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Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XIV. No. 364 Saturday, June 1, 1929

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

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FOR SAFETY

AND LONG LIFE

1. *The double length Cossor filament famed for its colossal emission. Note the seonite bridge holding it rigidly in position.*

2. *Around the two stout grid supports is wound the first grid, electrically welded at twenty-five points.*

3. *Note the strength and rigidity of the screen. Built on four stout supports, and anchored to seonite insulator.*

4. *Finally, observe the construction of the anode. Two rectangular nickel plates are used ribbed for greater rigidity.*

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BRITAIN'S STRONGEST AND MOST DEPENDABLE SCREENED GRID VALVE

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JUNE 1 1929 No 364. Vol. XIV

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

The Election: Latest!—More Nightingales—The Cenotaph Service—The T.T.—Talking from a Train—The B.B.C. Baton—Short Waves from Poo

The Election: Latest—At the time of going to press we learn that the arrangements for the broadcasting of election results have been revised, and the B.B.C. has decided to keep all stations open until four o'clock to-morrow morning, Friday. In addition to broadcasting the results as they are received a summary will be given of the state of the parties every half-hour.

More Nightingales—At the time of writing, the B.B.C. engineers are making new attempts to relay the song of the nightingale from the upper reaches of the Thames. Attempts are being made to capture the song of the birds between approximately 10.30 p.m. and midnight. One is rather tempted to ask why this stale "O.B." has been repeated, for we have had it for some years now and it can hardly be classed as a surprise item.

The "bones" of the new 2LO. Some of the massive steel girders which are being used for the aerial masts arriving at Potter's Bar.

The Cenotaph Service—The microphone arrangements for the recent British Legion Memorial Service, relayed from the Cenotaph, were exactly the same as those employed for last year's Armistice Day Service. The B.B.C. engineers, in conjunction with the Post Office, have arranged special "pot-heads" at convenient points near the Cenotaph and, thanks to a conveniently situated tree, the microphones themselves are practically invisible.

Embarrassing!—When Mr. Frank Titterton, who took the name part in *The Juggler of Notre Dame*, appeared at Harrogate recently, he had a very embarrassing experience. He had just left the platform after singing "Your tiny hand is frozen," when a lady, overcome with emotion, rushed up, flung her arms round his neck and kissed him! The microphone and the privacy of the broadcasting studio prevent such exhibitions of emotion!

Talking from a Train—Recently in AMATEUR WIRELESS was described the Canadian National Railway's system of picking up broadcast programmes on moving trains, for the entertainment of travellers. Now the C.N.R. has gone a step further and by fitting a telephony transmitter to a fast "Limited" running between Montreal and Toronto, two-way communication is possible at 40 m.p.h. The transmitter is being standardised, for it is hoped that business men will be able to make sufficient use of the radio phone service to make the cost worth while.

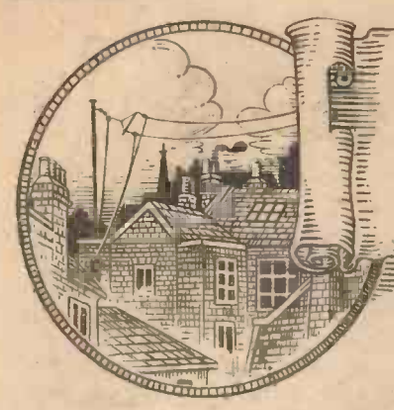
The B.B.C. Baton—Who is to succeed Mr. Percy Pitt, who is retiring at the end of the year, as Musical Director of the B.B.C.? There is no doubt but that such a position as this will make the lucky successor virtually the chief of the British musical world. There are rumours that Adrian Boult, who is a man of vast musical experience, is to take up the B.B.C. baton. He has been at Covent Garden, and has conducted every orchestra in the country. If the rumour is true then the B.B.C. will have found a worthy successor.

£100 for 25 Minutes!—Desly's and Clark, the well-known broadcast entertainers, are the first two cabaret entertainers who have come to England and opened up their own night club. They have just secured, through their broadcasts in this country, a contract to broadcast in America for a well-known trading concern at £100 for twenty-five minutes a week over a period of five weeks. This is some argument in favour of microphone anonymity!

The T.T.—Despite the popularity of dirt-track racing, the T.T. race in the Isle of Man is still one of the most prominent events in the motor-cycling world. In previous years it has not been possible for the B.B.C. to co-operate with the organisers, but this year the Senior T.T. race will be described by "Ixion," the well-known motoring journalist, in an eye-witness account which will be relayed from Liverpool to 2LO on June 14.

Short Waves from Poo—Fernando Poo is a Spanish colony in equatorial Africa and has come to the fore recently because it has given one more use for ultra-short-wave working. It was found that medium and long wavelengths would not maintain direct contact between Poo and the Spanish Government in Madrid. The Marconi Co. came forward with short-wave apparatus, after showing that the geographical position was not ideal for long waves.

PRINCIPAL CONTENTS



The "Talisman Portable"

ON AN OUTSIDE AERIAL

AS is the case with all receivers that have become favourites with our readers, we have been inundated with letters requesting information concerning slight modifications in the "Talisman Portable" which constructors would like to incorporate.

This picture shows how the aerial is connected

With this set the changes suggested have been very few. The most outstanding suggestion that has been put forward is that of being able to use an external aerial with the receiver. This, of course, is quite practicable, and will be of great advantage to those who, residing some distance from a main broadcasting station, wish to avail themselves of all the power they can obtain from the more distant stations.

As stated in the test report of the receiver, many of the more distant stations, especially those on the Continent, suffer from fading, and if an outdoor aerial can be used much trouble of this nature can be obviated.

Now the method of using an outdoor aerial is extremely simple, and really there is no need for an earth connection even though a large outdoor aerial be used.

Aerial Connections

Reference to the diagram will make quite clear the connection needed for an outdoor aerial. Connect the lead-in wire from the external aerial to one terminal of a .0001-microfarad fixed condenser and join the other terminal of this condenser to the terminal marked c, which is one of the frame aerial terminals, on the loud-speaker grille.

Should it be desired to use an external earth in addition to the external aerial, then the simplest way of connecting this to the set is to join the earth wire direct to the negative terminal of the low-tension accumulator.

A number of intending constructors have also suggested using an upright type of cabinet. It may be said at once that there is nothing against the use of such a cabinet, but it is essential that the frame aerial be wound round the inside of the front door of the cabinet and not completely round the main part of the cabinet, and incidentally around the receiver. If the frame aerial is wound completely round the receiving apparatus then there is every likelihood of direct interaction between the frame and the H.F. circuit of the receiver which will result in instability.

As far as possible, constructors should adhere to the original design in so far as measurements and components are concerned. If radical changes are made, then a certain amount of individual experimenting must necessarily follow.

Some letters have been received regarding the use of larger capacity H.T. batteries, and a few readers have asked whether the receiver can be used with a mains supply unit.

In each case the answer is: The suggestion is practicable, but to carry either into effect means using a larger cabinet and making the set a purely house type of receiver.

WIRED WIRELESS

IN wired-wireless systems a high-frequency carrier current is modulated with several different messages simultaneously and is then fed into a distributing wire. At the receiving end the messages are separated out by different filters, each tuned to the particular sub-carrier frequency used in modulation. In this manner a single wire can be used to distribute a number of messages simultaneously and without mutual interference.

It has recently been found possible to use the same line wire both for ordinary telephony and for wired-wireless messages. In the ordinary way this is not feasible, because in order to render the line suitable for carrying a modulated carrier wave it must be loaded, or pupinized, beyond the point at which it will carry voice currents without distortion. However, by using a comparatively lightly pupinised wire and eliminating the side bands of the carrier-wave messages before feeding them into the line, a compromise is effected, whereby the same telephone line can be employed to transmit both ordinary speech and one or more carrier-wave signals at the same time.

M. B.

The Russian Government has purchased the largest high-voltage rectifier ever constructed for radio purposes, according to the Radio Corporation of America. The rectifier which is now nearing completion at the laboratories of the General Electric Company in Schenectady, is capable of a power output of 750 kilowatts at 15,000 volts. It contains eighteen mercury-vapour rectifier tubes.

ELIMINATOR GRID-BIAS

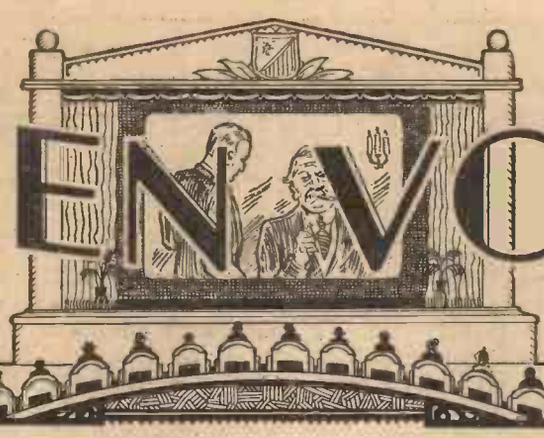
ALTHOUGH there are several systems now available for obtaining the necessary grid-biasing voltages direct from the mains, as a derivative of the H.T. supply, the game is not always worth the candle. Grid-biasing batteries are comparatively cheap to install in the first instance and should be long-lived if the set is properly adjusted.

On the other hand, it is difficult enough to avoid "motor-boating" and similar trouble even when the tappings from the eliminator are reduced to a minimum. The more complications introduced into the eliminator circuits the less likely is the system to run smoothly. Once any unbalance or hum appears it is usually a long and troublesome job to put matters right again.

M. A. L.

SCREEN VOICES

A BRIEF REVIEW OF THE VARIOUS "TALKIE" SYSTEMS

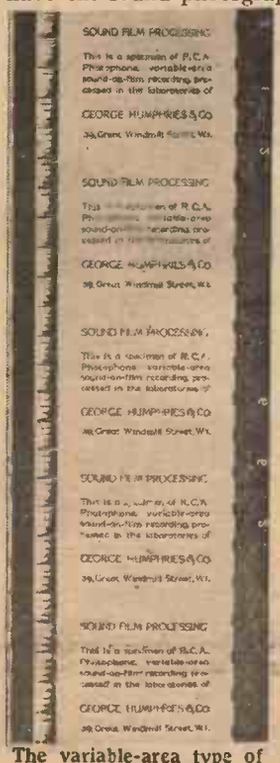


By BAYNHAM HONRI

"TALKIES" are booming! In more senses than one, they are booming in nearly two hundred cinemas in this country and two thousand in America. The lisping voices of heroines and booming chest tones of villains are reverberating over the empty orchestra pits of these enterprising places of entertainment. Cinema exhibitors and producers have become aware of the fact that the "talkies" have come to stay, and are making a fine harvest out of the initial "novelty" boom. The uncertainty of six months ago has gone; they're all in it now, so that they'll see that it is no nine days' wonder. And having made this decision, developments, both commercial and technical, have gone ahead in a most extraordinary manner.

Commercial

A year ago there were about twenty-five different talking picture systems available. Some used gramophone discs synchronised with the movie film, others preferred to have the sound photographed on the edge of the film, and a few odd systems used separate sound films, magnetised wires, and other "gadgets." Disc systems were re-divided into groups using records commencing in the middle, at the outside, turning at 33 revolutions a minute, turning at 78 revolutions, and discs of different diameters. Similarly, sound-on-film systems were divided up into individual variations in the width of sound track, type of photographic recording, distance of sound recording before or after the corresponding movie picture frame, and so on. There was, in fact, no standard in the way in which the sound and speech was synchronised with the picture.



The variable-area type of sound film

"Kommerce!"

The situation was aggravated by the attitude of certain of the apparatus manufacturers to the question of interchangeability. If it so happened that a film made on "B's" process could be run on the "A" make of apparatus, "A" would probably object to such use being made of his machines. In the same way, "A" objected to the projection of his films on "B's" apparatus. Questions of which was the best system were made secondary to the all-important problem of which system offered the largest range of film subjects. Important tie-ups between the Western Electric Company and three or four of the leading American producing firms gave that system a good "send off." Both discs and sound-on-film type of recording were available to producers who used this system, and in the first instance the gramophone record type of synchronisation achieved the greatest popularity. Next came the R.C.A. Photophone, a sound-on-film system developed by the Radio Corporation of America. This gave very fine quality, but it was several months behind the Western Electric in the matter of commercial tie-ups. British Talking Pictures, a sound-on-film system not unlike the Western Electric Movietone, made great technical progress and standardised its type of recording so that its films could be run on Western Electric or R.C.A. projectors. Klangfilm-Tobis, a union of German electrical concerns, stepped into the fray with three types of synchronised sound films, but eventually abandoned the disc and concentrated on one of its sound-on-film processes.

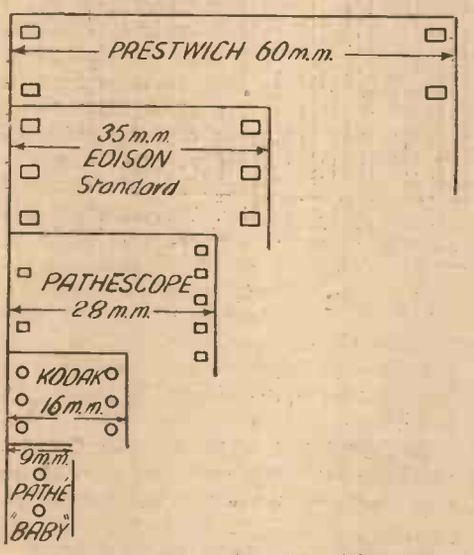


Diagram showing various sizes of film that have been used

Musical Ranges

One result of this commercial battle has been that many of the leading cinemas have installed apparatus which is possibly not the best, but which has available to it the largest number of films. On the recording side, methods have become more or less standardised and great progress is being made. On the British Talking Pictures process, for instance, frequencies of the order of 17,000 cycles have been recorded on the sound negative, though the highest frequency that has been printed on a positive film, for showing at the cinemas, has been about 12,000 cycles. There is no difficulty in recording bass notes fully. Unfortunately, owing to the lag of the photo-electric cell, the highest frequency that can at present be reproduced

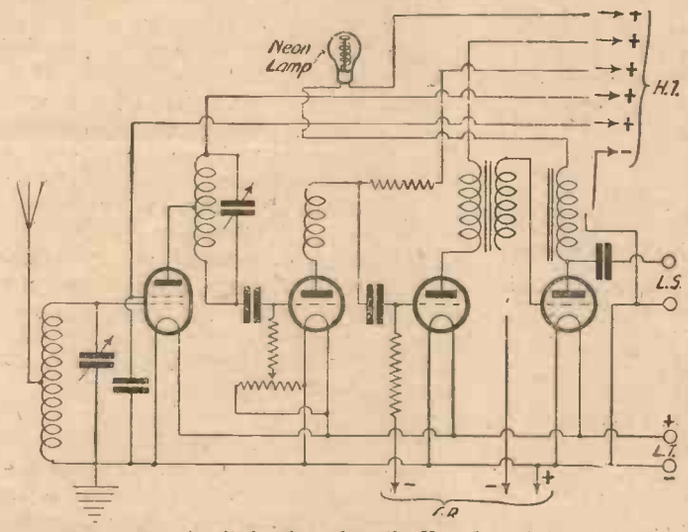
(*Continued at foot of next page*)

The variable-density type of sound film

AN INEXPENSIVE DISTORTION DETECTOR

An Article Showing How a Neon Lamp will take the place of a Milliammeter

THERE are probably many amateurs who do not feel inclined to incur the expense of a milliammeter, but who would welcome an inexpensive method of detecting fluctuations in anode current, so that the correct amount of grid bias could be given to the power valve to ensure undistorted reproduction.



Four-valve circuit showing where the Neon lamp is inserted

Those who use a mains battery eliminator for their H.T. supply can obtain this information by connecting an Osglim or similar glow-discharge lamp across the H.T. supply to the power valve. Suitable lamps can be obtained from any dealer in electrical supplies for about half a crown.

The suggested arrangement has three important advantages. In the first place, it forms a good protection for the condensers in the smoothing system of the eliminator. If the voltage rises for any reason above 160 volts (due, for example, to a sudden rush of current when switching on) the Osglim lamp strikes and prevents the voltage across the condensers from rising to a value sufficiently high to puncture the insulation.

In the second place, the arrangement can give a useful guide to the voltage being delivered by the eliminator. The striking voltage of the lamp is somewhat uncertain, as it depends on the conducting state at the moment the voltage is applied, but it can be assumed that the extinction voltage has a sharply defined value about 150 volts.

In the third place, by adjusting the filament current of the rectifying valve or by adjusting a well-insulated resistance in the primary of the H.T. transformer so that the "glow" in the lamp covers rather less than half of the area of the electrodes, the visible glow becomes very sensitive to changes of voltage. Thus, if the grid bias of the power valve is not correctly adjusted, or if the received signal is so great that the straight line portion of the power valve characteristic is departed from—in other words, if distortion is present—then the average anode current (which should remain constant for good quality reception) fluctuates in value, and gives rise to corresponding fluctuations in the visible glow of the lamp.

In one respect this method has an advantage over the more usual method of inserting a milliammeter in the plate circuit of the power valve, because the lamp is capable of responding to fluctuations at least as rapidly as the eye can follow, whereas the moving coil of the milliammeter must remain somewhat sluggish if the desired sensitiveness is to be obtained.

Many experimenters will no doubt make this inexpensive addition to their sets in view of the important advantages to be obtained.

The whole north of Canada is now linked up with a regular chain of wireless stations. So efficient is the service that a message can be sent from Ottawa to the vicinity of Coronation Gulf and a reply received in one day.

"SCREEN VOICES"

(*Continued from the preceding page*)

on the British Talking Picture system and most of the others is in the region of 5,000 to 6,000 cycles. So that the R.C.A. Photophone process, which has a very even "curve" from 0 to 8,000 cycles, with a fairly quick drop in response above this range, is at no disadvantage at the present stage of the development of talking picture reproducers. As a matter of fact, a reproduction range of 50 to 8,000 cycles is all that is required, and very little is missed if the audible region above is missing. Few people can hear 10,000 cycles, and still fewer 12,000.

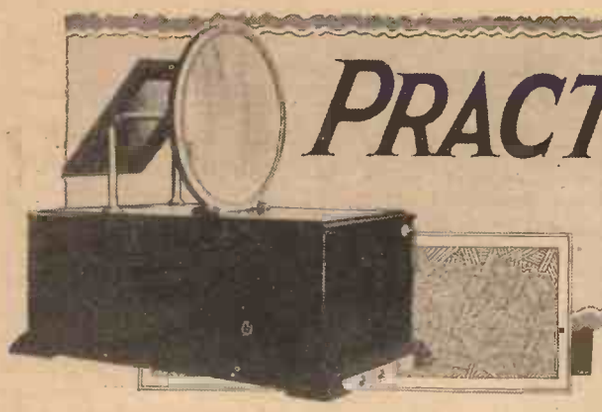
The Future

The sudden development of the film industry will not stop at the evolution of sound pictures. Stereoscopy and colour will be added, with two sound tracks which will operate separate banks of loud-speakers on each side of the screen. In order that all these developments can be carried out, the film will have to be widened. Experiments are now being carried out in America with a film 75 mm. in width, as against the present standard width of 35 mm. and the amateur sub-standards of 16 mm. (Kodak) and 9 mm. (Pathé). Film widths of 60 mm. and thereabouts were used by several pioneer film firms thirty years ago, notably Demeny, American Mutascope, and J. A. Prestwich. In those days cinema "showmen" used to carry different gauge sprockets and rollers which they could fit to their machines to take the various makes and sizes of film which were being supplied. It looks as though history is going to repeat itself!

