armature Unit (which has proved such an outstanding success) comes the Watmel Cone and Chassis. Like the Unit, it has several distinctive and original features based upon a keen observation of constructors' needs.

The Cradle itself is of rigid aluminium, and the arms supporting the unit are likewise of massive construction and dead true. The materials for the cone diaphragm as well as for the suspension have been carefully chosen after long experiment. They give a reproduction which is crisp without being "thin," and resonant without being "booming." In fact, when this chassis is used in conjunction with the Watmel Unit, a very high reproduction standard is obtained both on speech and on music.

Notice particularly that the diaphragm is clamped throughout its *entire* periphery by a heavy steel bezel ring, thus avoiding any risk of chatter.

THE BALANCED ARMATURE UNIT

This unit has already become famous for the pure reproduction it affords and above all for its extreme sensitivity. The magnet is of Cobalt Steel, giving across the turbo stalloy pole pieces a dense and powerful magnetic field. The Armature of best charcoal annealed iron rides balanced in this field, and is energised by two carefully insulated coils. When current passes through the coils, the Armature is acted upon by four poles at once, all of them assisting in producing the torque which actuates the diaphragm through the driving spindle. Not only does this four-pole action make the unit highly sensitive, but you should note that every movement of the armature is the result of magnetic force. We do not rely upon a spring or reed to return the armature, consequently there is no peak frequency to which the armature is specially sensitive—only an even response to all musical frequencies.

WatMel

This unit and its chassis are a thoroughly well thought out job which it will pay you to investigate.

Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex. Telephone: Edgware 0323

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Amateur Wireless

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Every Thursday 3d

Vol. XV. No. 376 Saturday, August 24, 1929

The HYPER-SELECTIVE 2

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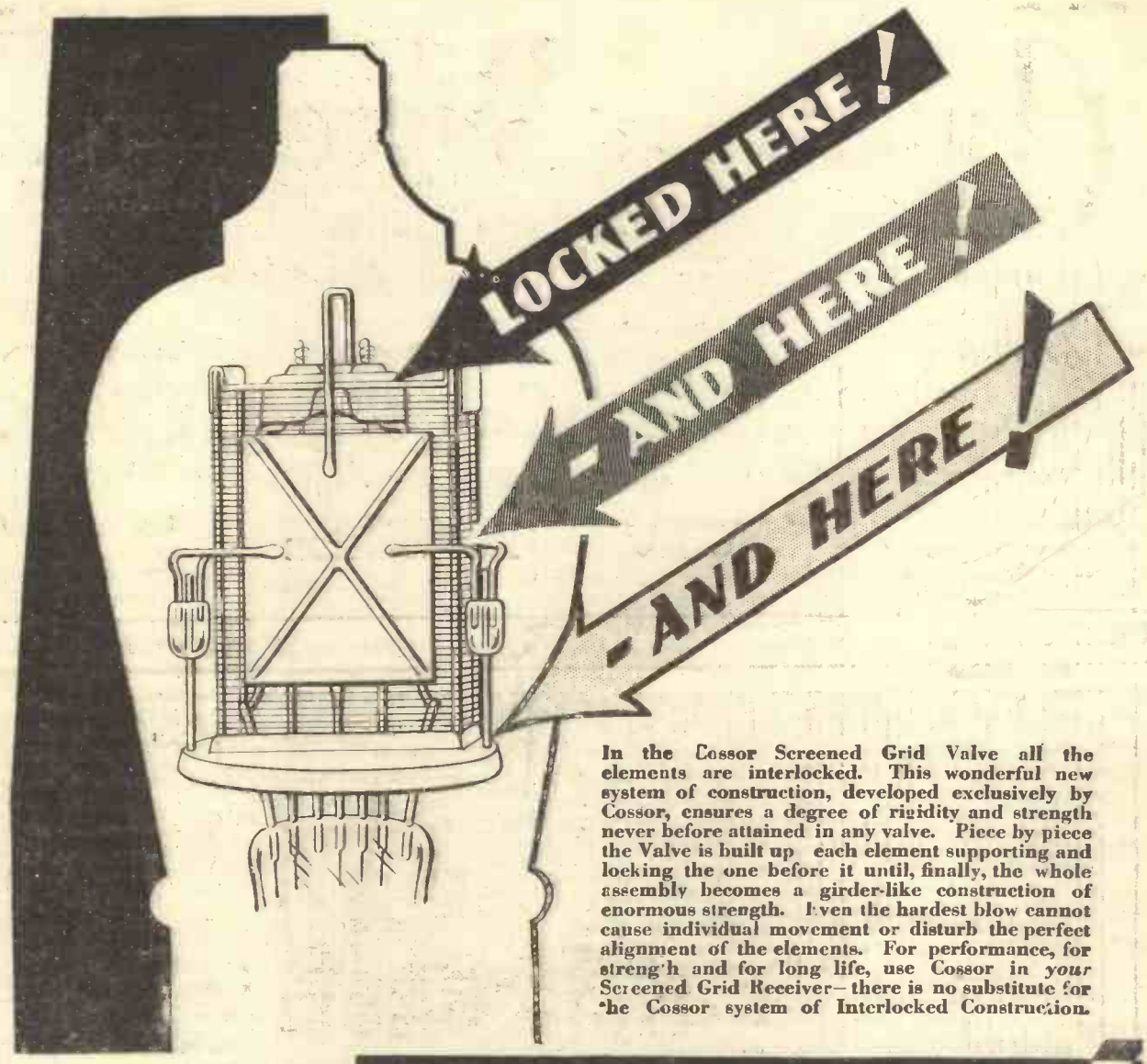

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AUGUST 24, 1929 No. 376 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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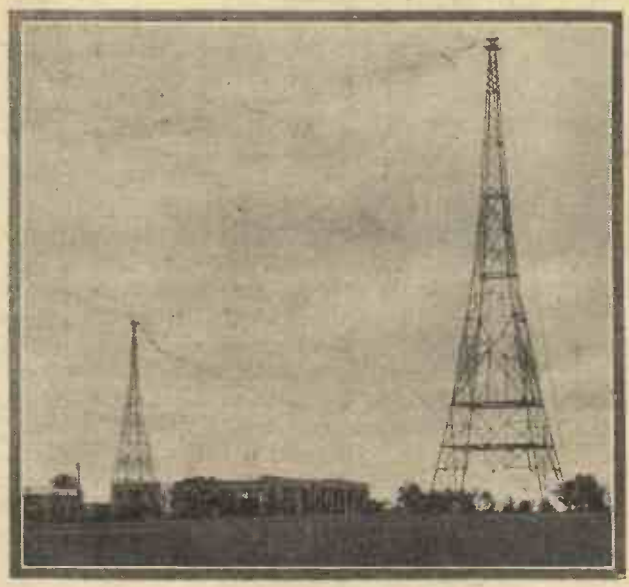
Sunspots—Where Walls Have Ears—Teaching the Teachers—A "Wipe-out"—Nauen on the Films—Fultograph in Australia—Talkie History

Sunspots—If you experience fading or an extraordinary amount of atmospherics, then put it down to sunspots. The astronomers are at it again, and report that an extraordinary flame is visible on the south-eastern rim of the sun, in the form of an enormous arch some 120,000 miles long and 100,000 miles high. Mount Wilson Observatory has been watching this arch with particular interest, and it is reported that solar storms (which mean atmospherics for radio listeners!) are to be expected during the next week or so. It may interest you to know that this particular flaming arch is burning hydrogen.

Where Walls Have Ears—The Canadian National Railways' hotel, Chateau Laurier, at Ottawa, has just been fitted out with a complete radio and public address system, including a large broadcasting studio. The studios are used for "house" broadcasting in the hotel, and can also be connected to the Ottawa station or to any of the eleven broadcasting stations which the C.N.R. operates in Canada, between Halifax and Vancouver. A very complex S.B. system can be brought into use, so that the whole of the Company's stations can be connected at Ottawa, the capital.

Teaching the Teachers—As last year, the B.B.C. is again out to cater for the technical side of school radio, while not wishing to usurp the usefulness of the local service agents. Talks on set maintenance and similar subjects are to be given on September 26, October 24, November 14, and December 4.

Nauen on the Films—In the film news bulletins recently you may have noticed that included in the variety were a number of views of that well-known German broadcaster, Nauen. The masts are certainly high and, for some of the views, the film camera was taken to the very top and views were shown of workmen painting the masts several feet below—with the ground hundreds of feet below them! It would be a good idea if the B.B.C. could have a similar film made of, say, 5SW, and of the masts at the new Brookmans Park station.



The new twin-wave transmitter at Brookmans Park is now practically completed. The aerial masts, seen here, are erected and it is expected that the station will be officially working by the early Autumn.

A "Wipe-out"—And, talking of Brookmans Park, tests may be heard almost so soon as this note appears in print; but not for some time will the twin-wavelength transmitter be filling its full role. At first it is proposed to test the transmitter on the present London wavelength. For instance, part of an evening's programme will be given from the Oxford Street transmitter and part from the new Brookmans Park station; late dance music will also be given every night after the main London programme has finished. This will give listeners a chance to get used to the new station—and also to fill the B.B.C. post-bag with complaints (chiefly), comments and criticism, constructive and otherwise!

Fultograph in Australia—When you have successfully received Fultograph still pictures from all the British stations, and from the Continent too, you may be sighing for fresh worlds to conquer! Well, arrangements have just been made for a five years' picture service in Australia and those who can get, say, 2FC (Sydney) on 31.28 metres might possibly be able to work a Fultograph successfully. All short-wave enthusiasts will hope that 3LO the 31.5-metre Melbourne station, which is now temporarily closed will start work again, and that he will let us have Fultograph pictures from the Antipodes.

Talkie History—As M. Gaumont, the well-known French inventor is at present engaged on a new talkie system, in which the sound is registered on the film strip by means of ultra-violet or infra-rays (the method being illustrated in the talkie article on page 203), it is interesting to note that he claims to be one of the first to have produced talkie films, away back in 1901.

PRINCIPAL CONTENTS

Studio H of the National Broadcasting Co., New York

The U.S.A. PRESS
and Our Staff Visitors

BEFORE we went to America we were advised that Americans would do most of the talking and that we would have to listen; but from a perusal of a batch of press cuttings it seems that, between us, Mr. Sieger and I did a considerable amount of talking—and Americans were not uninterested.

One of the most prominent American newspapers, the *New York Sun*, in its issue dated June 28 says of us :—

"Alan S. Hunter and Joshua Sieger, two young British radio experimenters and writers, have been sojourning here for the last week and spending most of their time visiting behind the scenes at both C.B.S. and N.B.C. studios. Both are voluble in their praise of the new American receivers and the abundance of entertainment available over the American air waves.

"Mr. Hunter reports that the British fans are still building their own sets, although there has been a steady increase in the use of commercial receivers, with a greater sales jump in prospect when the tax on sets and tubes is reduced. They are to visit the principal stations of the Middle West before sailing for home."

In the *New York Herald Tribune* dated June 30 we are extensively quoted as follows :—

"Although transatlantic flyers seem to find the hop from America to Europe more easily accomplished, it would appear that the situation is reversed in the matter of radio sound waves, according to Alan S. Hunter and J. Sieger, London writer and technician respectively, who are making a survey of broadcast facilities in the United States.

"The English visitors based their opinions on a comparison of short wave pick-up by the National Broadcasting Company of British programmes and similar pick-ups by the British Broadcasting Corporation of American stations.

"'America is able to pick up British programmes with a great deal more quality and volume than we have ever been able to get the American broadcasts,' Sieger declared after listening to a London programme at the N.B.C. studios."

In parenthesis I should make it clear that what my colleague meant was that, in his opinion, 5SW was a better signal than the American short-wave stations, and not that our receivers are inferior to the Americans !

"'If London were able to get American programmes as British broadcasts are received in New York it is almost a certainty that rebroadcasting would be an almost daily occurrence,' Hunter asserted."

Actually I was not so emphatic as this; but, then, American journalists must live, I suppose !

"Both Sieger and Hunter," continues the *Herald Tribune*, "were greatly impressed by the strength of the American stations, which they found greatly exceeded the power used to operate their own stations. The announcers' method of presenting programmes here also came in for a share of praise from the visiting radio men."

Under the heading "Britisher Says U.S. Radio Lacks Humour" the *New York American* says :—

"Though radio reception in the United States is far superior to that in Europe, American broadcasting lacks humour, according to Alan S. Hunter and J. Sieger, British radio experts, who sailed for home yesterday on the *Homeric*, following a survey of American radio conditions. Hunter declared: 'What has impressed us most of all here is the remarkable enterprise of the various stations. All are looking towards higher power and the establishment of finer studios. However, I think there is much more humour in a British programme than in an American.'"

It is an extraordinary fact that during the whole of our tour of the States we heard not a single definitely humorous turn on the radio. Asked why this type of broadcasting was so universally neglected by Americans, a well-known station manager advanced the theory that radio humour, to be worthy of the name, had to be more subtle than the average listener could grasp ! The fact is that American station managers steer clear of any type of broadcasting that does not "get over" to the majority of listeners.

ADJUSTING THE "BLUE SPOT" CONE UNIT

MANY readers must have built an AMATEUR WIRELESS cone speaker around the popular Blue Spot 66K adjustable unit, and among these there are probably not a few unfortunates who, in mounting the cone, have strained the driving rod to one side and now find that the adjusting knob has to be turned right to one end in order to keep the reed off the magnet pole, allowing of hardly any adjustment of the unit.

If such trouble is experienced it may quite readily be corrected by simply taking off the aluminium cover plate held by two small screws and removing the "stop" attached to the spindle of the adjusting fitment.

Replace the back protection plate, and it will be found that the knob may be turned several turns further in or out and a very wide range of adjustment secured. The alteration outlined above will readily be understood with a moment or two's examination of the unit and has no harmful effects upon it in any way.

Radio-Banlieue, a private transmitter at Paris, which for some time has broadcast a daily programme, including a news bulletin, on 300 metres, has closed down until the end of September. In October the station will be re-opened with a regular series of musical entertainments.

It is reported that the new Rome 50-kilowatt high-power station is expected to begin its tests towards the middle of October next.

The Eiffel Tower, Paris, has resumed its short-wave telephony transmissions on 31.2 metres; the experiments are carried out daily at 11.30 a.m. and 6.15 and 10.15 p.m. B.S.T.

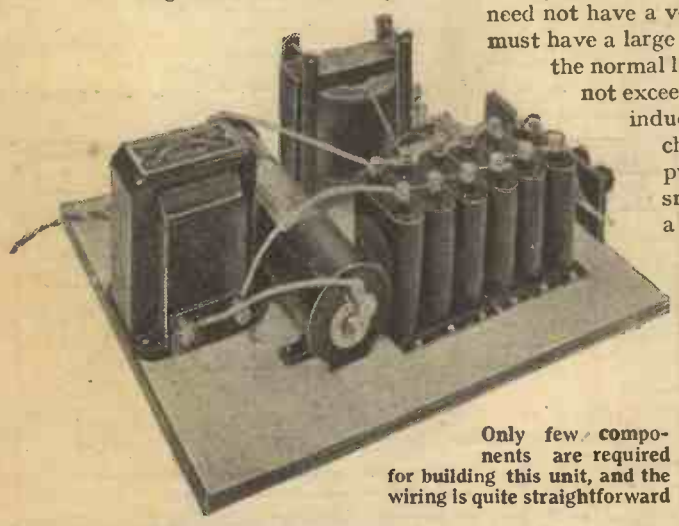
THE SIMPLEST H.T. UNIT

An eliminator for use with any alternating-current supply. Designed and described by Mr. W. James

Connecting the unit to the mains

THE introduction of a new-model metal rectifier by the Westinghouse Co., priced at such a low figure as 21s. means that anyone can now build a high-tension mains unit for about £5. This rectifying unit, which is known as Type H.T.3, is of the half-wave pattern and will give an output of approximately 120 volts at 20 milliamperes—quite enough for ordinary receivers, such as those having three valves. It comprises, as a matter of fact, one "limb" of a Type H.T.1 unit which will give an output of about 200 volts at 100 milliamperes. Type H.T.1 is a full-wave rectifier and is rather large for those using an ordinary receiver.

The Type H.T.3 unit must be supplied with a voltage of 135 measured when the full load is being taken from it, or 140 volts at no load. A transformer must therefore be used to adapt the mains voltage to one suited to the rectifier.



Only few components are required for building this unit, and the wiring is quite straightforward

This transformer will have a primary winding wound to suit the voltage and frequency of the alternating-current supply, but manufacturers may issue transformers having a tapped primary winding for various voltages. Care must then be taken that the flexible wires used for connecting the mains are joined to the correct terminals.

The transformer and rectifier together form a unit for converting the alternating current into a pulsating direct current. Actually there are 50 pulses of current per second when the frequency of the A.C. supply is 50 periods per second. The output from the rectifier is, therefore, varying all the time and is quite unsuitable for the anode current supply to a receiver.

Only smooth or an unvarying direct current is suitable, because variations produce noise or hum. It is, however, an easy matter to smooth the output by using condensers and a choking coil. These are shown connected in the circuit diagram and actually comprise a 4-microfarad condenser at C1 and another at C2, whilst the choke is joined in the positive side, but between them.

A good choking coil must be used. It need not have a very low resistance, but it must have a large inductance when passing the normal load current which should not exceed 20 milliamperes. If the inductance of the iron-cored choke is too small, the output will not be properly smoothed, with the result a hum will be emitted by the loud-speaker. A good value would be 50 henries at 20 milliamperes, although it can be much more, or even a little less and still be a satisfactory component for this unit.

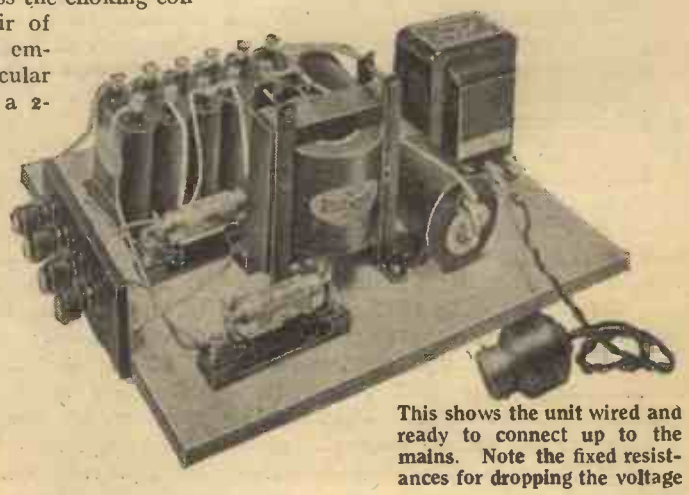
Condensers of 4 microfarads at C1 and C2 (or two of 2 microfarads each connected in parallel) are not absolutely essential, but unless the choking coil is a very good one the pair of 4 microfarads should be employed. With the particular choking coil illustrated, a 2-microfarad at C1 is satisfactory. There is a little advantage in using 4 microfarads, however, as the output voltage is a little greater than when a 2-microfarads condenser is used.

Having obtained a supply of direct current at about 120 volts, the next point to consider is the arrangement of the receiver to which the unit is to be connected. The H.T. unit illustrated, was designed for my "Dual-wave 3," which was described in the last number of this paper. In this receiver there are three separate high-tension circuits. The maximum output from the unit may be taken to the power valve, which is therefore connected to the positive side of the condenser C2 (terminal H.T.+3).

Detector Voltage

For the detector valve, a voltage of rather less than the maximum provided by the unit is needed. One of 90 volts is suitable, and it is therefore necessary to include a resistance in the anode circuit. This is shown at R1 in the diagrams. It must have such a value that 30 volts are lost in it. The value of resistance cannot be estimated, however, until the current passing is determined.

Let us assume this is to amount to

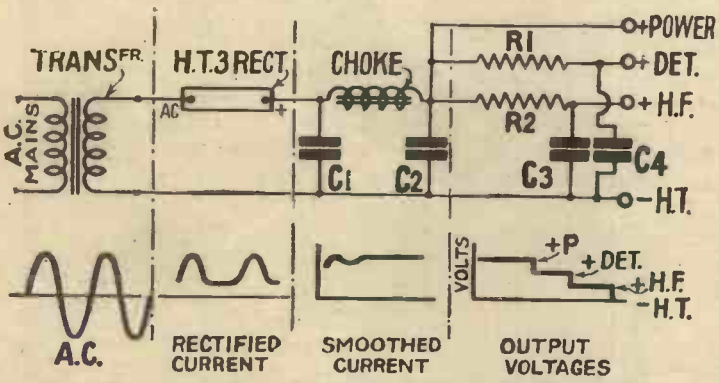


This shows the unit wired and ready to connect up to the mains. Note the fixed resistances for dropping the voltage

THE SIMPLEST H.T. UNIT *(Continued from preceding page)*

1.5 milliamperes; then the resistance must have a value of 20,000 ohms. If the current had been 2 milliamperes, the resistance would have to be less—15,000 ohms. A current of 1.5 milliamperes is an average value however, and the resistance R1 may, therefore, be fixed at 20,000 ohms.

The H.F. valve must be supplied with



The action of the eliminator is clearly shown by this modified circuit diagram

approximately 60 volts (terminal H.T.+1), and as the total voltage is 120, the resistance included in its high-tension supply circuit must reduce the voltage by 60. A normal anode current for this valve is 1 milliampere, therefore the resistance of R2 must be about 60,000 ohms. One of 50,000 ohms could be used, as the anode current passed by different valves of the same type varies by a few per cent.

As the voltage-reducing resistances are employed mainly for the purpose of regulating the voltages, they must be connected to condensers in order that they shall not affect the working of the receiver. Condensers C3 and C4 of 2 microfarads each are therefore connected as indicated.

Smoothing Arrangements

The combination of a resistance and condenser such as R1 and C4 form a most effective filter in two respects. In the first place, the output from the main filter is still further smoothed and, secondly, varying currents which may pass through the anode circuit of the valve will tend to flow through the condenser C4 and not through the resistance R1 to the main filter condenser C2. The output resistances and condensers therefore tend to prevent anode circuit couplings and motorboating or other forms of instability.

The effectiveness of the output filters may be increased by employing larger condensers or resistances, but, as the values of the resistances have to be decided according to the voltages desired, one may only vary the capacity of the condensers. It is sometimes necessary to use 4 microfarads each for the output condensers, but 2 microfarads each at C3 and C4 is sufficient in the unit illustrated here. The unit is easily constructed as there are only a few parts. The following parts are recommended :—

One baseboard, 12 in. by 10 in.

One H.T.3 metal rectifier (Westinghouse).

One power transformer (Varley, Regentone).

One power choke (Regentone, Varley).

Six 2-microfarad mains condensers (Ferranti, Dubilier, T.C.C.).

One 50,000 and one 20,000-ohms wire-wound resistances (Ferranti, Varley).

Four terminals, marked H.T.—, H.T.+1, H.T.+2, and H.T.+3.

Terminal strip, 2 in. by 5 in.

Screws, and length of rubber-covered wire for making connections.

A baseboard of convenient size may be used and the parts screwed to it, or some may have a small box or other container into which the parts may be fitted. The wiring, too, is easily completed, using systoflex and tinned copper wire, or Glazite.

Care must be taken when connecting the flexible wires from the mains, as in the Varley transformer the primary winding is tapped for various mains voltages. A fuse, in the form of a suitable flash-lamp bulb, may be fitted in the primary circuit if thought necessary and the apparatus should be covered in order to avoid an accidental contact with the metal parts or terminals carrying high tension.

It is true that the output voltage is low, but the input voltage, which may be up to 250 volts, is sufficiently high to give a shock. The cover may be of wood or metal and, if it is rather small so that the parts have to be fitted quite close together, a few ventilating holes should be provided. Do not connect the rectifier the wrong way round by ignoring the markings under the terminals, and do not overload the unit by connecting it to a set passing much more than 20 milliamperes.

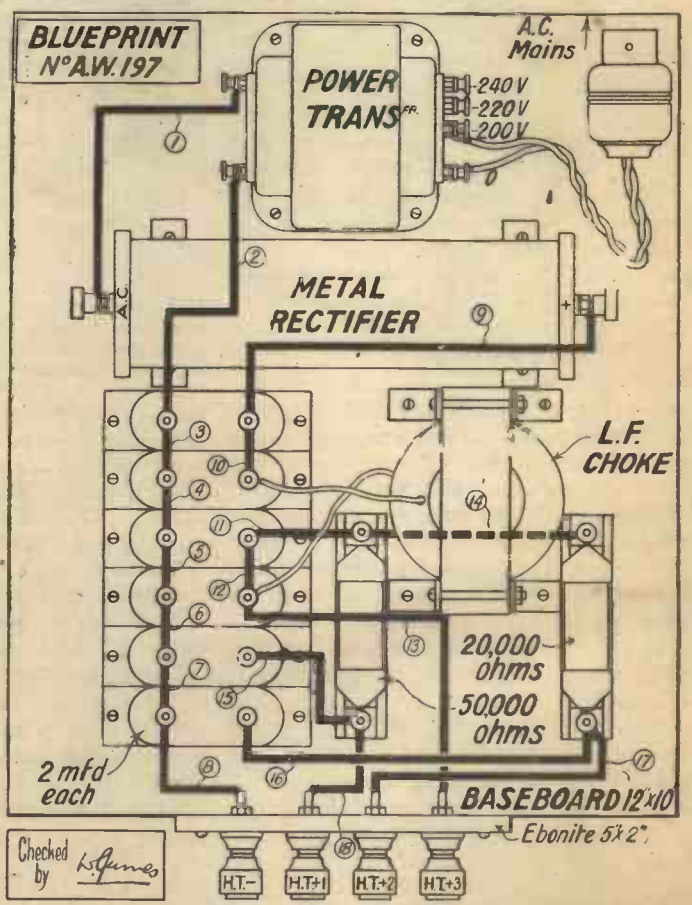
The usual practice of connecting the high tension after the valves of the receiver have been switched on should be followed, and, moreover, the practice of switching off the unit before the valves. The valves will then discharge the condensers in the unit.

If the unit should be connected to the mains without a load in the form of a resistance or a receiver, the condensers will charge up to a voltage considerably greater than 120, with the result that if the parts are touched, a sharp shock may be experienced as the condensers discharge.

Safe and Silent

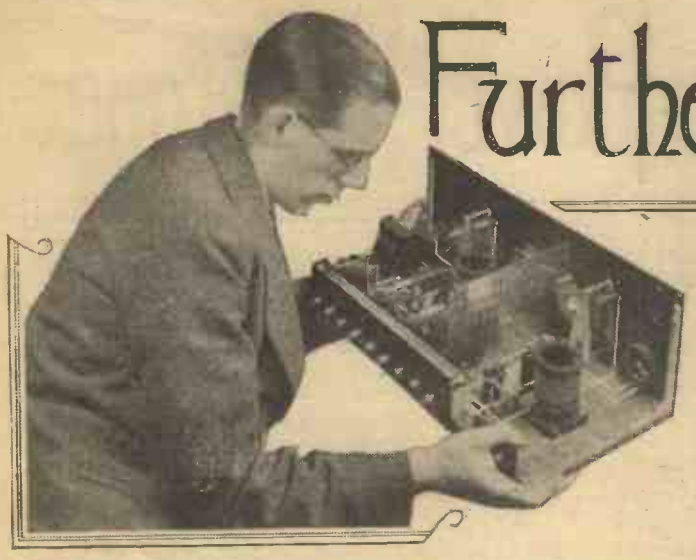
This little unit is perfectly safe and silent in operation. It is suitable for three-valve receivers and a few having four valves, but it is not arranged for sets having anode-bend detection or a shielded valve. The anode circuit of an anode-circuit detector should be supplied from a potentiometer and so should the shield of a shielded valve. These parts are easily added and I will describe them in a further article.

Previous to the official opening of the new Belgrade (Yugo-Slavia) broadcasting station some 10,000 licence holders had been registered by January 1, 1929. On June 1 the number increased to 14,000, but it is computed that already 6,000 "pirates" have started operations. The cost of the licence is roughly 16s. per annum.



This is the layout and wiring diagram. Blueprint available, price 1/-

Further Trouble Tracking



Some more interesting accounts of quaint faults, and how they were located

IN a recent issue "Thermion" mentioned some of his reminiscences of trouble tracking and invited readers' experiences of similar faults not easy to discover.

Even the best receivers occasionally have their "off" moments and some of the faults which develope are so extraordinary that unless one has heard of previous similar happenings it may not be possible to effect a cure without taking everything to pieces.

It is usually the simpler faults which happen in old sets, where things are more likely to go wrong. In modern sets only, as a rule, do we find those baffling little troubles which are all the more difficult to trace because the very best parts are used and the very best circuit followed.

Good Design

It might almost be said that neatness of design has grown up only in recent years. Sets built in the very early days of broadcasting were often constructed on rather haphazard lines and probably bad positioning of the components was the cause of some strange faults.

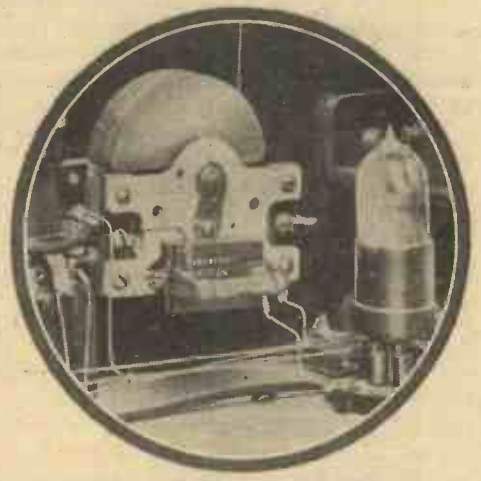
One of the accompanying photographs illustrates the portion of the receiver in which a very curious fault was found on first testing. Signal strength was not found to be even over the whole of the tuning condenser's range. Stations which might have been expected to be very loud at one tuning point did not compare at all favourably with more distant stations on a different wavelength. This, to a lesser extent, is frequently noticeable, but the effect was so marked in this particular receiver that something had to be done about it.

Grid-condenser Mounting

Eventually the cause of the trouble was traced to the fact that the grid condenser and leak were both mounted on the end plate of the tuning condenser and there was some kind of stray capacity effect (hardly to be wondered at) which was even more accentuated when the plates of the tuning condenser were "in," there being a greater mass of metal near the grid condenser.

Before this same receiver was modified, moreover, some peculiar troubles in the way of L.F. howls manifested themselves and these were finally traced to several causes as shown on the photograph.

The mounting of the L.F. valve holder immediately on top of the transformer, although the latter was of the shielded type, would not be tolerated nowadays, even in a portable set. There was interaction between the connections to the valve holder and the transformer windings which resulted in a more or less constant low-frequency howl, which varied only according to the condition of the H.T. battery and the temperature at which the L.F. valve filament was run. This, of course, was before the days of the present very dull emitter valves.



A "close-up" illustrating the incorrect component-mounting mentioned

The second cause of L.F. instability was the H.T. safety fuse which had a value sufficiently high to act as a common resistance in the H.T. lead. As a matter of fact this is a fault which is often found in receivers even of the latest design. It should be borne in mind that some of the special safety fuses rated to blow at anything in excess of 6 volts 60 milliamps, have a resistance of about 100 ohms. Unless care is taken this is sufficient to cause back coupling.

Other faults in the receiver illustrated by the photographs were fading due to the moving sockets of the two-coil holder being used to support the aerial coil; crackling noises due to dirty contacts at the jack points; finally a healthy "short," caused by the accidental touching of two of the long wires running parallel with the baseboard which put the whole set out of action!

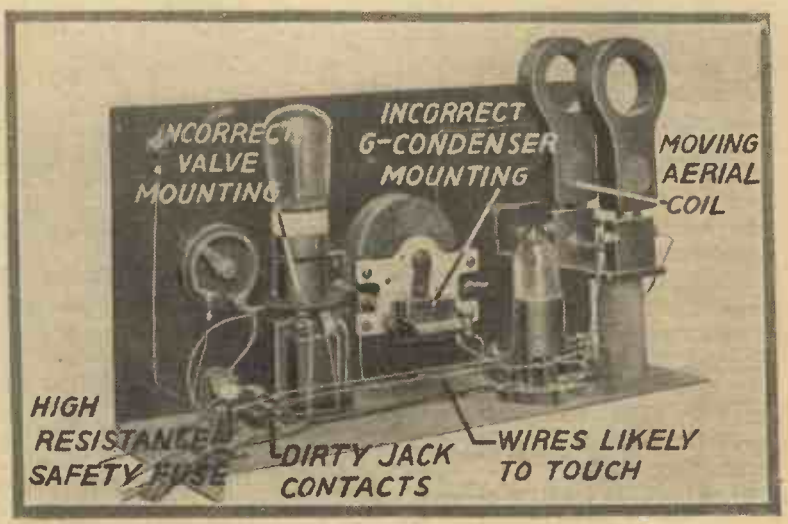
It should perhaps be explained that the first snag, namely, the fading, was due to the fact that flex leads had to connect the aerial coil socket to the terminals on the baseboard and this flex strayed as the coil socket was moved and caused variation in signal strength.

A Difficult "Dis"

Subsequently, the receiver was reconstructed and rewired, but refused to work properly for some time, the reason apparently being a disconnection, but not easy to trace. Each wire appeared to be rigid and neatly made with right-angled bends; but a test showed that there was a "dis" in the L.F. valve grid circuit.

Closer inspection revealed the fact that

(*Continued in 3rd column of next page*)



This is the complete receiver, showing all possible sources of trouble

Where to Use a Power Resistance

Special power resistances are now available for use in certain parts of a set—

—and here our Technical Editor explains where a power resistance should be inserted to get reliable working

SOME of the amplifying and reproducing equipment used to-day is capable of supplying a considerable amount of power. The various component parts have consequently to be designed to handle larger powers than normal. We have such things as power and super-power valves, power transformers, power chokes, and so on; yet a feature which is often neglected is the poor resistance.

The function of the resistance is generally to dissipate energy, although it does this in various ways. Perhaps the most common use for resistances in power amplifiers is in breaking-down the voltage from the maximum value to some suitable lower voltage. We may have 300 or 350 volts on the amplifier which is used to supply the output stage valve. Valves in the preceding stages do not require such a high anode voltage, nor would they stand it in ordinary practice, so it is necessary to reduce the voltage on these components.

Cutting Down Voltage

This is conveniently done by inserting a resistance in series with the anode circuit, so that the presence of the anode current passing through this resistance causes a voltage drop in consequence of which the voltage actually applied to the anode is of the required order. Such a practice is almost universal, but the point not realised is that the passage of this current through the resistance results in a wastage of energy which is dissipated as heat. Not only must adequate provision be made for this heat to be dissipated, but the resistance itself must be so constructed that it is not damaged by the application of a reasonable temperature.

The ordinary cartridge-type resistor will not dissipate more than 2 or 3 watts, and about 5 watts is the outside limit which may safely be used without the risk of serious damage to the resistance. This limit is quite easy to reach in relatively small amplifiers and it is preferable to use resistances specially constructed to dissipate more heat. Such resistances are usually not wound in such a manner as to give very small self-capacity, a feature which is desirable where the resistance is used in connection with coupling, but which is of little importance where the only object is to break down the voltage.

Air Cooling

A plain winding is used in the general course of events and the resistance is wound on tubes of special heat-resisting material, which are usually made hollow, so that the air has access to the greatest possible surface whereby the heat may be quickly conducted away.

The actual wattage dissipation may quite easily be calculated in various ways according to which constants are known. The watts dissipation is the product of the voltage drop on the resistance, and the current passing through it. Thus, if we have a resistance dropping 100 volts and it passes 10 milliamps, the dissipation is $100 \times .01$, which is exactly 1 watt.

If the actual voltage drop is not known, then the dissipation may be evaluated by multiplying the resistance value by the square of the current. As before, the current must be expressed in amperes, and the resistance in ohms. For example, a resistance of 20,000 ohms carrying 20 milliamps dissipates—

$20{,}000 \times (.02)^2 = 20{,}000 \times .0004 = 8$ watts.

An interesting series of power resistors is the Polymet marketed in this country by A. H. Hunt, Ltd. These are made in 10-watt and 20-watt sizes and are constructed by winding relatively fine wire on heat-insulating tubes. They are effective in use and relatively cheap.

The Varley power resistance is also a convenient unit. This is made in cartridge form in that it will fit a standard resistance holder. The wire is wound on a fireclay support and is adequately ventilated so that there is plenty of access to the air for ventilation purposes.

During Army manoeuvres "somewhere in the battle area," the radio van attracts a crowd of Girl Guides interested in wireless

"FURTHER TROUBLE TRACKING"

(*Continued from preceding page*)

one of the neatly formed wires was shaped so that it tended to spring away from one of the terminals on the L.F. transformer. It was firmly soldered at one end but, owing to its rigidity, did not make proper contact with the transformer terminal. Moreover, owing to the same property, the wire appeared to be very firmly fixed in place. This is a point which should be watched in all receivers where rigid wire and soldered joints are used.

Some users of home-made eliminators do not put a condenser in the earth lead because they know that the negative wire of their D.C. mains supply is earthed, and they think it safe to assume that this wire is always at zero potential. This is a fallacy. Most mains earths are never quite "dead" and, apart from the risk involved, much man-made static can be traced to slight difference of potential between the mains earth and the actual earth of the receiver

Readers have mentioned other strange faults, such as the presence of a hair on the rheostat winding, this causing a "dis" in the L.T. circuit. These snags, true, are difficult to trace but they would be eliminated to a large extent if amateurs would only follow the oft-repeated advice to make a periodic "spring-clean" of their sets.

On Your Wavelength!

Valve Characteristics

EVERY British wireless amateur knows the value of the data contained in the characteristic curves published on and in the boxes of radio valves. We have all become so used to thinking of valves in terms of their impedances and magnifications that it seems strange to us that the average American knows little of the valves—ahem! "toobs"—he uses. Characteristic curves are rarely published, and only scanty details of performances are given, other than superlative adjectives. Filament current and volts will be indicated on the valve box, but amplification factor, recommended grid bias, mutual conductance, and other important information are rarely disclosed.

Professional Ignorance

It is all the more surprising when one hears that the American "talkie" engineers who are over here are unable to give this information about American valves to the British engineers who are working American talkie apparatus! Valves are either "power" or "super-power," it seems, and the most important detail is the filament current! We are not quite so backwards as we try to "kid" ourselves.

Moving-coil Requirements

When a moving-coil loud-speaker is used with a coil having a resistance of about 10 ohms, the wires from the step-down transformer or auto-coupled choke should be as short and heavy as possible. Every additional ohm in this line will cut down the volume. It is better, therefore, to have the step-down transformer mounted on the loud-speaker baffleboard, as close to the loud-speaker as possible. This method is essential when a moving-coil loud-speaker is used some distance from the receiver, in other rooms in the house, or out in the garden, for instance. Personally, I rather like the idea of choke-coupling the two output valves, using either separate chokes or combined tapped auto-chokes, and putting large capacity condensers in each output lead. This will give good insulation if house mains are used for power supply, and no D.C. current will be flowing through the output line and loud-speaker step-down transformer. The capacity of each condenser should be at least 4 microfarads; there are two in series, and the effective capacity will be 2 microfarads. If smaller condensers are used quite a lot of bass notes will be stopped from getting through to the loud-speaker.

The Queen's Hall

The Queen's Hall transmissions turn up again, and the general quality and balance seem to be better than ever. The acoustics of the Queen's Hall stand out once more as being very nearly ideal for broadcasting purposes. The friendly atmosphere and good humour of the audience broadcast just as well as the actual musical sounds of the orchestra. The silly season of British broadcast music of which I complained recently automatically ceases with the commencement of the "proms."

Bitten!

Most readers, I expect, who go in for doing workshop jobs have had the palms of their hands more or less shrewdly nipped between the hook-shaped ends of the handles of tin shears. Certainly I have; in fact, I have often wondered why somebody can't produce a less bloodthirsty design. Never before, though, have I suffered so badly at the hands—or, rather, the handles—of my shears as I did the other afternoon. I was snipping off the end of a rather tough piece of metal—a job which required a considerable amount of beef. Gripping the handles firmly I must, I suppose, have leaned rather too far forward, for when the blades did go through the metal I leapt into the air with a scream. The hook things had caught that little fold of flesh that appears just over your lowest rib when you lean forward. Remember, I was putting all my strength into it, and you will realise what a bite it was. And the worst of it is that my free insurance policy from the *Daily Megaphone* doesn't seem to give any compensation for tin-shear bites!

A Fine Relay

One of the best relays that the B.B.C. has ever done was that which it gave the other night of a concert from the Kursaal at Ostend. It is an excellent place to choose, not only because music from it broadcasts so well, but also since so many listeners must have been there and could conjure up memories of happy holidays on the Belgian coast. That this concert could be sent out so successfully from British stations affords a demonstration of the tremendous advances that have been made in the last year or two in the matter of land-line and cable transmissions of speech and music. Do you remember a concert given some years ago by Radio-Paris, which was S.B. by all stations? Captain Eckersley and one or two other of the B.B.C. people went over and gave little talks from the studio at intervals. We all thought how very wonderful it was at the time, despite the fact that there was a lot of distortion present and that quite frequently the transmission was cut off for longer or shorter periods owing to a French operator having disconnected the land line at some point.

Programme exchanges are quite possible nowadays; in fact, they are practised quite often between German, Austrian, and Polish stations. Now that London is on the through-telephone line to most parts of the Continent, let us hope that we shall have many more of these excellent relays. I would certainly like to hear this winter an opera or two from some of the big German theatres.

Look Before You Leap

There was a little girl
And she had a little curl
Right in the middle of her forehead.
When she was good she was very, very good,
But when she was bad she was horrid.

The last line just about expresses the position at present with regard to portable sets. If you buy a good one you can be sure of trouble-free working and of reproduction of excellent quality. Lately, though, all sorts of portables have appeared on the market, and some of those made by small and unknown firms are the sort of things that one should examine rather carefully before planking down the purchase price. There seems to have been recently a competition to see who could produce the cheapest set. Naturally, there is a price limit below which it is quite impossible to go without sacrificing quality and almost everything else. Some of the very cheap sets that I have seen in the last few weeks look pretty good until one takes a screwdriver and takes a "dekko" into what is normally hidden by panel or cover plate. I mean, you really can't expect a low-frequency transformer of which the value is about half a crown to give you quite the same quality of reproduction as a more expensive article. And if you have valve holders and other components made of that grade of ebonite which is known to the trade as "mud" there is a certain likelihood of trouble.

A Matter of Price

The price of a portable set usually includes valves, batteries, and everything else. You should just see some of the batteries that I have come across in them, accumulators of no make that you have ever heard of, with cases constructed of celluloid about as thick as that used for photographic films, and H.T. batteries of the cheapest and vilest foreign make. There is a good deal more in the design of a portable set than just stuffing a few valves and their accessories into a case provided with a handle. One of the most important problems is to reduce the H.T.

On Your Wavelength! (continued)

current consumption to something reasonable without detracting from range or quality. This is done in the best sets; but what do you think of the portable which calls upon a little cheap H.T. battery to supply nearly 30 milliamperes? You can take it from me that the purchaser of this "bargain" will find, if he wanted the thing to work as nearly decently as it could, that he would have to supply a new H.T. battery every week. If you decide upon having a portable set, either buy one of really good make, paying a reasonable price for it, or make up one of the excellent designs that appear in AMATEUR WIRELESS or *Wireless Magazine*.

It Can't be Done

However attractive the price of a portable may seem, a brief analysis of facts and figures will soon show whether or not it can possibly contain components that are worth calling components. Take the case of a five-valver which sells at £10. Off that price you must knock first £1 5s. for Marconi royalties. That leaves £8 15s. Now let us suppose that the valves are those of the lowest price obtainable, costing 3s. 6d. apiece. We have to deduct a further 17s. 6d. There remains £7 17s. 6d. The factor's profit will be at least 20 per cent.; two more pounds to be deducted. We are down now to £5 17s. 6d. Then there is the maker's profit, which we will take at £1 10s. We are left with £4 7s. 6d. From this must come a further £1 for the accumulator and H.T. battery, again allowing for very low-priced articles. There remains £3 17s. 6d., out of which we have to purchase five valve holders, two variable condensers, two slow-motion dials, a reaction condenser, the intervalve couplings, switches, the frame aerial, the loudspeaker, and the case.

But the whole of this sum cannot be spent on these components, since a proportion of it must go to pay for the erection and wiring of the set and a further proportion to meet overhead expenses. Actually the amount left for the purchase of important components is probably not much in excess of £1 10s. Just what kind of components can be provided for this sum is best left to the imagination.

The Demise of the Kilohertz

Some time ago the B.B.C. in its announcements before the microphone and in its publications sought to simplify wireless for the average listener by adopting the term "kilohertz," meaning kilocycles per second. The wretched B.C.L., having been brought up on wavelengths, had with some difficulty swallowed the kilocycle and was just beginning to utter a sigh of relief, when the kilohertz was hurled at him. It was incorrect, we were told, to speak of a station having a frequency of so many kilocycles, because a kilocycle simply meant a thousand cycles, with no limit of time. Therefore let us have the kilohertz, the exact and precise term which indicated that a given frequency was in kilocycles per second. Most of us had been content to take it that "per second" was understood with kilocycles, but that did not satisfy the precisians at Savoy Hill. Therefore the kilohertz blossomed into being. But what, oh, what has happened to it now? No sooner had we assimilated the hideous word than the B.B.C. dropped it. They now give the wavelengths of both home and foreign stations in kilocycles (understanding, like us, the per second), and the kilohertz has vanished—let us hope for ever.

Ham-handed Henry Once More

One had begun to think that the oscillator—at any rate, upon the local station's transmissions—was becoming nearly as dead as the dodo. Recently, though, he seems to have taken on a new lease of life, though for the life of me I cannot think why. In my own little town 2LO comes in so strongly that good reception is obtainable even with a crystal set using an indoor aerial. With anything like a valve set hardly anything is required in the way of reaction for big volume; in fact, with my three-valve quality receiver I have to use a volume control. Yet for the past week and more some fiend has ruined every one of 2LO's programmes by running almost without pause up and down the scale of squeaks hour after hour.

Why Do They Do It?

It is difficult to believe that there are still people who try to receive their local station by finding the silent point between squeals. One thought that quality had by now become important enough to make this kind of reception out of date. It is probably beginners at wireless who are responsible. May I remind any new readers who glance through this paragraph that the little squeaks that you make are heard by everyone within a radius of at least five miles and that if you go on doing it you may spoil the pleasure of thousands of other listeners? You can't possibly obtain decent reception with the reaction coupling so tight that the set will squeal. Will old hands please pass on the gist of these remarks to any friends who may be recent comers into the ranks of the wireless fellowship?

Our Short Programmes

I have referred before to the rather poor fare provided during the afternoons for the owners of portable sets. I would like now to mention a rather wider aspect of the broadcast service. It does seem to me a thousand pities that there are such long intervals during the day when our stations are silent. For example, 2LO does not begin work on ordinary days until midday, whilst for the start of his Saturday programmes we have to wait until 1 p.m.; 5GB works even shorter hours, never starting before 3.30 p.m. and finishing, except on Saturday nights, at 11.15 p.m. Compare this service with that given by a typical American station. Its programmes begin at 6.15 a.m.; though I am not asking for such an indecently early hour as that. From this time until one o'clock the following morning there is no interval longer than a minute or two. Here is the after-breakfast fare on one morning chosen at random from the station's programmes: 9 a.m., women's hour: hints on cooking, household work, etc., and a poetry reading; 10 a.m., trio music; and from 10.30 a.m. until noon, talks, market and weather reports. At noon an organ recital, followed immediately by an orchestral programme.

These long programme hours are good in every way. They give the retailer ample opportunities of demonstrating his goods and prospective buyers every chance of hearing the sets at work. The purchaser of a set is assured of entertainment at any hour of the day, and, owing to the supply of the right kind of talks at the right kind of times, wireless has made itself much more a part of American home life than it has over here. Daventry Junior is no longer an experimental station, and I can see no reason why its programme hours should be so unreasonably short.

Television Brings About a Merging of Interests

One can draw significant conclusions from the announcement that the Paramount-Famous-Lasky Corporation has purchased a half-interest in the Columbia Radio Broadcasting System. Mr. W. S. Paley, president of the latter firm, made it quite clear in a recent press statement that talking pictures, aural broadcasting entertainment, and the rapid development of television must bring the cinema and radio in close co-operation in much the same way as we have seen the merging of the gramophone and wireless.

Undoubtedly wireless will be the *main nucleus* of the entertainment field within a few years. Scientific developments have served to introduce sound into motion pictures on the one hand and vision into aural broadcasting on the other; so these two large corporations are merging their interests and meeting the whole situation on a common field of action. With aural broadcasting an appeal is made to an audience greater than that ever assembled in the history of civilisation. Think of what added impetus will be given when the *two* senses can be brought into action—namely, sight and hearing—instead of the ear only, as at present! THERMION.

The JAMES DUAL-WAVE 3

A fine general-purpose three-valver which is simple to build and very easy to operate. No coil-changing is needed

This week Mr. W. James describes in detail the operation of his receiver

You will have no trouble in building the set if you follow the instructions given last week

A SET having an ordinary amplifying valve in its high-frequency stage may be considered by some to be not quite up to date, but I find a carefully arranged stage takes some beating. And there is the further advantage that what is often called a "general-purpose" valve may be tried.

I am, of course, a firm believer in using the right valve for the right job, and have probably emphasised this point as much, if not more than, other writers. But the advantage of the most suitable valve as compared with another having approximately similar characteristics is not sufficiently great in a set of this description to warrant me insisting upon a certain make and type.

Suitable Valves

A "general-purpose" valve, or one having an anode impedance of from 20,000 to 30,000 ohms, is therefore recommended; but had the coils been wound of litz wire and of great efficiency I should have insisted upon definite valve types.

The anode impedance of a valve used in a high-frequency amplifying stage does, of course, affect both the magnification and the selectivity. Thus for a given coil the tuning becomes more sharp as the impedance of the valve is increased. This is because the valve is, in effect, in shunt with the part of the anode tuning coil to which it is connected.

So far as the tuning of the anode circuit is concerned, we could replace the valve with a resistance of equivalent value and should find the sharpness of tuning not affected. Now the "Dual-wave 3" has a high-frequency stage consisting of an ordinary valve and a centre-tapped coil. This arrangement is therefore much more selective than when the whole of the anode coil is joined between the anode of the valve and the positive high-tension terminal. The damping effect of the valve is, in fact, only one quarter as much as in the ordinary tuned-anode circuit. This accounts for the better selectivity of the tapped arrangement, which therefore has a big point in its favour.

H.F. Magnification

But there is a second point not to be overlooked. The magnification of the high-frequency stage is as great when the coil is connected as in this receiver as when the full coil is included directly in the anode circuit. The reader may well ask why is this so. It is because the valve has an anode impedance which is less than that of the anode circuit and for the further reason that the amount of magnification to be obtained in the anode circuit itself is limited. A stage cannot be neutralised when the magnification in the anode circuit exceeds a certain amount, as the balancing circuit is normally far from perfect.

This will be more readily understood when it is remembered that an ordinary condenser, having a very small capacity, it is true, is used in an attempt to balance the anode-grid capacity of the valve due to the positions of its electrodes, wires, and contact pins. A perfect balance is therefore not obtainable; but, fortunately, neutralisation that is good enough in practice when too great magnification is not attempted is easily possible.

As a matter of fact, the average amateur does not always aim at a perfect balance, but at stability. The balancing condenser is so adjusted that the circuit is stable throughout its tuning range. This usually means that an amount of reaction is applied to the aerial circuit, although we should not overlook the fact that when reaction is arranged for in another part of the circuit it is better to balance as accurately as possible.

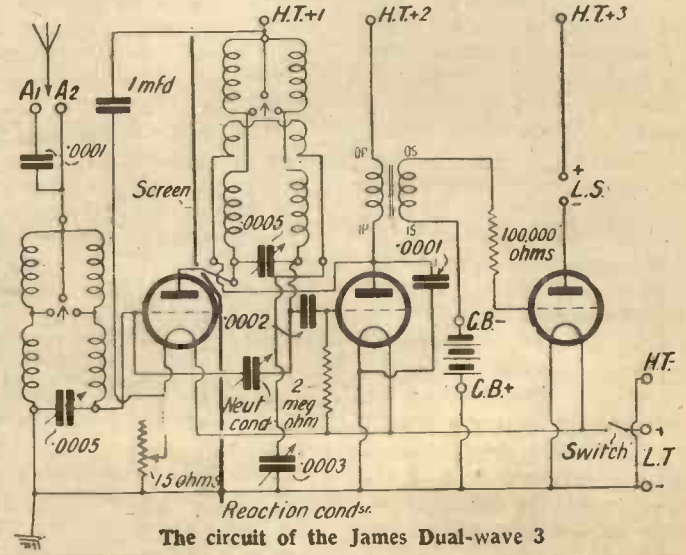
The easiest method of dealing with a single stage having a filament resistance is first to tune in the local station and then gradually to cut down its strength with the resistance. At the same time the reaction may be increased, so that even when the resistance is turned to its off position the local station will be clearly heard.

It is then necessary to adjust the balancing condenser until the signal strength is the minimum. If now the filament resistance is turned on again and a more distant station tuned in, it will be found that the reaction can be increased to the point where the anode circuit is oscillating, but the aerial circuit is not.

Selectivity

The set is more selective when the aerial is connected to terminal A1, but the signal strength is not quite as great as when it is joined to A2.

To tune in a distant station the filament resistance should be about half on and the anode circuit may be allowed to oscillate for a moment or two. The aerial tuning condenser will read about the same as the anode condenser, and, because the receiver is very selective, it is better to turn the



The circuit of the James Dual-wave 3

"THE JAMES DUAL-WAVE 3" (*Continued from preceding page*)

anode condenser a degree or so and then to swing the aerial condenser backwards and forwards over a few degrees. If searching is carried out in this manner there will be no difficulty in receiving a number of stations, depending, of course, upon where the set is used.

I have received more than a dozen with ease, and anyone more favourably situated would receive a greater number. A distant station may be controlled in strength by adjusting the filament resistance or the reaction. Sometimes it is better to use a little reaction and to turn back the filament resistance, as this improves the selectivity, but with a little experience one soon gets the best from the receiver.

The quality of the reproduction is good, but care must be taken not to overload the last valve, particularly when a two-volt valve is used. A number of stations will be received at such strength that the last valve will be overloaded unless the volume control is used. At the same time, the detector may be overloaded as well, with the result that quality will suffer.

This receiver should suit those who must have reasonable selectivity and ample volume from a three-valve arrangement. It is not a very expensive set to build and, owing to the spacing of the parts, the construction is easy.

Do not forget to use the filament switch when turning the set off, and not the filament resistance, as this is connected to the first valve only. Slow-motion dials could, of course, be fitted to the set, and they are recommended, as the tuning is simplified when they are used.

AN ALL-NIGHT SITTING—Jottings from my Log—By JAY COOTE

IF you are at all interested in the wanderings of Germany's latest airship, *Graf Zeppelin*, turn from time to time to the Stuttgart station, which of late appears to be in constant touch, through its short-wave listening post at Schloss Solitude, with WGY (Schenectady) and other U.S.A. transmitters.

On Sunday, August 4, when the dirigible landed for the second time at the Lakehurst Aerodrome, New Jersey, after a successful flight from Friedrichshafen, Stuttgart, with a view to giving German listeners a complete picture of the event, made an all-night sitting of it, taking relays of the proceedings in turn from W2XAD, W2XAF, W2XK, all of Schenectady, and KDKA (East Pittsburg). To while away the time the German studio gave its listeners excerpts from the WJZ, WGY, and WEAF programmes, and quite by chance, it is true, picked up a test from 2FC (Sydney) on the short waves.

Now, both Stuttgart and Munich, in view of their relatively close proximity to the Zeppelin's birthplace, take a proprietary interest in the airship, and arrangements have been made by the former station to secure from America a running commentary in German.

Forthcoming Transmissions

In the meantime you may have picked up one of these transmissions coinciding with the *Graf Zeppelin's* return to Europe. It may not work exactly to a time schedule, for much depends on weather conditions, but at the time of writing it is due to leave Germany again for Tokio on August 15 and to arrive at Los Angeles (California) on August 29, with a final spurt to Lakehurst on September 2.

I understand that in any case Stuttgart will endeavour to keep in touch, and has made arrangements with the U.S.A. stations for a running commentary from the moment it is sighted near the American coast. Personally, I should say that the broadcast of its reception at the Lakehurst Aerodrome on the airship's completion of the round trip should prove a "worthwhile" event.

The German stations have led the way in making these transatlantic relays not only a regular, but a reliable feature; they do not now consider them as stunts, but actual items of a definite programme.

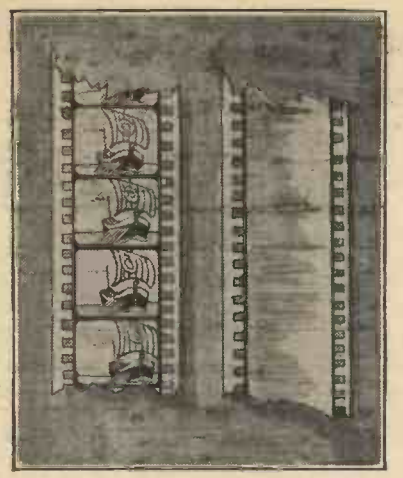
You may have heard of the Burney air ship; it is one of two giant dirigibles now nearing completion in Great Britain. I understand that after a trial flight it will cross the Atlantic to Canada. Will the B.B.C. give us an eye-witness' account of its departure, whatever the hour may be, and will we be allowed to assist *via ether* at its arrival on the other side? I wonder. Yet our broadcasting system possesses much greater resources than does Germany's provincial city Stuttgart.

ON THE FIRST DAY OF THE HOLIDAYS—

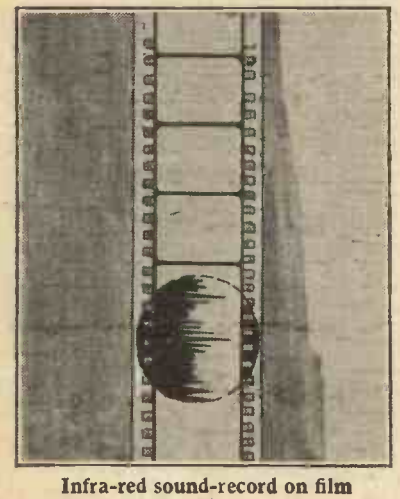
—MR. FLEX ANTICIPATES A STORM.

ALL ABOUT "TALKIES"

(Continued from last week)



Sound recording on separate film



Infra-red sound-record on film

A FURTHER process employing a sound track on the picture film, but a different method of recording, comes from the Radio Corporation of America. The sounds are picked up by a microphone, amplified, and recorded by an oscillograph on a separate film in a machine in a distant part of the studio. It is then photographically reduced and printed on the picture film after the latter has been printed and fixed. Variations of exposure during printing of the picture do not therefore affect the sound track.

A further advantage of the system is that outdoor scenes may be "shot" without taking all the amplifiers and recording gear about with the camera men, the ordinary telephone circuits being used to link up with the recording machines in the studio.