Charles Higgins—an impression

Has any reader picked up a French transmission on a wavelength between those of Radio-Toulouse and Hamburg? The call, according to a correspondent, is "*Ici Radio Havre*," and it would appear to emanate from a small broadcasting station in that district.

Four groups of loud-speakers, installed on the roof of the main building at the Le Bourget Aerodrome, announce the approach of aeroplanes; the loud-speakers can be heard clearly in all directions three-quarters of a mile away.



PRACTICAL TELEVISION IN AMERICA

By JAMES W. GARSIDE (New York)

PRACTICAL television in America may be said to have made its initial bow to the American public on July 2, 1928, in the form of the so-called Jenkins "Radio-movies." Since that time, many other experimenters have placed television signals on the air. To date, the results have necessarily been crude, but there is unmistakable evidence of a widespread interest on the part of the American public in the development of this new art. It is estimated that, at the present time, there are upwards of twenty thousand amateurs co-operating with Mr. Jenkins and the other experimenters who are engaged in popularizing the idea of television or, to be more accurate, motion pictures through space.

C. Francis Jenkins, with his television transmitting apparatus

Mr. Jenkins earlier has made many notable contributions to the technical progress of cinematography, particularly in the direction of new and improved optical systems. Quite recently, he developed an ultra-speed camera, capable of exposing 3,200 pictures per second. He has also had success in the facsimile transmission of photographs, drawings, maps, sketches and printed matter, both by wire and by radio. His most notable achievement in this connection is the development of a system of broadcasting weather maps to ships at sea. This system was developed at the request of the United States Navy.

Since the inauguration of the radio-movie service on July 2, 1928, the Jenkins Radio-movies, as they are called, have gone on the air three evenings each week. In order that they may reach as many people as possible, broadcasts are made simultaneously on two wavelengths. A short-wave band has been set aside for the benefit of the long-distance "lookers-in," and a regular broadcast channel is employed for television enthusiasts of Washington and the vicinity.

Televising Films

Confronted with the difficulties involved in televising subjects directly, Mr. Jenkins conceived the idea of filming them under the ideal conditions of the motion-picture studio, and broadcasting the pictorial record thus obtained.

A subject, therefore, carefully preselected with a view to its availability for television broadcasting purposes is permanently recorded on a motion-picture film. From the master negative of this film, a positive print is made and this is placed in the transmitter. As the film moves through the gate it is bent sharply to produce a perfectly straight edge. A narrow pencil of light, sweeping laterally across the moving film at the point where it has been bent, scans each frame, line by line. This beam of light passes readily through the translucent film and falls upon a photo-electric cell which converts its varying gradations into a series of varying electrical impulses. These impulses are subsequently amplified and impressed on the carrier wave of a broadcast transmitter.

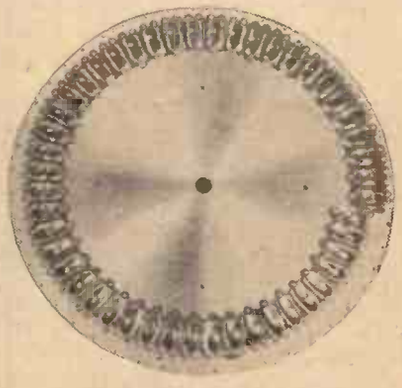
It is at the receiving end, however, that Mr. Jenkins has made his most notable contributions to the progress of the television art. Indeed, the Jenkins receiving system differs in everything but principle from the systems employed by other television workers.

In the Jenkins receiving system, the scanning disc has given way to the compact *scanning drum*, in the centre of which there is a neon lamp with four plates instead of the conventional one. It is known as a multiple target lamp. Each plate is so wired that it is flashed in rotation and in its proper turn, and each illuminates only its own particular fourth of the scanning drum.

The scanning drum incorporates still another refinement which has been developed by Mr. Jenkins. This takes the form of a number of quartz or special light-conducting rods which radiate, like the spokes of a wheel, from the glow plate to the inner rim of the scanning drum. This ingenious arrangement has enabled Mr. Jenkins to obtain a maximum use of the limited amount of light at his disposal. Quartz is an excellent conductor of light, and the rods guide it from the proximity of the glowing plates to the various holes in the scanning drum with a minimum of dissipation.

By means of an ingenious magnifying optical system whereby the glowing dots which weave the picture are reflected to an inclined mirror and thence to a powerful magnifying glass, Mr. Jenkins has increased the size of the television image to a point where it can be viewed by as many as a dozen persons at a time.

There are many advantages connected with recording the subjects permanently on a motion film; to mention one, the master negative can be made up into any desired number of positive prints, and these can be distributed over a wider area, and utilized by anyone equipped with a suitable transmitting device.



The Jenkins scanning disc

Notable progress has been made in the development of better amplifying methods, simplified means of effecting the requisite synchronisation between transmitting and receiving apparatus, improved detail, and

(*Continued at foot of next page*)

For the Newcomer to Wireless: ACCUMULATOR CAPACITIES

HOW long should my accumulator last at one charge?

That all depends on the capacity of the battery and on the current used for filament heating in your set.

The accumulator is labelled "40 A.H." and there is a small "I" in brackets after the "H." It doesn't look, though, nearly so big as that one of yours over there, which you told me the other day was a forty-ampere-hour.

From what you tell me I gather that you have been unwise enough to buy an accumulator of some unknown make.

I don't know how you came to that conclusion; but, as a matter of fact, you are right, for I bought this one as a great bargain the other day.

Sorry to disappoint you, but I am afraid that it may not be such a bargain after all.

What do you mean?

First of all your battery has a real capacity of only twenty ampere hours, that little "I" that you were talking about means that the reading on the label is "intermittent" and that the actual capacity is only half the figure given. First-class makers nowadays do not state the capacity in this way. They show the figures in actual ampere hours. I am afraid, though, that you will be disappointed and will not get a very long service life from a cheap battery.

I shall know better another time; but still, I must make the best of this one whilst I have it. How long should it work my set at one charge?

You have four valves, haven't you?

Yes. They are all of the "point one" type.

That means that the total filament current is .4 ampere. Divide that into twenty, the actual ampere hour capacity of your battery, and you get the number of hours' working that it should give at each charge, provided of course that it remains in decent condition.

That means that it should run the set for fifty hours?

Exactly, and if you use your set on an average three hours a night you can reckon that it will require a "refill" about once a fortnight.

I was thinking of installing a low-impedance output valve which is rated at .25 ampere for the filament. What difference would that make.

Then you will have three valves taking .1 ampere apiece and one drawing .25 ampere. The total becomes .55 ampere. Divide that into twenty and you get the answer.

I must have a scrap of paper for that. Let's see . . . it comes to thirty-six point something or other.

Then you can count on about thirty-six hours' working—say, eleven or twelve average days.

Do you consider twenty actual ampere hours a big enough capacity for my set?

In one way I do, for the current drain, whether it is .4 or .55 ampere, certainly should not do any harm even to a cheap accumulator. But the capacity is hardly a convenient or an economical one.

Why exactly?

Well, you will be making rather frequent visits to the charging station, won't you? And with a small accumulator like that there is always a chance that you will forget to have it refilled when it requires it and find it run down just when you want to use it.

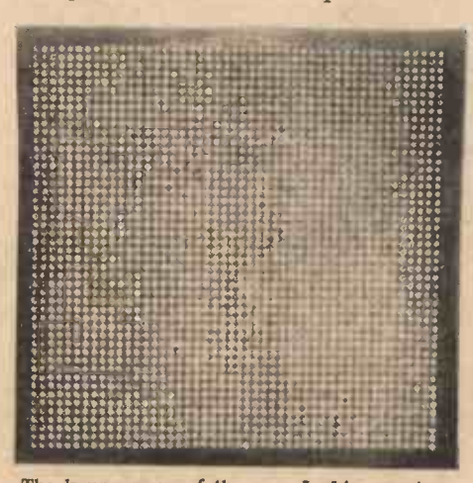
What is the best capacity?

The minimum economical capacity is that which will run the set for at least a month. You can work it out quite easily by taking the average number of hours that you use your set in a month and multiplying this figure by the total filament current. In your case three hours a day means roughly ninety hours a month, which multiplied by .4 gives 36—say, 40 actual ampere hours. With the output valve you spoke of the sum works out at 49.5 ampere hours and I should advise a sixty actual ampere-hour battery.

"PRACTICAL TELEVISION IN AMERICA" (Continued from preceding page)

refined optical systems which will enable the looker-in to view the television in broad daylight.

In order that the general public may be assured of an adequate television service, the Jenkins Television Corporation has

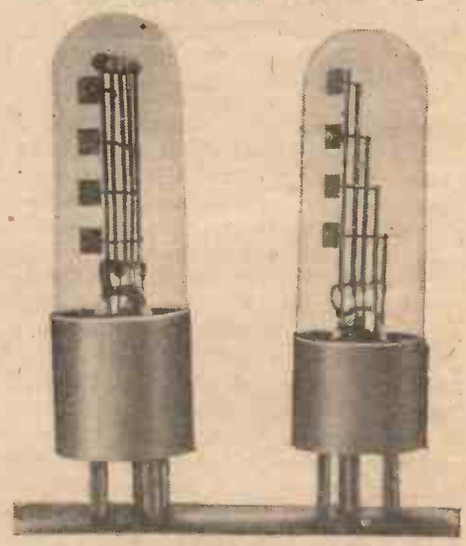


The lamp screen of the new Jenkins receiver

established two new television broadcasting stations which will co-operate with W3XK in providing programmes. One of these transmitters is located at Jersey City, and is sending out test programmes on a wavelength of 140 metres (2,100-2,200 kilocycles), with a power rating of 5 kilowatts. A second station is located in Montgomery County, Maryland, on a wavelength of 103 metres (2,850-2,950 kilocycles), also with a power rating of 5 kilowatts.

Mr. Jenkins is also working on a television camera, as he terms it, which employs the usual lens, focusing means, and, instead of the sensitive negative, a checkerboard pattern of light-sensitive cells. The detail that can be obtained is, obviously, determined by the number of light-sensitive cells employed for the checkerboard pattern. The image is focused by the lens on to the bank of light-sensitive cells, which interpret the varying degree of light into terms of electrical conduction. Each cell is connected to a segment of a large commutator, around which sweeps a contact arm driven by a motor.

At the receiving end we have the reverse process. The wire or radio signals are brought to a contact arm swinging around a large commutator, the segments of which are connected to successive lamps arranged in a checkerboard pattern. As the contact arm establishes contact to each lamp in



Multiple-target neon lamps used in the Jenkins receiver

turn, the lamp glows in accordance with the signal intensity at that moment, both receiver and transmitter being kept in perfect step.

On Your Wavelength!

Holiday Music

THOUSANDS of portable-set owners plodded their weary way through the countryside on Whit-Monday with their receivers in one hand and a packet of sandwiches in the other. At length, lunch-time drew near, and they sat down on the fresh, green grass for a little physical and mental refreshment; out came the sandwiches and on went the portable set. But the sounds that came from the loud-speaker were of a Bach organ recital from Southwark Cathedral! Now, I am all in favour of organ recitals, particularly when the time and mood happen to "synchronise" with the broadcasts. But in the middle of the day of the jolliest holiday of the year one is certainly not in the mood for this type of broadcast, particularly after having carried a none too light portable receiver for some distance. Organ recitals may fit in with the usual run of Mondays, associated with cold meat and pickles, the odour of soap, and the flapping of damp clothes in the breeze. But on a Bank Holiday the usual midday organ recital becomes something of a damp blanket itself.

Control

The problem of the balance and control of music seems to be as far away as ever from solution by the B.B.C. The "human element," so much advocated by the musical section of the B.B.C., frequently lays a heavy hand on the loud passages of music, reducing them to a volume which is actually less than that of the soft passages. This can actually be proved by measurement—an exceedingly interesting little experiment. If your loud-speaker has a choke-feed output circuit, connect a thermo-milliammeter in series with one of the loud-speaker leads. The range of the meter will necessarily depend on the power of the last stage of the amplifier, but for an average set it may have a maximum of 100 milliamps. If a moving-coil loud-speaker is being used, a milliammeter may be connected in series with the moving coil itself and the secondary of the usual twenty-five to one step-down transformer. In this case, a higher range instrument will be necessary and an ordinary hot-wire meter can be used. It must be remembered, however, that cheap low-range hot-wire milliammeters have a resistance in the neighbourhood of five or six ohms, and so the loud-speaker will not be working under normal output conditions. Nevertheless, comparative readings will be obtainable. Moving-coil and moving-iron milliammeters are, of course, useless for measuring output strength; some kind of thermal instrument is essential.

Making Measurements

The output thermal meter will not follow the "peaks" of current and there is quite an appreciable lag in its movements. Nevertheless, it gives a splendid indication of the mean current passing to the loud-speaker. One will quickly become accustomed to seeing, say, fifty indicated for speech, seventy for loud music, and twenty for soft. But when the control people go wrong at Savoy Hill the relative readings for what should be soft and loud music respectively will be practically the same, or in some cases the soft passages may even register a larger current. After taking note of the worst examples, you send your data to the B.B.C., who will be pleased to acknowledge it and assure you of their best attention at all times, etc.——

Automatic Control

Really, I think there is a very good case for some form of automatic volume control. The other day I was talking to a research engineer connected with one of the largest wireless companies, and he outlined to me an automatic control scheme which was something more than a mere "pretty idea." The amplifier following the microphone was divided into two sections, giving parallel but independent outputs. One of the outputs operated a control device for varying the strength of the second output. A special delay circuit on the second output lagged the music back so that the "controller" circuit operated just before changes in volume from the microphone, as heard at the end of the delay circuit. By this means the volume would be cut down slightly at the precise moment a loud note was played; not a moment before or after it. Further, the change of control would be almost instantaneous, infinitely quicker than turning a knob by hand, as is done with the manual method. The degree of correction could be adjusted so that the light and shade of music would not be lost. Control is, of course, essential, otherwise the light and shade of music become emphasised to a ridiculous degree.

A Simile

If there was not control of volume from the microphones at broadcasting stations the results would be comparable with an under-exposed photograph—a harsh affair of blacks and whites, with no half-tones. Full control would kill the blacks and the whites, resulting in a grey, flat result. Slight control reduces the extremes of light and shadow, and gives the full range of tones and gradations, from black to white—the perfectly exposed photograph.

What of the Regional Scheme?

The air is filled with rumours at the present time regarding the future of the regional scheme. The first man you meet tells you that he has it on the best authority that it is going forward in full. Man number two has equally good grounds for assuring you that big modifications are being introduced, whilst number three knows for certain that the whole blessed show has been scrapped. The position, so far as one can make out, is that the new 2LO at Brookmans Park will certainly be put into operation this summer, conducting single-wavelength broadcasting—at any rate, to begin with. If this is a success, then something may be done with regard to other regional stations; if it is not, then the whole programme may be "revised" out of existence. Readers may remember that I have never been an enthusiastic supporter of the regional scheme, for it seems to me to have been thought out on entirely wrong lines. It caters primarily for the crystal user, and the crystal user will in a few years' time be as extinct as the dodo.

High-power broadcasting at short range does not give the man with a good valve set a real chance of obtaining reproduction of the highest quality. There is no question that the best quality is obtainable from medium-powered stations. I maintain that instead of increasing the number of alternative programmes available to the man with an efficient valve receiving set, the regional scheme will reduce it, since with ten 25-kilowatt broadcasts taking place in these islands on wavelengths between 250 and 500 metres none but an ultra-selective receiving set will be able to receive foreign stations. I have a strong feeling myself that the scheme will not go forward in its entirety and that changes in the personnel of the B.B.C. high command may be responsible for quite a new programme.

How Not to Do It

In these days, when so much is said and written about the art of salesmanship, I am often astonished at the way in which business is carried on. Here is an interesting example. Some days ago a friend of mine who knows nothing whatever about wireless decided to instal a set. He visited the radio department of a big store, whose manager offered to send two sets down on approval so that he might determine by trial whether a three-valver or a four-valver would be the more suitable. Both were of the self-contained type, with the batteries contained in the cabinet. All, therefore, that had to be done was to connect up aerial and earth, switch on, and

On Your Wavelength! (continued)

twiddle the dials until sounds were heard. Each set was sent down complete with valves, batteries, and so on. . . . "T-r-r-r-r-ring!" went my telephone bell. "I have got two sets down on approval and I can't make either of them work. Could you spare a minute or two?" I could. I did. There was no doubt about it that set number one was completely silent, whilst set number two would do nothing but howl.

The Reasons Why

I never go out to render radio first-aid without taking with me a little instrument which measures volts and amperes and milliamperes. On applying the milliammeter part of the H.T. negative lead of the silent set I found that the total current passing through four valves was exactly half a milliampere! The voltmeter showed that the accumulator was not *exactly* up to the mark, the E.M.F. being 1 volt per cell. This explained the silence right enough, but there was more. On applying the voltmeter to the H.T.B. I found that of its original 99 volts only 60 or so remained. The set had obviously been used for demonstration purposes, and had been sent out to a prospective purchaser with a run-down accumulator and an H.T.B. on its last legs. I did not investigate the cause of set number two's misbehaviour, for to get at the disconnection, which obviously existed, would have meant pulling the thing to pieces. Needless to say, both sets have gone back and a deal has not taken place with that particular store. A silly business.

When Thermion Advises

"Do you advise me to buy a portable set?" is a question that I am always being asked, and probably one that heaps of readers are asking themselves and other people. The reply that I generally give is this: By all means, buy a portable so long as you don't intend it to be your only wireless set. There is nothing handier or more altogether delightful for outdoor use or for occasional use in rooms of the house, which are not equipped for loud-speaker reception from a stationary set, than the portable. It does, in fact, pay for itself over and over again in the pleasure that it gives.

Don't Expect Too Much

But one must not expect too much from the portable. No one has yet discovered a really satisfactory method of squeezing a quart into a pint pot, and you can't put into an affair about as large as a fat attaché case all the bits and pieces that are required for real quality reproduction of good music. I don't mean to say that portables give poor quality; they don't. In fact, the reproduction obtained with the best of them is astonishingly good. But the stationary set, with its bigger bulk and greater weight, must always be just a little bit better. And there is the further point that a portable is distinctly more expensive to run than a stationary set if used regularly for the reception of broadcast programmes. For economical working you must get your H.T. either from the mains or from big batteries. People are apt to forget that no small battery can stand up for long to the current drain imposed by four or five valves.

DX Conditions

Right up to Whitsuntide long-distance conditions on all wavelengths continued to be extraordinarily good; the effects of the coming of summer were hardly noticeable, and one could obtain first-rate loud-speaker reception from dozens of home and Continental stations. On the Whit-Tuesday there came one of those sudden flops that do sometimes happen at this time of the year. The most efficient set was hard put to it to find more than half a dozen stations really worth listening to. The bad period was luckily short-lived and conditions soon returned to normal. There need be little fear that during the present summer there will not be plenty to listen to, for there are now so many big stations on the Continent that good reception of a large number of them is assured right through the lighter months.

5SW's Good Work

Though we do not hear a great deal about 5SW these days, the station is exceedingly popular—not only in the Empire, but also in other parts of the world. With a power rating of 15 kilowatts the station sends out programmes from 12.30 until 1.30 p.m. on every day except Saturday and Sunday, and from 7 p.m. until midnight on Saturdays. These transmissions are received in every corner of the world, and most welcome they are to dwellers in out-of-the-way spots whose short-wave receiving sets provide them with a permanent link with the Old Country. So good is reception in America that relays of British programmes have now become quite a regular feature in broadcasting. We are promised in this country relays of American programmes, the new receiving system having been developed to a point which makes it possible to guarantee good results, as nearly as anything can be guaranteed in long-distance wireless. One thing with regard to 5SW which does rather surprise me is that he sticks to his wavelength of 25.53 metres at all times.

NEXT WEEK

A HOLIDAY (Portable) THREE

Television Standards

I see that they are already discussing television standards in America, and while definite details have been formulated by the Radio Manufacturers' Association of that country, there seems to be every likelihood of discrepancies existing in the matter of practical standards for the commercial equipment to be offered to the public. Some television workers appear to be clinging to a 24-line picture, while others use the 48-line picture as advocated by the R.M.A. It has just been learnt, however, that the Radio Corporation of America is working on a 60-line picture, and since this organisation has very wide broadcasting facilities, their choice must perforce have an important bearing in this field of activity.

Nothing could be more unfortunate than to have two or three different standards in the hands of the public, since this would limit the sphere of usefulness of receivers on the one hand and that of television transmitters on the other. While it is admitted that a rapidly advancing art such as television makes it almost impossible to establish hard-and-fast rules, no one can possibly gain by the unfortunate arrangement whereby different schemes are sponsored by different organisations, with all of them claiming to be the best. Fortunately, we in this country will not be faced with such trouble. The first broadcasting facilities through the medium of the B.B.C. stations have been granted to the Baird Company and the advantage of a unified control is at once apparent, for one standard only is required.

A Television "Eye" for the Air

The Jenkins television laboratories are at the moment engaged on a particularly interesting development, for they hope to perfect a television set by means of which a pilot in the air can make the country over which he is travelling visible to persons at a receiving station. The first efforts, according to announcements made, will be towards developing a set with a transmitting range of 500 miles. The apparatus will be of special type built to ensure the greatest refinement of visual detail, and by means of a scanning disc, light sensitive cells and the usual amplifiers, the panorama within focus will be recorded. Reception is to take place inside the laboratories on standard machines. Naturally, the attention of military authorities has been turned to this new aspect of television as a war aid, since intelligence officers could follow an actual flight while in progress. Then, if a particularly interesting object came into view the pilot could be directed to get as close as possible in order to improve the detail of the scene shown on the screen.

THERMION.

Why You Are Getting DISTORTION

THE other day I had the doubtful pleasure of listening to reception on a friend's set: just an ordinary "three," giving results in the way of distance-getting very little inferior to those which one expects from any good "detector and two L.F." combination.

But so far as purity was concerned, this little receiver was utterly disappointing: and the pity of it was that because it *worked*, my friend did not seem to realise that the reproduction could have been so much better. Indeed quite a number of people put up with bad reproduction, either through ignorance of the meaning of "perfect" quality, or through ignorance of the ways of obtaining it.

Now in this particular set there were at least half a dozen causes of distortion, and each was asserting itself. As a matter of interest, I made a note of them, starting from the "front" of the circuit. The tuning arrangements were quite satisfactory, as was evidenced by the good DX getting, but the first weak link in the purity chain was the grid leak. This was of some obscure make, with no indication of its ohmic value. Certainly it could not have been of the conventional 2 megohms, for the insertion of a well-known make of leak of the correct value caused an all-round improvement in both tone and selectivity, while the sensitivity of the detector valve (which depends to a large extent on the grid leak) was not appreciably altered.

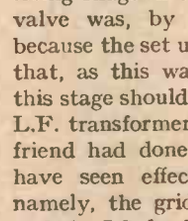
R.C. Coupling Values

The detector valve was coupled to the first L.F. with an improvised R.C. coupler, and the values of the components in this were, to mimic a famous wireless comedian, "all wr-r-rong." The anode resistance was out of all keeping with the impedance of the detector valve and, as you know, the two should bear a definite relation. In addition, the value was far too high and, as there was insufficient plate voltage (a further "snag," which later will be mentioned in further detail), the detector valve had only about 20 useful volts on its plate. Hence more distortion.

The Right Valve in the Right Place

To continue the sorry story of purity-losing snags in the set itself, the first L.F. valve was, by mistake, an R.C. valve, because the set user was under the delusion that, as this was the R.C. *coupled* stage, this stage should have the R.C. valve. The L.F. transformer was satisfactory, but my friend had done a quaint thing, which I have seen effected in some other sets, namely, the grid bias had been scrapped and the I.S. lead from the transformer left disconnected. When I asked the reason for this, I was told that no value of grid bias from 9 to 15 volts caused any improvement, but that taking the plug right out of the battery made the tone more bearable.

So far it may seem that I have mentioned only points which need concern set builders and not users, but what I am driving at is that it is never wise to use parts of doubtful origin. Very likely, if you will be honest with yourself, you will discover in your own set some so-called "economies" of a similar kind, which are really the roots of distortion. Bargain hunting is a bad business in wireless, and it is bad policy to expect a 10s. component to be so satisfactory as one costing £1. Obvious, true, but often forgotten.



H.T. Battery Snags

As the opportunity to get cheap and doubtful components is a ready one nowadays, there are many who fall. Batteries, valves, and loud-speakers seem to be the three chief temptations, and I was struck very much by this when I heard this set still giving bad results after the foregoing diagnosis had been effected. The H.T. battery was composed of small flash-lamp cells, and I felt sorry for my friend's feelings when I put this assembly to the test with a good high-resistance voltmeter. Before the test I inquired the voltage. "Well," I was told, "there are twenty-two units, and as each gives 4½ volts (they're quite new), that means 99 volts."

As you might expect, twenty of the batteries were still good after a couple of months' use, but the voltage of each had dropped to 3, therefore the total H.T. available was 60, and as two cells showed no voltage at all, the resistance they set up probably tended to "stifle" this meagre potential. This shows simply that it is never wise to measure H.T. voltage with pencil and paper, and even the best of flash-lamp batteries do not give 4½ volts for more than a fortnight or so of H.T. use. In any case a full 120 volts is advisable.

It was this H.T. bother which had caused some puzzling over the grid bias. This unlucky set user had read that 9 volts grid bias should accompany 100 volts H.T. and that the more G.B. the better. Therefore he used a 9-volt battery and added another one when he found that purity was not all that it might be. What he should have done, of course, was to have dropped the voltage down to about 3, as the H.T. voltage was only 60. By leaving the grid-bias leads disconnected, a negative charge accumulates on the grid, and this proved to be sufficient for working in this particular case.

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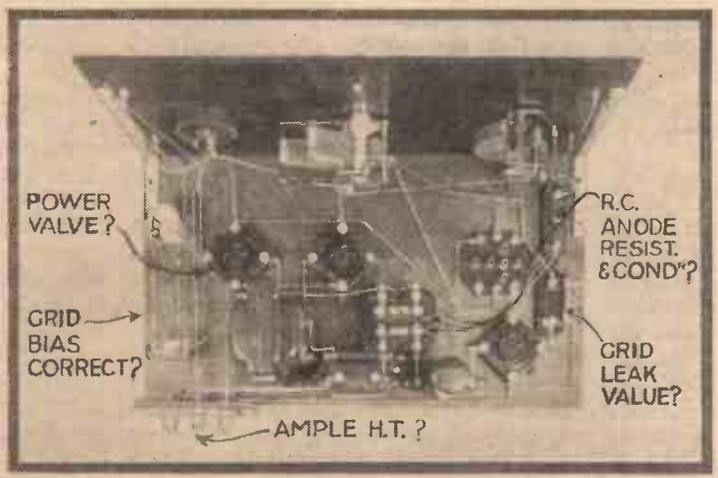


Some points in a typical three-valver where distortion may take place as explained in this article

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

Electrolytic Condensers

ELECTROLYTIC condensers for low-voltage circuits, such as filament circuits, have been available in this country for some time, but I have not seen types suitable for inclusion in high-tension mains units. I think it is generally agreed that the low-voltage condensers have proved reliable; may we therefore not have to wait too long for high-voltage types of reasonably large capacity.

H.F. Amplification in Portables

Many of the five-valve portable receivers have two high-frequency stages that are choke coupled. The choking coils used are generally of a different type from those employed in the anode circuit of a detector or in a low-frequency amplifier for stopping high-frequency currents, and sometimes one of the coils is arranged to be particularly good for magnification over the medium band of wavelengths, whilst the other is more effective over the longer wavebands.

This combination of a pair of different choking coils is usually good when the valves are suitable. Great care is necessary, however, to prevent self oscillation. A voltage of approximately 60 is therefore often applied to the high-frequency valves because with a higher voltage the amplifier oscillates. Portable receivers fitted with two high-frequency stages of this type usually have separate high-tension connecting wires for the groups of valves for this purpose. The full voltage of the battery would be applied to the two low-frequency amplifying valves and the other voltages would be set by experiment.

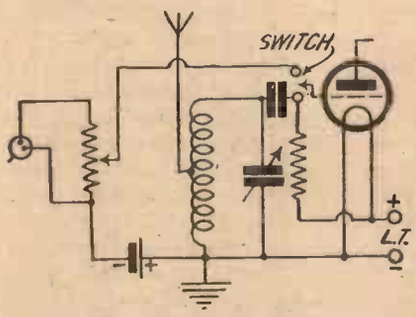
Choke "Dead" Points

The smaller types of choking coil sometimes have a natural period which occurs in the medium or longer wavelength bands, with the result that a set may not function satisfactorily in the region of this point. It is therefore reasonable to suspect the choking coil when reaction effects are troublesome. Thus, sometimes a set will oscillate, by adjustment of the reaction circuit, over a proportion of the tuning range and oscillate continuously with the reaction circuit adjusted to zero over a part of the tuning range. Peculiar behaviour of this nature is often to be traced to an unsatisfactory choking coil, which must, therefore, be removed from the set, as in the majority of instances it is not possible to effect adjustments that will put matters right.

Connecting a Pick-up

A question I am often asked is how to connect an electric sound-box to a receiver in order that the detector valve may be used as an amplifier as well as the remaining valves.

Users of two-valve receivers who wish to play gramophone records, and who must



Radio-pick-up Switch Arrangements

therefore employ both valves for amplifying, will be interested in the circuit above, which shows how the pick-up may be connected in the place of the grid condenser and leak. A simple two-position switch is employed for connecting either the gramophone or the wireless, and it should be noted that a potentiometer is joined across the pick-up as a volume control, and a single-cell grid battery for the purpose of biasing the first valve.

Mass Production!

The American manufacturer's method of turning out thousands of identical receivers often forces him to include a piece of apparatus in each receiver by means of which the dealer or the user himself can make an adjustment to suit the particular local conditions. An example of this is to be seen in mains receivers which are designed for working from 110 volts alternating current, which is the nominal voltage of the current available in most parts of America. But in practice the actual voltage as measured at the mains in the consumer's house may vary from 120 down to 100, depending upon the position of the house with reference to the supply station and the load upon the circuit.

In order to compensate for this wide range of voltages a tapped transformer for regulating the input to the set may be used. This transformer may be provided with a switch having several positions, each being marked to indicate the correct setting for particular mains voltages. It is therefore necessary for this regulator to be adjusted, and the work is usually entrusted to the dealer who supplies the receiver. American mains valves appear to have short lives if they are only just a little overrun; the importance of providing such a regulator and of properly setting it being therefore apparent.

"WHY YOU ARE GETTING DISTORTION"

(*Continued from page 769*)

It is a great pity that valve manufacturers charge more for a power valve than for an ordinary L.F. valve. Higher price is the only reason I can think of for many listeners not using a power valve in the last stage, which, of course, should always be done. In this particular case a power valve had been tried and subsequently replaced by an ordinary L.F. valve, because it was found to give inferior results! The reason, of course, was that there was not enough H.T. available for the power valve, and power valves are hungry fellows.

The loud-speaker was the final source of distortion. Here a good reed movement was ruined by being attached to a cheap diaphragm which did not give sufficient damping, consequently there was no response to the low notes, and the whole thing chattered at the slightest signs of overloading. The remedy was obvious.

All this may sound a very woeful personal tale, but so many of these faults are to be found in ordinary sets. The cost of correcting the distortion would certainly not be more than two or three pounds, including the provision of proper H.T. and valves. Why not try it yourself?

SUMMER-TIME AND THE SHORT WAVES—*By 5YM*

THE long hours of daylight we are now enjoying are not looked upon altogether as a blessing by the long-distance listener, rudely called by some folk "the DX hound." He finds that many of his favourite stations are very weak or almost inaudible until close on their switching-off time, and some he cannot hear at all. Mostly he has to depend on the stations on the longer waves; but even these are uncertain compared with their wonderful strength during the hours of darkness.

On the other hand, the short-wave listener still has the whole world to play with, and indeed is, in regard to many stations, in a more favourable position than during the winter, because many of the stations on the very short waves —25 metres and below—cover huge distances more readily, and at greater strength; and with less fading, during the hours of daylight than they do after dark.

Take, for instance, W8XK, which relays the famous KDKA on 25.4 metres. It is not a very powerful station and does not come over at all well during the dark hours; but now it can be heard every Sunday from 4.30 p.m. B.S.T. and is usually very steady. Another American station, W2XAD, on 19.56 metres, comes booming in from 8 p.m. on Sundays, whilst W2XO, on 21.96 metres, is likely to switch on at any hour on any day, and is very powerful indeed whilst there is daylight over the Atlantic.

A Glorious Uncertainty

The joy of short-wave listening is that, whilst you are almost certain to find some stations working well, you are never quite certain what you will get. It may only be Huizen (16.88) or PCJ (Hilversum, 31.4); but it may be that such fascinating fish as Radio Malabar (Java, 17) or Perth, Australia (6AG, 42) come to the net. Melbourne 3LO (31.55) is almost certain any Sunday evening between 7 and 8 p.m., and 7LO, which is in Nairobi and works on 31 metres, can occasionally be heard between 4 and 7 p.m. He works every day, but occasionally Bergen and sometimes Hilversum get foul of him and blot him out.

There are many quite good short-wave receivers now on the market, and several excellent designs have been published in AMATEUR WIRELESS. The chief considerations for the beginner are simplicity of operation and absence of those two chief bugbears of high-frequency work, hand capacity and "threshold howling." The first is self-explanatory. Obviously, it is impossible to tune in a station satisfactorily if the tuning is changed when the hand is removed from the tuning dial. The second is due to excitation of the grid circuit of the detector in most cases, but may also develop in the anode circuit. It takes the form of a most unpleasant howl just as the set is in its most sensitive state. It can often be cured by substituting another detector valve, by using a higher value grid leak or by connecting the leak to either the positive or negative side of the filament. That which will cure one receiver makes things worse in another. The removal of a really good intervalve transformer, operating in the detector anode circuit, and the substitution of a cheap or poor one, will sometimes effect a cure. But in a well-thought-out receiver neither of these troubles should be present and reaction should be perfectly smooth.

Aerial Needs

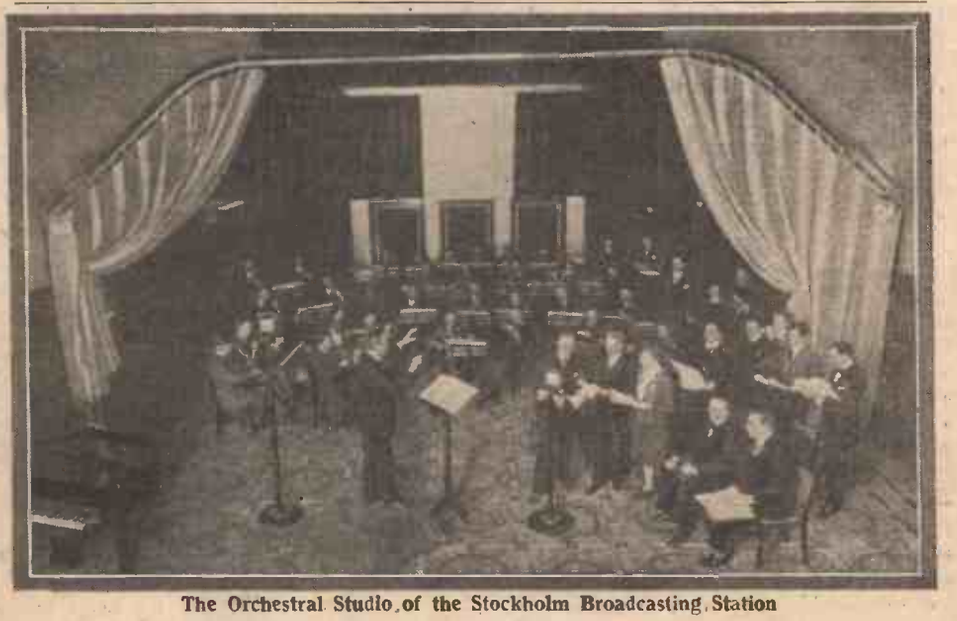
A short-wave receiver may be attached to any sort of aerial, and in many cases an earth connection is not necessary. Some receivers are definitely better without an earth when working below about 75 metres. A simple aerial across or round the ceiling is little less efficient than a full-length outdoor affair.

A great advantage of the short waves during the summer is that statics are far less troublesome. When you can hardly hear anything at all on the ordinary broadcast bands because of the roar of crashes and "mush," the short-wave channels will be almost entirely free of these annoying interferences; and the shorter the wavelength, the less is the interference, until you get below 15 metres, when the magnetos or coils of motor-cars begin to be heard when they are fairly close at hand.

The beginner at short-wave reception will find tuning a little difficult at first, because the stations have no "spread" at all. Even the most powerful telephony stations can be tuned in or out with a touch on the dial. For this reason the short-wave listener has to do that which is unforgivable in broadcast listening. He tunes in the carrier-wave of the station first and then reduces reaction until speech or music are resolved. Obviously, the reaction must be of a type that will not affect the wavelength, and for this reason the swinging-coil type is hardly ever used. A combination of fixed coil and variable condenser is used. This type of reaction control is now much used for ordinary broadcast receivers, with excellent results; but it was first developed to help the short-wave receiver.