Gaumont

These last two methods are rather limited as to the volume, range, and quantity of the noise they can reproduce owing to the narrow strip available on the picture film, which they cannot overlap. As sounds may easily vary several hundred times in intensity, and yet be detected by the ear, this is a serious handicap and has led to the introduction of yet another system of recording.

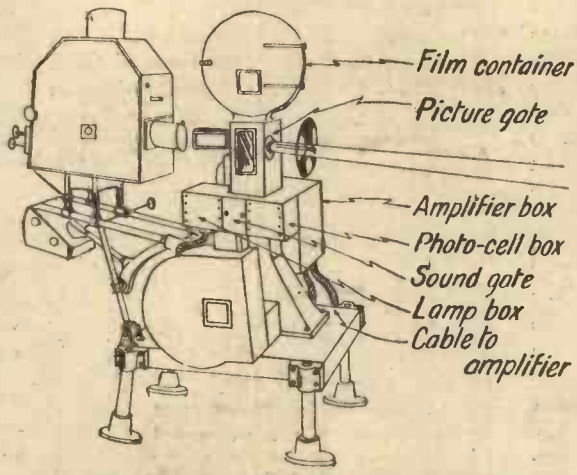
The pictures are taken on a standard film and the sound is recorded separately. After the picture positives have been printed and dried the sound record is overprinted by an invisible gum over the whole width of the film. This gum has the peculiar properties of being transparent to ordinary light and opaque to infra-red light. Thus its presence does not affect the picture on the screen, but becomes apparent to the photo-electric cell when infra-red light passes.

This idea is illustrated in one of the diagrams. Thus the whole of the film is available for the sound modulation, and the loudest passages can be recorded in their true proportions.

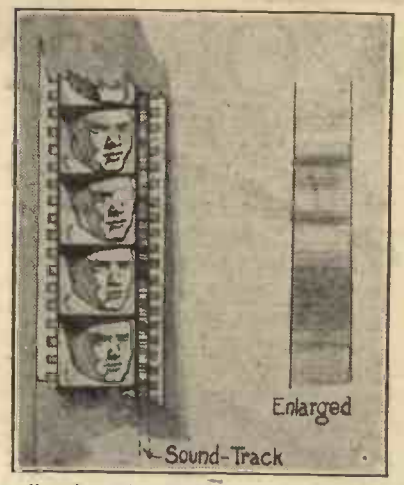
Amplifiers

We have now examined the methods of recording and reproducing the minute audio-frequency currents, which have now to be amplified and fed into giant loud-speakers placed behind the screen in the cinema. As the amplification is enormous —of the order of 100,000,000 times—it is very necessary to reduce unintentional pick-up of static and mush from near-by electrical machinery; and the operating-room of a cinema is really the last place one would choose to house a delicate amplifier.

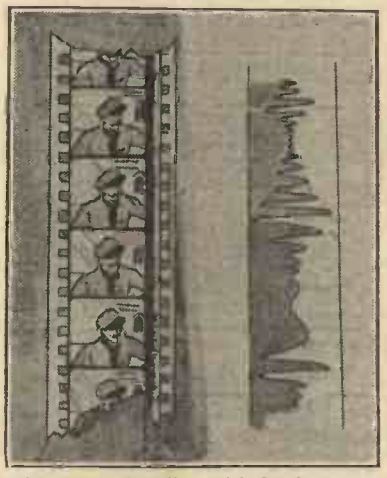
The first three stages following the photo-cell are always resistance-capacity coupled with high magnification valves and wire-wound resistances, the whole being enclosed in a compact metal box with the cell. This unit is mounted on the projector and is joined to the power amplifier by metal-sheathed cable. The valves are run from accumulators and dry batteries enclosed in a metal case, so that there can be no possible disturbance due to motor-boating or reactive coupling from the large speech currents to the loud-speakers.



The various parts are here shown of a film camera modified to run sound-on-film "talkies"



Recording in which exposure varies film density



Oscillograph recording with fixed exposure

The power amplifier consists usually of transformer-coupled stages giving a level output from 40 to 10,000 cycles, and the last stage can usually handle 60 watts output.

In the case of the Western Electric Co.'s three-stage amplifier all the valves here operate on alternating current and push-pull coupling is used. The anode voltage is supplied by rectifier valves.

With this outfit the amplifier is arranged to feed six loud-speakers in the theatre, each speaker having an individual volume control so that correct acoustic balance may be obtained. In addition, a further volume control is fitted at some convenient place in the theatre hall so that an attendant can raise the general loudness as the hall fills up —a human audience being absorbent of sound.

Some idea of the care taken to avoid a breakdown may be gathered by the fact that the valves in a talking film amplifier are changed every three months and broken up. This represents 1,000 hours' use, and is the usual guaranteed life for receiving and low-power glass valve.

WORKING ON 5 METRES!

W. F. FLOYD gives his experiences and describes the apparatus used in some of his recent experiments in ultra-short wave work

"ULTRA" high-frequency radiations have been occupying the attention of experimenters for some time past, but it is only in recent months that any really useful information has been collected on the radiations, the frequencies of which correspond with the wavelengths of about five metres. Permission to experiment with a receiver on this wave need not be specially obtained, but in order to carry out any work with a transmitter, or even a laboratory oscillator, a permit must first be obtained from the Postmaster General.

I have for the past eighteen months, used an oscillator capable of oscillating at frequencies corresponding to waves of from about eight to twenty metres in length. I have also been engaged upon work with an oscillator generating a five-metre wavelength. The following may explain to readers in the West Hampstead district of London the reason why I carried around that district for several days a massive

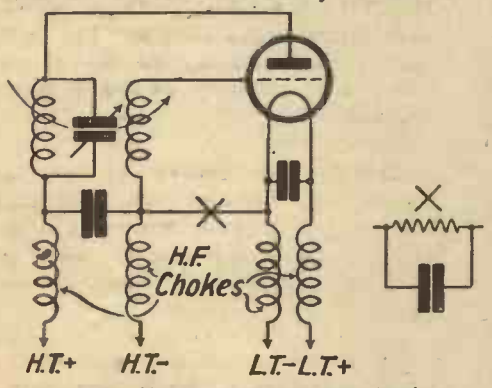


Fig. 1b. The reversed feed-back circuit

apparatus that attracted the attention of passers-by, the police, and errand boys!

Firstly, with regard to circuits, the ordinary simple oscillating circuits *will work* at these ultra-high frequencies. The tuned-plate tuned-grid circuit (more familiar to some as the T.P.T.G.) so successfully used by amateurs for 42- and 21-metre communication present little difficulties except that great care has to be taken to tune the two circuits to the optimum position which is that of minimum anode feed to the oscillating valve. This position is a delicate one, even for 42-metre work, and with the effect of the body capacity of the operator at sixty million cycles per second, it is almost impossible to hold the position unless tuning is accomplished with long extension handles. Coupling the coils as in the reversed feed-back arrangement only adds to the difficulty of operation.

The well-known Hartley circuit arrangement can be used with great success for these frequencies. The circuits are shown in Figs. 1a, 1b, and 1c.

The circuit finally chosen for the 5-metre wave transmitter was a modification of the ultra audion circuit in which the self capacity of the tuning inductance—there is

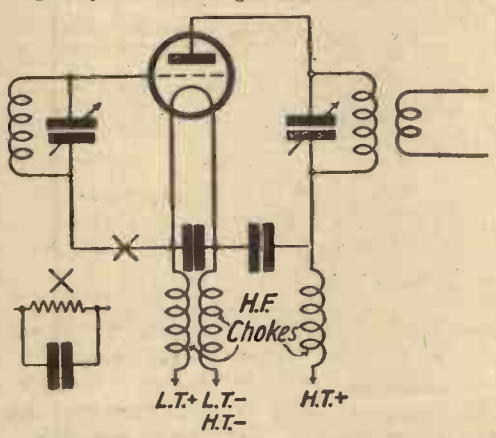


Fig. 1a. The TPTG circuit. At X a grid leak and condenser can be inserted to reduce the intensity of the oscillation

only one—and the added capacities of the feed condensers, together with the stray capacities, tune the circuit to the desired frequency. The circuit is shown in Fig. 2.

Extensive experiment has shown that the best type of grid leak to employ in the circuit is one of the ordinary receiving type. The value of this is usually critical, and varies considerably with the type of valve used in the oscillator. In the original set, Loewe leaks were employed and remained sensibly constant during all the time of transmission. Inductive leaks are apt to cause peaks, and will sometimes set up parasitic oscillations in conjunction with the H.F. choke in the anode power feed.

The H.F. chokes in the filament leads consist of about twenty turns of a gauge wire (in this case, 28 s.w.g., d.c.c., heavy enough to pass the filament current without overheating, wound on a ½ in. ebonite rod. There is not a great leakage of

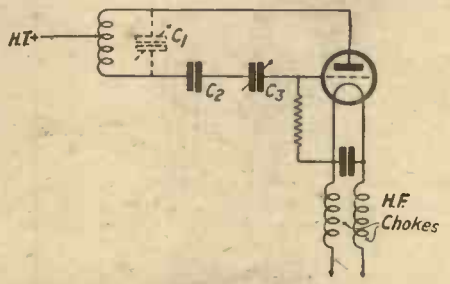


Fig. 1c. The Hartley arrangement used for 10-metre work. C_1 can be omitted and then C_2, C_3 and C_{ag} in series (C_{ag} is the anode-grid capacity in the valve) tune the inductance L to the desired wave. If the H.T. + tap is correctly adjusted there is no need for a radio-frequency choke in the H.T. lead

radio-frequency current if these fail to do their work efficiently. The choke that is important is the one in the anode power feed. This is one of Wingrove Rogers Polar chokes, namely the short-wave choke for 10 to 200 metres.

With regard to the valve to be used in such an oscillator, I had none of the difficulties usually said to exist. An ordinary valve holder was used and fitted with several types of British four-pin type valves. The valves which gave the greatest output for the moderate inputs of eight to ten watts were Cossor valves. Either the six-, four-, or two-volt power or super-power types gave from about 150 to 175 milliamperes of radio frequency current measured with a hot-wire instrument in the radiating system and not in the closed oscillatory circuit. With a somewhat larger input of about seventeen or eighteen watts the output is of the order of 200 to 225 milliamperes of radio-frequency cur-

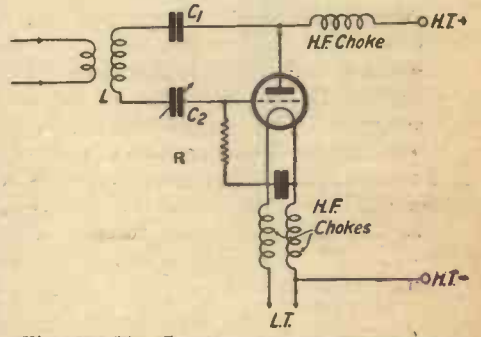


Fig. 2. The 5-metre oscillator circuit. L is one turn of gauge No. 10 copper 5 inches diameter. C_1, is about .0002 μF, C_2 = .00025 μF, R = 1.5 megohms with a Cossor 610 P or 610 XP and 250 to 350 volts on the anode. The filament is heated with 6 volts A.C.

rent, with a corresponding increase in the oscillating voltage generated by the valve.

The radiator employed was one which is technically known as a "half-wave current-fed Hertz." That is to say, a T-shaped aerial in which each of the two arms of the T are carefully measured so that they are exactly one quarter of a wavelength in length. The middle part of the T or "down lead" consists of two wires, one of which is connected to the right-hand arm and the other to the left-hand arm. The other ends of the feeders are joined to a single loop of wire which is coupled to the main inductance.

The receiver used, as a portable for the purposes of testing the range of this transmitter, incorporated the same design and same circuit as the power oscillator with the exception that the feed to the oscillating circuit was reduced to control the intensity of the oscillation obtained. The aerial in

(*Continued on page 220*)

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THE relay from Ostend was quite successful, although I was unable to understand the reason for the delay after the first item. But the singing was very good, was it not? Although some parts of Gounod's *Romeo and Juliet* must have been unfamiliar to a good many listeners.

The encore "O Night of Hymen," however, made up for it. Let us have more of these international transmissions when the music is as good as the singing.

◆ ◆ ◆

Mr. John Scott Hughes knows how to broadcast, and his quite colourful and lively tale of the Cowes' Regatta was interesting, even to the land-lubber.

◆ ◆ ◆

What they have to put up with at Savoy Hill! A journalist friend of mine complains to me that the play *Ingredient X*, by L. du Garde Peach, was Bolshevist in tendency! But, oh, sir, the play's the thing. It was well produced, too. And although some of the scenes were too short, and consequently there was too much changing about, it would stand a repetition. Let's have it again, Bolshevist tendency and all!

◆ ◆ ◆

Gracie Fields is deservedly popular, but if the B.B.C. censors won't get to work on it, she herself ought to sub-edit her material. Otherwise she will lose some of her friends.

◆ ◆ ◆

Oh, and here's a letter from Helena Millais, who writes from Barnes, thanking me for the "nice notice" given to her, but adding: "Alas, you speak of me as though I were a broadcast has-been, which is not yet the case. I am still broadcasting about once in six weeks." Her appearances apparently are not so frequent, "which I understand by letters from listeners is a source of great regret to them." Besides broadcasting, Helena does a good deal of concert work.

◆ ◆ ◆

And an interesting letter from friend Leonard Gowings, whose voice always charms. Says he to me: "You ask what is the extent of my repertoire?"

Very wide is the retort. Leonard has kept a record of his broadcast programmes since his first broadcast in 1924, and he finds that up to date he has sung 225 different songs. A very fine record. "Songs that Mother Taught Me" is the title of one of the songs I like him in best. Funny, I thought it was "Songs My Mother Taught Me."

◆ ◆ ◆

Need I add that I asked the question about repertoire of some of the bands and singers in all seriousness. So far as Leonard Gowings is concerned, he has sung in German, French, and Italian, and has taken part in a number of broadcast items from Wagner to Offenbach and in oratorios by Bach, Handel, and Mendelssohn. He tells me that there are many more songs he has not yet broadcast. I look forward to hearing them. In any case, let me assure him again that it is always a pleasure to listen to him.

◆ ◆ ◆

I want to stress this point about vaudeville. You may recollect that the B.B.C. accepted the verdict of a daily newspaper in regarding Variety as meaning "Vaudeville shows." I submit that readers took Variety to mean a variety of different items; instead of which we have the cheapest kind of Vaudeville shows that went out of the market before the war. I have listened to several this week, but they are not worth enumerating. They are nearly all of the same sort—twangy, dull, and first-person-singularish. I won't even mention the names of the artistes who perpetrate chestnuts.

Miss Sunny Jarmann—(in "Hold Everything")

◆ ◆ ◆

Joan Coxen can sing, can she not?

◆ ◆ ◆

A finely trained, agreeable voice has Mark Raphael, and his songs by Schubert and Schumann made even a chamber concert very agreeable.

◆ ◆ ◆

I only heard part of "Greenhorn's Further Adventures," but it sounded to me very good stuff. I hope they are genuine and not merely leg-pulls.

◆ ◆ ◆

Here is an interesting piece of psychology. The B.B.C. official organ heads the Sunday's special programmes as "The Day of Rest"; but *is* Sunday the day of rest? Didn't that misnomer go out of fashion after the war?

◆ ◆ ◆

Amazing, the hysteria of the Jack Hylton fans. Certainly this band knows how to put it over, and Jack almost sounds as if he had a good voice. But the whole show presents a good *spectacle*. Again, oh, for television!

◆ ◆ ◆

The promenade concerts once more. I wonder whether it would have been a better thing to have a *very* popular opening concert in view of the fact that millions of listeners are now among the "promenad ists."

◆ ◆ ◆

Did you listen to the "Fat Stock Prices"? What—*you didn't?* You naughty boy!

◆ ◆ ◆

The disputants in the discussion relative to youth and age did listeners the courtesy of taking their subject seriously, and although one felt that the discussion was really being read out—well, the consciousness of the recent fiasco made even this impression acceptable.

◆ ◆ ◆

Extraordinary that men of such talent as Stuart Ross and Joe Sargent, the syncopated duettists, who can sing such songs in German and French as the Continental favourite "Wass Est," etc., should have to descend to such tripe as the rest of their repertoire. I think they would go over well if they kept to a few more straight songs.

The HYPER-SE

A Two-valver designed to giv and using the coupled-circu

J. H. Reyner, B

ALTHOUGH the Regional Scheme is not actually with us just yet, and it will not operate in its final form with 130-kilocycle separation for some time, yet some experiments with coupled circuits will doubtless appeal to readers. The advantages of the use of two relatively ordinary coupled circuits as against one specially good circuit have been advanced in recent articles appearing in AMATEUR WIRELESS. The results obtained are better tuning, in that side bands are not cut off so sharply, while better selectivity is obtained. Provided a certain amount of reaction is employed, there is little loss of signal strength in using two coupled circuits as against one simple type of circuit.

The receiver described herewith makes use of a form of coupled circuit which can be utilised for experimental purposes and should therefore prove popular. Moreover, in order that the user may become thoroughly accustomed to the tuning properties, a stand-by and tune arrangement is provided.

The Circuit

The circuit diagram is shown in Fig. 1, from which it will be seen that a switch is arranged for coupling the aerial directly through a .0001 condenser to the second coil of the coupled-circuit arrangement and at the same time, isolating the first coil. The circuit then becomes a simple two-valve receiver, having a detector and one L.F. stage. By throwing the switch over to the other position, the coupled circuit is brought into operation and, as will be explained later, the extent of the coupling between the two circuits may be varied to give the required order of selectivity by a very simple means.

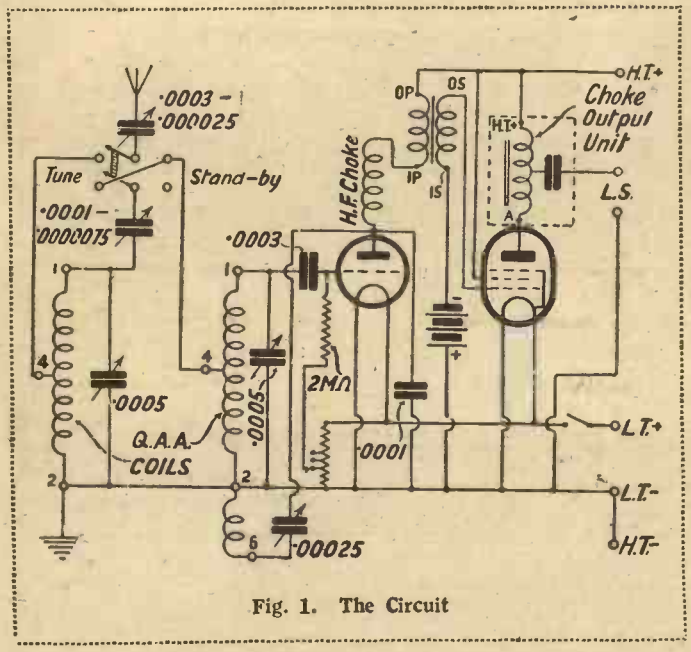
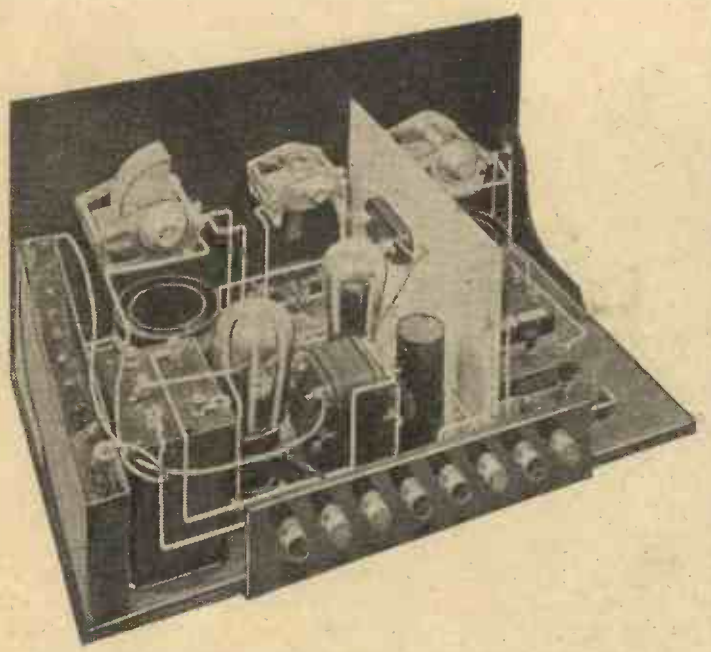


Fig. 1. The Circuit

A two-valve receiver has been constructed purely from the point of view of simplicity. It is equally practicable to add two low-frequency stages following the detector arrangements, if desired. As one of the principal virtues of the receiver is its capability for receiving distant stations, it is desirable to use a pentode rather than an ordinary valve and, for this purpose, a pentode output choke has been incorporated. This enables the pentode to be used with the maximum of efficiency while avoiding the risk of damage to loud-speaker windings due to the presence of the heavy anode current taken by a pentode valve.

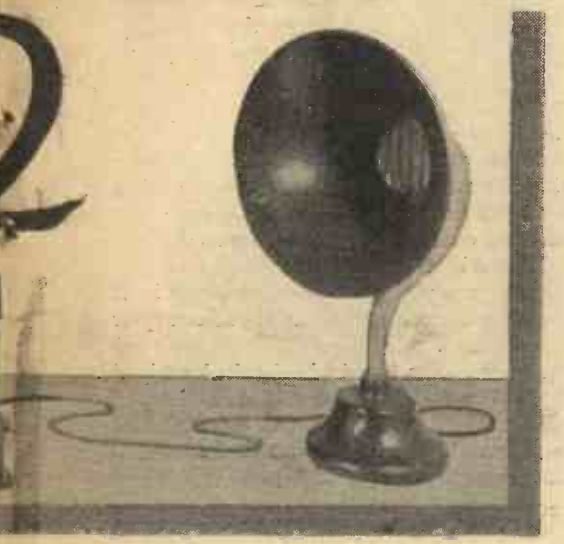
It is distinctly to be recommended that a pentode should be used in the set in order to obtain adequate volume, but an ordinary valve may be employed, if desired, without any alteration to the connections other than the leaving out of the connections to the side terminal on the pentode itself.



The "Hyper-selective 2" complete, wired and ready for working

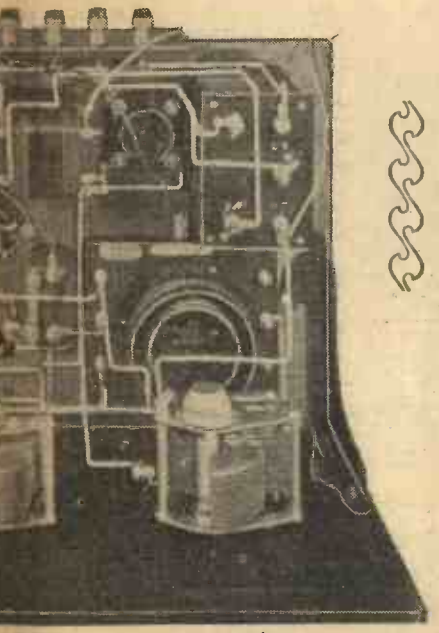
All the components are shown b

ELECTIVE



e very satisfactory selectivity it arrangement developed by .Sc., A.M.I.E.E.

For the tuning, "Q" coils have been used, since they enable the effect of the coupled circuit to be tried on both long and short wavebands. During the tests I found, for example, that Eiffel Tower could be separated from 5XX distinctly more easily with the coupled circuit in place than without it.



y this plan view of the receiver

The circuit diagram is re-drawn in simplified form, without the switching arrangement, in Fig. 2. It will be seen that the aerial is coupled through a pre-set condenser C1 to the No. 4 terminal of the first "Q" coil. This coil is tuned with the left-hand condenser on the front of the panel. The voltage developed in this circuit is transferred through a small coupling condenser, C2, to No. 4 terminal on the second "Q" coil, which is tuned with the right-hand condenser on the front of the panel. The voltage developed across this coil is applied across the detector valve in the customary manner, and the remainder of the circuit is conventional.

Reaction is applied around the detector valve on to the second coil, so that whether the circuit is used in the stand-by position or in the coupled position, it is possible to obtain reaction by the use of the condenser situated in the centre of the panel.

Before discussing the operation of the circuit in detail, reference may be made to the pentode output unit which is employed. This has a high inductance choke, the inductance being approximately 60 henries under working conditions. This is tapped to give a 2 to 1 step-down and the output is taken through a 2-microfarad condenser to the loud-speaker terminals. This is adequate for the lowest frequencies required and the use of a unit of this sort noticeably improves the quality. It also enables the set to be used quite satisfactorily with an eliminator, without any trouble from motorboating.

The coupling between the two tuned circuits is controlled by the value of the small condenser, C2, connected from the top of the first circuit to No. 4 terminal on the second. All other coupling is avoided as far as possible by the provision of a screen between the two coils. There is a small residual magnetic coupling left, but this is not sufficiently large to interfere with the normal operation of the circuit and the coupling can be increased or decreased at will by simply adjusting the value of the pre-set coupling condenser. When this is made large, the coupling is tight and, when it is reduced in value, the coupling is progressively weakened.

The maximum value of the condenser is .0001 and this is sufficient to give the

LIST OF COMPONENTS

Ebonite panel, 16 in. by 8 in. (Becol, Raymond, Ebonart, Paxolin).

Ebonite strip, 9 in. by 2 in. (Becol, Raymond, Ebonart, Paxolin).

Baseboard, 16 in. by 9 in. (Pickett, Camco, Clarion).

Two .0005-microfarad variable condensers (Polar, J.B., Burndept, Igranic).

One .00025-microfarad reaction condenser (Polar, J.B., Burndept, Igranic).

Two QAA coils (Lewcos, Wearite).

One Formodenser, type F, and one Formodenser, type J (Formo).

One Pentode output unit (Wearite).

One 4 to 1 L.F. transformer (B.T.H., Varley, Ferranti, R.I., Igranic).

One H.F. choke (Lissen, Varley, Wearite, Burndept, Lewcos).

One .0001 and one .0003-microfarad fixed condenser (Dubilier, Lissen, T.C.C.).

One 2-megohm grid leak (Dubilier, Lissen, Graham-Farish).

Two valve holders (Benjamin, Lotus, Wearite).

One fixed potentiometer (Polar, Lewcos).

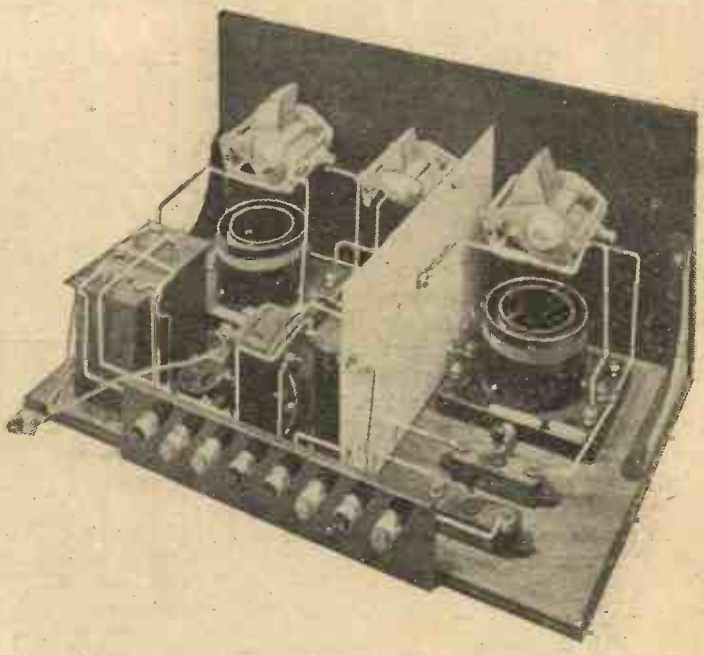
One panel-mounting on-off switch (Claude Lyons, Benjamin, Bulgin, Lissen).

One D.P.D.T. switch (Lotus).

Two panel brackets (Ready Radio, Bulgin).

One metal screen, 9 in. by 6 in. (Ready Radio, Parex, Peto-Scott).

Eight terminals, marked: Aerial, Earth, L.T.−, L.T.+, H.T.−, H.T.+, L.S.−, L.S.+ (Belling-Lee, Eelex, Igranic).



This view shows the screening and the coil arrangements

"THE HYPER-SELECTIVE 2" (Continued from preceding page)

tightest permissible coupling. In fact, it may be found that a slight double hump effect is present if this condenser is screwed right down, but in the model described, this was not noticed on test. At any rate, the coupling with the condenser at its maximum position is as strong as can be afforded and, as was pointed out last week, there is little advantage in using a tight coupling for a weaker coupling is equally effective, provided reaction can be utilised to make up any slight discrepancy in the strength.

Experiments, therefore, should be conducted to find the weakest possible coupling which can be used without serious loss of signal strength. Gradually reduce the setting of the coupling condenser, re-tuning on each occasion until the required degree of selectivity and signal strength is obtained. As the selectivity is increased, the signal strength falls off slightly and it is necessary to choose a compromise which suits one's own local conditions the best.

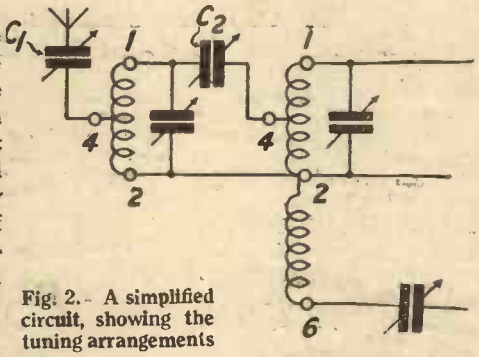


Fig. 2.—A simplified circuit, showing the tuning arrangements

The change-over from stand-by to tune is operated by switch on the front panel, situated centrally and immediately underneath the reaction condenser. Pushing this switch in sets the circuit to the "tune" position, while pulling the switch out sets it to the "stand-by" position. It is therefore an easy matter to choose whichever position one requires.

Constructing the receiver is straightforward and quite simple if the wiring plan provided is followed. For those who prefer it, a full-size blueprint can be obtained, price 1s. 0d. post free, and the wiring and layout can be followed very clearly by this means. In any case, wire up the set in the order indicated by the letters.

Suitable Valves

The valves required for the receiver will be a medium-impedance detector valve for the first stage and a pentode for the second stage. Either 2, 4, or 6 volts may be used, and the battery of 100 to 120 volts should be utilised to provide the high tension. The current consumption with a pentode is, of course, somewhat heavy and a large-capacity battery should therefore be used in order to obtain economical service. Grid bias on the pentode should be according to the makers' figures for the value of H.T. used.

In testing the receiver out, first of all place the switch in the stand-by position and tune in the receiver as a simple detector circuit.

It should be found to be quite lively and a number of stations will be receivable as it stands. When the handling of the receiver has been grasped, then the switch may be changed over to the coupled-circuit position. This should be done with the receiver tuned to some particular station. Then, on re-tuning on the first dial and slightly readjusting the second dial, the same station will be found again and can be brought up to the same strength with greater selectivity than before.

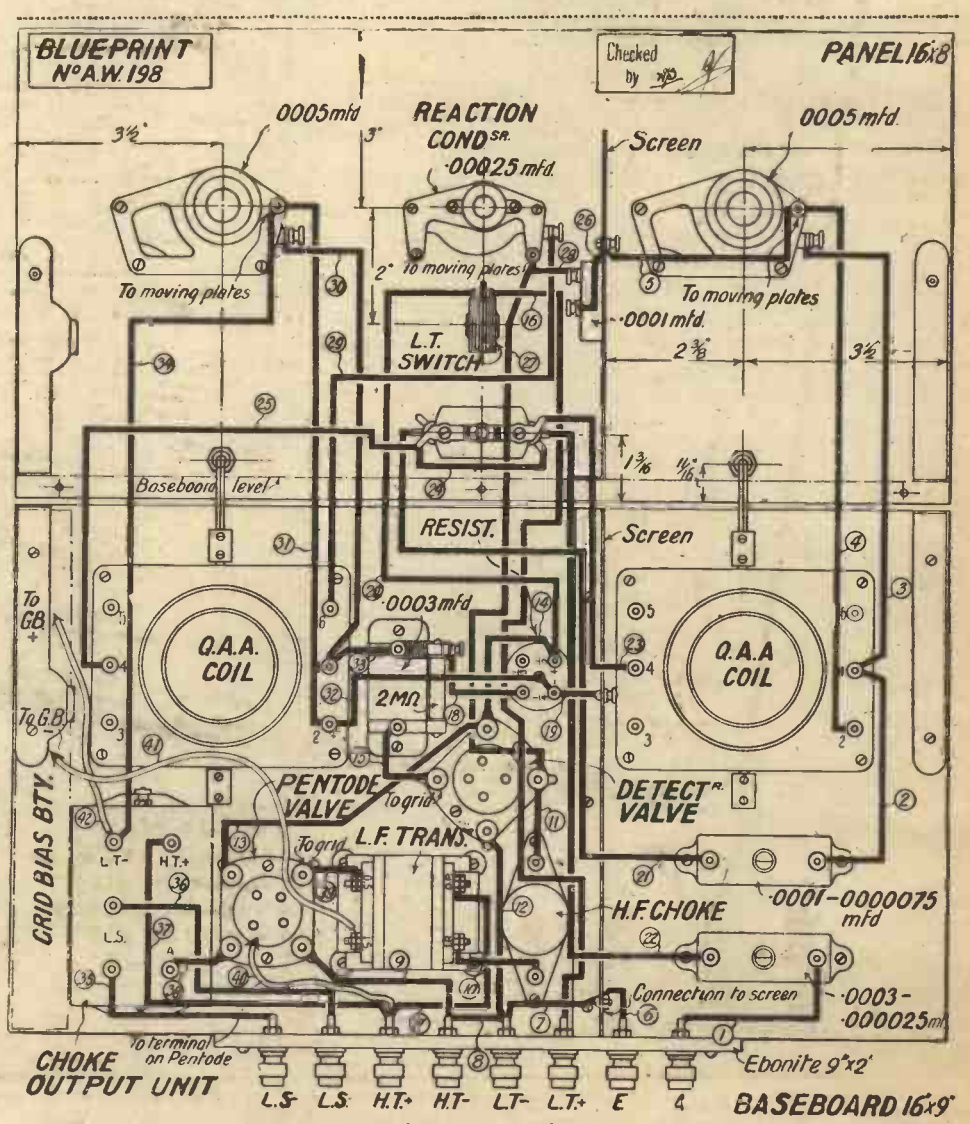
Further operating notes on this receiver will be given next week, together with some details as to the method of using the coupled circuit as a wave-trap. The set will be on view in Messrs. Selfridge's Somerset Street windows.

ACCUMULATOR HINTS

IF the level of the electrolyte remains below the tops of the plates it will lead to sulphation. The cell should therefore be "topped" from time to time, especially when kept in a warm room where the rate of evaporation is high.

Internal short-circuiting is frequently caused by the accumulation of sediment at the bottom of the case—sometimes a tree-like growth will spread from the negative to positive plate. Or one or more of the separators may break down. One or other of these defects should be suspected if the cell has a low open-circuit voltage and loses its charge rapidly. The only remedy is to open up the cell and clean it out or repair the damage.

Accumulator terminals should be wiped from time to time with a cloth moistened with ammonia water and then smeared with vaseline. This will prevent that disagreeable corrosion.



A full-size blueprint can be obtained for 1s., post free

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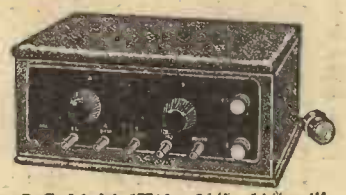
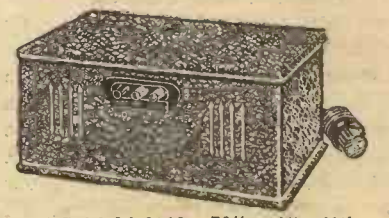
MODEL.	Current Output.	VOLTAGE TAPPINGS.			REMARKS.	PRICE COMPLETE. D.C.	PRICE COMPLETE. A.C.
ALL-POWER UNITS.	Milli-amps.	H.T.	G.B.	L.T.			
C 1. A	60	S.G.: 0-120: 120/150: POWER.	Up to 21.	D.C. Up to .6 amp. A.C. 2-6 volts from .3 amp. min. to 1 amp. max.	Completely Electrify your Radio Set with no alteration, whatsoever, to Set, Wiring or Valves. Westinghouse Rectifier in all A.C. Models.	£9-15-0	£17-15-0
C 2. A	20	S.G.: 60: 120/150.	Up to 12.	D.C. 2-6 volts from .2 amp. min. to .35 amp. max. A.C. 2-6 volts from .2 amp. min. to .5 amp. max.		£5-17-6	£10-17-6
H.T. UNITS.		120.			For 1 to 3 Valve Sets, or those not requiring more than 10 m/a. Westinghouse Rectifier in A.C. Models.	17-6	—
1 F. 10	10	60 and 120.				£1 - 9-6	—
2 F. 10		60 and 120.				—	£3-10-0
2 A. 10		S.G.: 60: 120/150.			For 1 to 5 Valve Sets, or those not requiring more than 20 m/a. Westinghouse Rectifier in A.C. Models.	£1-17-6	£3-19-6
3 F. 20	20	S.G: 0-120: 120/150.				£2-10-0	£4-12-6
1 V. 20		S.G: 0-120: 120/150: POWER.			For Multi-Valve Sets, or those not requiring more than 60 m/a. Valve Rectifier in A.C. Model: Philips 505	£3-15-0	£7 - 5-0
4 T. 60	60	S.G: 0-120: 0-120: 120/150: POWER.			Westinghouse Rectifier in A.C. Model.	£4-15-0	£10-10-0
RECTIFIER UNITS.		REMARKS.					
R. 20	20	For attaching to D.C. Units for use on A.C. Mains.			Valve Rectifier: Philips 373 or 505	—	£3 - 7-6
R. 60	60				Valve Rectifier: Philips 505	—	£5 - 0-0
L.T. UNIT							
L.T. 1		2-6 Volts from .3 amp. min. to 1 amp. max.			Westinghouse Rectifier	—	£8-15-0
TRICKLE CHARGER.							
T. 500		Charges 2, 4 or 6 volt ac. from A.C. mains at ½-amp.			Westinghouse Rectifier	—	£2-12-6
ISOLATING TRANSFORMER.							
I. Tr		For isolating Loud-speaker or 'Phones from set where a Power Supply Unit is in use.			Westinghouse Rectifier		15s. 0d.

"EKCO"



D.C. Model, 5T60. 9¼"×5½"×4".



A.C. Model, 2A10. 7¾"×6½"×4½"

PLUG IN—THAT'S ALL

E. K. COLE, LTD., DEPT. K, "EKCO" WORKS, LEIGH-ON-SEA.

MY WIRELESS DEN

By W. JAMES

Weekly Tips Constructional and Theoretical—

For the Wireless Amateur

Earthing a Frame

RECEIVERS having a stage of high frequency are sometimes rather difficult to stabilise, I find, when the earth lead is very long or the earth itself is a poor one. This seems particularly true on the longer wavelengths, although much depends upon the receiver.

A definite earth should, of course, be used when the receiver is designed for the usual outdoor aerial working, and stability may be assisted by adding an earth to a frame aerial set that provides considerable high-frequency magnification.

Doubtful Improvements

A week or so ago I came across a receiver which was faulty because its builder thought he would improve upon the usual method of connecting the parts. He had decided that the usual wire joint at the terminals was not good enough, and that he would solder every joint.

This he had done, but, owing to lack of skill, rather too much flux was used in places, with the result that some of the joints were poor although, until the terminals were loosened, they seemed satisfactory. I am afraid that not a few amateurs feel that a soldered joint must be better than the connection formed by the wire itself looped round the terminal, but experience shows this is not true, provided the wire ends are bent around the shanks of the terminals.

Grid Leaks and Tone

It is not generally known that the use of a grid leak of too high a resistance in the detector stage will result in the higher musical frequencies being considerably weakened.

Those who have a number of grid leaks ranging from .5 to 5 megohms will be able to find by experiment, the effect of using a low-resistance leak as compared with a high-resistance one, and they will discover that the reproduction is more brilliant and higher pitched when a low resistance leak is used.

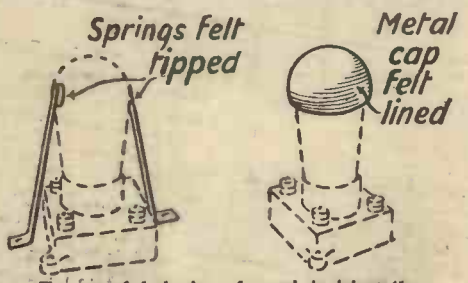
This is because the grid condenser is effectually in parallel with the grid leak, and the grid-to-filament path of the valve, and therefore tends to by-pass the higher frequencies.

Two Useful "Gadgets"

In portable and other receivers having a number of valves there is sometimes a tendency for a howl to commence as the result of vibration or even the sound waves themselves, reaching the detector.

I was, therefore, interested in trying two gadgets which, when fitted to the detector valve, certainly reduced howling troubles. One of them is a form of metal cap lined on its inner surface with felt. It is fairly heavy and is fitted over the top of the bulb of the valve.

The second gadget takes the form of a pair of fairly stiff springs which are screwed to the baseboard, and whose upper ends



Two useful devices for minimising the vibration of valves in a portable set

press against the glass bulb. Their tops have felt pads in order to minimise the chance of breaking the glass, as the springs are fairly strong. The diagrams above will make these devices clear.

Incidentally a bad valve may often be used satisfactorily when a lump of plasticine is stuck over the top of the valve. It should not be necessary to have to resort to one of these devices, but an occasional valve is troublesome.

Convenient Connections

There are several makes of fixed condenser on the market that have three terminals, or connecting points, to which may be fitted clips for carrying a grid leak. These condensers and grid leaks may be arranged for the series or the series-parallel method of connection.

In the series method, the grid leak is joined between the grid and filament of the valve. This is the method which must be used when a tuned anode circuit is employed or when one side of the tuned circuit is taken to the negative L.T., and the grid leak returned to positive L.T. Unfortunately the combined grid condenser and leak is sometimes not properly connected, with the result that only very weak signals may be heard. Therefore, one should always be very careful when connecting one of these components, taking particular notice of marks on the condenser.

Beware of Big L.T.!

Valves having filaments that may be heated with an alternating current, such as those in the "Point 8" series, and those having indirectly-heated cathodes, pass a relatively heavy current in comparison with ordinary valves, with the result that a suitable valve holder must be used.

There are holders which are perfectly satisfactory for use with battery valves, but are not quite suitable for carrying the heavier currents passed by mains valves. When it is remembered that the filament voltage of the valves in the "Point 8" series is only .8 volt, and the current from .8 to 2 amperes according to the type, it will be realised that we cannot afford to lose voltage at the filament contacts. It is therefore essential that the filament pins of the valve make a firm connection with the sockets of the holder, as even a small amount of resistance at the contact points may seriously affect the results.

One should employ holders having plenty of metal in their construction and having sockets that will grip the valve pins over a reasonably large surface. Always carefully open the pins and make certain they fit well.

Radio-Normandie, the small private station at Fécamp (France) resumed its broadcasts on August 15 last on a wavelength of 220 metres; its power has been increased to 500 watts and the transmissions are clearly heard in the southern districts of England. Concerts are given on Tuesdays, Thursdays, and Saturdays between 8.30 and 10.30 p.m. B.S.T.

PTT Grenoble (France) now works on 329 metres, and Montpelier, the latest official station to be installed by the French authorities, has chosen 286 metres for its transmissions.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

New Marconiphone Portable

ALTHOUGH ambitious claims are often made for the capabilities of portable sets to receive numerous stations, distortionless reception of the local and high-power English stations at comfortable loud-speaker strength is one of the most important qualities which the average portable should possess.

It has therefore been the object of some manufacturers to concentrate their efforts upon obtaining good quality in reproduction and ease of tuning rather than extreme sensitivity to weak signals, and certainly many of us would rather retain the former. We have recently had an opportunity of testing a Marconiphone five-valve portable set utilising normal three-electrode valves.

An inspection of the portable with the back of the cabinet open shows the practical manner in which the various components are laid out. The five valves are mounted in a readily accessible position and may be removed without any juggling. Aperiodic coupling is used for the H.F. stages, thus affording single dial tuning. The two low-frequency stages are transformer-coupled, and a Marconiphone cone loud-speaker is fed from the final power valve, a P215.

The layout of the controls is commendable, both in appearance and simplicity. On the left a horizontal drum drive operates the aerial tuning condenser, and on the right a similar drive controls reaction. The on-off and change-over switch combined is placed in the centre of the panel. The complete set is housed in a handsomely-polished wooden cabinet supported on a turntable.

After handling this receiver, we gained the impression that it is eminently suited to the needs of the normal user who has little opportunity to study the intricacies of tuning. There is no necessity for ultra-fine setting of the controls to prevent side-band emphasis; at the same time, owing to the directional properties of the frame aerial, interference is unlikely to be experienced. The local and Daventry stations can all be received at adequate loud-speaker strength with ease and without in any way forcing the reaction. The quality of reproduction of music and speech elicited remarks of approval from those who heard the set.

As it is useful to give some idea of the number of distant stations received, we will state that there was no difficulty in tuning in such stations as Radio Paris, Hilversum, and one or two others on the long wavelengths at comfortable, if not strong, loud-speaker strength. Although distant stations were not so easy to receive on the short wavelengths, compensation was amply given by the good volume and quality obtainable from the local and Daventry stations.

The new Marconiphone Five-valve Portable Set ready for working

H.T. and L.T. consumption figures are always interesting to the intending purchaser, since they afford an appropriate check on the life of the batteries. It is evident that economy has been studied in the Marconiphone portable, and the figures taken in our laboratory gave an anode consumption of 23 milliamps and a filament consumption of .55 ampere. The accumulator has an actual capacity of 24 ampere-hours, whilst a 108-volt standard-capacity battery is fitted.

Obeta H.T. Battery

AT this present stage of wireless development H.T. batteries give such uniformly good results as regards capacity output and long life, that the types are generally classified according to sizes and voltages rather than to specific makes. Many users are in favour of the 60-volt units, since these may be built up to give 120 volts or more if desired, whilst others prefer to have the H.T. batteries in a single unit. It was thought at one time that the advent of the screen-grid valve, with its recommended anode voltage of 120, would tend to put the 100-volt unit in the shade. It has been proved, may times, however, that screen-grid valves and the like will work excellently on voltages of less than 100, provided, of course, the screen voltages are correspondingly reduced.

This week we are giving the results of tests undertaken on an Obeta H.T. unit having a maximum voltage of 99. This unit is liberally tapped at every 3 volts, and a cardboard cover is placed over the tapping points with the necessary holes for plugs; as is well known, such practice tends to prevent accidental short-circuit due to the presence of a metal object inadvertently placed on top of the battery.

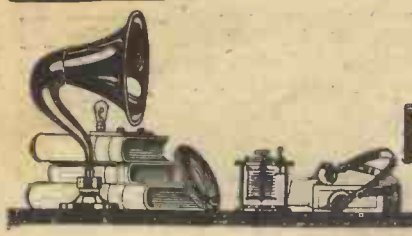
As usual, our test consisted of a continual discharge at a fixed rate: in this case the value was 7 milliamps, to suit the standard capacity cells. The discharge was continued until the voltage and, consequently, the current consumption, had fallen to half the original value. During this time over 1,000 milliampere-hours were taken from the cells, indicating that the battery is well up to our set standard.

The dimensions of this unit are 9½ in. by 5¼ in. by 3 in., and it may be recommended to readers. The makers are Messrs. Hook and Willis, 29, Ely Place, London, E.C.1.

AMERICAN BROADCASTING STATISTICS

IN a report recently issued by the National Broadcasting Company of the United States, some interesting details are given in respect to the growth of broadcasting in the United States since its inception some eight years ago. On June 1, 1929, it was computed that roughly twelve million radio receivers were in daily use, of which two-thirds consisted of sets equipped with a minimum of five or six valves. Of this number one-fifth were operated with less than five "toobs." Simple crystal receivers have died out to the extent of representing but 2.92 per cent. of the total quantity. It is roughly calculated that on a basis of twelve million families, each of three to four members, the daily audience represents something like forty-five million listeners who, up to December 31, 1927, have spent over two billion dollars in radio components and accessories. Statistics collected from various sources also demonstrated that the greater proportion of the listeners confined their attention to two main transmitters and that the most popular hours of the day were those comprised between 7 and 11 p.m.

Budapest transmits pictures on the Fultograph system every Monday and Friday at 3.45 p.m. Later, similar broadcasts will be made daily in the course of the evening programme.



OUR INFORMATION BUREAU

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, laycuts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Garden Radio.

Q.—*A number of my friends enjoy their radio in the garden and I have attempted to do likewise by running long leads from the receiver to a speaker arranged in the garden. The arrangement, however, has proved to be unsatisfactory inasmuch as the volume drops very considerably as soon as the speaker is connected to the ends of the extension wires. My friends do not appear to be troubled in this respect and after purchasing new H.T. batteries and getting the accumulator freshly charged I am still faced with the trouble.* —*F. R. (Richmond).*

A.—The long-leads between the receiver and the loud-speaker give rise to a considerable drop in voltage between the H.T. battery and the anode of the last valve in your set. This accounts for most of your trouble and can be remedied by introducing a choke-filter output circuit in your set between the output of the last valve and the extension leads to the speaker.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

If you have no room inside your set for the additional components then we would suggest you make up a unit for attachment to your set inside the house. The Universal Output Unit, blueprint A.W.153, will be a suitable unit for you to construct and add to your set. To add the necessary components inside your receiver disconnect the wire now joined between the anode of the last valve and the negative loud-speaker terminal. Now connect the anode of the valve to one terminal of an output choke. The other terminal of this choke should be connected to the positive H.T. terminal supplying current to the anode of the last valve. In other words this other terminal should be connected to the existing loud-speaker positive terminal. Now take another wire from the anode of the last valve and connect it to one terminal of a 2-microfarad fixed condenser. The other terminal of this fixed condenser should be connected to the L.S.-terminal.—L.C.

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.2
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	17.0
*1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	5.0
*453	666	Klagenturt	0.5
*517	581	Vienna	15.0
BELGIUM			
235	1,276	Charleroy (LL)	0.25
246.1	1,218.8	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,071	Liége	0.5
*509	590	Brussels	1.0
CZECHO-SLOVAKIA			
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava (Feriby)	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	1.0
1,153	260	Kalundborg	7.5
ESTHONIA			
*297	1,010	Reval (Tallinn)	2.0
FINLAND			
*221	1,355	Helsingfors	0.8
*1,796	167	Lahti	40.0
FRANCE			
170	1,750	St. Quentin	0.25
220	1,364	Fécamp	0.5
220	1,364	Béziers	0.1
237	1,265	Juan-les-Pins	0.4
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
*255	1,175	Toulouse (PTT)	1.0
*265	1,130	Lille (PTT)	0.8
*276	1,087	Rennes (PTT)	1.0
*: 86		Montpelier (PTT)	1.5
292	1,028	Radio Lyons	1.5
*294	1,020	Limoges (PTT)	0.5
*304	986	Bordeaux (PTT)	0.5
304	986	Casablanca	2.5
307	985	Agen	0.3
*316	950	Marseilles (PTT)	0.5
329	914	Grenoble (PTT)	1.5
336	892	Petit Parisien	0.5
346	869	Strasbourg	0.3
353	849.8	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	9.0
411	729	Radio Maroc Rabat)	2.0
436	687	Radio Flandre (Lille)	0.5
447	671	Paris (Ecole Sup. PTT)	0.7
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
*1,460	205.4	Eiffel Tower	8.0
*1,725	174	Radio Paris	8.0
GERMANY			
*218	1,373	Flensburg	1.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	4.0
*239	1,256	Nurnberg	4.0
*246	1,220	Kiel	0.7
*246	1,220	Cassel	0.7
*253	1,184	Breslau	4.0
*259	1,157	Leipzig	4.0
*270	1,111	Kaiserslautern	1.5
*276	1,085	Koenigsberg	4.0
*283	1,058	Magdeburg	0.7
*283	1,058	Berlin (E.)	0.7
*283	1,058	Stettin	0.7
*319	941	Dresden	0.75
*325	923	Gleiwitz	6.0
*339	887	Bremen	0.75
*360	833	Stuttgart	4.0
*372	806	Hamburg	4.0
*390	770	Frankfurt	4.0
*418	716	Berlin	4.0
*453	662	Danzig	0.75
*456	657	Aachen	0.75
*473	635	Langenberg	25.0
*533	563	Munich	4.0
*560	536	Augsburg	0.5
*560	536	Hanover	0.7
*560.2	527	Freiburg	0.7
*1,635	183.5	Zeesen	20.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
1,220	246	Luxembourg	2
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
*300	1,000	Huizen via Hilversum aerial (until 5.40 p.m. B.S.T.)	5.0
*1,070	280	Huizen via Hilversum aerial (after 5.40 p.m. B.S.T.)	5.0
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Hilversum via Huizen aerial (AVRO)	5.0
HUNGARY			
*550	545	Budapest	15.0
ICELAND			
*1,200	250	Reykjavik	1.0
IRISH FREE STATE			
*225	1,337	Cork (1FS)	1.5
*413	725	Dublin (2RN)	1.5
ITALY			
*274	1,094	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	3.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
*308	973	Zagreb (Agram)	1.25
*431	694	Belgrade	2.5
*560	527	Ljubljana	3.0
LATVIA			
*525	572	Riga	4.0
LITHUANIA			
*1,935	155	Kovno	7.0
NORWAY			
*283	1,058	Notodden	0.7
*365	820	Bergen	1.0
*394	761	Frederiksstad	1.0
445	674	Rjukan	1.0
453	662	Tromsoe	1.0
453	662	Aalesund	1.0
453	662	Porsgrund	1.0
*493	608	Oslo	1.5
POLAND			
*313	959	Cracow	1.5
*335	896	Posen	1.5
385	779	Wilno	1.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	10.0
ROUMANIA			
*394	761	Bucharest	2.0
RUSSIA			
*351	855.5	Leningrad	10.0
*427	702.5	Kharkov (NKO)	5.0
*483	621.5	Homel	2.0
*825	364	Moscow (PTT)	25.5
1,000	283	Tiflis	10.0
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	5.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
*268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	0.5
368	815	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	3.0
453	662	Salamanca (EAJ22)	0.55
SWEDEN			
231	1,301	Malmo	0.5
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.4
*322	932	Goeteborg	6.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsyall	1.0
*770	389	Ostersund	2.0
1,200	250	Boden	2.0
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.6
680	442	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Aug. 25 A concert from the Kursaal, Ostend.
" 26 Vaudeville programme.
" 28 A Queen's Hall promenade concert.
" 29 Two plays, *The Pierrot of the Minute*, by Ernest Dowson, and *The Man with the Flower in His Mouth*, by Luigi Pirandello.
" 30 *Werther*, a lyric drama by Massenet.
" 31 *Too-ral-i-oo-ral-i-ay*, a revue by Ernest Longstaffe.

DAVENTRY EXPERIMENTAL (5GB)

Aug. 26 Queen's Hall promenade concert.
" 28 *Werther*, a lyric drama by Massenet.
" 29 *Too-ral-i-oo-ral-i-ay*, a revue by Ernest Longstaffe.
" 30 Queen's Hall promenade concert.
" 31 A vaudeville programme.

GLASGOW

Aug. 27 A programme of Old English music.

BELFAST

Aug. 29 A programme of "Promenade" favourites.

The German Reichs Patent Office in a recent official statement appears to have solved the doubts regarding the first patent taken out for a radio circuit on the supersonic-heterodyne principle. It has declared that the idea of amplifying an intermediate frequency by superimposing a local frequency was clearly explained in a French patent taken out by Lucien Levy at Paris on August 4, 1917, whereas the German patent dealing with the same principle was only filed on July 2, 1920.

Tests are being carried out by the new Luxembourg broadcasting station on 1,220 metres (246 kilocycles) on Sundays between 12.30 and 1.30 p.m., and on Wednesdays and Fridays between 9.20 and 11.20 p.m. B.S.T.

RADIOGRAMS

ON August 30, 2LO and 5XX will relay the lyric drama *Werther* from the Parlophone studios; the title role will be taken by the well-known tenor Frank Titterton, who is also to appear in the promenade concert from the Queen's Hall on the following evening.

The Roosters Concert Party will broadcast an hour of music and humour from Daventry 5GB on September 7. This will include their original army sketch, *The Lead Swingers.*

Listeners to the promenade concert to be relayed from the Queen's Hall by 2LO on September 15 will hear the well-known British violinist, Marie Hall, when she takes the solo part in the "Violin Concerto in D" by Tchaikovsky.

Florence McHugh, who appeared in *The Show Boat,* will be heard by 5GB listeners on September 5.

The vaudeville programme from 5GB on September 5 will include the following artistes: Sandy Rowan, Len Russell and Allan Glen, Liam Walsh and his Irish pipes, and Jack Norman, a Yorkshire farmyard mimic.

Paul Robeson, from *The Show Boat,* will give the first of a series of six broadcasts of negro spirituals in a concert relayed by 2LO from the New Pavilion, Bournemouth, on August 25.

On September 1 the Cardiff station will relay a concert given by the National Orchestra of Wales at the Pavilion, Llandaff Fields, in which Enid Cruickshank (contralto) will be the vocalist and Ronald Harding principal 'cellist of the orchestra.

On September 2 and 6 Cardiff will relay a concert given by the Welsh Guards Band from Bristol's Annual Exhibition at Colston Hall.

Apart from the eye-witness account of the race for the Schneider Trophy, which the B.B.C. is to broadcast on September 7, listeners will also hear a running commentary on the Ulster Grand Prix Motorcycle Race from the Antrim Course broadcast through the Belfast station.

The half-an-hour's vaudeville programme from Belfast on September 7 will be given by George Barker, a versatile entertainer and clever musician, and his partner Jean Harley.

On August 27 the Northern Wireless Orchestra will broadcast from all northern stations a programme of the works of Eric Coates in celebration of this famous composer's birthday. He was born in 1886.

On September 4 the Scottish stations will relay the first performance of the Scottish Command Torchlight Tattoo from Dreghorn Castle grounds. The massed bands include four battalions: the Royal Scots Greys, the Royal Scots, the Black Watch, and the Queen's Own Cameron Highlanders.

An interesting talk will be given by Mr. Leonard T. Scott from the Edinburgh studio on September 3. It is an account of his 1,300 miles canoe voyage on the River Niger. Mr. Scott is the first man to attempt such a journey since the famous Scottish explorer, Mungo Park, set out to ascertain the course of the river some hundred and thirty-four years ago.

The B.B.C. has persuaded the Rev. Kenneth MacLeod, perhaps the greatest authority of the day on folklore of the Hebrides, to leave once again his isolated island of Gigha in order to take part in a "Folklore of the Isles" programme from the Glasgow studio for all Scottish stations.

An important production of the opera *Faust* is being given from Belfast on August 22. Parry Jones, Joseph Farrington, May Blyth, and Enid Cruickshank are in the cast.