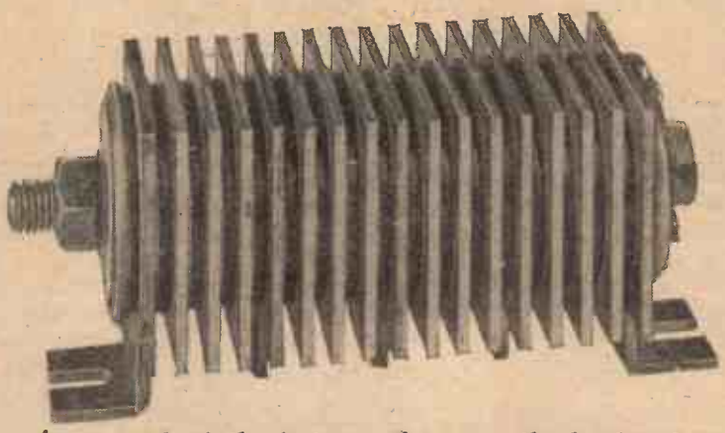
In short-wave reception a "log" showing time, dial readings, and name of station and wavelength is necessary. There are about fifty or sixty telephony stations operating between 15 and 100 metres on fixed wavelengths, many of them with regular working hours. A number of them relay the programmes from ordinary broadcasting stations, just as our own 5SW relays the London programmes. In such a case it may be a considerable time before the station gives its own call sign. Once these stations have been identified, however, they serve as "land marks," particularly as many of them give their wavelength as well as their call sign. There are also many experimental and amateur stations with irregular working hours.

Any time of the day or night there is always something going on on the short waves, and from now to October is the best time of the year for the most interesting of them.



The Orchestral Studio of the Stockholm Broadcasting Station

A NEW DRY-PLATE RECTIFIER



An account of the features of a recently-developed cupric sulphide-magnesium metal rectifier

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

THE dry-plate rectifier came into popularity a little over a year ago, when the Westinghouse Brake and Saxby Signal Co., Ltd., first introduced a series of rectifiers for low- and high-tension supply. These were not marketed in a suitable form for the home constructor and experimenter until a few months afterwards, but they were distinctly in evidence at the exhibition and have been extensively used since then.

These rectifiers, as readers will doubtless remember, are composed of a series of rectifying junctions consisting of a disc of copper in contact with another disc, the surface of which has been oxidised to form cuprous oxide. This combination has the property of permitting the current to pass better in one direction than in the other, the ratio of forward to reverse resistance being of the order of 1,000 to 1. Each disc will stand some 3 to 4 volts, depending upon the conditions under which it is used, and the complete rectifier consists of a series of these rectifying junctions built up to stand the required voltage.

There are various sizes of disc, two principal types being made—one to carry 100 milliamps and the other to carry ½ ampere. Larger currents than these are handled by placing a suitable number of rectifier units in parallel. The question of current-carrying capacity is important, for a certain amount of heat is generated by the passage of current across the junction and the total temperature rise must be kept within certain limits or the rectifying film is broken down. Particularly with the heavy current models, therefore, large cooling fins are provided which tend to radiate the heat more efficiently.

A New Rectifier Combination

It is only natural that other forms of rectifying junction should be discovered and exploited. One of the most successful of these is the cupric sulphide-magnesium type. This is of American origin and is known as the Elkon. It is marketed in this country by the Igranic Electric Co., Ltd., and would appear to have a number of points which render it worthy of attention. We have had a number of these rectifiers on test at the Furzehill Laboratories for some time, and the following comments on their performance will therefore be of interest.

The Elkon rectifier depends on a somewhat different action from that employed in the copper-oxide rectifier. The rectifier is built up of discs of magnesium in contact with copper discs treated on the surface to form cupric-sulphide. The junction of the cupric-sulphide and magnesium is not in itself an efficient rectifier, but when an alternating current is applied across the terminals a film is formed at the junction of the two substances which has the property of restricting the conduction of current in one direction. This film forms very rapidly, and a few seconds after switching on, the junction exhibits a unilateral conductivity. The rectification is not so good as with the copper-oxide type, the ratio of forward to reverse resistance being about 30 to 1, and in consequence of this the rectification efficiency is slightly lower than usual.

The junction, however, has some important advantages. In the first place, it can be worked at a much higher temperature than the copper-oxide junction, it being possible to operate it at temperatures as high as 150 degrees centigrade, the normal operating temperature being about 90 degrees centigrade—a little below boiling point. Blood heat, by the way, is approximately 37 degrees centigrade, so that this rectifier runs considerably hotter than normal.

This is a feature which has two aspects. If the rectifier is enclosed in any box or is built into some other apparatus, means must be provided to ensure adequate ventilation, as this temperature is considerably above the values normally permitted in electrical apparatus. On the other hand, we are able to make the apparatus smaller, since the cooling surfaces necessary are not by any means as large, and in many cases this more than offsets the slight disadvantage of having to provide increased cooling facilities.

Self-healing

Another important advantage of the cupric-sulphide type of rectifier is that it is self-healing. Owing to the fact that the film is formed afresh each time the rectifier is put into commission, no serious damage is done if the voltage on the rectifier exceeds the critical voltage which the film will stand. Such an overload will cause a breakdown of the rectifier, but when the voltage is reduced to its normal value again the film reforms and the rectifier continues to function exactly as if nothing had happened.

If a rectifier of this type is being worked in an eliminator at a voltage near the critical value it is sometimes found that an occasional breakdown will occur, accompanied by a sharp crack in the receiver, but the damage is immediately repaired and the apparatus continues quite as it should do. This, of course, is an exceptional circumstance and is only quoted to illustrate the self-healing action. Under normal conditions the rectifier is quite silent in action.

The smoothing required for this type of rectifier is less than with a valve rectifier, this being a property common to dry-plate rectifiers as a class, while a point which is of no little importance is that the price is comparable with that of a valve. A high-tension rectifier connected up as a double-wave unit and capable of delivering from 60 to 100 milliamps costs 27s. 6d. only, which is little more than a double-wave valve rectifier.

This type of rectifier is known as the E.B.H. type and will stand up to 250 volts A.C. input. The output can be run up to 100 milliamps, but this depends on the load. The rated output from the rectifier is 15 watts. This means that if the D.C. output voltage is 150, then 100 milliamps may be passed, but if the output is higher

(*Continued in 3rd col. of next page*)

Moschetto

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

DO you like Ruby Starita? With his mixed assortment of marinbas, vibrophones and what-not, I think he is rather entertaining. His best performance is on the vibrophone, that mellow, organ-like instrument which I understand requires an electric motor to make it vibrate. But I am afraid Ruby falls rather flat with his xylophone solos because we know Teddy Brown too well, and few can hold a candle to our heavy-weight friend when it comes to high-speed tinkling.

◆ ◆ ◆

I was disappointed with Ann Sutar. In fact, I thought her very ordinary. She gave us the usual nasal songs in a mannish voice and didn't impress me one bit.

◆ ◆ ◆

If David Jenkins and Susette Tarri were to stick to negro spirituals they would be more likeable. As it is, they attempt to sing jazzy songs, which are quite out of their province, and so spoil themselves.

◆ ◆ ◆

Further to our recent controversy as to who is considered the best broadcasting comedian, W.F., of Leicester, writes :—

"I should like to say that I have never heard such sloppy tosh and such a ridiculously sentimental broadcast as that served up only this week by Leonard Henry. To compare this rubbish with Fred Duprez, Tommy Handley, Norman Long, Julian Rose, Ronald Frankau, etc., is, to my mind, absolutely absurd."

I don't agree with my correspondent's adjectival criticism, but I must admit that Leonard Henry is sometimes rather dull.

◆ ◆ ◆

A ray of sunshine amidst the patchiness of de Courville's hour has been Charles Norton. Did you hear him imitate Chirgwin, Joe Elvin, and Eugene Stratton? I considered this act to be quite good, especially when he gave us Joe Elvin as a "bookie." What a treat it must have been for the old-timers.

◆ ◆ ◆

It seems to me that there is something wrong with the organ broadcasts from the Bishopsgate Institute. I am not for one moment criticising Mr. Joseph Bonnet's masterly playing, but the acoustics in the hall do not seem to be right for broadcasting purposes.

◆ ◆ ◆

Recently we were treated to a discussion on "What the Younger Generation Thinks." It was one of a series, I believe, but the sample I heard was not at all convincing. In fact, it was not, to my mind, at all critical.

◆ ◆ ◆

The broadcast of the second act of *Siegfried* from Covent Garden was certainly the best of the broadcasts of the Ring cycle, and most likely the best of all the operas broadcast yet.

◆ ◆ ◆

In a recent issue I gave space to the opinions of the youthful offspring of B.M. (Wood Green). Now another correspondent, J.R. (Staines), demands the same privilege for his young hopeful.

She is eleven years old and thinks that some of the Uncles make "awful asses" of themselves. She regards a lot of their songs and talks as an insult to her intelligence !

◆ ◆ ◆

One must remember that the Children's Hour has to cater for youngsters varying in ages from four to twelve and what may be very entertaining to tiny tots may be an awful bore to those approaching their 'teens, and *vice versa*. I don't think they do so badly with it.

I listened to a Children's Hour quite recently, and included in it was a most helpful talk on how to play tennis—which did *me* quite a lot of good !

◆ ◆ ◆

Even "Harold" is beginning to turn against the flooding of wireless programmes with those senseless American syncopated songs.

The B.B.C. fail to help in this matter by including more than one of these turns in a single vaudeville hour. In addition to which artistes who have never perpetrated such songs before are beginning to take them up, and I foresee a time when a variety programme will consist solely of these songs. I appeal to Julian Rose not to succumb to this pernicious evil !

◆ ◆ ◆

The Kneller Hall Band gave us a very bright ninety minutes from 5GB recently. It is rarely that one hears a band which pulls together so well. But I was sorry they did not give us one or two of their characteristic symphonic numbers.

"A NEW DRY-PLATE RECTIFIER"

(*Continued from preceding page*)

than this, then the current must be reduced proportionately and at 250 volts output, 60 milliamps is the maximum load. These figures are in excess of normal requirements and indicate that the rectifier should have a good field of application.

A range of L.T. rectifiers is made suitable for various input voltages and delivering 1½ and 3 amperes respectively. The photograph accompanying this article shows one of the 1½-ampere types. This measures 3½ in. by 1¼ in. by 1¾ in., so that it will be seen to be very compact.

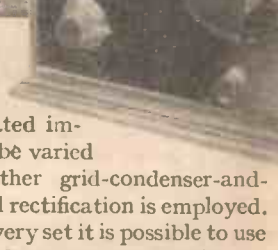
As was stated at the beginning of the article, these rectifiers have been used for some time and appear to be quite satisfactory. Some further points in connection with their use will be given in future articles.

For the present Finland, in Lahti possesses the most powerful European transmitter.

The largest organ in the world—you may possibly have heard it from the Munich Station

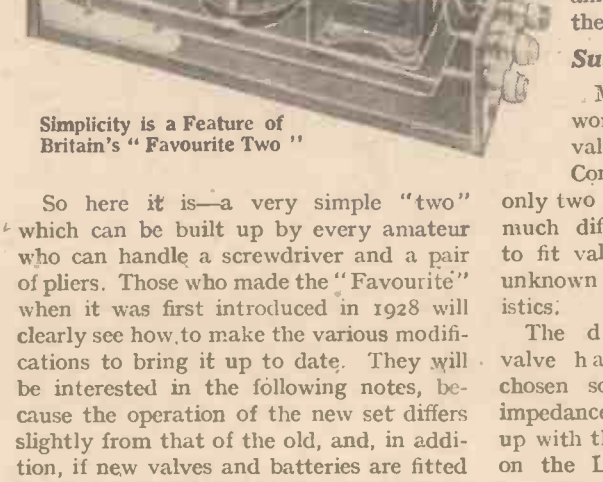
OPERATING NOTES AND T

BRITAIN'S "FA



THE "A.W." SET VOTED

CONSTRUCTIONAL details were given last week of Britain's "Favourite Two," the set which was voted the best two-valver in an AMATEUR WIRELESS competition to celebrate the Christmas of 1927. In AMATEUR WIRELESS, No. 295, was given the first version of the "Favourite," and so great was the reception of this, and so comprehensive the correspondence received regarding results with it that it was deemed in the interests of readers to produce an up-to-date model.



Simplicity is a Feature of Britain's "Favourite Two"

So here it is—a very simple "two" which can be built up by every amateur who can handle a screwdriver and a pair of pliers. Those who made the "Favourite" when it was first introduced in 1928 will clearly see how to make the various modifications to bring it up to date. They will be interested in the following notes, because the operation of the new set differs slightly from that of the old, and, in addition, if new valves and batteries are fitted (as may be advisable owing to technical developments in the past twelve months) the operating conditions themselves may be different.

Check the Wiring

In the past week you will have doubtless completed all the constructional operations, and before the valves are inserted or the batteries added the wiring should be checked over. This can most easily be done with the aid of the blueprint, whereon are shown all the wires in their correct positions. Moreover, take particular care to see, if the wiring is carried out with bare wire, that there is no possibility of vibration causing one wire to touch against another, and so causing a "short."

Probably the best way of checking the wiring is to take each lead in turn, for each is numbered on the blueprint, and to mark the wire on the print with a pencil as its actual counterpart is checked as O.K. in the set itself. Also, to ensure that the set will work properly the first time it is connected up, give some attention to the mechanical details. Loose contacts at the coil and valve sockets and similar little troubles may cause annoyance, but are easy to check at the outset.

Suitable Valves

Much of the success obtained with working the set depends on the valves and batteries employed. Consider the valves first of all. As only two are required there should not be much difficulty in resisting the temptation to fit valves having unknown characteristics.

The detector valve has to be chosen so that its impedance matches up with the primary on the L.F. transformer. In some particular cases it is advisable to use an R.C. valve, or an H.F. valve having a very high impedance. In this set, however, the recommended low-frequency transformers are B.T.H., Lissen, Philips, R.I., Ferranti, and Igranic. For working with these a valve having an impedance of about 25,000 ohms is suitable. It should be remembered always that the rated impedance tends to be varied according to whether grid-condenser-and-leak or anode-bend rectification is employed.

In practically every set it is possible to use 2-, 4- or 6-volt valves and, as a guide, it may be mentioned that in the 2-volt range the following valves are suitable for the detector stage. Cosmos SP16G, Cossor 210HF, Ediswan HF210, Marconi HL210, Mazda HF210, Mullard PM1HF, Osram HL210, and Six-Sixty 210HF. There are 4- and 6-volt equivalents of these in most cases.

Now for the power valve. Generally the "Favourite" will be used within easy range of a B.B.C. station, and this means that at least two programmes will be receivable at full loud-speaker strength providing an outdoor aerial is used. Thus, if an ordinary L.F. valve is placed in the power valve holder, there is a danger of it being overloaded and in any case, owing to

A Test of Britain's "Favour

Carried out by a Lady Reade

I WAS flattered when the E make a test of the "Favourit not see much purpose in it, readers of AMATEUR WIRELESS *minority. But when I was told of the test was to give an idea the receiver, then I agreed at onc the "Favourite" is very simple there are only two knobs to be and after a little practice, in one in picking up Königsberg, London Langenberg, Vienna, Hilversum Paris, and Daventry Senior. T of other squeaks, and I should little more practice I could rec or five stations on the loud-spe doubt at all that a more experien*

EST REPORT OF THE 1929 VOURITE TWO"

THE BEST TWO-VALVER

the comparatively low H.T. which can be applied to its anode, the volume of sound it delivers will not be very great.

The "Favourite" is provided with two H.T. tappings, one for the detector valve and the other for the power valve and thus there is no need to fear fitting a large power valve because—as might be the case with a common H.T. tapping—the great H.T. required for proper working will upset the detector valve's working point.

Power Valves

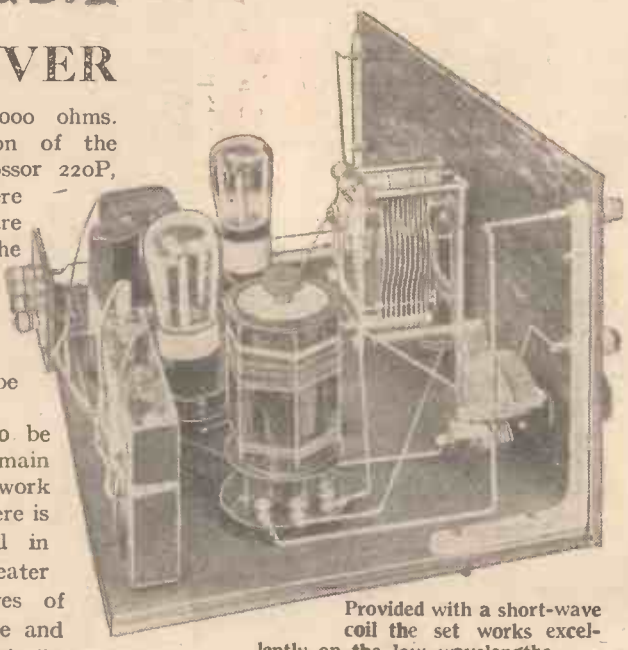
Among the small power valves available in the 2-volt range are the following: Cosmos SP18RR, Cossor 220P, Ediswan PV215, Marconi DEP215, Mazda LF215, Mullard PM2, Osram DEP215, and Six-Sixty 215P. If you care to glance at any table of valve characteristics you will see that all these valves have an impedance in the neighbourhood of 5,000 ohms. Moreover, with the exception of the Cosmos SP18RR and the Cossor 220P, both of which consume .2-ampere in current, all these valves are of the .15-ampere variety. The detector valve will consume .1-ampere and thus, the total filament consumption of the "Favourite" being .25-ampere, most economical working will be obtained.

However, when the set is to be operated very close to a main station and it is desired to work a number of loud-speakers, there is some advantage to be gained in fitting power valves of even greater capacity for grid swing. Valves of the DEP240 class are available and with a two-valver it is practically a physical impossibility to overload a power valve of this class. It must be quite understood that the need for using such a power valve, which is more extravagant, of course, in filament consumption and in its demands upon the H.T. battery, is limited only to those occasions—somewhat unusual for amateurs—when the set is working right under the shadow of a station and consequently there is a possibility of even a leaky grid detector overstepping the limit of a valve of the DEP215 class.

H.T. Supply

So far as H.T. is concerned a two-valver does not place very severe demands on dry cells. "Popular" type batteries are available, which the manufacturers recommend as suitable for two-valvers. This, indeed, is quite workable but the greatest economy is always to be obtained, in the case of dry batteries, by buying cells much bigger than really required for the job in hand. Certainly do not attempt economy by using only a 66-volt battery.

The H.T.+2 tapping is that which goes to the anode of the power valve and connects the 120-volt socket on the battery to this terminal. The H.T.+1 tapping should be taken to about the 60-volt tapping on the battery although here is the opportunity for a little safe experimenting. About 9 volts grid bias will be needed with the full 120 volts H.T.