Suggestions are being seriously put forward in certain religious quarters for the establishment of a religious broadcasting station, from which on Sundays there would be broadcast services, with great variety in the form of worship, addresses, and answers to questions on the lines made successful in the United States.

Leading football clubs in Scotland are divided on the question of the broadcasting of reports of matches. The Scottish Football Association sides with the objectors, but has, apparently, no power to make any ruling. Wireless listeners, it is understood, can look forward to a series of Saturday afternoon broadcasts this season, though it is possible that, in consequence of the attitude of some clubs, a few of the more interesting encounters will have to be omitted.

Tunis-Kasbah, the new 600-watt transmitter, erected by the French PTT, broadcasts a concert daily, with the exception of Saturdays and Sundays, on 1,350 metres between 9 and 10.30 p.m. B.S.T.

The Federal Radio Commission of the United States has decreed that all aerial masts owned by broadcasting stations in North America shall bear electric lights at their summits to act as a warning to night-flying aircraft.

Work has already begun on the new 12-kilowatt Strasbourg transmitter at Brumath. It is stated in Paris that the actual plant will be that actually now used by the Radio-Paris station, and that for the latter a new 50-kilowatt transmitter is to be installed. Strasbourg should be on the air by the summer of 1930; its wavelength will be 346 metres (869 kilocycles).

Listeners who for some time may have lost the transmissions from San Sebastian (Spain) will find this station to-day on 368 metres. Although, as a rule, it relays Madrid programmes, on Mondays, Wednesdays and Fridays it takes its entertainments from the local Casino.

Advance Notes on the Radio Exhibition

NEW APPARATUS FOR THE MAINS

FROM advance information already available relating to the forthcoming Radio Exhibition, we can safely forecast a big increase in the number of mains units and sets running entirely from the mains.

One of the chief advantages to be derived from the use of the mains unit, as distinct from the mains set, is the ability to provide existing battery-operated sets with an all-mains drive.

As one of the pioneer firms in the field, E. K. Cole, Limited, of Ekco Works, Leigh-on-Sea, have had considerable experience in the design and manufacture of mains units. Their "safe, silent, sound" slogan has been amply justified by results. We have received from this firm some advance details of the new Ecko range of mains units. These include the following :—

Two representative Ekco units which provide both H.T. and L.T. from alternating-current mains

Ekco A.C. Model C1A

(Size : 12¼ by 12 by 5½)

Running Cost.—The current consumption of this unit is 30 watts and the cost per 1,000 hours with electricity at 6d. per unit is approximately, 15s.

Model C1A provides :—

(*a*) H.T., 4 tappings of—S.G. for the H.T. supply to S.G. valve; 0-120; 120/150 and "power."

(*b*) L.T., 2—6 volts from .3 amp. minimum to 1 amp. maximum, so being suitable for any combination of valves of the same filament voltage, provided that the sum total of current consumed by the filaments does not exceed 1 amp., e.g. :

up to 10—.1 amp. valves
or 2—.1 amp. valves, and 1—.8 super-power valve
or up to 5—.1 amp. valves and 2—.25 amp. power valves
or 4—.25 amp. valves, etc., may be used.

(*c*) G.B., 7 tappings up to 21.

Price £17 15s. complete.

Ekco A.C. Model C2A

(Size : 11¼ by 9¼ by 5¼)

Running Cost.—The current consumption of this unit is 12 watts, and the cost per 1,000 hours with electricity at 6d. per unit is, approximately, 6s.

Model C2A provides :—

(*a*) H.T., 3 tappings of—S.G. for the H.T. supply to S.G. valve; 60, and 120/150.

(*b*) L.T., 2—6 volts from .2 amp. minimum to .5 amp. maximum, so being suitable for any combination of valves of the same filament voltage, provided that the sum total of current consumed by the filaments does not exceed .5 amp., e.g. :

up to 5—.1 amp. valves
or 2—.1 amp. valves and 1—.25 amp. power valve
or 3—.1 amp. valves and 1—.15 amp. power valve, etc., may be used.

(*c*) G.B., 5 tappings up to 13.

Price, £10 17s. 6d. complete.

This unit provides L.T. current only from A.C. mains for 2-, 4-, or 6-volt valves up to 1 amp. No alteration whatsoever is necessary to the receiving set. "Just plug in—that's all!" This unit is also most suitable for use in conjunction with an A.C. H.T. unit as two mains sockets are provided into which can be plugged the adaptor leads of H.T. unit. A switch is fitted on this L.T. unit which then controls both the H.T. and L.T. supply.

Ekco A.C. Model L.T.

(Size : 11¼ by 7 by 4¼)

Running Cost.—The current consumption of this unit is 15 watts and the cost per 1,000 hours with electricity at 6d. per unit, is approximately 7s. 6d.

Model L.T.1 provides :—

2—6 volts from .3-amp. minimum to 1 amp. maximum, so being suitable for any combination of valves of the same filament voltage, provided that the sum total of current consumed by the filaments does not exceed 1 amp., as below :

up to 10—.1 amp. valves,
or 2—.1 amp. valves and 1—.8 amp. super-power valve.
or up to 5—.1 amp. valves and 2—.25 amp. power valves
or 4—.25 amp. valves, etc., may be used.

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LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Is the Pentode Worth While?

SIR,—I have read "Thermion's" article on the pentode in a recent issue of AMATEUR WIRELESS, and should like to point out that in my opinion he has rather overlooked the extra cost.

According to my reckoning, a two-valve pentode set costs only 6d. less than a three-valve set giving the same volume, and, furthermore, if the pentode burns out the cost of replacement is 25s. against 15s.

A. R. (Clapton).

Curious Troubles

SIR,—The following may amuse your "Thermion." I once owned a set with which it made no difference to reception (which was very good indeed) whether the earth was connected or not. I tried several "earths" with no difference. I even wrote to one of the many helpful "query departments" run by our enterprising press. Finally, I woke up one night screaming with laughter—the solution was easy, once I had thought of it. In those days I had my own electric-light plant—engine, dynamo, and storage battery—50 volts. I used it for H.T. with a 90-volt battery in series with the lights for the last valve. The negative house lead was presumably earthed—*voilà!* If it wasn't, the wiring made a very good counterpoise earth, but I think it was a case of an earthed lead, so far as I can remember.

I had another set which, when first made, refused to give more than one-valve results (with two S.G. H.F. stages!). Curiously enough, the loud-speaker was much louder when inserted in the detector H.T. lead than in its proper place—quite a respectable noise, in fact. The trouble lay in the last component to be suspected: the coupling condenser of the single R.C.C. L.F. stage, which had an *internal disconnection*—a peculiarly insidious fault. A substitute was fitted, at the maker's expense, and everything went beautifully.

P. (Woking).

The "Short-wave Adaptor"

SIR,—Regarding the letter from Margate on the "Short-wave Adaptor," described in the issue dated May 4, I can also speak well of the excellent results. I made up the adaptor as laid down in your journal. My set is an old "Favourite Two," reconstructed, with a third valve added, the only new parts being coil and condenser; some parts have been in use a few years.

The afternoon entertainments from W2XO, W2XAD, etc., from New York by the General Electric Co. come through in the evening and usually last until about 10 p.m. (British time), and make a pleasant change.

R. (Sutton).

"WORKING ON 5 METRES!"

(*Continued from page* 204)

this instance was not inductively coupled as for the transmitter, but was coupled through a small-capacity condenser—about 15 micro-microfarads—direct to the anode of the valve.

So far as the present results show, it would seem that in London, amongst houses and other buildings, these ultra-high-frequency radiations are absorbed after distances of about one to two miles from the transmitting station. They most certainly have some property akin to the other short waves in that they will cover fairly large distances. Already, signals have been sent from Nantwich to Sussex and from Hampstead to Sussex, and it is hoped to send some signals across the Atlantic during the next few months. There is a possibility that the signals are not absorbed, but are just obeying the law for skip-distance effects which states that as the frequency increases, after a certain value, the width of the first skip distance increases. This would mean a decrease in the distance over which the ground wave would be strong enough to be detected by ordinary means. Further experiments on the state of polarisation of the emitted wave may result in greater success over distances between two miles and forty miles.

A second possibility arises from the consideration of the foregoing. According to the ordinary energy equations, the higher the frequency, the greater the energy. This may result in the ground wave travelling some considerable distance such as that already attained with these transmissions. The wave which would normally be reflected by the Heaviside layer may be of sufficiently short a wavelength to penetrate the layer in a manner similar to that in which X-rays will penetrate the ordinary diffraction grating used in light experiments. The consequence of this would be that except for a comparatively small area near to the transmitter, the place to receive these signals is outside our atmosphere.

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

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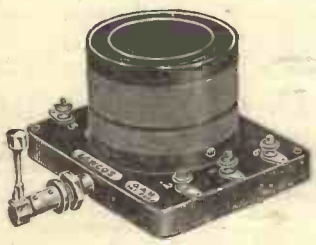

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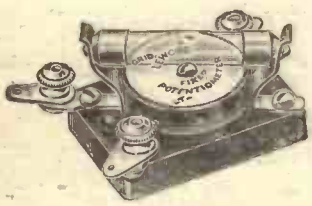

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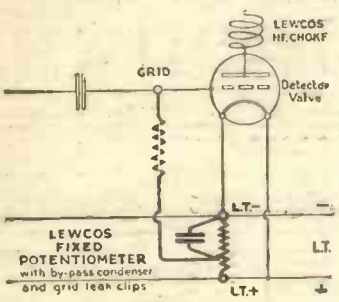

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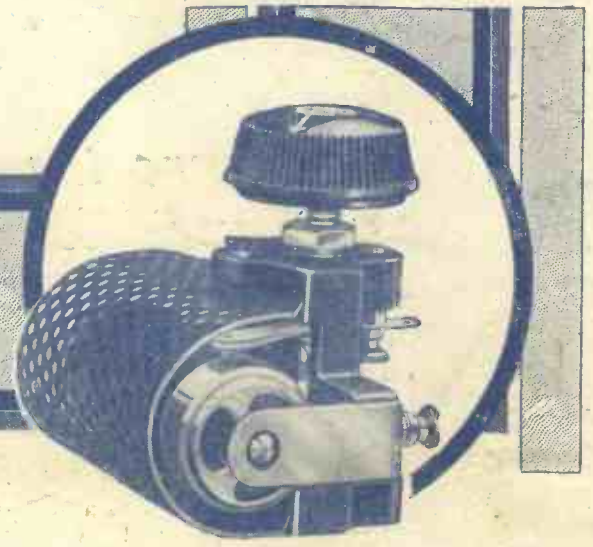

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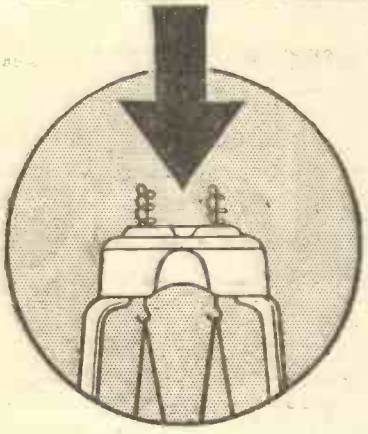

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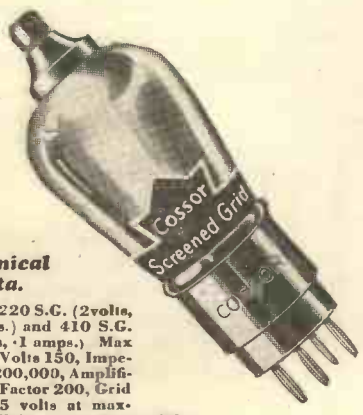

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AUGUST 31, 1929 No. 317 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

Baird Tele-Talkies—Brookmans Park Starts—Future Activities—High- and Low-power Regionals?—National Lectures—More "National" Events

Baird Tele-Talkies—It is, of course, a much more simple matter to televise a film than an actual scene (as with television proper), but the televising of films unaccompanied by sound has been proved to have very little entertainment value, because in the present stage of the science of television, the field of view is restricted to one or two persons. It has been left to J. L. Baird, though, to make the interesting innovation of transmitting the picture with an accompaniment of synchronised sound which places transmissions of this nature on quite a different plane. Thus, it is possible to see the reproduction of a film of, say, a comedian and hear his voice. Talkies in your home!

Brookmans Park Starts—Completed to contract time—twelve months—the Brookmans Park high-power Regional transmitter "took the air" for the first time on Saturday, August 17. An unmodulated signal was radiated and will continue to be radiated at intervals for some days. Listeners who have heard these test signals, which are sent out after broadcasting hours, should not, as yet, attempt to form an estimate of the future strength of the Regional transmitter in their district, because the power is being constantly varied—and for the present is considerably less than the maximum in hand.

Future Activities—By the time this is read, some of our wide-awake readers may have picked up modulated signals from Brookmans Park, where preparations are being made for announced broadcasts to take place at the end of the month. For the time being, only one of the twin plants will be in operation, but we are advised by the B.B.C. that both will probably be testing together before Christmas, on wavelengths of 256 and 361 metres.

High- and Low-power Regionals?—The considerable difference in frequency between the two proposed Regional wavelengths has led to the suggestion that the transmitter with the lower wavelength should be given more power than the transmitter with the higher wavelength; the higher frequencies, it is pointed out, suffer more appreciable attenuation than the lower frequencies, with the result that two equal-power transmissions taking place on the two wavelengths suggested may not give two equally strong receptions. The next few weeks' experiments will clear up many doubtful points, such as the one mentioned. So far, the B.B.C. engineers are more than satisfied with progress; more power to them!

Floyd Gibbons, a noted war correspondent and author, at the hangar in New Jersey with the portable transmitter with which he broadcast the arrival of the Graf Zeppelin on August 4.

National Lectures—Great names are down in the B.B.C.'s list of National Lectures, three dates for which have just been fixed. On November 18, Professor Trevelyan will talk on the "Historical Aspect of the Union of England and Scotland, 1707." If this topic seems a trifle "heavy," the next is of more popular appeal, for on January 27, 1930, Sir J. J. Thomson will lecture on the "Tendencies of Recent Investigation in the Field of Physics." Looking rather far ahead, the date March 24, 1930, ought, if possible, to be kept in mind for Lord Hewart, who will give another National Lecture, on "Law, Ethics, and Legislation"—subjects we are all, more or less, interested in.

More "National" Events—Between now and Christmas, the B.B.C. programmes Department inform us, two symphony concerts from the People's Palace will be broadcast, and six afterwards, to augment the Queen's Hall series of symphony concerts.

Edison's Stamp—Philatelists, please note! An electric lamp figures on a new 2-cent. postage stamp which has been issued by the United States post office to commemorate the fiftieth anniversary of the perfection by Thomas Elva Edison of the incandescent lamp. The stamp shows a thing which bears a faint resemblance to Edison's original lamp, and gives the dates 1879 and 1929. There must be a number of stamp collectors in the U.S.A., for 180,000,000 of these stamps have already been sold and there is to be a new issue of 110,000,000.

PRINCIPAL CONTENTS

BROADCAST ARTISTES IN PICTURE

ELSIE BLACK.—A charming young contralto who was heard on the 11th from Glasgow, Miss Black is noted for her wide choice of repertoire and ability to sing distinctly.

"STAINLESS STEPHEN."—One of the B.B.C.'s "discoveries" contemporary with John Henry, and with whom he often appeared, Mr. Arthur Clifford has rapidly become one of London's best-known entertainers.

BLODWYN CAERLYON.—This brilliant Welsh contralto has appeared in most important programmes, notably on the 27th, with the National Orchestra of Wales; she gave a special midday recital at the beginning of the month at 2LO.

HORACE STEVENS.—This famous bass and oratorio singer led off the first Wagner concert of this season's "proms." He has achieved triumphs in Wagnerian operas and in the two recent performances of "Hiawatha." He hails from Australia.

DOROTHY SILK.—One of the earliest of broadcast "stars," Miss Silk specialises in classical music. She will be heard on September 19 at Queen's Hall in the British composers' concert, as well as in the Bach concert of August 28.

FRANK LAFITTE.—A famous Continental pianist, Mr. Lafitte is of English birth. He has just concluded a week's broadcast in the "Foundations of Music" series at 2LO on Chopin.

MEGAN THOMAS.—Famed for her operatic and oratorio work alike, Miss Thomas is one of the most popular broadcasters. Heard at the "proms." on the 24th, she will appear on September 5 with the National Orchestra of Wales.

EDWARD O'HENRY.—Mr. O'Henry has gained for his organ-playing at the new Tussaud's Cinema a notable place in London's music. A clever musician, his playing at this hall makes it an integral part of the performance.

MYRA HESS.—For many years this great classical pianist has stood forth as exponent of a special style of playing, that originated by Tobias Matthay, and carried to a high plane. She is heard in most classical recitals, and will be at Queen's Hall, August 30.

IMPROVING MOVING-COIL SPEAKER SENSITIVITY

By J. H. REYNER, B.Sc., A.M.I.E.E

IN the early days of moving-coil loud-speakers the principal criticism against them was that they were not sensitive. This defect has been removed, to a very large extent, by the improvements which have resulted from the steady development of this class of instrument. The whole question of sensitivity is bound up with the actual field strength in the gap, and some remarks on this subject will, no doubt, be of interest.

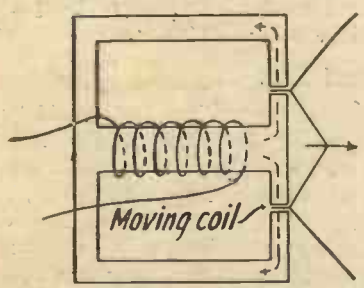


Fig. 1.—Diagram of moving-coil speaker

Fig. 1 shows a skeleton moving-coil speaker. There is a magnetic circuit having a gap at one particular point, and in this gap is centred the moving coil. The magnetic field flows across the gap at right angles to the turns on the coil. If a current is passed through the coil, then a mechanical force is produced acting at right angles both to the direction of the magnetic field and to the direction of the current. It is clear from the diagram that this force will act in the direction of the arrow, tending to push the coil out of the magnetic field.

This force is quite readily determinable. If we have a wire carrying a current of amperes in a magnetic field having strength of B lines per square centimetre and if the conductor is L centimetres in length, then the force on the conductor is B I L dynes. This formula is very simple, and shows that the force on the coil is proportional, firstly, to the current through the coil, secondly, to the length of the wire which, in the present instance, is the number of turns in the coil; and, thirdly, to the magnetic field strength. Now, the current in the coil and the number of turns are, to some extent, interdependent and, moreover, are usually controlled by other considerations. In order to improve the sensitivity of the loud-speaker (i.e., to increase the force of the coil) we must increase the magnetic field strength B.

This question of field strength is one with which some readers may not be familiar. Faraday, in his original researches in magnetism, propounded the idea that magnetic effects could be represented by imagining "lines of force" to radiate from the magnet in question. He further went on to define magnetic strength, and he chose for his unit one "line of force" per square centimetre. Thus, if we divide up the area into square centimetres, then, if the magnetic field strength is unity, we assume that we have just as many lines of force as there are square centimetres in the area under consideration.

Field Strengths

Actual field strengths in use range from 5,000 to 50,000 lines per square centimetre. The lower value is the order obtained in moving-coil speakers, while the higher values are used in chokes and transformers. In order to improve the value of field strength in the gap we must consider what effect the gap has on the iron circuit.

We may consider the magnetic system as a circuit much in the same way as an electrical circuit. Fig. 2 shows a magnetic system and the equivalent electrical circuit. In the electrical case we have the battery, which corresponds to the magnetic force produced by passing a current round the coil of wire inside the "pot." The force which we exert here is determined by the space available and is limited, just as the voltage from a battery is limited by the number of cells. Now, the magnetic field produced by this coil flows through the iron or steel constituting the "pot" and home through the air gap. This corresponds to the connection of the circuit across the battery.

Iron is a much better magnetic conductor than air, so that we can regard the iron as of low resistance, while the air gap is of high resistance. The total magnetic field produced is analogous to the current flowing in the electrical circuit, which is clearly determined by the value of the resistance. Moreover, since the majority of the resistance occurs in the high-resistance portion corresponding to the air gap, our present aim must be to reduce the value of this resistance.

This we do by reducing the actual length of the air gap. We quickly come up against a limit set by mechanical considerations, for we cannot make the coil thinner than a certain amount if we are to get the number of turns in the space, and a gap of $\frac{1}{16}$ in. is the practical working limit in most cases.

The reduction of the gap from $\frac{3}{32}$ in. to $\frac{1}{16}$ in. reduces the reluctance of the gap by one-third. This is equivalent to reducing the resistance of the higher resistance portion in the electrical equivalent to two-thirds of its original value, and the gain in current will immediately be obvious. In the same way, the increase in the magnetic field flowing across the gap is distinctly marked when the gap is reduced.

Fig. 2.—Magnetic circuit and equivalent electrical circuit

It might appear as if this were all that could be done, for even with a small gap of $\frac{1}{16}$ in. the reluctance or magnetic resistance of the gap is something like 2½ times the reluctance of the remainder of the iron circuit. It would not appear to be of much value, therefore, to pay any attention to the iron circuit itself. Yet, as most readers will probably know, a distinct improvement is obtainable by using cast steel instead of cast iron for the "pot." Why this should be so will be explained in a further article, and some method of measuring the flux will be referred to.

UP LEITH HILL WITH THE "TALISMAN" PORTABLE

From the summit of Leith Hill in Surrey it is said that on a clear day it is possible to see into fourteen COUNTIES. The writer of this article conceived the idea of listening in to fourteen COUNTRIES from this vantage point, and below are given his experiences

I HAVE lately become the owner of an AMATEUR WIRELESS "Talisman" Portable. I had finished building it on a recent Sunday morning, and then an idea struck me. I would take it up Leith Hill —one of the highest points in the south of England—and see whether, in view of the extra great height above sea-level, I could *hear* into fourteen different *countries* with ease.

I could see that the ether would have to be a clear one if the term "with ease" was to be fulfilled, for even with the greatly increased height, which privilege is seldom given to a portable, and the efficiency of this particular one, I was almost convinced that the task of hearing fourteen countries with ease was going to be no easy one to accomplish.

Quality an Essential

I had, of course, studied the published test report, but I could hardly believe that it was possible to tune-in forty-one stations on the loud-speaker at good quality—that is to say, the standard of quality I had formulated in my mind and to which my "with ease" designation had to attain. But before I continue further it would, perhaps, be as well to explain what conditions that term embraced. Before a station could be considered satisfactory, quality would have to be good to the extent that reaction would not have to be pushed to its utmost, that there would be entire freedom from heterodyne or other kind of *incessant* interference, and must, of course, come through at comfortable strength on the speaker.

The climb up the hill was, fortunately, made much lighter and easier by the luxury of a car—that is, as far as was possible, as the roadway, after reaching its zenith just by the inn some distance below the actual summit of the hill, again starts on its downward journey and disappears in a westward direction into an avenue of trees. At this point I took out the set and began to ascend the almost perpendicular slope. At the top the portable seemed portable no longer. The ascent was trying, but the descent was to come.

Our arrival at the top with the set caused a mild amount of interest among the people who chanced to be about at the time. It seems contradictory and surprising in these days to talk about the interest an ordinary portable can create, but one sees amazingly few at work among picnickers and the like—few when compared with the vast number of humans who are genuinely interested in wireless and who decamp to the countryside, river, or sea at the first opportunity. There must be some reason for this lack of interest, and I think it is not hard to find.

The potential buyer of a portable is he who is entirely satisfied with his own good stationary receiver at home; when he hears a portable, therefore, working under bad conditions of which he is not aware, he is at once bound to start making comparisons. I believe I am right when I say that the portables on demonstration in the London shops which can give of their best are in the great minority, as there hardly exists a shop anywhere in London which is not surrounded by a veritable network of power cables, lifts, and other possible causes of interference and screening. Signals are often not only weak, but even if they are of good quality—a real pointer to the worth of the set—they are often hopelessly mixed up with a dense conglomeration of "mush" and "crackle," and my sympathy always goes out to the retailer who is unfortunate enough to be afflicted with such conditions.

A Start

The mild amount of interest which I have mentioned grew as the first station the set had ever tuned in—Hilversum—came through. My companions and neighbours were expecting London, and some of them perhaps London only. It was, however, too early for London or, for that matter, any of the B.B.C. stations. We were listening to some Beethoven pianoforte sonatas, and my crowd was beginning to display lower-browish tendencies, I moved both dials up to Kalundborg. This was a shock to me. I was expecting something, but . . . Here was one of the Danish station's Sunday afternoon features—a wind-instrument orchestra—reproduced to perfection. Every instrument and every note was there in person.

I returned to Hilversum at about 3.15 p.m., and this I did purposely. Previously, when Beethoven was being played, the transmission had been perfect. Now, at about a quarter past the hour, the distinct heterodyne, which I have repeatedly noticed on the Dutch station elsewhere, started. London had come on the air. I tuned London in. Then 5GB. From these I returned to the long waves. To 5XX Up a little to Radio Paris.

The Real Test

I then put the receiver to the acid test. Tightly fitted in between the strong signals of Radio Paris and 5XX, somewhere, was Zeesen. I sorted this out, but it was not quite clear of 5XX. This did not fulfil my conditions, and I could not yet, therefore, count Germany as a logged country. Back to the medium waves again—and Langenberg. That made five countries, and in daylight. To do much more I had to wait for night to arrive, but in the meantime Motala had come. Six countries. Towards dusk came Cologne and Nurnberg, followed closely by Toulouse. Dublin was next at great strength. At about 9 o'clock I had Brussels giving an orchestral concert. Just after this Katowice. Then Barcelona giving dance records and Graz relaying Wien's Fultograph transmission. That brought my number to eleven. I had forgotten Italy. This was easy prey. Torino, as always, at prodigious strength. I encountered Rome on my way up the dials for Budapest, Hungary—my thirteenth. I had but one more. "Switzerland," I decided, and thereupon made for Bern. Search where I might, I failed to discover it. As an alternative I tried Oslo or one of its relays, as Norway had not yet had a representative. I was again unlucky. In my search for Bern I imagined I had had everything that was for the taking. Was I going to be beaten at the end? Up the dials again

(*Continued in 3rd column on page 232*)

YOUR RADIO RISKS

Occasionally one sees in the papers accounts of wireless listeners being severely hurt, or even killed, by lightning or by something going wrong with the set. These cases are so rarely due to anything that can be blamed upon the innocent receiver that it is really in the interests of safe listening to make the position quite clear.

NEWSPAPERS are always ready to jump upon anything with a radio or sensational interest. It is much more thrilling to read a headline "Radio Listener Killed" than some rambling account of the death of a Wigan butcher, baker, or candlestick maker, as the case may be!

The question of preventing lightning risks has been dealt with from time to time in AMATEUR WIRELESS and the Query Department receives a number of letters on this subject. It would seem, however, that all listeners are not aware of the fact that the lightning "risk," such as it is, can be placed under two heads.

First, there is the possibility of the aerial, the house, the receiver, or the listener himself being struck by lightning. We have very scant knowledge of the way in which the immense energy contained in a lightning discharge does its damage, but it is absolutely certain that lightning is not "attracted" by small earthed bodies.

Lightning Risks

It is reasonable, however, to suppose that a well-earthed body with a large surface above earth might induce atmospheric potential to discharge itself; but the area above earth would have to be very large indeed in order to have this effect. Thousands of miles of telegraph wires, or the metal roof of a very large building, might be conductive; but telegraph wires are definitely earthed through lightning arrestors, and the roofs of buildings are generally connected electrically to earth, through the walls and framework.

It is ridiculous to suppose, *per contra*, that the midget area presented by the average aerial wire could have any attractive effect upon the immense power dissipated during an atmospheric storm. As near as it is possible to tell, in cases where wireless apparatus, as part of the house, is struck by lightning, the same damage would have resulted had no aerial been adjacent. There have been cases, however, where an aerial wire has run very close to power lines or 'phone wires, and some weird effects have been noticed during thunderstorms. Here it is probable that there is an inductive effect between the fairly large amount of metal contained in the near-by lines and that the aerial is, electrically speaking, a virtual connection between the lines and earth. In such cases the apparatus attached to the aerial is certainly in greater danger.

Useless Precautions

It has been said time and time again that lightning switches which necessitate the aerial and earth wires being brought into the house before being "shorted" are almost useless. Yet one sees so many of these switches, which really increase whatever little danger there is.

There is, then the second head under which lightning danger may be classed, and this is not the possibility of the aerial and set being struck, but of the insulation of the whole equipment being strained by cumulative atmospheric discharges. Heavy rain during thundery weather usually goes hand in hand with a considerable difference of potential between the upper and lower atmospheric strata. If some kind of safety switch or spark gap is not fitted between aerial and earth then a very high voltage may be induced into the aerial and this may cause a severe shock if some parts of the set are touched, thus leading some listeners to suppose that the set has been struck by lightning, although there is at the time no storm.

There have been some rather foolish cases in the papers of listeners suffering injury through some accidental short-circuit of the lighting mains. One listener was actually killed by attempting to listen-in while in his bath, and a puzzle arose owing to the fact that his receiver was a crystal set and was not connected in any way to the mains. Examination, however, showed that the earth lead had come in contact with an above-earth mains lead and the current had travelled through the metal bands of the phones and the metal of the bath. A somewhat similar fatality occurred when a short-circuit occurred in a reading lamp and connection was accidentally made with part of a wireless set.

A useful tip which will usually prevent the possibility of similar happenings is to connect in the earth lead of a receiver, of no matter what type, a large mains-tested condenser of at least 2 microfarads. This safety condenser is always recommended when the mains are employed, either for H.T. or L.T., or both, and is usually incorporated in the eliminator itself.

But it can equally well be used when the receiver is not connected to the mains but a listener is afraid, for example, that overhead power lines, near to his aerial, might fall down and accidentally touch it. The safety condenser can be placed in the aerial lead if desired or two condensers may be used, one in the aerial lead and one in the earth lead. In this case the condenser in the aerial lead should be very well insulated, otherwise it may cause loss of signal strength.