Provided with a short-wave coil the set works excellently on the low wavelengths

Tuning

Users of the original "Favourite" in particular will appreciate the advantages of capacity reaction. When tuning in, take as little advantage as possible of the reaction control and certainly if the aerial is efficient for reception of the local station, the reaction condenser vanes should be wide apart. Tuning is simplicity itself, and if you have any doubts about your ability to work the set properly, then turn to the test report given herewith. This has been carried out by a lady reader, and it is quite an independent and impartial test. Moreover, a lady reader was selected because, obviously, if a set can be made to give good results in the hands of one who openly confesses to being more interested in receiving than in knowing how to receive, then it is a sure thing that a technically-minded user will find it simplicity to handle.

rite Two" Up-to-date Model

r, Miss Bess Marshall, of Mayfield, Woodford, London, E.

ditor asked me to e." At first I did for the fair-sex must be in the hat the purpose he simplicity of e! I consider that o control. Really djusted at once, evening I succeeded Daventry Junior, Huizen, Radio here were plenty think that with a eive another four aker. I have no ed operator (which means, probably, a male!) could do this and still find a few more stations which could be heard on headphones. But headphones are not very comfortable nor sociable. I like the little switch for changing from the long wavelengths to the short. It is a boon because I find coil changing as difficult as gear changing! For the test I used one 120-volt high-tension battery and a 9-volt grid-bias battery, with the plug in the 7½-volt socket. I used 2-volt valves. At first I had a little trouble with the high tension, but this was cured by putting the wander plug on the lead from the terminal marked "H.T.+1" in the 60-volt battery socket. Probably many other lady readers of AMATEUR WIRELESS *will get better results than I have done, and, if I may say so, I should like to hear of their experiences through Amateur Wireless.*

"A.W." TESTS OF APPARATUS

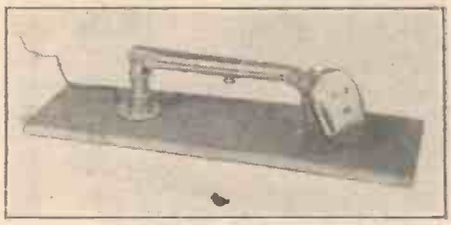
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

B.T.H. Pick-up

GRAMOPHONE pick-ups are enjoying much popularity amongst owners of wireless sets at the present time, owing largely to the fact that they may be so readily linked up with the set to give reproduction of gramophone records.

The latest B.T.H. pick-up has caused a good deal of favourable comment on account of its neat and businesslike appearance. We have placed several of these pick-ups on a fairly strenuous test, and can testify to their performance in conjunction with good-quality amplifiers and loud-speakers.

The frequency characteristic of this pick-up differs widely from the majority of those



B.T.H. Pick-up

now on the market, since it reproduces with maximum efficiency the higher frequencies above 2,000 cycles. In consequence, the reproduction is particularly brilliant. The disadvantage of a good high-frequency reproduction is that more scratch than usual is reproduced in the loud-speaker, but then it is always a simple matter to fit a scratch filter so designed that it will minimise the harmful scratch frequencies and still maintain proper reproduction of the higher musical frequencies.

The B.T.H. pick-up is supplied with a special tone arm, and this has recently undergone improvement in order to obtain better tracking. A spring is incorporated in the holder, which counterbalances to some extent the weight of the pick-up and thus balances the needle pressure on the record to the correct degree for reproduction and minimisation of wear.

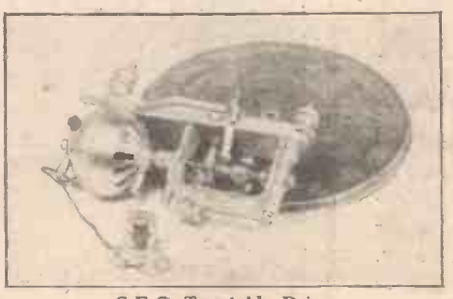
Although the characteristics of this pick-up are unusual, its internal construction more or less follows standard design, in which the needle causes a reed to vibrate between the pole pieces of a powerful magnet. The armature is damped by suitably placed pieces of rubber.

We have no hesitation whatsoever in recommending this component to readers. The manufacturers, of course, are the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

G.E.C. Turntable Drive

VALVE amplification has opened up a new field for the gramophone enthusiast allowing him so to magnify and proportion the tone from his gramophone records that he may obtain the best results from them. Apart from the normal amplifying equipment and loud-speaker, all that one requires for reproducing gramophone records is a pick-up and electric motor. Since so many listeners have mains at their disposal, the electric gramophone motor appeals above all else for reproducing records.

We have recently had an opportunity of testing a G.E.C. gramo-drive electric motor during a period of several months. This particular motor operates directly off 240-volt mains and it consumes approximately 60 watts. The complete unit consists of an electric motor with suitable governing device, turntable and automatic stop. Given a correct baseboard, the unit may be set up by drilling a few holes. We found that in operation the motor was moderately silent, that is to say, it could not be heard during the playing of a record. A noteworthy feature is that the speed remains extremely constant which is a *sine qua non* with discriminating listeners. We found it necessary at intervals of approximately a fortnight to oil thoroughly the governor disc on which the felt pad presses, otherwise the movement became sticky with a consequent variation of speed.



G.E.C. Turntable Drive

Junit Flux

THE process of soldering relies largely on certain factors which, if attended to properly, result in quick and sound electrical joints being made. The expert solderer who has obtained the knack of his job appears to do all his work with a minimum amount of trouble, but if you watch him carefully, you will notice, that he keeps his iron always clean and at approximately the correct temperature; then, in making a joint, he covers the surfaces with just the right amount of flux, that is to say, not too much but sufficient to form a fine layer over the surface to be jointed.

The application of a suitable flux is a most important matter, for this material cleans the joints and prepares the surfaces for the solder which otherwise would not run properly: it is therefore most important to use an efficient type of flux and for electrical work this should not be of the acid or corrosive type.

We have just tested a small tube of Junit soldering flux, supplied by the Junit Electrical Co., of 2 Ravenscourt Square, W.6. This is in the form of a grey non-corrosive paste and may be applied with ease by unscrewing the cap on the tube and gently pressing the end until sufficient flux flows over the material to be jointed.

We made several joints with different types of wire utilising this flux and in all

Red Diamond Detector

cases it proved satisfactory. It was necessary to apply only a small amount to the joint in question. We cannot say more without a prolonged test, but the flux appears to be satisfactory.

Red Diamond Detector

WE have just completed a test on a Red Diamond semi-permanent crystal detector made by the Jewel Pen Co., Ltd., of 22 Great Sutton Street, London, E.C.1. This little detector, which costs 2s., consists of a crystal-to-crystal combination. There is a fixed cup containing one crystal, whilst in a second cup attached to a spring loaded and rotatable plunger, the second crystal is mounted. This combination has been found to be sensitive at the majority of contact positions; thus it is no trouble whatsoever to set the detector and once set it remains so unless unduly disturbed. For a small extra charge one may obtain an insulated cap to match the insulated container, and this fits over the plunger. The detector may be fitted to the panel by drilling a single hole.

We placed the crystal in a simple circuit followed by a pair of high-resistance phones, and after connecting to a standard aerial and earth, were able to pick up at good strength London at twelve miles and the two Daventrys at about seventy miles. There was no difficulty in obtaining a sensitive spot.

We can recommend this detector.

You cannot get the SECRET PROCESS in any battery but LISSEN

You can only get this pure D.C. current—this steady flow of noiseless power, from a Lissen Battery.

No mechanically generated power can equal the power that is produced by the Lissen secret process and chemical combination: It is pure, it is noiseless, it is steady flowing; there is never a sign of ripple in it, never a trace of hum. The power flows smoothly, sustainedly from the large cells throughout the longest programme and through months and months of use. And Lissen Battery power is the most economical source of power for radio.

Ask for Lissen New Process Battery and be sure to take no other. Obtainable at all good dealers.

PRICES:

60-volt (reads 66)	7/11
100-volt (reads 108)	12/11
36-volt	4/6
60-volt Super Power	13/6
9-volt Grid Bias	1/6
4½-volt Pocket Battery (4/6 a dozen) each	5d.
Single Cell Torch Battery ... ... each	4½d.

LISSEN LIMITED, 16-20, Friars Lane, Richmond, Surrey

(Managing Director: THOS. N. COLE.)

You will Help Yourself and Help Us by Mentioning "A.W." to Advertisers

RADIOGRAMS

STARTING on June 25, Mr. George Grossmith will visit the 2LO studio at regular intervals to broadcast a series of six selected episodes from *The Diary of a Nobody*, a joint work of his father and uncle, Weedon Grossmith. In these transmissions he will assume the character of the immortal Charles Pooter.

A Danish short-wave experimental station installed at Lyngby on several occasions has re-broadcast the Copenhagen programmes on wavelengths in the immediate neighbourhood of 30 metres. It is stated that, in future, these relays will be carried out on 19 metres, at irregular intervals for the present, and that the power of the transmission will be raised to some 10 kilowatts.

Mr. M. K. Foster on June 15, through 2LO and 5XX, will furnish an eye-witness account of the first test match of the 1929 series between England and South Africa; it will be relayed from Birmingham.

More Djinn and Bitters, a second edition of a revue written by Clifford Seyler, will be included in the London programme down for broadcast on June 15.

Climatic conditions make radio reception difficult throughout the greater part of the year in Guatemala and few receivers are sold.

On June 8 Mabel Constanduros, in a request programme, will broadcast a further adventure in the life of the Buggins' family—in this instance, a day on the river.

Through 5GB on June 12 we are to hear *Micro-phun*, a new revue from the pen of Edmund Wynschenk.

L. du Garde Peach is responsible for a short thriller entitled *Ingredient X*. It will be found in the London and Daventry programme on June 6.

As in previous years, through all stations, the B.B.C. will furnish an eye-witness account of the Derby on June 5.

From June 1 certain alterations will be made in Germany's broadcasting system. Up to the present the individual programme companies have been responsible for the studios only, leaving all microphone amplification and actual broadcast to the State Post and Telegraph Officials who operate the transmitters. From the above date the amplification and control of signals will be left to the studio, which will thus supply the "finished article" to the State engineers.

Berlin has started its early morning broadcasts of concerts from 6.30 to 8 a.m. B.S.T. For the present, these are limited to the week-ends, and relays of entertainments are carried out from the Zoological Gardens.

A discussion in the French Chamber of Deputies on the proposed new broadcasting law has resulted in a provisional agreement amongst the parties to bring it into force on January 1, 1930. The receiving licence may be fixed at 20 francs (3s. 2d.) for crystal sets and 60 francs (10s.) for valve receivers. It is proposed to erect a P.T.T. relay at Rheims with a view to taking the Ecole Supérieure and Lille programmes, but there is every probability that the project will not mature until the Strasbourg station has been built, for the latter, according to the French press, is more urgently needed.

According to reports, the recent tests of the new Marconi broadcasting station at Bratislava, Czecho-Slovakia, were heard in all parts of the British Isles. One London listener reported that he heard the station on a crystal set.

Successful wireless telephone tests between Berlin and Sydney, Australia, were carried out recently.

The number of wireless receiving sets in use in Switzerland increased from 62,000 to 70,000, or about 12 per cent., during 1928.

The International Standard Electric Co. has secured an order for another 60- to 120-kilowatt broadcasting station at Prague. New stations are to be constructed also in Bratislava, Slovakia, Moravska Ostrava, Moravia, and in Kosice, Sub-Carpathian Russia.

Station WCFL, of Chicago, will broadcast pictures as a regular feature between 9 and 11 a.m., Sundays excepted. Programmes will consist of motion pictures and still subjects. The broadcast is on a wavelength of 146.25 metres, standard 48-hole scanning disc, r.p.m. 950.

During the last six months the number of radio licences in Australia has increased by more than 20,000—from 263,340 to 283,923. Victoria, with 142,334 licences, has more receivers than all other states combined.

(*More Radiograms on page 787*)

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.

Moving-coil v. Linen-diaphragm

SIR,—Your correspondent A.G. (Bolton) states that the higher frequencies are smothered by lower frequencies when using a moving-coil speaker. If he will communicate with me through you I will give him the name of a M.C. speaker where this condition does not obtain. In fact, I can reproduce the higher frequencies as crisply and clearly as with a horn-type speaker, the balance between high and low frequencies being ideal. Referring to the linen diaphragm, having made one for a friend, I can state that while it is an *exceptionally* good instrument, it quite definitely does not come up to my moving coil, either in quality of reproduction or sensitivity. My receiver is constructed purely for quality reception, the output stage having 300 volts H.T.; both speakers have therefore been tested out under ideal conditions. The linen diaphragm will not, however, show up the defects in a receiving set to the same extent as a M.C. speaker will; so it is more suitable with the average receiving set where the output is not too great. MOVING-COIL (Glasgow).

A Blank Space?

SIR,—Regarding "Thermion's" remarks on his inability to coax anything worth while out of his set on a short waveband round about 400 metres, since being in England I also have been able to do nothing in this quarter of the ether; the only "foreigner" which is any good—and this not always—is Frankfurt. On most nights, even in the depths of winter, after reaching and passing Toulouse, continuing up the dial, one strikes a perfectly bald patch as far as Langenberg, this latter station being often not worth while. But, then, my set is only a modest detector and two L.F. As a direct contrast to this, however, when I was living in Northern France up till May, 1928, I could always rely upon Hamburg, Berne, Stockholm, Frankfurt, Rome, and Katowice to operate the loud-speaker on the same three-valver with a minimum of reaction. Toulouse was decidedly not so strong over there as here in England, and I have never succeeded in doing anything with Paris P T T. either in France or this country, which is rather difficult to explain, as the same land masses have to be traversed since the general direction is the same. It is interesting to note that Union-Radio Madrid and Toulouse when they wandered up and down after the wave change lost some of their erstwhile strength, but an explanation of the whole affair I would not like to offer. J. S. (London, S.W.).

H.F. Switching

SIR,—I noticed that in a recent issue of AMATEUR WIRELESS your contributor "Thermion," in discussing conditions which will rule when the new regional station at Potters Bar commences to broadcast, gave it as his opinion that attention would have to be directed to the possibilities of introducing switching in the H.F. side of modern circuits.

I have had no experience in handling any of the S.G.-det.-L.F. sets which have been brought out recently, but have heard conflicting reports regarding the degree of selectivity obtainable, from which it would appear that something rather more selective will be required in order to deal satisfactorily with the new conditions.

"Thermion" implied that for London listeners no H.F. stage would be necessary for the new station's programmes; in fact, it would probably be a waste of power and even a positive nuisance for all those like myself who do not wish to produce a volume of sound audible several streets away.

No doubt you have this question under consideration, and my object in writing to you is simply to emphasise the need which many of your readers—for there must be a great number similarly situated to myself—have of some such solution to the difficulties which will confront them in July (?).

May I add, in closing, that I am a very appreciative reader of your two wireless periodicals, from which I have derived a very large proportion of such knowledge of wireless matters as I possess.

J. R. B. (Seven Kings).

5GB and 5XX

SIR,—A recent issue of AMATEUR WIRELESS contained a paragraph stating that "In the south of Ireland Toulouse is heard better than 5GB!" It might interest the B.B.C to learn that the "Experimental" is one of our worst stations here in Dublin. I can put Manchester, Belfast, and the German 4-kilowatters on the loud-speaker when 5GB is almost or entirely inaudible. Unfortunately, the alternative programme is the one we would like to get, as, although 5XX is king of the air as regards strength and quality, the dreary succession of talks and musical interludes between 6 and 9.30 o'clock make it useless on most week nights. The afternoon programmes are all right, but they are not for the man who earns his living or his busy wife, and therefore we feel thankful for such stations as Berlin, Vienna, Turin, etc., which do not think it beneath their dignity to broadcast good and popular music for the *entertainment* of their listeners.

I should add that the Sunday programmes from 5XX are very much appreciated here, and personally I would not think of tuning in any other station on that day. DUBLINER (Dublin).

In a series of papers read before the American Institute of Radio Engineers recently it was stated that radio engineers have been able to measure time with an accuracy to within one part in a hundred million.

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
243.9	1,230	Newcastle (5NO)	1.0
258.6	1,160.1	*Leeds (2LS)	0.13
288.5	1,040	*Sheffield (6LF)	0.13
288.5	1,040	*Bournemouth (6BM)	1.0
288.5	1,040	*Edinburgh (2EH)	0.35
288.5	1,040	*Hull (6KH)	0.2
288.5	1,040	*Dundee (2DE)	0.13
288.5	1,040	*Liverpool (6LV)	0.13
288.5	1,040	*Stoke-on-Trent (6ST)	0.13
288.5	1,040	*Swansea (5SX)	0.13
294.1	1,020	*Bradford (2LS)	0.13
302.6	991.1	Belfast (2BE)	1.0
311	964	Aberdeen (2BD)	1.0
323	928	Cardiff (5WA)	1.0
358	838	London (2LO)	2.0
378	793	Manchester (2ZY)	1.0
396	757	*Plymouth (5PY)	0.13
401	748.3	Glasgow (5SC)	1.0
482	622	Daventry Ex. (5GB)	17.0
1,500.5	191.5	†Daventry (5XX)	25.0

* Relay stations. †Relays 2LO.

AUSTRIA			
250	1,200	Linz	0.5
283	1,060	Innsbruck	0.5
354.2	847	Graz	3.0
456	694	Klagenfurt	0.5
520	577	Vienna	20.0
BELGIUM			
220	1,360	Chatelineau	0.25
249	1,203	Schaerbeek-Brussels	0.5
275	1,090	Ghent	0.5
280	1,070	Liége	0.5
512	586	Brussels	10.0
CZECHO-SLOVAKIA			
265	1,128	Kosice	2.0
278	1,080	Feriby (testing)	12.0
306	980	Bratislava	4.0
343	873	Prague (Praha)	5.0
432.3	694	Brunn (Brno)	2.4
DENMARK			
339	883	Copenhagen (Kjobenhavn)	1.0
1,158	259	Kalundborg	7.5
ESTHONIA			
408	735	Reval (Tallinn)	1.3
FINLAND			
374	800	Helsingfors (Helsinki)	0.8
1,502	199	Lahti	20.0
FRANCE			
175	1,714	St. Quentin	0.25
212	1,415	Fécamp	0.3
211.3	1,420	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
244	1,213	Lille (PTT)	0.8
250	1,196	Juan-les-Pins	0.4
254	1,180	Rennes (PTT)	1.0
255	1,175	Toulouse (PTT)	1.0
268	1,118	Strasbourg	0.3
274	1,092	Limoges (PTT)	0.5
285	1,050	Montpellier	1.5
292	1,028	Radio Lyons	1.5
300	996	Bordeaux (PTT)	0.5
305	982	Agen	0.3
309	970	Vitus (Paris)	2.0
318	943	Marseilles (PTT)	0.5
336	892	Petit Parisien	0.5
352	850	Algiers (PTT)	2.0
368	815	Radio LL, Paris	1.0
384	784	Toulouse (Radio)	9.0
400	749	Mont de Marsan	0.4
413	725	Radio Maroc (Rabat)	2.0
423.7	708	Radio Flandre Lille	0.25
429	699	Grenoble (PTT)	1.5
446	672	Paris (Ecole Sup., PTT)	0.7
468.8	640	Lyons (PTT)	5.0
1,350	222	Tunis (testing)	
1,473	203	Eiffel Tower	8.0
1,749	171	Radio Paris	8.0
1,825	164	Radio Carthage (Tunis)	
GERMANY			
219	1,370	Flensburg	1.5
240	1,250	Nurnberg	4.0
250	1,200	Kiel	0.7
250	1,200	Cassel	0.7
263.2	1,140	Cologne	4.0
267.8	1,120	Muenster	1.5
275	1,090	Kaiserslautern	1.5
280.4	1,070	Königsberg	4.0
283.1	1,058	Berlin (E)	0.7
283.1	1,058	Stettin	0.7
283.1	1,058	Magdeburg	0.7
317.5	945	Dresden	0.75
320	937	Breslau	4.0
326.4	919	Gleiwitz	6.0
329	910	Bremen	0.75
361.9	829	Leipzig	4.0
374.1	802	Stuttgart	4.0
391.6	766	Hamburg	4.0
427	711	Frankfurt	4.0
455.9	654	Danzig	0.75
456	651	Aachen	0.75
462.2	649	Langenberg	25.0
476	630	Berlin	4.0
538	558	Munich	4.0
566	530	Augsburg	0.5
566	530	Hanover	0.7
577	520	Freiburg	0.7
1,051	181.7	Zeesen	20.0
1,051	181.7	Norddeich	10.0
GRAND DUCHY OF LUXEMBOURG			
1,220	245	Radio Luxembourg	0.5
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
336.3	891.5	Huizen (until 5.40 p.m. B.S.T.)	5.0
1,076	278	Hilversum (ANRO)	5.0
1,846	162.5	Huizen (after 5.40 p.m. and on Sundays	5.0
1,846	162.5	Scheveningen-haven	5.0
HUNGARY			
548	548	Budapest	15.0
ICELAND			
333.3	900	Reykjavik	1.0
IRISH FREE STATE			
222.2	1,350	Cork (5CK)	1.5
411	730	Dublin (2RN)	1.5
ITALY			
278	1,078	Turin	7.0
333	900	Naples (Napoli)	1.5
387	775	Genoa (IGE)	3.0
442	677	Rome (Roma)	3.0
450	666	Bolzano	0.3
503.5	596	Milan	7.0
JUGO-SLAVIA			
308.3	973	Zagreb (Agram)	1.25
450	668	Belgrade	4.0
582	515	Ljubljana	5.0
LATVIA			
529	567	Riga	2.0
LITHUANIA			
2,000	150	Kovno	15.0
NORWAY			
242	1,240	Rjukan	1.0
297	1,010	Notodden	0.7
365	820	Bergen	1.0
387	774	Fredriksstad	1.0
456	657	Tromso	1.0
456	657	Aalesund	1.0
456	657	Porsgrund	1.0
496	604	Oslo	1.5
577	519.9	Hamar	0.7
POLAND			
314	955	Cracow	1.5
337	890	Posen	1.5
415.5	722	Kattowitz	10.0
456	658	Wilno	1.5
1,397	214	Warsaw	10.0
PORTUGAL			
317.5	945	Lisbon CTIAA (Wed. and Sat.: 10—midnight)	
ROUMANIA			
395	757	Bucharest	4.0
RUSSIA			
492	609	Kharkov (NKO)	5.0
825	363.6	Moscow (PTT)	25.0
925	323	Homel	2.5
1,000	299	Leningrad	20.0
1,440	208	Moscow	30.0
1,684	178	Kharkov	15.0
SPAIN			
314	956	Oviedo (EAJ19)	0.5
324	926	Almeria (EAJ18)	1.0
346.8	865	Barcelona (EAJ1)	10.0
369	811	Seville (EAJ5)	0.5
400	750	Radio España	1.0
405	740	San Sebastian (EAJ8)	0.5
426.7	703	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
261	1,150	Horby	10.0
265	1,130	Trollhattan	0.4
333	900	Falun	0.5
350	858	Goteborg	6.0
437	686	Stockholm	1.5
550	546	Sundsvall	1.0
770	390	Ostersund	2.0
1,200	250	Boden	2.0
1,345	223	Motala	30.0
SWITZERLAND			
406	739	Berne	1.0
496	604	Zurich	0.6
680	441	Lausanne	0.6
780	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,200	250	Stamboul	5.0
1,809	164	Angora	5.0

FOLLOWING THE ZEPP

Jottings from my Log

By JAY COOTE

ON more than one occasion foreign broadcasting stations—in particular, Stuttgart, Munich, and Vienna—have given us opportunities of hearing their cross-talks with the dirigible *Graf Zeppelin*, and listeners will not have forgotten the broadcast carried out by Germany, Great Britain, and America when the airship landed last year at Lakehurst Aerodrome, U.S.A. When, on Thursday, May 16, hurriedly taking advantage of weather conditions, the Zeppelin left its base at Friedrichshafen at 5 54 a m. I take it that the German studios had not received sufficient notice to allow them to carry out their relay of the start, as in the previous year, for a search towards that hour brought me no information from their transmitters.

Hamburg in its early broadcast, and later Berlin throughout the day, reported on the airship's ill-fated progress. The next day, however, with its more disquietening news regarding adverse winds and broken down motors, brought with it some considerable excitement and the anxiety in Germany regarding the safety of the dirigible was such that many studios, especially Munich, Stuttgart, Cologne, Frankfurt, and Berlin, cancelled whole chunks of their radio programmes, interrupting them at all moments to broadcast to their listeners the contents of the latest messages.

From roughly 4 p.m. on Friday, May 17, until late that evening I was able to follow the *Graf Zeppelin* in all its wanderings over Valence, Grignan, Saillans, Marignan to its final resting place, and it was curious to note how the contents of a telegram given out by, say, Radio Paris, which on this occasion furnished an exceptionally good news service, could be picked up barely thirty minutes later, in a literal translation from one or other of the German transmitters. To compare times, also, was a fascinating pastime, for in two or three instances barely fifty minutes had elapsed between the broadcast in Germany of a message received from a well-known Paris news agency and the *actual occurrence* to which it referred. Through Radio Toulouse, the P.T.T. stations, Munich, Stuttgart, and Berlin I was given full particulars of the final landing of the airship at the Cuers-Pierrefeu Aerodrome.

Seventeen stations are now licensed for television in America. They will broadcast on three short wavebands, ranging from 2,000 kilocycles to 2,950 kilocycles.

A number of readers have inquired who are the makers of the self-winding gramophone motor recently described in AMATEUR WIRELESS. The motor is made by Auto Electrical Devices, Ltd., Diamond Works, Brighton.

The Japanese Broadcast Net

JAPAN now owns a well-organised broadcasting system of seven stations which, with the exception of that at Nagoya, all have a power of 10 kilowatts. Strung as they are across the Archipelago, they ensure an adequate service to this little empire. The entire broadcasting system is controlled by one official corporation, possessing a State charter, and is solely supported by fees from licences. The annual tax amounts to roughly 40s., and it is computed that some 550,000 wireless receivers are in daily use

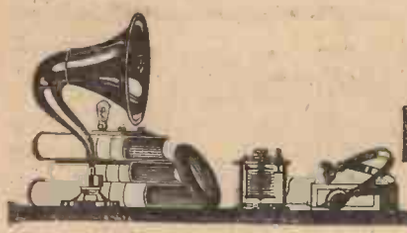
The seven stations are connected together by means of landlines, and so are able to carry out simultaneous broadcasts.

All wavelengths adopted have been chosen from the middle broadcasting band, as can be seen by the list hereunder :—

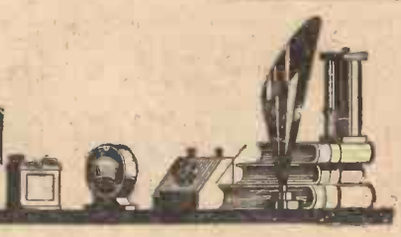
		Kilowatts
JOAK (Tokio)	345 m. (870 khz.)	10
JOBK (Osaka)	400 m. (750 khz.)	10
JOFK (Hiroshuna)	353 m. (850 khz.)	10
JOCK (Nagoya)	370 m. (810 khz.)	1
JOGK (Kumamoto)	380 m. (790 khz.)	10
JOHK (Sendai)	390 m. (770 khz.)	10
JOIK (Sapporo)	361 m. (830 khz.)	10

GRIDDA.

On 49.9 metres possessors of short-wave receivers may pick up the new Vienna experimental transmitter which is now testing nightly. The call is : "*Hier Kurzwellensender Ravag, Wien.*"



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

"Clarion Screen-grid Four?"

Q.—*I have read about the "Clarion Screen-grid Three" receiver and think it a very fine set. As I am restricted to an indoor aerial, I fear that I may not get sufficient volume from distant stations for working a loud-speaker, and therefore ask if you contemplate bringing out a Clarion Screen-grid Four?—"Astonian" (Aston).*

A.—We have nothing "in the air" at the moment regarding a four-valver on these lines, but your letter will be considered as a suggestion. If you are urgently wanting a four-valve set, and one to cover both wavebands without coil-changing, then we would suggest you construct the "Binowave Four."—C. A.

A TECHNICAL NOTE

Screen-grid Valves and Poor Selectivity.

A large number of the letters received by the staff of the Information Bureau contain complaints regarding the poor selectivity obtained with screen-grid valve sets. Now from the introduction of such valves we have consistently advocated the use of a very small aerial in conjunction with sets using them.

This advice has met, in some cases, with the reply that to employ a screen-grid valve with a small aerial means getting results about equal to those from an ordinary three-electrode valve set with a good outdoor aerial.

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.

This may appear to be correct on the face of things, but is not accurate by any means. The screen-grid valve is capable of enormous amplification, and weak signals are amplified to a far greater degree than is the case when an ordinary three-electrode valve is used. It is this fact that accounts for much of the apparent poor selectivity.

As is well known, to be sure of reasonably pure reproduction the tuning circuits of any telephony receiver must be somewhat flat in tuning, to avoid cutting off the side bands. In making the circuits flatly tuned, signals of different frequency from different stations actuate the aerial system and consequently the screen-grid valve amplifies both interfering signals and the required signals. The remedy is to reduce the efficiency of the "picking-up" properties of the aerial.

It must be admitted that the use of a small aerial does mean reduced energy from all stations, but the reduction of the interfering energy is far greater than the reduction of the actual energy of the station it is desired to receive.

As a rough guide, we suggest using an aerial of 20 ft. (over all) of wire indoors for listeners living within a radius of eight miles of a main broadcasting station, and 20 to 25 ft. of aerial wire outdoors for listeners living outside that radius.

MORE RADIOGRAMS

THE first two-way radio conversation between an aeroplane and local newspaper offices was successfully accomplished under the auspices of the Western Electric Company recently. Reporters flying 2,500 ft. above Hadley Field, New Jersey, rang up their office and gave out the story of their flight.

"*Ici Radio Normandie*" is the call put out by the small Fécamp (France) broadcasting station locally operated by a wireless association. A concert is transmitted every Thursday from 8.30 to 10 p.m. B.S.T. on a wavelength of 212 metres. Listeners may identify this transmitter by a carillon to be heard at 9 p.m. and by the playing of a melody from a popular French operetta (*Phi Phi*), immediately followed by a few bars of "La Marseillaise." The call is given out between musical items.

At Wierzbowo, in Poland, a number of peasants recently lynched a wealthy farmer who had installed a wireless receiver in his home; they contended that by his communications with the Underworld he was able to inflict disease on their cattle!

Radio Flandre, a private commercial transmitter at Lille (France) broadcasts daily from 7 to 7.30 p.m. B.S.T. on a wavelength of 420 metres. Announcements in French are made by a female speaker.

The programmes of the National Broadcasting Company in America are made up as follows: Jazz music, 15 per cent.; classical music, 28 per cent.; sentimental melodies, old favourites, and folk songs, 10 per cent.; radio drama, 2 per cent.; band music, 4 per cent.; advertising, 14 per cent.; educational programmes, 6 per cent.; women's programmes, 6 per cent.; physical exercises, 4 per cent.; humour, children's programmes, religious programmes, etc., take up the remaining time.

A weekly feature from WAIU (Columbus, Ohio) is a broadcast from the State prison. All the performers are convicts, and the announcing and much of the technical work are done by men serving sentences. Connection with the prison studio is made by remote control.

Messrs. Climax Radio Electric, Ltd., desire us to state that their new telephone number is Primrose Hill 1171-2.

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.)

1929 Crystal Receiver	AW165
A Daventry-Local Crystal Set	AW185

ONE-VALVE SETS (1s. each)

Beginners' One-valver	AW140
Reinartz One	WM127

TWO-VALVE SETS (1s. each)

East to West Short-wave Two (D. Trans.)	AW159
Beginner's Two (D, Trans)	AW171
Auto Two (D, Trans)	AW174
All-Mains Two (D, Trans)	AW180
1929 Favourite Two (D, Trans)	AW186
Key-to-the-Ether Two (D, Trans)	WM107
Meteor Two (D, Trans)	WM114
Clipper Two (D Trans)	WM135
Twinflex (Reflex)	WM138

THREE-VALVE SETS (1s. each)

All-wave Mains Three (HF, D, Trans, Rectifier)	AW144
All-purpose Short-wave Three (D, RC, Trans)	AW147
Screen-grid Q Coil Three (HF, D Trans)	AW150
All-Britain Three (HF, D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Hartley Dual-range Three (D, RC, Trans)	AW165
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
Everyday (D, 2 Trans)	WM52
All-wave Screen-grid Three (HF, D, Trans)	WM110
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2LF-dual Imp.)	WM118
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

FOUR-VALVE SETS (1s. 6d. each)

Overseas Short-waver (HF, D, 2 Trans)	AW133
The Ranger (SG, D, RC, Trans)	AW145
Broadcast Picture Four (HF, D, 2RC)	AW163
Orchestra Four (D, RC, Push-pull)	AW167
All Europe Four (2 HF, D, Trans)	AW173
Stability Four (H.F, D, RC, Trans)	AW182
"Q"-coil 4 (HF, D, RC, Trans)	WM71
Five-pounder Four (HF, D, RC, Trans)	WM91
Touchstone (HF, D, RC, Trans)	WM109
Reyner's Furzehill Four (SG, D, 2Trans)	WM112
Economy Screen-grid Four (SG, D, RC, Trans)	WM113
Binowave Four (SG, D, RC, Trans)	WM119
Standard-coil Four (HF, D, 2 RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
The Drum Major (HF, D, RC, Trans)	WM137

FIVE-VALVE SETS (1s. 6d. each)

"Q" Gang-control Five (2HF, D, 2Trans)	AW161
Empire Five (2 SG, D, RC, Trans)	WM96
Fidelity Five (HF, D, 2 RC)	WM130

SIX-VALVE SETS (1s. 6d. each)

Short-wave Super-6 (Super-het, Trans)	AW67
Eagle Six (3 HF, D, RC, Trans)	WM106

AMPLIFIERS (1s. each)

Screened-grid HF Amplifier	AW138
"A.W." Gramophone Amplifier (3RC)	AW162
Searcher Unit (HF)	AW176
Gramophone Amplifier (3 v.)	AW187
Gramo-radio Amplifier (2v) (Trans.)	WM72
Signal Booster (HF Unit)	WM128
Auditrol Amplifier	WM132

MISCELLANEOUS (1s. each)

H.T. Eliminator for A.C. (200 v. output)	AW102
L.T. and H.T. Mains Unit (D.C.)	AW123
Listener's Speaker, price 4d. free with copy of "AW"	AW170
Arcadian Linen-diaphragm Loud-speaker (Full-size)	AW177A
D.C. Unit (HT)	AW178
Short-wave Adaptor (1 v.)	AW183
Universal Short-wave Adaptor	WM83
Buzzer Wavemeter (6d.)	WM121
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

PORTABLE SETS

House Portable (SG, D, RC, Trans)	AW163	1/6
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
Chummy 4 (with modifications for LS and HT)	WM831	1/6
Wayfarer Portable (Super-het)	WM139	1/6

Send, preferably, a Postal Order (stamps over sixpence in value unacceptable) to Blueprint Service

AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

June 3 A vaudeville programme.
" 5 A running commentary on the Derby.
" 6 *Ingredient X*, a thriller by L. du Garde Peach.
" 8 A request programme.

DAVENTRY EXPERIMENTAL (5GB)

June 4 *Acis and Galatea*, a serenata by Handel: words by J. Gay.
" 5 A running commentary on the Derby.
" 6 *Four in Hand*, a revue by John Watt and Claude de Ville.
" 7 Covent Garden opera.

CARDIFF

June 4 A programme by winners at the Bristol Eisteddfod, 1929.
" 8 A night in dockland.

NEWCASTLE

June 5 Concert from the North-East Coast Exhibition.

The Cossor Wireless Book.—This interesting little publication, which is issued by Messrs. A. C. Cossor, Ltd., of Highbury Grove, N.5, has been prepared with the idea of helping owners of old and new-type "Melody Makers" to get the best reception. Instructions are given for operating the set, a clear explanation is given of the way in which it works, and finally a number of pages are devoted to useful hints and tips of general radio interest. The booklet may be had free upon mention of AMATEUR WIRELESS.

A microphone and loud-speaker were introduced in a court-room at Cincinnati recently for the first time during the murder trial of Joseph Rason.

"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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Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS.

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As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

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58/61, FETTER LANE, LONDON, E.C.4.

To-day—

EXISTING Varley products are known for their efficiency and reliability, and many of our components are the admitted standards for comparison throughout the length and breadth of the British Isles.

The radio enthusiast who has proved for himself how really good wireless can be will be quick to pick out of the above group of components our famous Bi-duplex wire-wound Anode Resistances, H.F. Choke, and Resistance Capacity Couplers. Or, if he is a lover of radio gramophones, he will see our compound Mass Suspension Pick-up and Automatic Pick-up Arm. Then follows the Anti-mobo, Anti-mobo R.C. Couplers, Rheostats, Potentiometer, Volume Control, etc.,—and in each case, these components or accessories will be remembered for their efficiency and reliability.

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Several of our new components are nearing completion and in a very few weeks you will be able to buy these new Varley products from your local dealer. It is no exaggeration to say that they will do more to popularise radio in this country than anything else has done for years. Look out for our advertisements and see for yourself the enormous contribution these new Varley products will make to the improvement of Broadcast reception in this country.

For RADIO OLIVER PELL MANUFACTURE Varley

For RADIO OLIVER PELL MANUFACTURE Varley

Advertisement of Oliver Pell Control Ltd., Kingsway House, 103 Kingsway, London, W.C.2. Telephone: Holborn 5303.

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, June 1, 1929.

ANOTHER LINEN-DIAPHRAGM LOUD-SPEAKER

Amateur Wireless

and Radiovision

Every Thursday 3d.

Vol. XIV. No. 363 Saturday, June 8, 1929

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

JUNE 8, 1929 No. 365. Vol. XIV

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

Blowing its own Trumpet—"Swopping" Programmes—Music for the Mike!—Talkies Again!—Grammar, Please!—Listening for Fish!

Blowing Its Own Trumpet—A fact which is beginning to make itself even more painfully obvious than it was in the past year is the B.B.C.'s self-advertising. In saying this a casual "dig" is not being made, for many listeners complain that the constant repetition of what the B.B.C. does and can do, over the microphone, is wearisome. And yet the powers that be have seen cause to forbid the broadcasting of names of dance tunes! There would be some excuse for microphone self-advertisement if broadcasting were run on competitive lines; but as this is not the case why does the B.B.C. seek to make itself more than ever a monopoly?

Loud-speakers on board! The *Crested Eagle*, which makes trips from the Tower Pier to Margate and Ramsgate, is now fitted with a loud-speaking installation. At present the speakers are used only to broadcast accounts of the scenery passed *en route*, but music and concerts are later to be given.

"Swopping" Programmes—The recent visit of Mr. Aylesworth, who is President of the United States National Broadcasting Co., showed that our transatlantic cousins are very interested in the idea of occasionally "swopping" programmes with us. When Mr. Aylesworth returned to the States a number of Press reports were issued stating that he had been discussing plans in London, of a programme exchange scheme. It is probable that the new experimental station at Tatsfield may be used by the B.B.C. in connection with its part of the relay.