(*Continued on next page*)

Do You Use a Pentode? If so, remember that—

The H.T. current passed by a pentode is on the heavy side for the average loud-speaker windings and it is advisable to incorporate an output transformer in the set.

The high impedance of a pentode necessitates the use of a step-down output transformer if best quality reproduction is required.

It is advisable to use super-capacity H.T. batteries with a set incorporating a pentode valve, as the H.T. current passed by a pentode is too great for the ordinary small battery to cope with economically.

Although a pentode will enable increased loud-speaker volume to be obtained, the pentode must not be overloaded, and it is therefore best to incorporate some sort of volume control operating before the pentode.

For the Newcomer to Wireless: FRAME AERIALS

I AM not altogether satisfied with my outdoor aerial in the garden and I am rather thinking of changing over to a frame. Will my set work just as well with it?

Unless you already have a very big reserve of high-frequency amplification you will have to make certain alterations.

What shall I have to do?

To obtain with the frame the same signal volume from the local station as you now get with the outdoor aerial and to be able to receive as many foreign stations you will have to add another stage of high-frequency amplification.

Why is that?

The frame is a much less efficient collector of oscillations than the outdoor aerial.

Why should that be?

The outdoor system is really a condenser of very large size but small capacity. The frame is nothing more than a glorified coil. Unless, therefore, the frame is of so big a size that it is quite unwieldy it must always be less efficient than the outdoor wire and earth.

I can quite easily add another stage of H.F., so that the problem of signal strength is easily solved.

In that case you will probably find the frame a better servant than the ordinary type of aerial.

Please explain.

We agreed just now that the outdoor system was a particularly good collector! Now obviously it cannot discriminate between one set of oscillations and another if both are on or near the wavelength to which it is tuned.

You mean that it picks up interference from atmospherics and so on and that it may make stations on neighbouring wavelengths difficult to separate, don't you?

Exactly. The one great advantage of the frame is that it is much less susceptible to the effects of interference caused by atmospherics, power lines and so on.

But how does it increase selectivity?

In two ways. First of all it introduces far less damping than the overhead wire, which means that the set naturally tunes much more sharply.

What is the second way?

The frame has very marked directional properties. Though we cannot claim that a signal is definitely at its strongest when the frame is pointing straight towards the station from which it comes, we can say with certainty that a signal is at its weakest when the frame is turned so that it is at right angles to an imaginary line joining the transmitting and receiving stations. If we start with the frame pointing towards a given station, we shall notice little difference if it is turned a few degrees one way or the other, but a bigger turn produces a pronounced weakening of the signal.

How does this help in separating transmissions on neighbouring wavelengths?

It very often happens that the two transmissions are coming in from quite different directions. By turning the frame, therefore, a point may be found at which the unwanted transmission is reduced almost, if not entirely, to silence whilst the wanted one still has sufficient strength for reception purposes. There is one very important point about the frame that one does not always realize.

What is that?

Some old-fashioned sets are not properly stabilized; they are, in fact, so designed that they are held down by the damping of an outdoor aerial. If you try to use one of these with a frame it will howl horribly.

You mean, then, that you can't use a frame unless the set is properly stabilized?

Yes, that's it exactly.

"YOUR RADIO RISKS"

(*Continued from preceding page*)

If phones are used, even with a crystal set which, of course, has no batteries, care should be taken to see that the metal bands are not connected in any way to the internal windings of the earpieces. For comfort alone it is usual to bind the metal bands with some resilient material and this is also a good point in the interests of safety.

It is never wise to omit the safety condenser already referred to when using the mains. Some amateurs who are fortunate enough to have a negative earthed D.C. supply of a convenient voltage use the very minimum of components in the H.T. eliminator. As the negative lead is earthed they assume, wrongly, that there is no need for a safety condenser in the actual earth lead of the receiver.

This is a fallacy and one which is apt to be dangerous, because the mains earth of a D.C. supply is generally not actually at zero potential. A considerable difference of potential may arise, owing to local conditions, above that of the earth lead at the set, and this voltage may be such as to damage the receiver or harm the listener. At the least the varying of potential can cause crackling sounds which are difficult to trace unless the safety condenser is inserted.

With an A.C. mains supply, or when the positive wire of the D.C. supply is earthed, the safety condenser must be inserted in the earth lead in order to get the eliminator working at all and to prevent short circuits.

Most home constructors of eliminators are aware of this fact and very few cases have occurred of "shorts" happening during the initial testing of an eliminator. In any case, whenever the mains are employed for "feeding" a set, the eliminator should include a fuse in both the positive and negative wires, in the input side of the eliminator itself. The fuse wire chosen should be such that it will "blow" before the mains fuse, or even before the subsidiary fuses which are generally included at each wiring junction in a house.

K.U.

WE FIND MR. FLEX AT THE SEASIDE—

On Your Wavelength!

Musical Floods

THE commencement of the "Proms." is the signal for the general start of the British musical season, as regular radio listeners have discovered. The more popular classical symphonies of Beethoven and Brahms find their way into many programmes at this time of the year, and the over-ripe *Samson and Delilah* and *Tosca*, etc., are fiddled away more strenuously than ever by the less imaginative orchestras. The tone of the music changes somewhat with the coming of autumn, and September sees—or, rather, hears—the performance of lesser known works and some modern music, while the end of October rings another musical change with the annual epidemic of oratorios. Volumes and volumes and thousands of aerial amps. of musical electrons are about to shoot from the filaments of B.B.C. transmitting valves!

The "Canned" Variety

A lot of hard things have been said in the Press about "canned music," a term which covers the wide range of mechanically produced music from talking pictures to gramophones and radio. But there is no denying the fact that, notwithstanding the "mechanism," the standard of general musical intelligence is very high at the present moment; in fact, it is far higher than it was in the days when prim musical evenings were practically the only times the average person listened to music. The days of the sentimental drawing-room ballad have passed, and no amount of microphone boosting will bring songs of the "Onaway, Awake, Beloved!" and "Come into the Garden, Maud" type back into popularity. "Canned music" has very considerably increased the number of people who can appreciate "good" music.

Good Music

But what is "good music," anyway? I am no musician, but I can appreciate the beauty and grandeur of the two big "B's," Brahms and Beethoven; and I also derive a great deal of pleasure from listening to a good jazz band. I find that there is good jazz music and bad, and that the difference between the two is more often in the orchestration and performance than in the music itself. "Happy Days and Lonely Nights" is a fairly ordinary popular jazz number when played "straight," but the same composition gains very considerably when performed with a "concert orchestration," such as heard on the Piccadilly record made by Percival Mackey's Band. To my way of thinking, Jack Payne's Band is at its best when it gets off the beaten track with special orchestrations of common or garden "numbers." But that doesn't answer my own query at the beginning of this paragraph. Who is to judge what is *good* music? The man who can only digest Bach and Stravinsky, the hard-headed listeners who prefer Ketelby and Rachmaninoff's "Prelude," or the other extremists who revel in jazz? Echo answers "Who?"

Talkie Humours

I have been having an orgy of talkies lately, and really some of the things one sees are extraordinarily ludicrous. I do not mean the absurd sob-stuff of the earlier American talkies—which, thank heaven, we seem to be leaving behind now!—but unintentional little bits of humour which present themselves from time to time.

The other day I was at the theatre where it is the custom to show one good silent film and one talkie. During the silent film—which, by the way, was a typical modern production, in which the sub-titles were reduced to the minimum—one saw people talking, chatting away quite merrily, and there was nothing in the least ludicrous; nor did one expect anything else. A little bit later, however, during the talkie film the apparatus broke down at a particularly dramatic moment, and we had the villain of the piece striking attitudes on the screen without the slightest sound coming from the loud-speakers. The audience was immediately convulsed with mirth; and, indeed, it did look exceedingly funny. Yet had the same thing been shown on the screen without any suggestion of synchronised speech it would have made an excellent silent film, and we should not have thought it the slightest bit humorous. It is simply a matter of the environment and indicates the adaptability of the human brain, which in the short space of one hour will alter its entire outlook on any particular question.

Wrong Perspective

Another point which interested me very much was in another theatre, where I went to see *Blackmail*, the first British all-talkie picture. I may say, in passing, that I was very pleased indeed with this, for, although there were a number of obvious defects which one might almost expect in a first attempt, the whole production was most refreshingly sane and free from the sentimentality and over-emphasised song and dance touch of so many of the American films. What a relief it was to hear good, honest, English voices, particularly Donald Calthrop, who was essentially himself as regards his voice, although the character which he so admirably portrays is not a particularly noble one. However, to return to the theme, the same theatre was showing one or two short fill-up pieces, one of which was a song accompanied by a jazz band by Estelle Brodie. This was also produced at the Elstree Studios, and was a very poor show. The part that amused me was the drummer, situated at the back of the band, who was obviously working at a terrific speed and executing accompaniments on cymbals. Yet all that one could hear was a faint tinkling in the background. To make matters worse, they took a close-up of this fellow going flat out and putting his whole soul into it, while the loud-speaker produced a noise like somebody tapping a wine glass. Yet not a soul in the audience laughed. I suppose they thought it was wonderful!

—STUDYING CHARACTERISTIC CURVES!

On Your Wavelength! (continued)

The Spot That Didn't

All sorts of terrible things were prophesied for August 16. It appeared that one of the biggest sun spots of recent times would on that day be slap in the middle of Old Sol's countenance, and might therefore be expected to exert a terrific influence on things electrical in this world of ours. Telegraph, telephone, and cable communications would be interrupted, wireless reception would become impossible, and so on, and so on. Actually, the day and the night thereof passed in something like perfect peace. My long-distance set was in action during the evening until 11 p.m., and there was hardly an atmospheric to record. The queer thing is that next day reports came from all sorts of places in this country that the Aurora Borealis had been very brilliant. The Aurora is extremely rare in summer-time in this country, and when it does happen it nearly always means a big electrical disturbance.

A Welcome Sign

I had to report recently that all was not well with the working of the Prague Plan, since so many heterodynes were noticeable and that these were undoubtedly due to wavelength wandering. Sometimes they were very high-pitched whistles which could be got rid of—almost, if not entirely—by slight detuning; sometimes they were so bad that certain transmissions were practically blotted out by them. I am glad to be able to say that there has been a very great improvement in this direction of late. If the increase in heterodynes had been due to a growth in signal strength it would have continued, and would probably have become much worse, for stations are coming in, on the whole, better now than they were a week or two ago. Actually, there is a very considerable diminution in the amount of heterodyning; in fact, during the last week or so I have made very few entries on this score in my log.

Necessary for Success

With only a 9-kilocycle separation between stations, the success of the Prague Plan depends absolutely upon the use of exact wavelengths by all European stations. Stations individually are responsible for smooth working, but the ultimate responsibility rests with the Brussels Laboratory, whose official job it is to police the ether, to check wavelengths, and to inform such delinquents as there may be of any offences that they may commit. Let us hope that Brussels will keep a vigilant eye upon European stations and that if anyone errs or strays he will keep the land lines red hot until the error is corrected.

A Peep Into the Future

An event took place the other day which gives us, I think, a peep into the future of communications between country and country. In Australia, right at the other side of the world, an English boy lay seriously ill. In this country was his mother, driven almost to distraction by grave news from the hospital where he was a patient. The last dispatch that she had received told her that he was continually asking for her. If only she could speak to him or, at any rate, send him some message without delay! The Post Office authorities, when they were approached, expressed their willingness to see what could be done. There is as yet no regular telephonic service between this country and Australia, though for a long time experiments have been in progress. Australia was called up through the experimental apparatus. Australia replied. A request was put through from London that communication over the land line should be established with the hospital. A little later a call from the Antipodes announced that this had been done. The mother was called to the telephone and found herself, within an hour or so of the time that the call had been "put through," speaking to the matron of the hospital and able to send a message straight to her son!

Slipping Through the Tests

Reputable manufacturers of wireless goods are collectively and individually most anxious that the listening public should be thoroughly satisfied with anything that may be purchased from them. One of the worst kinds of customer that they can have is the person who purchases some article which, for one reason or another, is not quite satisfactory, and then says nothing about it, either because he is too lazy to do so or because he has an inherent hatred of "making trouble." Goods of first-rate make have to pass through tests of astonishing strictness before they are allowed to travel from the manufacturer to the sales department. I have spent many a day in factories of various kinds, and it has struck me again and again that it should be completely impossible for a dud of any kind to slip through.

This, at any rate, was my view until I visited the Mint. No one can possibly imagine stricter tests and checks than those which obtain at the place where all our coinage from farthings to sovereigns is turned out. Having been through the various departments you would bet all your wireless gear to a grid leak that no faulty coin could conceivably be passed for issue. Yet, despite the impossibility of their doing so, faulty coins, as any bank will tell you, manage to escape the numerous scrutinies, both human and mechanical, that come their way and travel out into the world to puzzle you and me and everybody else. If the Mint can err, so can the manufacturer, no matter how careful he may be.

Don't be Flabby!

Now, here is an instance of the kind of person who hurts both himself in particular and wireless in general owing to his unwillingness to take trouble. One friend of mine purchased a filament accumulator of well-known make together with a first-rate trickle charger. The combination had not been long in use before it was observed that sulphation was taking place in the battery. Tests showed that the trickle charger was certainly not at fault; it was therefore certain that the battery was not up to the mark. I urged him to communicate with the makers, but he was too inert to do so. Had he taken this simple step he would have received complete satisfaction. As it was, he went about with a grievance, and probably did quite a lot of harm to a first-rate firm.

Other Cases

Another fellow had a valve of expensive type which, after the first few hours, gave hopeless results. But he would not give the unfortunate manufacturer a chance of putting matters right; instead he preferred to cut his loss, as he expressed it, and to go about grumbling at the quality of this particular maker's goods, which in the ordinary way were quite beyond criticism. Another man purchased a high-priced L.F. transformer of a type which I know well. The primary broke down within a few days owing to no fault of his. Would he return it? He would not. He preferred to grumble.

I Buy It

Many a time have I told readers pontifically how foolish it is to commit the elementary error of closing down by turning over the earthing switch instead of by putting that which controls the batteries to the "off" position. I have shown how completely easy it was to avoid any such folly. I have proved that the man who does that kind of thing is nothing more or less than a mutt—the kind of fellow who takes the "proof" out of foolproof. But, dear reader, I have to confess that a bare twenty-four hours ere the writing of these notes I was guilty myself of that very quintessence of muttishness. I cannot tell you how it happened. I have no excuses to make. All I know is this. I closed down at 11 p.m. on Monday evening, and when I came to switch on at 6 p.m. on Tuesday I found the milliammeter, which I always keep in the H.T. circuit, showing as near zero as makes no matter and the ammeter in the L.T. circuit showing far less than it ought to have shown if the set was switched on, and infinitely more than it ought to have shown if it was switched off.

In future I am going to use no set which has not an L.T. tell-tale lamp.

THERMION.

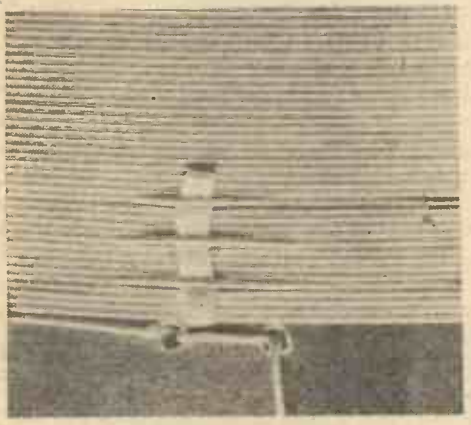
PRACTICAL COIL MAKING for the Home Constructor

Part III—Winding Single-layer Long-wave Coils

By W. JAMES

A COIL that will tune over the longer broadcast wavelengths with an adjustable condenser of .0005 microfarad usually has an inductance of about 2,000 microhenries. Such a coil will tune from below 900 metres to about 2,000, and it is therefore of suitable size.

The exact tuning range of a coil having an inductance of 2,000 microhenries is, of course, dependent upon the capacity of the circuit as well as that of the adjustable condenser. Thus one should not expect the wavelength range to be satisfactory when the full coil is included in an aerial circuit, for the effect of the capacity of the aerial will be to increase the minimum



Method of tapping coil

value of the wavelength to approximately 1,200 metres.

Signal Strength and Selectivity

Quite apart from the question of tuning range, however, is that of signal strength and selectivity. For any reasonably good tuning coil the signal strength will be the maximum when the aerial is joined to a point on the coil. The exact point will depend upon the characteristics of the aerial as well as upon the electrical properties of the coil, but it is a fairly easy matter to determine by experiment a satisfactory tapping point.

The effect of moving the tapping point towards the end of the coil connected to earth is to improve the selectivity. It is therefore possible to adjust, within limits, the selectivity and the signal strength.

As one would expect, the selectivity and signal strength are also dependent upon the construction of the coil. A 2,000-microhenry coil may very well be of the pile-wound type or it may comprise a former having a number of slots filled with wire. Quite good coils of the single-layer type may be constructed, however, and as they are easily wound I shall describe a number. Pile- and slot-wound coils may be constructed to have better efficiencies, but amateurs are not always able to pile-wind or to obtain slotted formers; so for the time being we will examine single-layer types.

Coil Sizes

I have worked out a number, as will be seen by referring to the table. The best coil of the series is the one 4 in in diameter, having a winding of No. 32 double-silk-covered wire. As one would expect, the coils of large diameter are better than the small ones, and should be used when space is available. It will be noticed that the 4-in. winding of No. 32 is nearly 2 in. long.

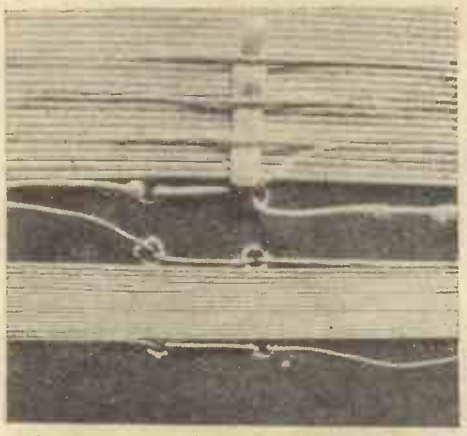
The worst coil of the series is the one 2 in. in diameter and having a winding of 220 turns of No. 40 wire. This is just over 12 in. long, and is therefore a small coil, which would have its uses.

Coils 4 in in diameter have been used in popular receivers, and so have others having a diameter of only 2 in. Much depends upon the circuit in which the coil is to be used, as well as the space available. Diameter is, if anything, of more importance in long-wave than short-wave coils of the single-layer type.

It is more difficult to screen a large than a small coil without introducing heavy losses and its stray field is greater. These points must be taken into consideration when arranging coils in a receiver, as it is easy to spoil good coils.

Coils of 2-in. diameter are quite satisfactory for dual-wave coils, which may be used in sets having a high-frequency stage, as their stray field may be made so small that stable working can be obtained. It would be much more difficult to stabilise a set having large coils.

Owing to the relatively fine wire used



This photograph shows how the ends of the wires are secured

in the construction of long-wavelength coils it is necessary to tap them very carefully or, alternatively, to use separate windings for the aerial circuit or the anode circuit. Sometimes this winding is put on as a continuation of the main winding or it may be wound over one end of the coil, as has been shown before. A reaction winding is nearly always a separate one, but may be on the same tube as the main winding.

Tappings

The diagrams show various windings, and a method of tapping a coil is illustrated. The photographs also show how the ends may be finished by passing them through holes in the former.

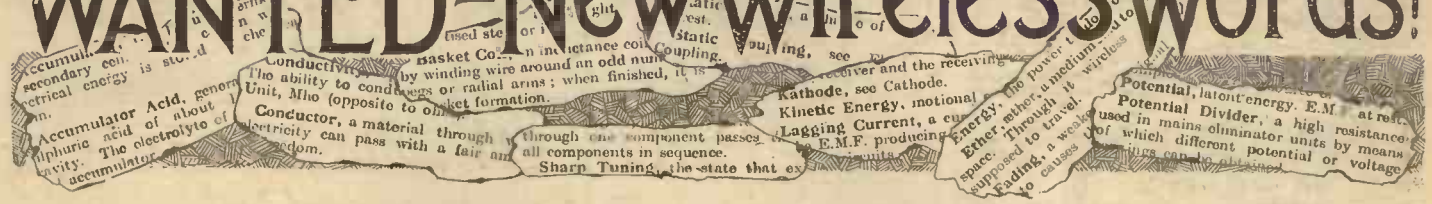
Enamelled wire of good quality may be used instead of double-silk-covered. In the finer gauges the thickness of the covering

(*Continued on page 248*)

LONG-WAVELENGTH COILS
(2,000 Microhenries)

Diameter of coil. Inches.	*Gauge of wire No.*	*No. of turns*	*Length of coil Inches*
2	36	268	2.6
	38	240	2.0
	40	220	1.55
2.5	34	220	2.55
	36	200	2.0
	38	185	1.5
	40	170	1.2
3	34	176	2.1
	36	160	1.6
	38	150	1 3
3 5	32	163	2.2
	34	147	1.7
	36	140	1.4
4	32	138	1.85
	34	126	1.5

WANTED—New Wireless Words!



"WINDING astatic coils," I said, in answer to a question from my beginner friend, Gubbinsby, "is quite a simple matter. Having provided yourself with a coil of wire and a tubular former, you proceed to put thirty turns clockwise on to the latter."

"Don't you mean on to the former?"

"Why, of course."

"Then why do you call it the latter?"

"Why, because in this case the latter is the former, if you see what I mean."

"It is a little hard to follow, but I am doing my best. Please go on."

"Having done this, take a turn round the screw in the middle of the former, turn the former over——"

"Wait a minute, that makes thirty-two turns."

"No, it doesn't. You make thirty winding turns round the former and then just bring the wire round the screw. The turn round the latter doesn't count as a turn at all, and, of course, turning over the former——"

"Do you know, it seems to me that your wireless words are really rather confusing, for every one of them seems to mean several different things."

"It's all perfectly simple if only you have the capacity to take it in."

"What do you mean by capacity?"

"Why, ability, of course."

"Then would it be right if I asked for a condenser with an ability of .0003?"

"No, you idiot. In electricity capacity means the property which a condenser has of holding a certain quantity of electricity. It is measured in farads. A 1-farad condenser, if there were such a thing, would hold 1 coulomb of electricity when a pressure of 1 volt were applied to its terminals. An ampere is a flow of 1 coulomb per second."

"Then I suppose that I shall be quite in order in speaking of farads rather than of ampere hours when I order my new accumulator?"

"No, no, no. Accumulator capacity is quite a different thing from condenser capacity."

"And both seem to be quite different from ordinary capacity. I won't dispute your word. Tell me one thing about valves."

"Well, what's that?"

"What is the plate?"

"The plate, of course, is the anode."

"Then are both the grey and the brown plates of my accumulator anodes?"

"No, of course not. The brown ones are the positive and the grey ones the negative plates—that is to say the plates to which the respective positive and negative terminals are attached."

"Why do you make that proviso?"

"Because, strictly speaking, the positive electrode of a battery is that to which the negative terminal is attached and the negative electrode that to which the positive terminal is attached."

"Everything is becoming clearer than mud!"

"You are raising unnecessary difficulties. What I mean is this. In a dry cell the carbon rod, which has the positive terminal, is really the negative electrode, and the zinc pot which supports the negative terminal, the positive. Don't you see, we have to consider what goes on not only outside, but also inside the battery. If we regard the current as flowing in the external circuit from positive to negative, it must clearly flow inside the cell from negative to positive. Therefore, considering the inside of the cell, the carbon rod is the negative terminal, since current flows to it."

"But I thought that current really flowed in the opposite way, that is, from the zinc to the carbon in the external circuit?"

"So it does, but really I can't go into all that now. Don't you think that we have talked enough about cells?"

"I understand now what a plate is: a thing to which or from which direct current flows. Is that right?"

"Yes."

"That doesn't seem quite to fit in with my variable condensers, for I understand that no direct current flows through them."

"Oh, hang it all! Can't we talk of something else but plates?"

"May I ask you one more question about dry cells?"

"Please do."

"What exactly does 'polarised' mean?"

"It means that the cell is choked by a collection of hydrogen bubbles round the central carbon rod, which the depolariser has failed to dissipate."

"Thanks very much. But I was reading an article the other day which explained that wireless waves, especially the short ones, might become circularly polarised."

"Well, of course, that's quite a different meaning of the word."

"Just what I thought. I think I said just now that all your wireless words seem to have half a dozen meanings."

"That's not at all fair. Electricity is an exact science, and so is wireless, one of its most important daughters."

"Well, supposing we take a few words belonging to science. Cell, I take it, means in ordinary parlance part of a honeycomb or part of a prison. In physiology it appears to signify a microscopic body consisting of a nucleus and various other parts. In electricity it seems to mean a container, two electrodes and a quantity of electrolyte."

"That is so."

"I don't quite follow your argument about exactness. If I just say that I have a cell I might mean any one of many different things."

"Oh, well, you are just taking an isolated example."

"I wonder if I am. There seems, if I may say so, to be some difference between the 'secondary' of the secondary cause, secondary school, secondary battery, and transformer secondary."

"Aren't you rather wandering from the point?"

"Well, let me come back straight to wireless. I have been doing a bit of reading lately in the text-books and I have been trying to discover just what an ohm is. It seems to be a kind of vague unit of resistance. I follow it all right as applied to direct currents, but with reference to alternating currents it seems to mean two different things. The ohm is the unit of reactance and the unit of impedance."

"Er—yes."

"Then again, dry batteries are not dry, accumulators don't accumulate, and condensers don't condense. Also I find it rather confusing when I have carried out instructions to bury a piece of copper in the soil to find both the latter and the former (forgive me for using those terms, won't you?) referred to as the earth."

"????"

"Don't you think that we want some new wireless words?"

"I begin to think that we do."

A DEMONSTRATION of NOCTOVISION

When the principles of Noctovision were first demonstrated by Mr. Baird in 1926 to the members of the Royal Institution it proved so popular that he repeated his experiments at the British Association meeting at Leeds in 1927. The Noctovisor as demonstrated recently and described below, while essentially the same as its 1927 prototype, is vastly different in its range and size.

PICTURE a châlet-like dwelling-house situated at the top of a hill side and set in a beautiful garden where an uninterrupted view of the country can be obtained for miles around. The setting would appear wholly out of place for demonstrating an invention, the ramifications of which may conceivably give to the mariner that measure of safety which he so sorely needs when fogbound, and yet this is what actually happened. Impossible as it may appear, Mr. Baird, a few nights ago, demonstrated at his home at Boxhill this wonderful apparatus and achieved such a measure of success that some of the leading navigators of the Mercantile Marine and the Royal Navy were enthusiastic in their praise.

The bare principles of Noctovision have previously been described in these columns and it was shown how the machine which the inventor has named the Noctovisor is really an eye which sees by invisible infra-red rays, that is by rays which cannot be seen by the naked eye. The electric cell of the Noctovisor, however, sees these rays and since the rays have the extraordinary property of penetrating fog, the apparatus sees not only in the dark but through fog that would be completely opaque to unaided vision.

The privileged company at Boxhill saw a large camera-like device which could be swung on universal pivots and directed on any part of the valley below. Whatever object comes within the focus of the lens is thrown on a small ground-glass screen, it being borne in mind that the image is made entirely by the infra-red rays and not by visible light. By means of a cell sensitive to these rays and the appropriate amplifier, exploring disc and neon lamp, the object is analysed and built up again in somewhat the same fashion as ordinary television. Thus it is possible to see any light, say, for example, a ship's light, even when this light is obscured by fog or any substance which cuts off all the visible light, provided, of course, that the substance allows infra-red rays to pass through it. One of the commonest substances of this kind is ordinary sheet ebonite and actually this was the artificial fog used at Boxhill.

Ebonite Makes the Artificial Fog

A motor car with flashing head-lights was moving in the valley about three miles away and, at a given signal, the lights were covered with a sheet-ebonite and, of course, the car's location was lost. The Noctovisor was then made to sweep the valley until suddenly on the screen there appeared a small white spot. This was the moving motor car's head-lights made visible through the aid of the infra-red rays. Still more startling, perhaps, was a graduated scale under the screen which showed the exact position of the light in relation to the apparatus being used.

The potential value of this remarkable device cannot be over exaggerated, for fog, the greatest dread of the mariner, will lose its terror if a Noctovisor is placed on the bridge of a vessel and thus enable the navigator to see ships, lights or lighthouses, even in the densest fog. The apparatus also has an application to aeroplanes in times of peace or war which is of inestimable value. Small wonder then that some of the highest authorities have evinced far more than a passing interest and I have no doubt that we shall hear more of this invention in a short time.

A view of the Noctovisor invented by Mr. J. L. Baird. There is a small circular screen on which the lights are made visible. A graduated scale at the base of the instrument gives their exact bearing in relation to the Noctovisor.

THE ELECTRET

THE electret is the electrical equivalent of a permanent magnet. It is formed by subjecting a mass of liquified Carnauba wax and resin to an intense electric field whilst it is drying in a pan. After drying, the wax first shows a polarisation corresponding to that of the applied field. This gradually dies away and is replaced by two intense and permanent charges of opposite signs on the front and back of the plate. These are so durable, that they persist even after the "electret" has been scraped with a knife, or even melted. Washing with acids or spraying with X-Rays does not remove them.

The inventor—a Japanese professor at the Naval College at Tokyo—has kept an electret fully charged for over three years by wrapping it in foil.

B. M.

Until recently the Government of Greece prohibited radio broadcasting and other radio activities in that country. This ban has been lifted, however, but as yet there are no broadcasting stations.