Music for the Mike!—Is this a record? Max Butting, a German composer with a fair reputation in his native country, has composed an orchestral work especially for broadcasting. It is understood that Butting is himself something of a technician and his musical composition is said to take into account present defects, both at the transmitter and in receivers. We have not yet heard the piece, but it is hard to see what he has done. Has he cut out the bass, used only instruments which broadcast well, or cramped his style in some similar way? But perhaps the B.B.C. will broadcast it and then we shall know.

Talkies Again!—Listeners seem to be likely to lose something by the advent of talkies, which are attracting (as has recently been pointed out in AMATEUR WIRELESS), a number of former members of the B.B.C. staff. Now here is a new hardship. Owing to the installation of talkies it is no longer possible to relay Frank Westfield's orchestra from the Prince of Wales Playhouse, Lewisham. Unless the B.B.C. does something off its own bat we have probably heard the last over the microphone of this popular combination.

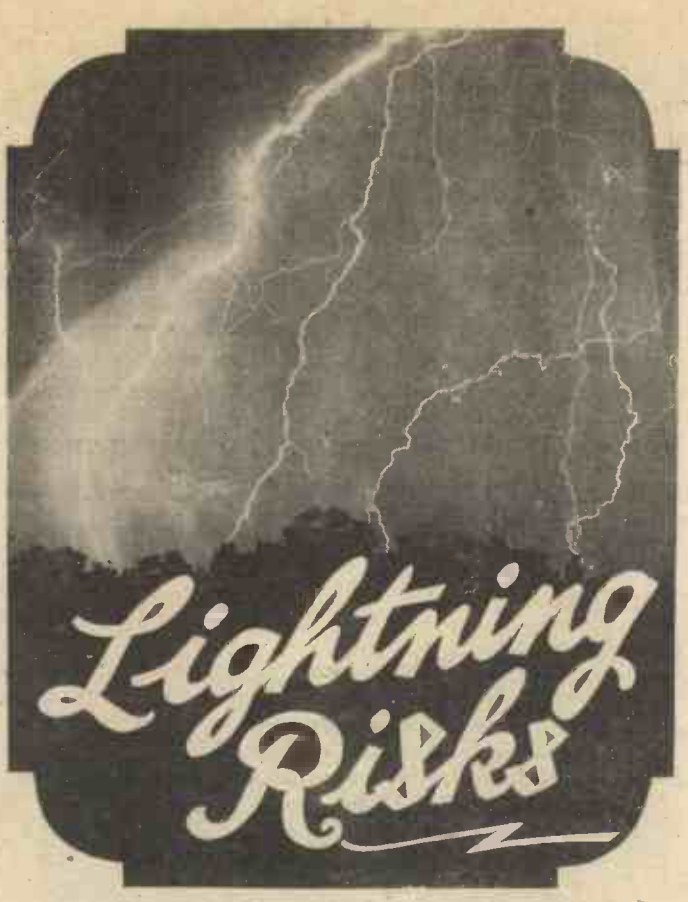
Grammar, Please!—The other day in a literary contemporary with which a well-known broadcaster is connected we came across that horrible grammatical error, or Americanism (whichever way you like to look at it!) "broadcast*ed*." One would think that after all these years' experience of broadcasting the various tenses of the verb "to broadcast" would be common knowledge. True, it is rare that literary lights slip up on such subjects; but who would say "he *casted* a stone."

Listening for Fish!—The technical folk of the Marconi Co. seem to be adept at finding new uses for radio, one of the latest being in connection with the fishing fleet. A number of steam trawlers leading the fleet have been fitted out with radio and many of the boats carry two-valve receivers. Members of the fleet can communicate with one another up to a distance of about 300 miles and reports are constantly being received of the way in which a member of the fleet, finding good fishing ground, can ensure a good catch by summoning other boats.

Yacht Radio—Sir William Berry's famous motoring yacht *Sona* can now boast of one of the most up-to-date radio outfits. It has on board a four-valve broadcast receiver with loud-speakers arranged at various points and permanent wiring thereto. In addition there is a 1½ k.w. valve transmitter for long-distance communication.

This Week—In the centre pages of this issue you will find constructional details of another addition to the ranks of AMATEUR WIRELESS portables. This is the "Holiday Portable Three," which is designed to fill a very definite need.

PRINCIPAL CONTENTS



MANY cautious listeners use an outside earthing switch even when it entails having to go out into the open to switch off after listening to an evening's broadcast programme. Others whole-heartedly accept the risk involved in leaving the aerial unearthed.

Inside switches are most commonly used, though their effective value is more moral than actual should lightning ever make a direct hit on the aerial. The proper solution is, of course, to use an outside switch arranged to be operated from inside, of which there are a number of types available.

The principle employed is to make the conducting rod slideable to a limited extent through the vulcanite lead-in tube. A knob or handle at the inside end of the rod then enables the listener to slide the rod so as to open and close switch contacts at one or both ends of the rod.

In one position the aerial wire is connected directly to an earth wire and in the other position the aerial has no direct earth connection, but is connected through the lead-in tube to the receiving set. The position and shape of the switch contact varies in different designs.

In making a selection from these, care should be taken to note the following points: In the first place, the direct aerial-to-earth path when the switch is in the "off" position should be as straight as possible, as any sharp bends or curves in the conducting path would render the arrangement practically useless in the case of a direct hit. Good contact in this part of the switch is a minor consideration so long as the path is straight.

In the next place, the switch contact connecting the aerial to the set must give good contact, preferably a rubbing contact under spring pressure, as this will keep the surfaces bright. In some designs this switch contact is omitted altogether, the aerial being permanently connected, either by screw terminals or soldered joints, to the inside wire leading to the aerial terminal of the set.

This prevents any loss of signal strength due to high resistance at the switch contacts, but, on the other hand, it leaves the aerial connected to the set even when the set is not in use and the aerial is earthed.

This may not recommend itself to listeners who are inclined to nervousness, as they may argue that no leads entering the house should be connected to the aerial when the set is switched off. There is little ground for fear, however, as the main discharge would almost certainly take the straight path to earth and ignore the high-resistance shunt through the set.

There still remains the possibility of a lightning discharge when the set is in use. The usual protection against this is to provide a small air gap between the down lead and the earth connection. Any heavy discharge will pass across the gap in preference to following the indirect path through the set.

Even where there is no special provision made for a special spark gap the small gap normally existing between the aerial and earth switch contacts, when these are open, would in most cases serve as a safeguard.

M. A. L.

SECRET WIRELESS

THE latest methods for keeping wireless signals secret are quite sufficient to daunt the most enthusiastic listener, quite apart from the recent official prohibition on the subject by the P.M.G. The object in view is, of course, to place commercial wireless telephony on an equal footing with the ordinary telephone service as regards immunity from unauthorized eavesdropping.

In one system that has recently been proposed, the voice currents, as spoken into the land-line leading to the wireless transmitter, are first divided up into three different bands of frequency, by means of filter circuits. These bands are then transposed and recombined in a definite sequence so as to bear no resemblance whatever to intelligible speech. They are then imposed on a carrier wave and transmitted over the ether in this form.

At the distant end, the signals are detected, and split up again into the three original frequency bands. These are then reshuffled into their proper sequence before being fed to the telephone. In this way a spoken message can be kept absolutely inviolable in its passage across the ether.

B. A. R.

MAINS-ELIMINATOR HUM

THE recognised method for removing any trace of "hum" due to the A.C. component or ripple from the electric-light supply consists in the use of filter circuits comprising inductances or chokes in series with the supply, and condensers in parallel. The problem is now, however, being tackled on new lines which may render the use of such filters unnecessary. Broadly speaking, the new method consists in diverting part of the ripple or A.C. voltage fluctuations on to the grid of the amplifier, in phase opposition with the residual ripple voltage between the plate and filament. The valve thus automatically neutralises the initial disturbance in much the same fashion as in the well-known balancing methods used for stabilising H.F. amplifiers.

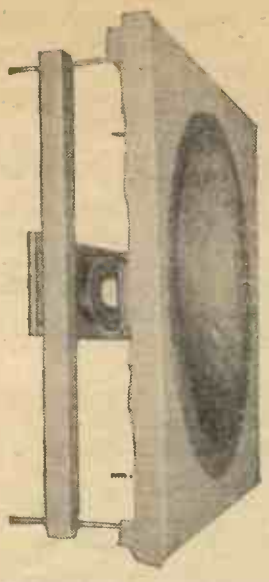
M. B.

CIRCULARLY-POLARISED WAVES

IT has been found that waves of 400 metres length when received after reflection from the Heaviside layer often have circularly-polarised components. That is to say, the electric and magnetic fields remain constant in amplitude, but rotate at a constant speed about the path of travel. The direction of rotation is anti-clockwise. The effect has been attributed to the action of the earth's magnetic field, in which case the rotation should be clockwise in the Southern Hemisphere.

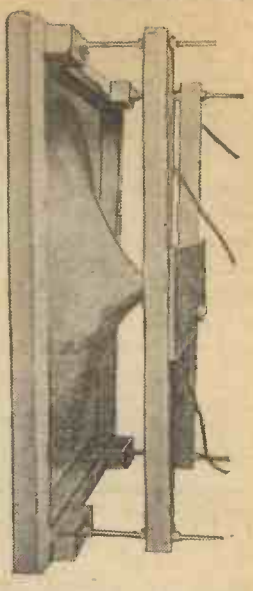
On shorter waves, under similar circumstances, the waves are plane polarised, but the actual plane of polarisation rotates slowly, making a complete cycle every few seconds. Such waves if received on an upright aerial "fade" periodically. This defect can, however, be overcome by receiving the signals simultaneously on vertical and horizontal aerials spaced a few wavelengths apart and connected to a common receiver.

A. H.



THE MONO-CONE LINEN-DIAPHRAGM SPEAKER

Constructional Details of a New Type of Instrument



By G. M. GREEN, M.Sc. and B. THOMPSON, B.Sc.

DURING the past few years the cone type of speaker has become increasingly popular and deservedly so. Many cones however have a tendency to reproduce the lower register better than the higher, this failing being by no means entirely due to inherent faults in reed movements, and very much that passes a non-critical ear as "bass" is really false resonance or booming.

In the single-cone linen-diaphragm speaker to be described, which the authors have named the "Ianora," the reproduction of all frequencies is very uniform, this being due in a large measure to the method of floating the cone, the nature of the material, and the kind of dope.

False resonance is entirely eliminated, whilst the reproduction is extremely good, and will probably come as a revelation to constructors.

Briefly, the diaphragm consists of a cone of rather large diameter made of a fabric known as Dorcas Lawn Permanent. This is doped to give it the necessary stiffness—this point is vitally important if the best results are to be obtained—*and floated on the same material*, not doped. The cone and the floating medium are made from the same square of cloth, thus giving perfect continuity.

The construction of the speaker is perfectly simple and straightforward, but the utmost care must be taken in following out the instructions, otherwise the results will not be guaranteed.

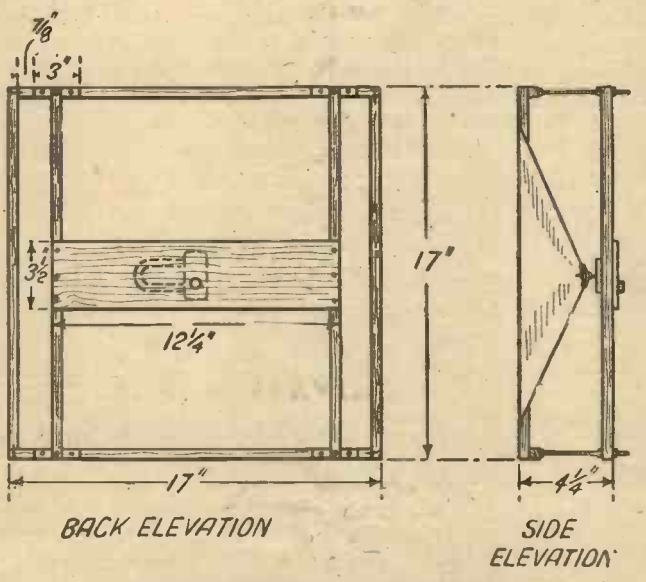
The following materials will be required to make the speaker:—

¾ yd. Dorcas Lawn Permanent.
10 ft. ⅞ cross section wood.
1 strip five-ply, 12 in. by 3½ in.
2 ft. No. 2B.A. screwed brass rod.
16 nuts and washers to fit brass rod.
Balanced-armature unit (Blue Spot 66K).
1 cone washer assembly unit.
Screws, tacks, glue, dope.

Making the Cone and Float

Cut out a square of Dorcas Lawn Permanent (this material is specially recommended as giving the best results, several other kinds of standardised fabrics having been tried and found very much wanting by comparison) having sides 27 in. long. *Wash thoroughly* to remove any sizing; dry, and iron out any creases.

Place on a flat board, fastening down with drawing pins, and draw a circle of 8-in. radius (diameter 16 in.) in the centre. The compass should be fitted with a piece of indelible pencil, since the line representing the edge of the area to be doped must be clearly seen.



Elevation and Section of the Speaker Frame

Now draw a horizontal line from centre to circumference on the right of the circle. Draw another line below this inclined at an angle of 30 degrees. To do this, stretch the compasses to a width of 4 in. and mark off this distance on the circumference below the horizontal line. Join this point to the centre of the circle. Now find the middle point of each line. On the top line draw a thick-line semicircle with a radius of 4 in. and a dotted or interrupted line with a radius of 4⅜ in. On the bottom line construct a dotted-line semicircle of 4 in. radius and a thick-line semicircle with a radius of 4⅜ in. See sketch on next page. Note that the lower thick line stops short where it reaches the upper line.

When the cloth is doped sufficiently as to be stiff, the scissors are taken along the thick lines to the centre of the circle, thus cutting out a moon-shaped portion.

Doping the Material

The authors have used various kinds of advertised dopes or varnishes in their experiments, but found that the one recommended gives the best results.

Dissolve in one-third of a pint of acetone, with repeated stirring and shaking, as much celluloid as will give a solution as thick as golden syrup. The price of this acetone is about 2s. The celluloid from a discarded accumulator will answer. This quantity of dope is sufficient to give the four coatings recommended.

In applying the coats of dope, keep the fabric stretched on the board and work from the circumference inwards, taking care not to overstep the boundary. Use a soft brush.

When the whole surface has received its coat, remove the linen from the board and hang up to dry. This is complete in an hour or less.

Return to board and dope for a second time on the reverse side. Remove and dry. After doping for the third coating—this time on the front side—and drying, the stiffened diaphragm is ready to have its moon-shaped sector cut out, so that the cone may be shaped and glued up.

At this stage it is strongly recommended to practise the complete operation of

folding and glueing up a circular sheet of ordinary stiff notepaper.

When the cone is being formed see that the dotted lines and the two edges of the cut-out sector coincide with each other. Use a thin layer of fairly stiff glue (not Seccotine) for fastening the overlap down, and work in easy stages from the centre of the cone to the edge. It will be observed that a fold in the cloth occurs and that the square of cloth loses its shape. This fold can be nicely arranged later on the frame and plenty of cloth remains for securing purposes.

Fixing to the Frame

The frame, which supports the cone and

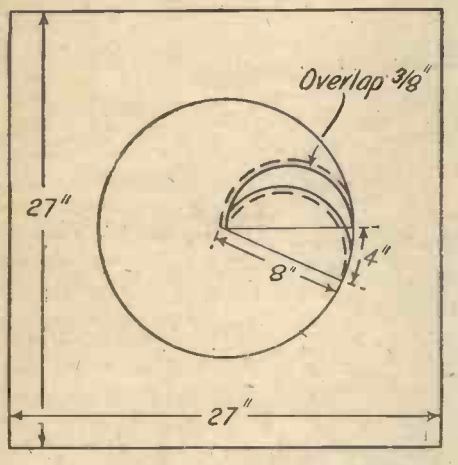


Diagram showing method of cutting diaphragm

its float, is made from four lengths of ⅞-in. square-section wood, 16⅛ in. long. If these are screwed down to each other, as in the diagram, the result is a square of great rigidity. No angle plates are required.

Lay the cone and the undoped fabric on a flat board and place the frame down over it. Pull the fabric into position so that the doped cone lies symmetrically in the centre of the frame. Fold up the surplus fabric and tack down to the back of the frame with ½-in. tacks. By tacking opposite sides alternately and working from the centre of each side outwards with a judicious pull on the fabric here and there, the result is a fairly respectable-looking cone floating on a slightly stretched creaseless square of undoped fabric.

Now punch a small hole in the apex of the cone and fit the cone washer assembly unit. The authors use one in which the spindle of the cone unit has to be held in position by a small screw from the side.

At this stage it is necessary to pull the cone into its final shape. This is done by passing a thin string through the cone washer unit, fastening one end to a small screw and the other to a weight of three or four pounds. Rest the frame between the edges of two chairs and give the cone a last but generous coat of dope. The wet material under the influence of the weight below takes on a better shape. Do not worry if the diaphragm when dry is not regularly conical from circumference to tip.

All that now remains is to connect up the cone unit. Saw off four 3-in. lengths of the ⅞-in. section wood In the centre of each bore a hole to take the 6-in. length of 2B.A. brass rod. Countersink deeply on the side that is to lie on the frame so as to take a nut without any part projecting and fasten the rod securely by means of a nut and washer on the opposite side. Screw each one down to the back of the frame by 1½-in. screws in the positions indicated in the sketch.

Take two lengths of ⅞-in. wood, 17 in. in length and bore holes at the top and bottom slightly bigger than the diameter of the brass rod in the positions which will be found by resting the wood on the brass rod ends, the ends of the wood being flush with the edges of the frame. Use five-ply wood 3½ in. wide to take the Blue Spot unit. Its length might be a little more than the sketch would indicate to allow for any adjustments.

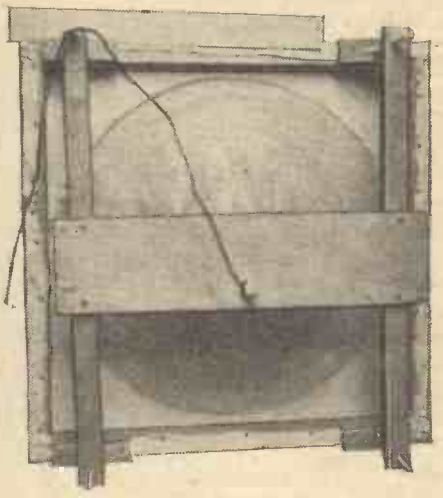
In attaching to the cone see that the latter travels freely along the spindle of the unit on slight compression. Do not pass the spindle through the washer unit so as to have any part projecting unless your cone washer assembly unit necessitates the use of securing nuts.

The Merits of the Single-cone Speaker

It is necessary to assume that a good three-valve set (such as H.F., det., power valve) is being used to provide the impulses. Under these circumstances the authors guarantee the following :—

(1) Speech is extremely clear and very natural.

(2) Music is well and truly rendered in the bass, middle register and the treble. In the bass the notes of the tympani or



A rear view of the speaker

drums may be clearly identified. There is an entire absence of false resonance or booming in the lower register.

(3) The volume obtainable is surprising.

(4) The instrument will stand up to very strong signals without any signs of distress.

(5) Slightly improved results will be gained by surrounding the speaker with a baffle in the shape of an open-backed cabinet just made to fit it, the front being fretted.