TRUNK CALLS FROM RAILWAY TRAINS

Passengers travelling on the Canadian National Railways train between Montreal and Toronto are now able by means of the wireless telephone, to converse directly with friends in either city although travelling at 40 miles an hour. This is the first successful experiment of its kind in Canada.

The Canadian system is said to have eliminated several of the difficulties encountered by the German State Railways in the operation of a similar system.

USING THE SCREEN-GRID "HUMP"

—and Improving Selectivity

By JOHN TROSS

"I'VE got the 'hump' with the screen grid," said a friend of mine the other day. "It gives me the mag. all right, but selectivity seems to have gone by the board, and that's no use when I'm so close in."

"What's your circuit?" I asked.

"Two H.F. with tuned anode and no reaction. Very stable and heaps of volume, but I can't get clean separation of stations

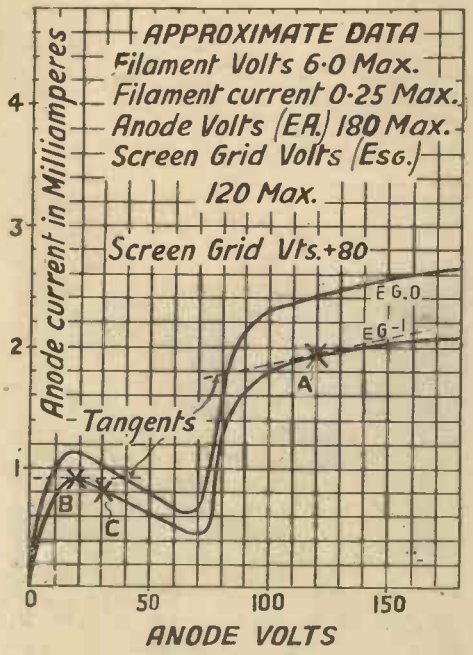


Fig. 1. Characteristic curve of Screen-grid Valve

like Lahti or Zeesen on my outdoor aerial; there's a background of 5XX, which is, of course, at roaring strength here—hardly 50 miles away. I know I could improve things by tapping my coils or using some kind of transformer, but I want to keep the ones I have. They are quite good and small enough to fit the space I can spare."

Turn the "Hump" to Advantage

"Well," said I, "You've got the 'hump,' so why not use it. I suppose you are working at 80 volts on the screen and 120 on the plate? . . . Right; why not drop the plate to twenty-five or so and turn the 'hump' in the curve to advantage?"

The screen-grid-valve curve (Fig. 1) is now very familiar, and most of us are aware that the normal working point is up on the slightly curved section, where saturation is being approached (A, Fig. 1). Here the tangent to the curve is almost horizontal, the magnification and impedance being about 200 and 200,000 respectively. On the portion of the curve below this point the tangent is nearly vertical, and both magnification and impedance drop. Conversely, if we can find a working point where the tangent is absolutely horizontal, then at that setting both magnification and impedance will be infinite.

The rise of impedance is, of course, unfortunate when one considers amplification alone, for it reduces the step-up per stage actually obtainable in the circuit to some value in the region of, or slightly less than, that given at A. But one important advantage accrues; the valve damping across the tuned circuit has been reduced to a negligible quantity and selectivity is therefore improved to a corresponding extent—which in the present instance is our chief aim.

How, then, to find a working position on the curve where the tangent is horizontal?

Voltage Values

The most obvious way is to increase the high-tension voltages to the saturation limits, but this is wasteful and harmful to the valve life. So we turn to the "hump."

By reducing the voltage on the plate to a value in the neighbourhood of eighteen to twenty, and maintaining the screen grid volts at eighty, we transfer ourselves to point B, or somewhere near it. At first sight, the plate volts would appear to be critical. The curve is fairly sharp, and half a volt one way or the other will evidently tilt the tangent considerably out of the horizontal, so counteracting any advantage. In practice, however, this does not introduce any difficulty, and there is quite a wide range over which results do not vary appreciably. With the modern S215 valve in an average circuit, any tapping between 18 and 25 seems to operate equally well.

The reason is not difficult to understand. If we move from B towards a lower anode voltage the tangent slopes upward, indicating that the valve resistance is lower and *positive*—the normal case. But when we move along the curve towards C the tangent slopes down, and the valve has a *negative* resistance. Its effect is then similar to that of reaction, and if the circuit is in itself highly efficient, oscillation commences. In the average case, however, this negative resistance is of the greatest value, for it counteracts the damping effect of the resistance in the coils and circuit, thereby raising the efficiency and sharpening up the tuning to a greater extent than would occur when working exactly at B.

Increased Sensitivity

Furthermore, we have here a very nice method of increasing the sensitivity of a screen-grid circuit in which no reaction is used, without the necessity for any alteration or additional components. By setting the plate voltage to produce oscillation when the filament rheostat is fully out, and then reducing the filament brilliancy by bringing part of the resistance in, the receiver may be brought to its most sensitive point at will.

There are two problematical cases. If the circuit already incorporates reaction, the advantage to be gained is clearly less, but often appreciable. Similarly, if the coils, etc., are of high efficiency, then the damping may be reduced too greatly and oscillation takes charge at all settings between B and C. Here the value of the change will depend on the degree of control obtainable with the filament rheostat.

In any case, the screen-grid enthusiast will find the "hump" a most interesting point for experiment, and wherever selectivity is in doubt, it is worth a good trial.

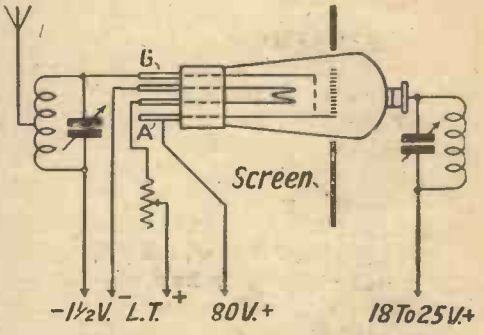


Fig. 2. How to work on the "hump," showing voltages on plate and grids.

"UP LEITH HILL WITH THE 'TALISMAN' PORTABLE"

(*Continued from page 224*)

to the region of Budapest. He had disappeared; either closed down or a fade. I searched for him—the vagaries of Budapest always interest me—but instead, captured a strange transmission Then Fredriksstad, Bern, Prague and, on the long waves, Lahti tumbled in in quick succession. This made eighteen different countries in all and forty-four different stations at full loud-speaker strength.

I had achieved easily what I had set out to do, and as it was getting late and, what was more important, dark, I took up my set and descended the slope. This was no easy matter with my load. I fell the last ten feet with the portable underneath me. . . .

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We—the portable and I—emerged from the melée apparently undamaged. In the case of the portable this was confirmed on our arrival home, where, on switching on, everything was as usual.

JEAN SURAC.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THUS Mr. Harvey Grace in prefacing his talk on Next Week's Broadcasting Music: "As I am late, I warn listeners I shall have to read out what I have to say fairly quickly."

Let me tell Mr. Grace that this is *not* the way to handle a situation of this sort. What he should do is to cut his talk in half. Obviously, a *whole* talk hurried and jumbled is useless, whereas a *half*, delivered as it should be, might be tolerable. Thus

An impression of Ivor Vintor

warned, I for one switched off, just as Mr. Grace began his express journey.

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Outside broadcasts are a change. The worst of it is that while orchestras and military bands are tolerable enough, the vocalists are sometimes not up to B.B.C. form.

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One should be able to put up with a "first performance in England." I must confess, however, that whenever I see that statement I always tremble. Usually with good reason, too. The new suite, "From the Northland," by Leo Sowerby, was, no doubt, "jolly clever," "picturesque," "poetical," and all that; but was it "moosick"?

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The "Student's Songs" by the Birmingham Studio Chorus were quite jolly, and reminiscent.

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When I switched on to Brighton before a concert party was to broadcast I immediately looked for the usual cliches. And there, bless my soul, was old "Angus MacDonald," grown grey and weary. But sung quite nicely; followed by an encore which grandmother liked equally as well—when she was a girl.

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This concert party, by the way, had plenty of go, but poor material. But it doesn't take much to make a seaside audience split its sunburnt sides with laughter.

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I liked the talk from the "typical Miss America." Sensible and, happily, *not* typically American. However, hurrah for Miss America!

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I have already pointed out that quick-time songs become absolutely pointless, since you can never understand what they are all about. For instance, there was a song the other night about talkies. I put on my best power of concentration, and all I heard was "talkies . . . talkies . . . talkies."

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One has seen the name of Mr. Compton Mackenzie on the programme quite a lot recently. And deservedly so. His talk on "Eriskay" was a poem, and by interpolating Miss MacDonald, who sang that beautiful lyric, "The Eriskay Love Lilt," Mr. Mackenzie showed inspiration as well as genius.

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The Channel swim cod which was put over as a "surprise item" was quite funny and dressed up Mr. Thomas Handley and his usual monologue in a refreshing manner.

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Not all the great plays in the series that has just come to an end have really been great plays. But who can gainsay that *Henry the Eighth* was not only a great play, but a great production? I can only add this: That if we had had the opportunity of learning Shakespeare through such an agreeable medium when I was a boy—well, I should have been a great Shakespearean fan by now.

And, while I think of it, whose was the setting to the well-known "Orpheus" song? It was not the one with which I am familiar.

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And the same evening I also listened to part of the Bach concert relayed from the Queen's Hall. I had my money's worth that night.

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Listening to Nelson Jackson the other night recalled Margate to me twenty-five years ago when he sang "Lanagen's Log" and a charming lady rendered "Only Wait, Little Child, Time Will Bring You Roses." Why doesn't Nelson keep to the old songs? I must confess I preferred them to his own original compositions.

◆ ◆ ◆

A good idea was "The Lure of a Dance," relayed from Manchester and given by the Northern Wireless Orchestra. The contrast between the international dances lent an added interest to the concert. You didn't need to know much about music in order to distinguish the nationality of the composers.

◆ ◆ ◆

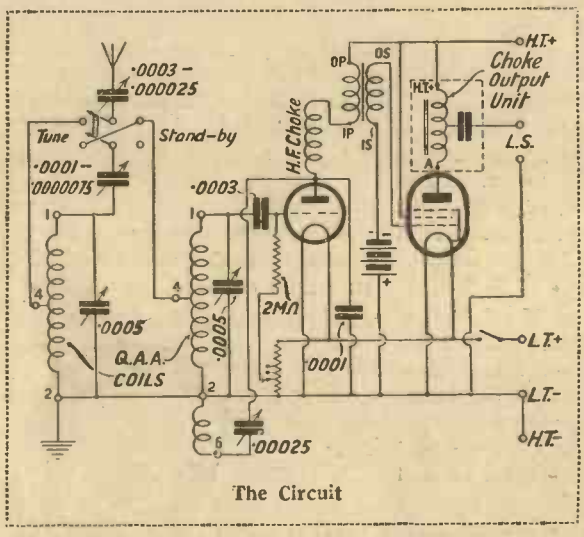
A good idea, too, that interchange of preachers for Sundays with the United States. This idea might easily be extended to other eminent Americans.

Starita—the Xylophone player

Further Notes on The HYPER

The constructional details of this receiver, which circuit arrangement, were given in last week's is say upon getting

THE constructional details of the "Hyper-selective 2" were given in last week's issue, in which it was explained that the object of the design was the provision of the additional selectivity obtained from extra tuning circuits without the necessity for using high-frequency amplification. The receiver is worth making up in order to obtain experience in these coupled circuits, for it is quite within the bounds of possibility that when the regional scheme is operating in its full glory we shall have to employ a coupled-aerial circuit even where a high-frequency stage is used.



The Circuit

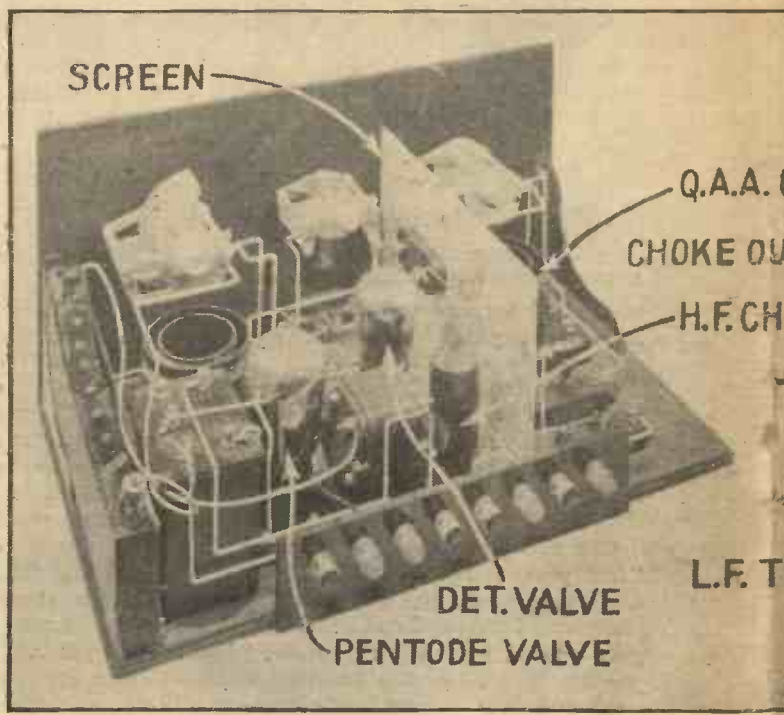
Aerial Coupling

The coupled circuit used here is of the capacity-coupled type. The aerial is coupled to the first tuned circuit in the same way as it is associated with the tuning circuit of an ordinary receiver. The voltage produced across the condenser of the first circuit is transferred through a small coupling condenser on to the second circuit and from there on to the grid of the valve. A switch is provided for coupling the aerial directly to the second circuit, isolating the first, so that a simple detector circuit is obtained for ordinary purposes or for searching. It is, indeed, similar to the old stand-by-tune arrangement which used always to be fitted as a standard on ship sets.

Tuning

First of all, set the aerial to the stand-by position. Tuning is then effected on the right-hand dial, while the top centre knob is used to control the reaction. After the operation of the receiver in this manner has been mastered the switch should be thrown to the tune position, both the tuning circuits coming into operation. For any given station the dial reading on the second circuit will now be increased slightly, owing to the removal of the aerial capacity. The reading on the first dial will be similar to the second. The two circuits must both be tuned in order to receive the required signal, but it will be found that the tuning is to some extent inter-dependent. That is to say, if one dial is moved away from its tuning point, then the whole circuit can be retuned on the other dial within two or three degrees on each side of the tuning point.

This assists the tuning to some extent, the degree to which the effect is experienced being controlled by the tightness of the coupling between the circuits. This in turn is controlled, as was explained last week, by the Formodensor between the two circuits. This is the condenser having a maximum value of .0001, and not the .0003 Formodensor connected in the aerial lead. For first experiments screw this coupling condenser down towards its maximum position; tuning on both circuits will then be found to be fairly broad.



The various features of the set will be c

R-SELECTIVE 2

is a highly-selective two-valver using a special coupled-sue. Here is what the designer, J. H. Reyner, has to the best results from it.

Reaction

Reaction will still be obtained by using the centre knob, and after a little experience the idea of handling a two-tune circuit will readily be obtained. When this is done the coupling condenser should be unscrewed a little, so that the capacity is reduced, and the various stations should again be tuned in. It is a good plan at this stage to get hold of some foreign stations relatively close to a local station. Some of the tests which I made were carried out on Eiffel Tower, which is situated just below Daventry. Another good station to test on is Zeesen on the long waves, while the best short-wave stations depend entirely on the locality; and there are nearly always some good German or French stations relatively close in wavelength to one's own local station. The best thing to do is to try to tune in one of these foreign stations, and then gradually to reduce the value of the coupling condenser, noting its effect.

Probably at first it will be found that there is a strong background of the local transmission and that as the coupling condenser is reduced, so the tuning becomes sharper and sharper, and it is possible to tune in the foreign station free of interference. Beyond a certain point, however, the strength of the foreign station will be found to be noticeably increased, and it is a matter for compromise as to where the coupling condenser shall be left. By making the coupling condenser very small, the tuning can be made very sharp, but the signal strength will be rather weaker than normal.

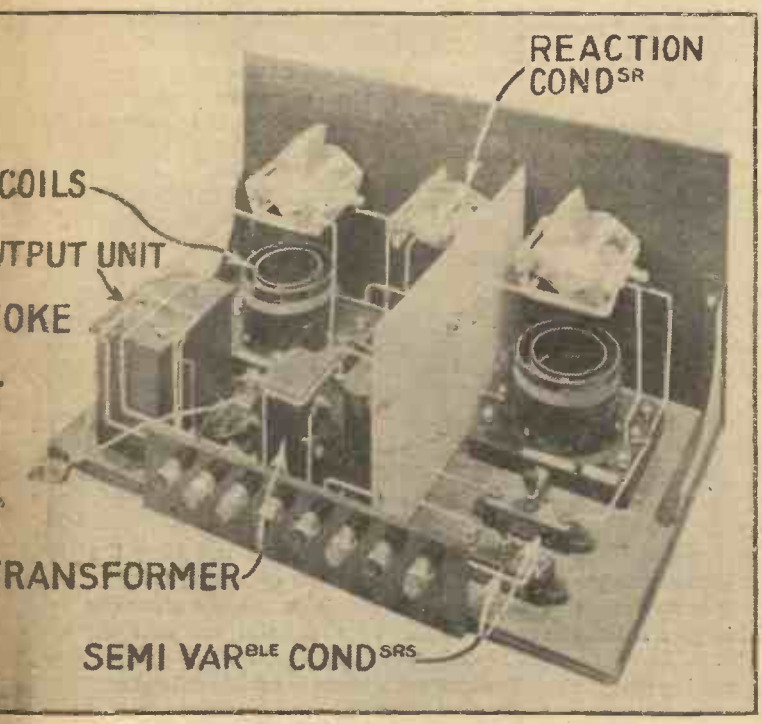
A Wavetrap Effect

One interesting point which may be mentioned—a purely accidental effect which was discovered during testing. With the switch in the stand-by position so that the aerial is connected to the second circuit directly, there is still a small amount of capacity coupling through the switch on to the first tuned circuit. This is sufficient to enable this circuit to be used as a wavetrap. For use in this way, tune in a local station on the right-hand dial in the ordinary manner. Then rotate the left-hand dial until, at one point, the strength from the local station will be found to be sharply diminished. This dial should then be left at this setting, under which conditions the receiver will be acting as a tuned circuit with a coupled wavetrap, and under certain conditions this may be found very useful.

The coupled-circuit method, of course, has the advantage that the selectivity is retained throughout all points of the tuning scale. With modern conditions it is not only the local station which causes trouble, for in many cases distant stations cause interference. This is more especially the case in outlying districts, where one's own local programme is interfered with by a powerful foreigner. The use of a coupled circuit in such cases is invaluable.

One final point may be mentioned regarding the coast dweller. Although spark interference is being reduced, it is still very prominent and results in considerable mutilation of the programmes. The difficulty with spark interference is that, owing to the highly damped character of the wave, the tuning circuits are subjected to shock excitation, and will therefore oscillate at the frequency to which they are tuned. Consequently, tuning arrangements, as such, do not constitute an entire solution of the problem. It is found, however, that under practical conditions the use of a coupled circuit arrangement does give a greater freedom from spark interference than is obtained with a simple circuit.

The transfer of the energy from one circuit to the next is not so effective on the damped wave, due to the spark transmission, as with the continuous waves. It is probable that in many instances readers living in coastal areas will find a distinct improvement in their reception by utilising this set.



clear from these lettered photographs

LIST OF COMPONENTS

Ebonite panel, 16 in. by 8 in. (Becol, Raymond, Ebonart, Paxolin).
Ebonite strip, 9 in. by 2 in. (Becol, Raymond, Ebonart, Paxolin).
Baseboard, 16 in. by 9 in. (Pickett, Camco, Clarion).
Two .0005-microfarad variable condensers (Polar, J.B., Burndept, Igranic).
One .00025-microfarad reaction condenser (Polar, J.B., Burndept, Igranic).
Two QAA coils (Lewcos, Wearite).
One Formodenser, type F, and one Formodenser, type J (Formo).
One Pentode output unit (Wearite).
One 4 to 1 L.F. transformer (B.T.H., Varley, Ferranti, R.I., Igranic).
One H.F. choke (Lissen, Varley, Wearite, Burndept, Lewcos)
One .0001- and one .0003-microfarad fixed condenser (Dubilier, Lissen, T.C.C.).
One 2-megohm grid leak (Dubilier, Lissen, Graham-Farish).
Two valve holders (Benjamin, Lotus, Wearite).
One fixed potentiometer (Polar, Lewcos).
One panel-mounting on-off switch (Claude Lyons, Benjamin, Bulgin, Lissen).
One D.P.D.T. switch (Lotus).
Two panel brackets (Ready Radio, Bulgin).
One metal screen, 9 in. by 6 in. (Ready Radio, Parex, Peto-Scott).
Eight terminals, marked: Aerial, Earth, L.T.+, L.T.—, H.T.+, H.T.—, L.S.+, L.S.— (Belling-Lee Eelex, Igranic).

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Leyton H.T. Cells

MANY people feel that they would like to construct their H.T. battery for themselves, and if one has the necessary parts this can be done quite simply. The Leyton Battery Co. have sent for our inspection a number of component parts whereby this may be done.

First of all, a simple dry battery may be made up by taking units consisting of carbon, depolarising agent, active agent, and zinc-containing case, and wiring these all up together. Detailed instructions are given in the leaflet as to how this may be done, together with advice regarding the necessary precautions, and the directions are quite practical and lucid.

The size of the cells is what is known as treble capacity, so that they will stand quite a heavy discharge, and a figure of 20 milliamperes is quoted as being safe.

In addition to the simple dry cell, particulars are given of what is called a dual battery. This consists essentially of the elements used for making a dry battery together with provision for turning them into a wet battery after the first period of exhaustion. It is well known that if a dry battery which has become partially exhausted is pierced with holes and immersed in water it is possible to obtain a recovery effect, thereby extending the life, and this is the principle which is made use of here.

A zinc contact clip is provided which fits round the outside zinc container of the

Leyton H.T. Cell Units

individual cells. Instead of soldering one zinc to the next carbon, this contact clip is used for the purpose, and each cell is placed in a glass jar. The cell is used first of all as a dry battery, but when it commences to give out, water is added to each cell, the glass jars being filled about three-quarters full. The cell then functions as a wet cell and a certain additional life can be obtained.

Those readers who like to make their own batteries will find these parts distinctly helpful.

Harlie Volustat

MESSRS. HARLIE BROS., whose products have been reviewed in these columns from time to time have submitted to us for test and report a variable high-resistance of their own manufacture, known as the Volustat. The component is made in three ranges, the "Universal" type with a specified range from 50 to 500,000 ohms, the medium resistance type from 2,000 to 2 megohms and, finally, the high-resistance type varying from 10,000 to 10 megohms. It is claimed that these resistances will handle up to 10 watts and cannot burn out.

Investigation showed that this resistance belongs to the compression type, in which a

Harlie Volustat

mixture of carbon and mica form part of the ingredients. The elasticity of the material is such that the values of resistance are approximately constant at any given setting of the material. The makers claim silence of operation when passing high values of anode current and tests were accordingly made to substantiate these claims. In the minimum position, with the mixture fully compressed, the spindle comes up against a definite stop: the samples tested varied in their minimum values from 25 to 35 ohms. The mixture in these samples was compressed and released 20 times, but the variation in minimum value never exceeded 2 ohms.

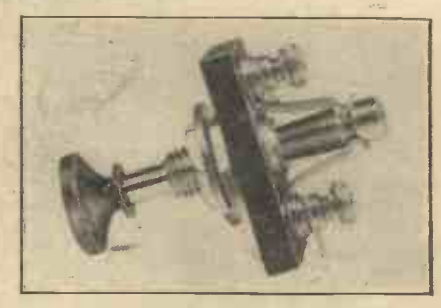
The maximum resistance in all cases exceeded the specified value of 500,000 ohms; owing to the loosely packed nature of the material, however, we should not recommend the use of the resistance above the rated maximum or, perhaps, a little less. Either the medium or high-resistance types should be used according as to whether a volume control or variable grid leak is needed.

Our next test consisted in passing varying currents through the resistances, to check the heat-resisting and power-absorbing qualities. A current exceeding 100 milliamps could be passed giving a voltage drop across the resistance of 100 volts before any pronounced heating of the material was noticeable. The Volustat was then used as a variable anode resistance in a resistance-coupled amplifier, and served as a useful and silent volume control. Finally, the Volustat was tested in an H.T. eliminator as a de-coupling resistance and afforded an efficient means of adjusting the voltage to any desired value. Owing to the low minimum resistance, the full H.T. voltage was available when passing high anode currents. The silent background during these tests indicated that the resistance remained appreciably constant at any setting within the specified range.

The Harlie Volustat appears to justify the claims made for it and can be recommended for a variety of purposes. The price is 7s. 6d.

Deckorem Switch

THIS week we have tested a Deckorem push-pull switch, a product manufactured by Messrs. Bulgin & Co., of 9-10 Cursitor Street, E.C. Although this component is necessarily simple in design an inspection reveals a number of refinements which might persuade the discriminating reader to use it on his own sets. The parts of the switch visible on the front of the panel are exceptionally well-finished. The small insulated knob is highly polished and the metal parts are nickel-plated. Behind the panel, the component occupies barely 1¼ in., whilst the dimensions of the insulated support carrying the contact strips and terminals are ¾ in. by 1¼ in.



Deckorem Push-Pull Switch

By suitably shaping and polishing the insulated portion of the operating spindle, the movement has been made noticeably smooth with very definite on and off positions.

The contact springs are fairly robust and make good electrical contact with the metal portion of the spindle. To both terminals soldering tags are fitted. The component sells at a modest price and can be recommended.

MY WIRELESS DEN

By W. JAMES

Weekly Tips Constructional and Theoretical—

For the Wireless Amateur

Choosing a Choke

I HAVE often considered whether a high-frequency choking coil connected between the anode of the detector valve and its coupling (low-frequency transformer or resistance capacity) is really worth while.

A good choke is, after all, a fairly expensive part and the various makes have their little peculiarities, and therefore do not always behave in the same manner. I have found—and readers have as well, to judge by my correspondence—that a set may work well when a choke of one of three or four makes is included, but that the results are definitely not so good when different makes are used. Some chokes appear not to work well in certain circuits, and are therefore to be avoided.

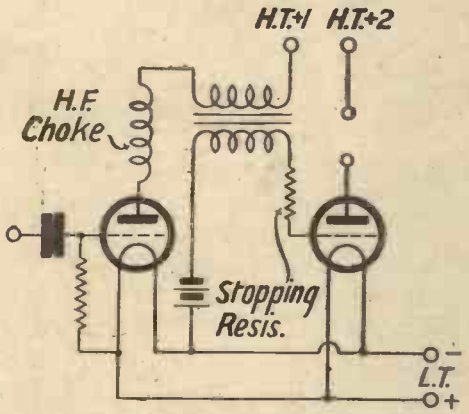


Fig. 1. Showing position of stopping resistance

When the parts used in the receiver are such that a stopping resistance in the grid lead of the next valve is satisfactory, then I prefer to use one and not a choke. A resistance is cheaper, and quite reliable. Fig. 1 shows the arrangement.

Tracing a Fault

A few days ago I was testing a set having a push-pull output stage, and the quality was not right. The circuit was satisfactory, and so were the valves and the power supply.

What could be the matter? Were the push-pull transformers working properly? Fortunately, I had a valve voltmeter handy, and I decided to test whether the output from the two parts of the secondary winding of the input transformer was equal. I therefore connected the voltmeter first to one half and then to the other.

The result was interesting and showed quite clearly why the quality was bad. Much higher voltages were being set up across one half than the other. This is, of course, quite wrong, and I wondered how a cure could be effected. A pair of ¼-megohm grid leaks were connected across the two secondary windings, and they improved matters to a great extent. The output voltages were more nearly equal, the higher reading being, of course, reduced.

This seemed a satisfactory cure, for although the two sides did not, even with the grid leaks, give identical voltages, the quality of the reproduction was fairly good. Push-pull amplification is a little more difficult to carry out in practice than it seems from the theoretical diagram!

Coupling S.G. Valves

The right coupling for a shielded valve in the majority of instances is, as I have often pointed out in these pages, a tapped anode coil or a high-frequency transformer.

A high-frequency amplifier having a plain tuned-anode circuit will usually oscillate if the coils are only reasonably good. This is because a shielded valve has anode-grid capacity, in spite of the second grid or shield, which we connect to a positive voltage. It therefore follows, even when full precautions are taken to avoid stray magnetic couplings and also capacitative ones, that if the anode voltage (high-frequency) exceeds the grid voltage by more than a certain amount the stage will oscillate.

Instability may be prevented by using a relatively high-loss aerial coil, but then both magnification and selectivity suffer. The correct thing to do is to connect the anode to a point on the anode tuning coil, as in the Binowave coil, or alternatively to wind a separate anode coil over the tuned coil in order to produce a transformer.

A transformer is a little more difficult to make than a tapped tuned-anode coil, but it has certain circuit advantages. Incidentally, the first shielded valve set that I made, and probably the first one published, had a transformer coupling. The two coupling devices are shown by Fig. 2.

Use a "Pot"

Valve detectors are usually called upon to provide detection and reaction effects, with the result one might expect, in order to obtain smooth reaction, detecting efficiency is lowered.

Thus one sometimes has to connect the grid leak between the grid and negative low tension in order to secure the desired reaction effects. But this is often not satisfactory from the point of view of detection. Often the grid must be biased by taking the grid leak to the positive side of the filament for the maximum sensitivity. Much depends upon the valve used and the circuit values, as would be expected.

However, satisfactory reaction and detection may always be obtained by attention to the valves and when necessary, by taking the grid leak to a potentiometer joined across the filament circuit. This component need not be fitted to the panel, as it does not have to be adjusted after it has been set to suit the valve used.

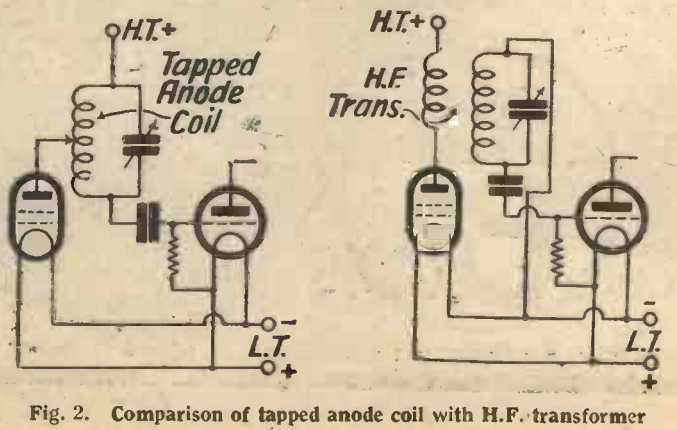


Fig. 2. Comparison of tapped anode coil with H.F. transformer

RADIOGRAMS

A RUNNING commentary on the water polo match, Germany *v.* England, which takes place at the Pitfield Street Baths, Hoxton, will be relayed by 2LO and 5XX on September 28.

The Daventry 5GB vaudeville programme on August 31 will include the following artistes: Percy Honri, Pitt and Marks, Jock Walker (the Scots comedian), Helen Alston (songs at the piano), and Frank Staff (entertainer) This entertainment will be assisted by the Miami Dance Band.

Listeners to the 2LO vaudeville programme on August 29 will hear Florence Oldham, Bransby Williams, and the Albert Sandler Trio.

Newcastle listeners on September 2 are to hear Rona Valdez, the popular soprano from the Carl Rosa Opera Company, in a group of songs which up to the present have not been published or broadcast. Miss Valdez will be accompanied by the composer, Kenneth Watson.

According to a series of articles contributed to the Russian wireless journals, Professor Protoff, a radio engineer at the Nijni-Novgorod State Laboratory, has been experimenting for many months in ultra-short wave transmissions. In practice it has been found possible to utilise waves as short as 7, 12, and 19 centimetres and the tests demonstrated that with a transmitting power of but 20 watts signals were clearly picked up several thousand kilometres away. For these experiments special valves were made, but their cost would not prevent them from becoming a commercial proposition.

The number of registered listeners in Sweden during the past few months has shown a considerable increase; at the end of July it had reached 412,000, or a proportion of 6.7 licence holders per hundred inhabitants.

John Dalton, the English chemist, was born in Cumberland on September 6, 1766, and to celebrate the anniversary of the birth of this great man, Manchester on that date will broadcast a play which has been specially written for the occasion by the Sheffield playwright Edwin Lewis. John Dalton spent most of his life in Manchester, and the opening scene takes place before his statue in the vestibule of the Town Hall in 1929. The Northern Wireless Orchestra will provide the incidental music.

A Welsh programme is to be given to listeners to the Cardiff station on September 11. The chief feature will be *The Pennillion Singer*, by Ernest Rhys, a well-known Welsh writer, whose name will be familiar to everyone as the editor of the Everyman series.

A new Dutch radio-beacon station, recently installed on the Noordhinder lightship in the North Sea, has now commenced I.C.W. transmissions on a wavelength of about 962 metres. This station may be recognised by its characteristic signal, consisting of the letters NR in morse, sent twice, and followed by fourteen one-second dashes. In clear weather the transmissions take place every three hours, and in "thick" weather six times during the last forty-five minutes of each hour. They can be received strongly in eastern England.

Miss Marie Burke—An impression

When the Band of the Royal Air Force, under the direction of Flight-Lieut. J. H. Amers, M.B.E., visits the North-East Coast Exhibition during the beginning of September their programme on September 5 will be broadcast by the Newcastle station, and also relayed to 2LO and 5XX listeners.

On September 8 Cardiff will relay a concert given by the National Orchestra of Wales from the Coney Beach Pavilion, Porthcawl. The soloists are Tudor Davies (tenor) and Lionel Falkman (violinist).

Glasgow and all Scottish stations on September 3 will relay from Ecclefechan the ceremony at the unveiling of a bronze bust presented to the Dumfries County in memory of Thomas Carlyle. The ceremony takes place at a point on the Great North Road, facing the house where Carlyle was born some 134 years ago. The bust will be presented by Carlyle's nephew, Alexander Carlyle, and unveiled by the great Scotsman's grand-niece, Miss Betty Carlyle.

Belfast listeners on September 13 will hear *Samson and Delilah*. Although this now popular opera was a great success when first produced at Weimar, it was originally rejected by the Paris directors and twelve years elapsed before it was heard in the composer's native country.

The Radioptimists—that popular band of mirth-makers from Glasgow—are still as active and popular as ever. In their latest revue, in which particular attention is being paid to the musical side of the show, all the original cast will participate, in addition to the Eight Babes, who are featured with two pianos and a band.

Portrush is now being brought in as a source of entertainment to the Belfast station listeners. Relays have been arranged of Sibbald Treacy's Dance Band from the Northern Counties Hotel at the resort, and also of light string music by the sextet at the Trocadero Restaurant.

A broadcast appeal for a blood-transfusion operation which was sent out from Edinburgh recently resulted in no fewer than fifteen people offering their services within three minutes. A woman was selected from the applicants, and as a result of the operation the patient is now doing well.

For its annual "spring cleaning" the Ljubljana broadcasting station will be closed until the end of August.

THE DENSITY OF LISTENERS

THE heading refers simply to statistics and must not be taken personally. Curiously enough Denmark, one of the last countries to instal a broadcasting system, has now nearly 300,000 licensees out of a total population of 3,300,000. This represents the greatest ratio of listeners to population in the whole of Europe, being more than 50 per cent. higher than that of the United Kingdom. After Denmark comes Sweden, with a total of nearly 400,000 listeners out of a population of 6,000,000. Germany shows the most rapid development. During last year no less than 626,000 new licenses were taken out, as compared with slightly over 233,000 in this country. A large proportion of this increase was, however, due to the removal of broadcasting restrictions in the occupied territory of the Ruhr.

M. A. L.

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Condensers Across H.T. Terminals.

Q.—*I notice that in some designs of receivers there is usually connected across the H.T. terminals of the receiver either a 1- or 2-microfarad fixed condenser. In other receivers these large capacity fixed condensers are omitted. Can you tell me why this should be? Surely if such large capacity condensers are needed in one receiver they are necessary to the good working of every receiver?—F.D.* (*Bedford*).

A.—These large capacity fixed condensers are usually termed "reservoir" condensers. Their initial duty in the circuit is to store up the energy or current discharged from the H.T. supply and to discharge it through the wireless circuit with almost perfect smoothness. When the H.T. supply is obtained from batteries and these are somewhat run down the current supply is liable to be variable and so cause noises in reception. The reservoir condensers will overcome this difficulty and reduce the noises due to a faulty H.T. supply. Quite apart from this the condensers also by-pass any H.F. currents which would normally pass through the H.T. battery and combining with the L.F. current cause instability or L.F. howling. In some designs these condensers are omitted for the sake of economy or because the receiver is designed for use with a mains supply. It is always a safe plan to add such condensers to any receiver provided that the reservoir condensers are tested to withstand at least double the voltage of the normal H.T. supply voltage.—L.C.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Output Transformer versus Output-filter Circuit.

Q.—*Having suffered damage to one loud-speaker and not wishing for a repetition of the trouble I am thinking of fitting an output circuit between the set and the speaker. I have been advised to do this by several friends, but, as one says use an output transformer and another says use a filter circuit I am rather at a loss to know which to use. Can you explain the advantages or disadvantages and tell me which, in your opinion, is the best to use.—G.K.* (*Barnes*).

A.—There is very little to choose between the two output systems. When using a low-resistance, loud-speaker or a moving-coil speaker we think it by far the best to use an output transformer. In this case the secondary of the transformer should be chosen to match the "impedance" or "resistance" of the loud-speaker windings. In ordinary cone- or horn-type speakers it is much simpler to use a choke-filter output circuit, inasmuch as there is not so much need for a critical matching of the impedance of the output circuit with the "resistance" of the loud-speaker. It is, however, essential to use a "high-resistance" speaker with the choke-filter output system.—C.A.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Correspondence should be brief and to the point and written on one side of the paper.

The Old Circuits

SIR,—Your correspondent G.R. (Windsor), who talks of using an "Armstrong Super" (one-valver), perhaps would be interested to know I have used this set built as a portable in an attaché case for at least four years and scrapped it two months ago. I did not get the whistle of which he complains, and I got some astonishing results with it, but the handling was so tricky.

I scrapped it because it often burst into oscillation and no other member of the family could stop it until I came along. Otherwise I endorse his remarks on this particular set, and add that the other circuits he mentions are not strangers to me.

W. C. (Battersea).

The Linen Speaker Again

SIR,—Whilst on holiday a few days ago in Hertfordshire I heard one of Sir Henry Wood's concerts received on a home-constructed loud-speaker. The reproduction was so amazingly sweet and clear, and also lifelike, that it appealed immediately to me. As far as I could ascertain, the speaker was built in accordance with detailed instructions given in AMATEUR WIRELESS. A. E. L. (Norwich).

Relics of the Past

SIR,—Regarding the old-stager "Thermion" described in AMATEUR WIRELESS dated August 3, it might interest you to know that I still have by me an old-time relic and in good working order.

This set was brought to me for converting into an up-to-date receiver, and—ye gods!—I doubt if P.P.E. himself could have followed that circuit through the first time. Below are a few of the parts used :—

Terminals, 18; rheostats, 4; screws, 32; dials, 9; switch arms, 5; contact studs, 20; valve windows, 4; valve-leg sockets, 20; condenser vanes, 70; wires in set, approximately 84; valves, Marconi R10817, R13686G, B.T.H. B4, PM5X.

Everything is fixed on the panel, including transformers; these latter I should say are seven to nine years old.

J. H. (Pensnett).

A Good Holiday Set

SIR,—I have built "The Holiday Portable Three." With the exception of fitting R.C. valve in the first stage and Watmel choke, the components are as in the list given. Tested in Birmingham as a portable, 5XX and 5GB come in very well. At night 2LO and Radio Paris can be heard. With a good aerial on the short waves, Budapest, Frankfurt, Radio Toulouse, Hamburg, Stuttgart, London, Barcelona, Bratislava, and Manchester are received at good strength; Dublin, Katowice, and several other stations not recognised at fair strength. On the long waves, 5XX, Radio Paris, and Hilversum day or night.

The set was taken to Levin, on the Welsh coast, which is badly screened by mountains. As a portable, Dublin (about eighty miles away) was received at night at good loud-speaker strength. With a 70-ft. length of Electron wire thrown over the house and kept about 15 ft. high Dublin roared through any time of the day; 5XX could be heard fairly well; 5GB just a whisper; 2LO, Hamburg, Barcelona, Radio Toulouse, and Manchester at fair strength after dark. With a super-power valve in the last stage, purity and volume are wonderful. The gramophone pick-up works well.

S. (Birmingham).

Linen-speaker Sizes

SIR,—The only drawback to the excellent AMATEUR WIRELESS "Linen Loud-speaker" is the amount of space it takes up, especially in a small house. Reducing its size reduces its volume and quality of reproduction. I have made several experiments with the object of making this type of speaker fit into a smaller space—or, rather, to take up less room. I have now completed a linen speaker which is equal to the original type in volume, quality, and sensitiveness; will stand comfortably in any corner of a room and looks very well.

The idea is as follows: Make the large diaphragm 16 in. wide and 48 in. long; the small diaphragm 16 in. wide and 24 in. long. The frames are strengthened to prevent bending. This speaker is equal to the older type in every way and, of course, does not need so much room space.

A. W. E. (Sandiway).

Trouble Tracking

SIR,—I noticed your appeal for curious faults. Here is an account of one. I had a faulty rheostat. It had a very small "dead point" a few ohms from one end of the barrel, and though on either side of this spot all was well, the said spot was definitely dead.

Suspecting a loose spring, I increased the pressure, but it was still the same. Then I took it down and cleaned it, with no result. As my set is very silent when not

on a station, I fitted a spot light across the L.T. to minimise risk of leaving it on all night, should I not switch off when the station closed down.

By the light of this I saw on the rheostat barrel *one* hair, which was causing all the trouble. It was well fixed, and so, being not noticeable when I took the rheostat down, I had concluded that wiping the barrel had cleaned off any dust which might have caused an open circuit.

H. M. (Manchester).

THE SHORT-WAVE ADAPTOR

SIR,—As I have only seen one letter in AMATEUR WIRELESS about your "Short-wave Adaptor," described in No. 360, I thought it might be of interest to other readers to know of the good reception I have had with this set. I made this up exactly as described and used it in conjunction with the "Mullard Master 3 Star." I have received the following stations, besides several other French and German stations :—

	Metres
*Transatlantic Telephone Service, Rocky Point	22.48
W6XN (Oakland, California) ...	23.35
W8XK (Pittsburgh, U.S.A.) ...	25.4
W2XAF (New York)	31.48
7LO (Nairobi, South Africa) ...	31
*5SW (Chelmsford)	25.53
*DOA (Doberitz, Germany) ...	33.8
*PCJ (Hilversum)	31.4
KIX1 (Philippine Islands) ...	24.5
*VK2ME (Sydney, Australia) ...	28.5

Those marked with an asterisk have been received at good loud-speaker strength.

D. (Cockfield).

SELENIUM CELLS

ALTHOUGH calling for care and neatness in manipulation, the construction of a selenium cell, or light bridge, unlike the thermionic valve, lies well within the capacity of the skilled experimenter. The usual method is to coat a small glass or quartz plate with a thin film of a collodial solution of gold in oil such as is used for gilding pottery.

When the metallic coating is dry, it is scribed or ruled out in fine lines about 0.2 millimetre in width by means of a style or dividing engine. The original metallic coating is thus split up into a fine grating. The metal part forms the electrodes, whilst the gaps are bridged over by the selenium crystals laid in parallel. Generally the grating is arranged in two sections, the lines of one section meshing with the other like two interlocked combs. The grid so formed is then embedded in paraffin wax and a battery connected across the two sets of electrodes.

M. L.

In the Land of the Four-volters

JOTTINGS FROM MY LOG

By JAY COOTE

WHEN, on the Saturday night, through the B.B.C. relay, I listened to a concert broadcast from the Ostend Kursaal, little did I think that two nights later I should be seated, with some other thousand or more "Britishers," in that same concert-hall; but the Belgian coast tempted me again as a holiday centre. If through your loud-speaker you have heard a good entertainment it is always interesting to trace it to its source, for any further broadcasts you may pick up in the future from the same origin will take on an enchanted charm.

I had sworn to abjure radio, yet within an hour of my arrival I might have been found wandering down the High Street—or whatever its name may be—taking the usual amount of interest in every wireless receiver or component exhibited in the shop windows. "If there is one thing I cannot resist it is temptation," and to it I succumb wherever a "set" was in action.

Belgium, as are most of the Continental countries, is a land of four-volters; one sees but few six-volt valves or accumulators, and even fewer two-volters. Of the dozen or so receivers to which I listened in the course of a few days I found but two which might have been considered "fair" in Great Britain. It was not that they were not selective; it was not that they failed in volume or power; simply that the quality of reproduction was very poor. On the coast, curiously enough, interference from morse was not too persistent; at times it was bad, but the periods usually coincided with the departure or arrival of the mail steamers at Ostend or Flushing. The French coastal stations, with their flat tuning and jarring spark, worried me less than they do in London.

The small two- or three-valve receiver is not popular in Belgium, for the fan must "reach out." He possesses but one local station (Radio Belgique), and until its broadcasts are regularly made on higher power the transmissions are disappointing in many parts of the country. Generally speaking, on this side the average listener turns to Daventry 5XX or Radio Paris; although, personally, I found that Zeesen, Motala, Warsaw, Kalundborg, and many others provided excellent signals. The English broadcasts are great favourites, for the main reason that, owing to the annual summer invasion via Dover and Harwich, most Belgians on this coast have become fluent in our language.

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
		GREAT BRITAIN	
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.2
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	17.0
*1,554	193	Daventry (5XX)	25.0
		AUSTRIA	
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	5.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
		BELGIUM	
235	1,276	Charleroy (LL)	0.25
246.1	1,218.8	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,071	Liége	0.5
*509	590	Brussels	1.0
		CZECHO-SLOVAKIA	
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava (Feriby)	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
		DENMARK	
*281	1,067	Copenhagen (Kjobenhavn)	1.0
1,153	260	Kalundborg	7.5
		ESTHONIA	
*297	1,010	Reval (Tallinn)	2.0
		FINLAND	
*221	1,355	Helsingfors	0.8
*1,796	167	Lahti	40.0
		FRANCE	
170	1,750	St. Quentin	0.25
220	1,364	Fécamp	0.5
220	1,364	Béziers	0.1
237	1,265	Juan-les-Pins	0.4
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
*255	1,175	Toulouse (PTT)	1.0
*265	1,130	Lille (PTT)	0.8
*276	1,087	Rennes (PTT)	1.0
*286		Montpelier (PTT)	1.5
292	1,028	Radio Lyons	1.5
*294	1,020	Limoges (PTT)	0.5
*302.9	990.4	Bordeaux (PTT)	0.5
304	986	Casablanca	2.5
307	965	Agen	0.3
301	970	Radio Vitus	2.0
*310	950	Marseilles (PTT)	0.5
329	914	Grenoble (PTT)	1.5
336	892	Petit Parisien	0.5
346	869	Strasbourg	0.3
366	819.5	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	0.0
411	729	Radio Maroc Rabat)	2.0
436	687	Radio Flandre (Lille)	0.5
447	671	Paris (Ecole Sup. PTT)	0.7
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
*1,460	205.4	Eiffel Tower	8.0
*1,725	174	Radio Paris	8.0
		GERMANY	
*218	1,373	Flensburg	1.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	4.0
*239	1,256	Nurnberg	4.0
*246	1,220	Kiel	0.7
*246	1,220	Cassel	0.7
*253	1,184	Breslau	4.0
*250	1,157	Leipzig	4.0
*270	1,113	Kaiserslautern	1.5
*276	1,085	Koenigsberg	4.0
*283	1,058	Magdeburg	0.7
*283	1,058	Berlin (E.)	0.7
*283	1,058	Stettin	0.7
*319	941	Dresden	0.75
*325	923	Gleiwitz	6.0
*333	887	Bremen	0.75
*360	833	Stuttgart	4.0
*372	806	Hamburg	4.0
*390	770	Frankfurt	4.0
*418	716	Berlin	4.0
*453	662	Danzig	0.75
*456	657	Aachen	0.75
*473	635	Langenberg	25.0
*533	563	Munich	4.0
*560	536	Augsburg	0.5
*560	536	Hanover	0.7
*569.2	527	Freiburg	0.7
*1,635	183.5	Zeesen	20.0
2,100 / 2,290	142 / 131	Norddeich	10.0
		GRAND DUCHY	
1,220	246	Luxembourg	2
		HOLLAND	
31.4	9,554	Eindhoven (PCT)	25.0
*300	1,000	Huizen via Hilversum aerial (until 5.40 p.m. B.S.T.)	5.0
*1,070	280	Huizen via Hilversum aerial (after 5.40 p.m. B.S.T.)	5.0
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Hilversum via Huizen aerial (AVRO)	5.0
		HUNGARY	
*550	545	Budapest	15.0
		ICELAND	
*1,200	250	Reykjavik	1.0
		IRISH FREE STATE	
*225	1,337	Cork (1FS)	1.5
*413	725	Dublin (2RN)	1.5
		ITALY	
*274	1,094	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	3.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
		YUGOSLAVIA	
*307	977	Zagreb (Agram)	1.25
*431	694	Belgrade	2.5
		LATVIA	
*525	572	Riga	4.0
		LITHUANIA	
*1,935	155	Kovno	7.0
		NORWAY	
*283	1,058	Notodden	0.7
*365	820	Bergen	1.0
*394	761	Frederiksstad	1.0
445	674	Rjukan	1.0
453	662	Tromsoe	1.0
453	662	Aalesund	1.0
453	662	Porsgrund	1.0
*493	608	Oslo	1.5
		POLAND	
*313	959	Cracow	1.5
*335	896	Posen	1.5
385	779	Wilno	1.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	10.0
		ROUMANIA	
*394	761	Bucharest	2.0
		RUSSIA	
*351	855.5	Leningrad	10.0
*427	702.5	Kharkov (NKO)	5.0
*483	621.5	Homel	2.0
*825	364	Moscow (PTT)	25.5
1,060	283	Tiflis	1.0
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	5.0
		SPAIN	
251	1,193	Almeria (EAJ18)	1.0
*268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	0.5
402	746	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	3.0
453	662	Salamanca (EAJ22)	0.5
		SWEDEN	
231	1,301	Malmo	0.5
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.4
*322	932	Goeteborg	6.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	1.0
*770	389	Ostersund	2.0
1,200	250	Boden	2.0
*1,348	222.5	Motala	30.0
		SWITZERLAND	
*403	743	Berne	1.0
*459	653	Zurich	0.6
680	442	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
		TURKEY	
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

BLUEPRINTS

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of all these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

All Post Free

CRYSTAL SET (6d. each)

A Daventry-Local Crystal Set	AW185

ONE-VALVE SETS (1s. each)

Beginner's One-valver	AW140
Reinartz One	WM127
The A.1	WM153

TWO-VALVE SETS (1s. each)

East to West Short-wave Two (D, Trans)	AW159
Beginner's Two (D, Trans)	AW171
1929 Favourite Two (D, Trans)	AW186
Loud-speaker America Two	AW190
Talisman Two (D, Trans)	AW194
Hyper-selective Two (D, Pentode)	AW198
Key-to-the-Ether Two (D, Trans)	WM107
Meteor Two (D, Trans)	WM114
Clipper Two (D, Trans)	WM135
Twinflex (Reflex)	WM138
Continental Two (D, Trans)	WM143
Stay-put Two (All-AC, D, Trans)	WM155
Ether Ranger (D, Trans)	WM156

THREE-VALVE SETS (1s. each)

All-Britain Three (H.F., D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Listener's Three (HF, D, Trans), price 4d., free with copy of "AW"	AW169
The Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
1929 Favourite Three (D, RC, Trans)	AW179
Local and Continental Three (HF, D, Trans or D, RC, Trans)	AW189
Broadcast Three (SG, D, Trans)	AW192
James dual-range Three (HF, D, Trans)	AW196
All-wave Screen-grid Three (HF, D, Trans)	WM110
Standard Coil Three (HF, D, Trans)	WM117
Wide-world Short-waver (SG, D, Trans)	WM120
New Year Three (SG, D, Pentode)	WM123
The Q3 (D, RC, Trans)	WM124
Lodestone Three (HF, D, Trans)	WM129
Simple Screen Three (HF, D, Trans)	WM131
Dynamic Three (SG, D, Trans)	WM136
At Home Three (D, 2RC)	WM141
Short-Wave Link (D, RC, Trans)	WM142
Binowave S.G. Three (SG, D, Trans)	WM152
Fanfare (D, 2 Trans)	WM157

FOUR-VALVE SETS (1s. 6d. each)

Overseas Short-waver (HF, D, 2 Trans)	AW133
Touchstone (HF, D, RC, Trans)	WM109
Binowave Four (SG, D, RC, Trans)	WM119
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
The Drum Major (HF, D, RC, Trans)	WM137
Music Player (HF, D, RC, Trans)	WM144
Arrow (SG, HF, D, Trans)	WM154

FIVE-VALVE SETS (1s. 6d. each)

Fidelity Five (HF, D, 2RC)	WM130
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146

SIX-VALVE SETS (1s. 6d. each)

Short-wave Super-6 (Super-het, Trans)	AW671
Eagle Six (3 HF, D, RC, Trans)	WM106

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Searcher Unit (HF)	AW176
Gramophone Amplifier (3 v.)	AW187
Signal Booster (HF Unit)	WM128
Auditrol Amplifier	WM132

MISCELLANEOUS (1s. each)

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Arcadian Linen-diaphragm Loud-speaker (Full-size)	AW177A
D.C. Unit (HT)	AW178
Short-wave Adaptor (1 v.)	AW183
High-tension Battery Charger	AW191
Mains Unit for S 8 Valves	AW193
Scratch filter (6d.)	AW195
Simplest H.T. Unit (1/-)	AW197
Universal Short-wave Adaptor	WM82
H.T. Unit for A.C. Mains	WM125
Lodestone Loud-speaker	WM126
James H.T. Unit for D.C. Mains	WM133
Short-wave Adaptor for Dominions Five	WM140
Two Ampere Low-tension Unit	WM147
A.C. Mains Amplifier	WM149
A.C. Mains Unit for All-wave Lodestone Five	WM151

PORTABLE SETS

Arcadian Portable (SG, D, 2 Trans) with linen-diaphragm loud-speaker (half scale)	AW177	1/6
£5.5.0 Portable (D. Trans)	AW181	1/6
Talisman Portable (SG, D, 2 Trans)	AW184	1/6
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Wayfarer Portable (Super-het)	WM139	1/6
1929 Chummy (SG, D, Trans, RC)	WM145	1/6
Picnic Portable (D, RC, Trans)	WM148	1/-
Enchanter Portable (2HF, D, RC, Trans)	WM150	1/6

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AMATEUR WIRELESS 58-61 FETTER LANE LONDON E.C.4

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Sept. 2 A vaudeville programme.
" 3 A. J. Alan—"The Dinner Club."
" 4 The Scottish Command Tattoo, S.B. from Edinburgh.
" 5 Queen's Hall promenade concert—British composers.
" 7 Running commentary on the Schneider Cup seaplane race.

DAVENTRY EXPERIMENTAL (5GB)

Sept. 2 Queen's Hall promenade concert—Wagner.
" 4 Queen's Hall promenade concert—Brahms.
" 5 A programme of selections from the musical comedies.
" 7 The Roosters Concert Party.

NEWCASTLE

" 6 Recital on New Zealand War Memorial Carillon.

GLASGOW

" 7 A Scottish concert.

BELFAST

Sept. 7 Running commentary on the Ulster Grand Prix motor race.

Marconiphone Portable—In the test report of this product of the Marconiphone Co., Ltd., we stated that the H.T. current consumption was 23 milliamperes, whereas the measured consumption is actually less than nine milliamperes. For economy of working this low figure is entirely satisfactory.

To install and operate a radio receiver in El Salvador, Central America, costs from £5 to £6 for the first year and £3 12s. 6d. for subsequent years.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

"PRACTICAL COIL MAKING"

(*Continued from page* 229)

is comparable with the diameter of the actual wire, which is, incidentally, much more expensive per pound than the thicker wire so commonly used in medium-wave

A winding device may be improvised.

coils. When enamelled wire is used it is necessary to take care there are no bare places in the wire, as one or two short-circuited turns would affect the tuning range of the coil and its resistance.

The wire must be handled with care. Fine wire twists and kinks easily, and may therefore break. The bobbin of wire should therefore be held loosely, so that the wire is not strained when winding.

Winding Spaces

The table gives the actual length of the windings, and it is therefore necessary to employ formers of greater length in order to allow for an additional reaction or aerial winding and also for fixing. An aerial winding will have, as a rule, from one-third to one-fifth as many turns of the same gauge of wire as the main coil and the reaction winding will have slightly fewer turns. Much depends, of course, on the detector valve used, but these values may be tried. The adjustable reaction con-

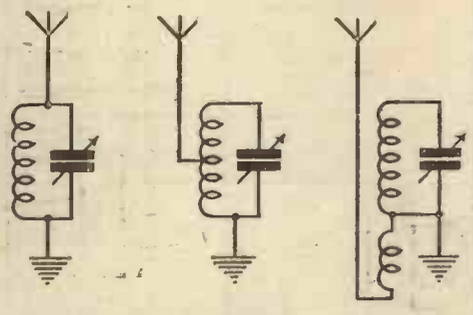

Fig. 1. Method A should not be used. In B the coil is tapped and in C separate active winding is employed

denser ought to have a capacity of from .0003 to .0005 microfarad.

Single-layer long-wave coils are quite inexpensive and will be found as good as many commercial multi-layer coils. Four inches is probably as large in diameter as one could conveniently use, and I would suggest that those who have never used a coil of this size should try one, when they would probably be surprised at its effectiveness. Do not forget to join the aerial to a point on the coil. If the aerial is an outdoor one, a tap may be tried at one-quarter or one-fifth the length of the coil

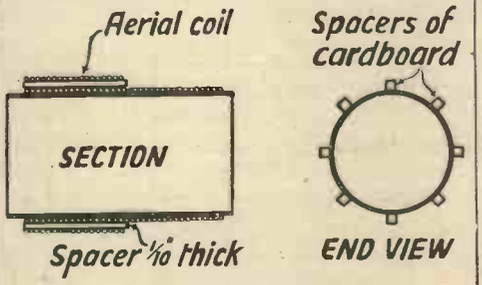

Fig. 2. Method of coupling an aerial or primary winding

from the end joined to earth or, alternatively, a separate winding having one-fifth as many turns as the main coil may be used. The separate aerial coil may commence about ¼ in from the earthed end of the main coil.

Figures from the United States Department of Commerce show that there are 83 radio receivers for every 1,000 persons in the United States, 63 in Denmark, 60 in Sweden, 56 in Great Britain, and 52 in Australia and Argentina.

OUR BLUEPRINT SERVICE

Constructors of receivers described in this Journal should make full use of our Blueprint Service and avoid all risk of failure.

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