BUENOS AIRES CALLING!

JOTTINGS FROM MY LOG :: BY JAY COOTE

IT was just luck which prompted me to tune in to Radio Paris at about 6.20 p.m. on Saturday, May 25, when, much to my surprise, I heard an announcement in Spanish. Such an unusual occurrence demanded investigation, and without delay I made a rapid search, with the result that I discovered that the day was a national fête in the Argentine Republic, and that on this auspicious occasion one of the principal Buenos Aires broadcasters—LR4, if I heard the call rightly—was transmitting a special concert for the benefit of the two American continents and Europe.

Now, when after listening to a gramophone record—an obvious test—I was told, in Spanish, English, French, and German, to stand by, I did so, and was duly rewarded. At 6.35 p.m. Radio Splendid, Buenos Aires, the station in question, put over the Argentine National Anthem, and followed it up with short talks in all four languages, which put me wise to the route by which I was receiving the concert. Apparently, by previous arrangement, Radio Paris was taking it from the short-wave transmitter of Ste. Assise (France), which in its turn picked it up from Monte Grande (Buenos Aires). Simultaneously, as I quickly discovered, Nauen (Germany) was capturing it from the same source, and passing it on to Berlin and Königswusterhausen, the latter, curiously enough, giving me, notwithstanding its greater distance from London, a much clearer and purer relay than did the Paris station.

Many will recall the transatlantic relays effected by our own home stations—some successful, some not—and also the poor result achieved when we tried to reach out to the Antipodes. In the Buenos Aires transmission, Monte Grande, in conjunction with Nauen and Ste. Assise, scored heavily, for it proved a perfect success. No fading was noticed, distortion was remarkable by its absence, and fortunately, notwithstanding thundery weather conditions, atmospherics caused but little interference. Bear in mind that this took place in full sunshine on a day when, to all appearances, reception should have been poor.

Checking the Changing Currents

The whole Science of Wireless Telephony depends upon Changing Currents. Our Technical Editor here discusses the various forms of Current and shows how their action may be checked up by actual inspection

RADIO engineering is built up on the use of alternating currents. We start by generating current which alternates at some millions of times per second. This current is caused to run up and down a vertical wire known as an aerial in consequence of which it causes disturbances in the ether which travel outwards in all directions, unless, as in the case of a beam system, they are restricted to a certain direction only. These disturbances we call wireless waves and at the receiving point we set up a collecting system in which oscillating currents are induced similar to those at the transmitting end.

A.C. Currents

Thus, in the first place, the whole mechanism by which we transmit energy from point to point by wireless is based upon the production and utilisation of alternating currents, that is to say, currents which go first in one direction and then in the other. In wireless telephony, however, we go farther than this, because we modulate the alternating currents in the transmitter with low-frequency speech currents and in consequence we receive similarly modulated currents at the distant end. Here again, we have introduced fluctuating currents of an entirely different order of frequency, the rate of vibration here varying from some 50 cycles per second up to 6,000 or 8,000.

Still lower down in the scale we come across power frequencies, for the electric lighting current which is often used to supply some or all of the voltages necessary for operating the transmitter or receiver is often alternating in character, the frequency here being anything from 25 to 50 as a general rule. In America 60 cycles is the standard frequency while some districts in this country have some freak periodicity, such as 93 cycles, but the generally accepted standard is 50.

It is because of the varying nature of these currents that we are able to do such extraordinary things with them. Direct current—that is to say, current produced by a steady source and flowing through a steady resistance—is a more or less uninspiring form of electricity. The current is directly proportional to the voltage applied and indirectly proportional to the resistance and this is practically all that can be said about it. As soon as one commences to vary the current, however, all sorts of effects come into play. We have to consider, for example, the inductive effect of the circuit. If the wire encloses any area we have an inductive effect which cuts down the current. We can make alternating currents flow in paths which direct current will not take any notice of. Thus, two pieces of metal separated by an insulator constitute a path to alternating current, for such an arrangement acts as a condenser and will charge and discharge in harmony with the variations of voltage applied to it.

Many Considerations

Not only have we to consider numerous effects which do not come into play with a steady current at all, but we have also to consider the extent to which the various properties of the circuit affect the current. For example, a circuit which is designed to give a certain result at a low frequency, such as would be used for a power transmission, would give entirely different results if it were supplied with radio frequency. A single turn of wire would have very little effect on a power frequency current where as at a radio frequency its presence would be quite appreciable. Again we all know the distressing trouble known as "hand effect." The presence of one's body capacity is sufficient to cause a leakage of current from the circuit in question to earth and particularly on very short waves, which operate at extremely high frequencies, the whole operation of the circuit may be changed by coming near to, or farther away from, the apparatus. At a power frequency on the other hand, no such effects are experienced, for although the capacity effect is still there, the frequency of the current is too low to take any account of such a path.

Voltage Variations

These are some of the simple effects arising from the use of alternating currents, and it is quite an easy matter to calculate the currents which will flow in various classes of circuit when an alternating voltage which is constant in its effective value is applied across the terminals. An alternating voltage can never be constant in the same sense as a direct current can, but it is possible for the variations in the voltage or current to take place at regular intervals and to go through the same changes so that the form of any one "cycle," as it is called, is an exact duplicate of that immediately preceding it. There are, however, many cases which arise in scientific practice much more complicated than a simple case of this nature.

When one speaks into a microphone, sound waves are converted into electrical currents which must vary in an identical manner, as far as we can arrange it, and the whole question of natural reproduction depends essentially upon these small points. When one begins to work out the theory of such variations as this, the matter becomes distinctly more complicated. Indeed, there are some aspects of the question about which we have not yet obtained enough information to enable us to theorise with any degree of certainty. The principal test of the correctness of any theory is whether it enables one to produce the desired results in practice, and in many cases we fall short of this because we have not sufficient information to work upon.

There are cases, however, where we can assist our theory or gain further knowledge on any given problem by arranging in some manner to observe the form of the current in a circuit. Not only does this enable us to verify our theoretical ideas, but it may lead to the discovery of unsuspected effects.

To take a very simple example we assume that an alternating current varies in a certain defined manner and if we do certain things to the circuit, the current will change and it may be that the wave form will alter. That is to say, the manner in which the current varies may change from

(*Continued in 3rd col. of next page*)

THE MICROPHONE FOR SHOP-WINDOW DEMONSTRATIONS
The window of a London store in which the demonstrator speaks into the microphone. The crowd outside listen to the voice via the loud-speaker.

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

A Puzzle

A SHORT while ago I was asked to try a receiver of the three-valve type, having a shielded grid high-frequency stage, because magnification was poor and the tuning was rather broad. I will not describe the tests which were made in order to determine the cause of the trouble, but, having found that the coils, condensers, and valves were in order and having fitted new valve holders, the receiver functioned normally.

It was the valve holders which were reducing the magnification of the original set and making the tuning broad. They were of an old pattern, the insulating material of which was defective. There was no actual leakage between the valve terminals, but the material was so poor that they in effect acted as resistances across the circuits.

Tests on a number of valve holders have shown me that the differences as between one type and another are sufficient to account for noticeable differences in the behaviour of receivers.

One-knob Control

I think it is generally realised that in order to obtain sharp tuning without introducing distortion it is advisable to rely upon a number of tuned circuits, each of which tunes relatively broadly, than upon one or two sharply tuned circuits and reaction.

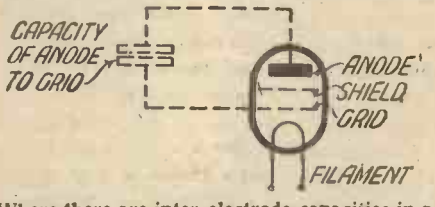
This is because the combined effect of several circuits that may individually tune rather broadly is to pass a band of frequencies more or less equally well. The band in telephony is from 15,000 to 20,000 cycles wide, and an object of a designer would be to pass the whole band and to stop currents having frequencies outside this band. Unfortunately, it is rather troublesome having to tune so many circuits unless a multiple condenser is employed to tune them all, when the circuits have to be fairly closely matched. But given good coils and a suitable layout, it is found that by providing properly constructed condensers or, alternatively, condensers that may be adjusted after the set is assembled, it is a practicable proposition to employ a one-knob control.

Some of the multiple condensers are therefore fitted with vernier condensers or have a loose plate in order that the circuits may be put into tune with ease when the construction is complete. As one would expect, the individual condenser adjustment can only compensate for the initial variations in the circuit capacity. This adjustment cannot correct for inductance differences.

S.G. Valve Capacity

On former occasions I have pointed out that, in spite of its special construction, there is still sufficient capacity between the grid and the anode of a shielded valve to cause trouble. The capacity is indicated below, and although it is very small indeed in comparison with that of ordinary valves it cannot be neglected.

It is this capacity which will cause a high-frequency amplifier to oscillate when good tuning coils are used, even though the anode and grid circuits are completely



Where there are inter-electrode capacities in a screen-grid valve

screened and the various de-coupling filters are employed. This capacity effectually limits the amount of the magnification that can be obtained with stability, and failure to recognise this has in the past resulted in an amount of trouble.

Before the valve capacity is reckoned to be the principal cause of instability, however, all other stray couplings must be minimised by suitable shielding and circuit connections.

Finding a Good H.F. Choke

There are so many types of high-frequency choking coils available to-day that the ordinary reader may well wonder whether it is possible to distinguish between a good and a poor one by inspection or other simple means.

These choking coils vary greatly in their size and in the amount of the wire used in their construction. Some of them comprise a former of cylindrical shape, but others are conical or, at all events, smaller at one end than the other. Most of them are section wound, and, as one would expect, the more expensive ones are larger and have more wire in them than cheaper types.

From my experience of many types, I should say that when the choking coil is to be used in the anode circuit of a detector valve and really good high-frequency choking is required, the amount of the wire used is a fair guide regarding merit. Small choking coils having comparatively few turns of thick wire cannot in the nature of things be quite so effective over as wide a range as larger, well-constructed coils wound with many more turns of finer wire.

"CHECKING THE CHANGING CURRENTS"

(*Continued from preceding page*)

a substantially regular formation to some irregular but still symmetrical form.

Under certain conditions, we are able to verify whether this is so, by causing the current to trace out for us a picture of itself. Such a device is known as an oscillograph, and it virtually enables us to watch the current itself. The essential parts of an oscillograph are simple. We have, first of all, a device producing a small spot of light. This may be a mirror on to which we throw rays from a source and which reflects a tiny beam of light on to a suitable screen. Another way of producing a light spot is to set up a stream of electrons moving at a high velocity, which may be done by making use of the same principles as are utilised in an ordinary valve. By arranging in the path of these electrons a screen covered with fluorescent material, we can arrange to observe the pencil, for at the point where it strikes, the screen will glow slightly and we shall have a small spot of light.

The next procedure is to cause this spot of light to move about the screen under the control of the current which we wish to observe and if we can do this in a satisfactory manner it will tell us exactly how the current has varied during the time we have been examining it. I propose to show how this is done in next week's article, when I shall talk about two types of oscillograph which are commonly used to-day.

On Your Wavelength!

An Empire Broadcast

ONE of the most general broadcasts ever made took place on the evening of Friday, May 24, when the service and the speech made by the Prime Minister at the great Empire Day Festival in Hyde Park were relayed to the world from 5SW. I have pointed out in the past what a wonderful part wireless was bound to play in strengthening the bonds of Empire, and this is a fine example of what it can do. Reports show that the transmission was well received in many parts of the Empire and that it was thoroughly appreciated. Myself, I regard 5SW as one of our most important broadcasting stations, for the very reason that it transmits Imperially. I hope that more and more use may be made of its splendid possibilities.

Missed Opportunities

For some reason that I have never been able to fathom, 5SW is not given a chance of doing more than a fraction of the good that it might. The station is in operation from Monday until Friday between 12.30 and 1.30 p.m. and between 7 p.m. and midnight, but that is all. On Saturdays and Sundays it is silent, though these days are almost as much a time of rest with golden opportunities for using the short-wave set in the Dominions and Colonies as they are in the Mother Country. Worse still, the news bulletins are not sent out from our short-wave station. The dweller in far-off places delights to hear the voices of the announcers and the music that comes to him from the B.B.C. studios; but what, above all things, he does want is news from home, and this is exactly what he does not get. Sad though it is to think of, he must rely for his news upon American short-wave stations such as W2XO, W8XK, and W2XAF. I maintain that it is the moral duty of the B.B.C.—which, after all, is now a Government department—to relay every portion of the London programmes throughout the day from 5SW and, above all things, to send out the news bulletins. There should, I think, be also special news bulletins of considerable length sent at various times during the day specially for those whose wireless sets provide them with the only link with the Mother Country.

No Longer Experimental

If you remember, the B.B.C. could not be persuaded to start a short-wave station until public opinion had brought considerable pressure to bear upon it. When the station was opened the B.B.C. took every opportunity of pointing out that it was purely experimental; that perfect reception at vast distances could not yet be guaranteed on the short waves, and so on and so on. But short-wave transmissions can no longer be regarded as mere experiments. The Dutch stations at Bandoeng, in Java, and the various American short-wave transmitters have proved to the hilt that, though occasional bad nights or even bad periods must be expected, a pretty useful service of news and entertainment can be guaranteed at ranges of thousands of miles in normal circumstances.

Quality Not Necessary

The short-wave man living in some remote country of the Empire does not demand super-quality reception of the type that we associate with banks of L.S.5's and moving-coil loud-speakers. What he wants is to be able to put on his telephones when he has half an hour to spare and to hear what is going on in the big world. The American short-wave services, besides being regular and good, are at work for many hours on every one of the seven days of the week. Surely it is not too much to ask that our own short-wave station should do as much for countless thousands of British subjects.

Last-minute Hitches

One had hoped that we had come to the end of the "episodes" between those responsible for musical entertainments of one kind or another and the B.B.C. Few things are more disappointing than a last-minute hitch, as occurred recently. Act III of Wagner's *Die Walküre* was down to be relayed from the Opera House at Covent Garden. This being something of an event, I—like many others, no doubt—had invited a party of musical friends to come in and enjoy the transmission. At the very last moment it was discovered that the opera could not be given over the wireless. Let it be understood clearly that the B.B.C. was in no way to blame. The whole thing was apparently cut and dried, and it was not until that very evening that the Opera House authorities informed the B.B.C. that the relay would not take place. The explanation is that some singer taking part in the opera had in his or her contract a clause which barred broadcasting. Surely this could have been discovered earlier by the opera people; or might not the part have been taken by another artiste? Happenings of this kind are pretty hard on listeners.

A Wonderful Picture Feat

The Berlin newspapers published the other day a picture of the scene of the appalling hospital disaster at Cleveland, Ohio, U.S.A. The story of the journey made by this picture from Cincinnati to Berlin is one of the most astonishing that I have come across in all the years that I have been connected with wireless. From Cincinnati to New York it was sent by an American picture system over the land line, the distance being something over 400 miles. Having reached New York it was handed over to the beam service people, who sent it to this country by radio, using the Marconi picture system, which is completely different from that employed for the first stage of the journey. From London it was sent six hundred odd miles to Berlin, over the submarine cable and the land telephone line, by the Fultograph system. And the wonderful part of it all is that it arrived in the German capital in so good a state that it could be used as a newspaper illustration!

Well Done!

Just think what this means. First of all, three different vehicles were used: the land line, the cable, and the beam. Secondly, no less than three entirely distinct systems of picture transmission were called upon to deal with the photograph in turn. To transmit an original photograph from point to point is a sufficiently remarkable feat. To re-transmit successfully a picture which has already made one journey is still more wonderful. To send through six hundred miles of cable and wire a picture which has already made two long journeys, and to do it so well that a recognisable print is received, is a performance that simply leaves one gasping.

Heat-wave Effects

It was only to be expected that the sudden big rise in temperature which occurred in the last third of the month of May should have considerable effects upon wireless reception. Until the warm weather came, long-distance reception had been phenomenally good for the time of year. Then quite suddenly even the biggest Continental stations began to go on just anyhow. On one night one could hardly hear a sound from some of them, whilst others came in with a roar. On the next those that were still small voices on the previous evening might have developed unexpected strength, whilst the ones that had been heard so well now needed quite a lot of reaction to bring them in at all. Such conditions, fortunately, seldom last for long, and I don't think that it will be many days before matters settle down. There are signs of an improvement at present so far as signal strength is concerned, though the thundery weather that has prevailed has made atmospherics rather a nuisance at times.

On Your Wavelength! (continued)

The Undying Joke

From the May issue of one of the American publications devoted to broadcasting I learn that the funny man in a certain concert party is having a great success with "the latest radio joke." It appears that he has a little love scene with the soprano, in which he begs her to marry him and become his loud-speaker. The "latest radio joke," which was originally cracked in one of the earliest issues of AMATEUR WIRELESS, seems to be a genuine evergreen. I fully expect that the "talkies" will give it a new lease of life.

What the Sun Did

Strolling along to the Furzehill Laboratories the other day, I was astonished to find Mr. Reyner considerably perturbed. Upon inquiring the reason, I was handed two gadgets, one of which was an attractive looking thermal milliammeter and the other a glass bulb affair which I managed to recognise as a thermo-couple. I knew that this class of instrument, which is for measuring very small high-frequency currents, was often in use at the laboratories, but I did not quite see the significance in having them pushed at me in this manner, until it was explained that they had both given up the ghost in a quiet and refined manner during the holidays.

The reason for this was apparently that they had inadvertently been left in circuit on a bench, and that during certain parts of the day the said bench is flooded with rays from that great luminary the sun. Now, a thermo-couple or a thermal instrument works by virtue of the heat produced by the passage of the current through a very fine wire. This heat itself is not very great, and is, indeed, quite comparable with the heat of the sun. What had happened was that the strong rays from the sun had heated up the whole apparatus to such a point that the filament had burnt out.

Mr. Reyner told me that he was quite aware that the sun's rays would invalidate a reading being taken on either of the two instruments, due to the heating effect which added itself to the heating effect produced by the current to be measured. During any actual experiments it was necessary to shield the instrument from the direct rays of the sun, but he said that he had never come across an instance such as this, where the sun's rays had been sufficiently powerful to burn out the thermo-couple. I gathered that the actual damage was assessed in the neighbourhood of £5, which, as he said rather ruefully, was an expensive experience.

Success at Last

This morning's post has brought me a triumphant letter from the friend who has been trying so long and so hard to get down to 5 metres. He has succeeded, at long last, and after terrific work, in constructing a set that gives fine results from 5 to 5.4 metres. Not a very wide band of wavelengths, you may say. Just work it out in frequencies. His aerial coil consists of one turn of ⅛-in. copper wire 1¾ in. in diameter and reaction is produced by a coil ¾ in. in diameter, containing six turns of No. 24 d.c.c. The grid is tuned by a minute variable condenser, whilst another of rather larger size controls reaction. The valve is a DE5, with its cap removed. There is no doubt that the short waves offer a very interesting field for the experimenter, for their possibilities have by no means been fully explored. Many amateurs are taking up this ultra-short wave work just now, and we may expect reports of some remarkable achievements. WGY, by the way, occasionally conducts a relay of his programme on about 5 metres.

Temporary Insanity!

The other day I decided to make certain alterations in the layout of the detector part of my long-range receiver in order to obtain rather better spacing of the components. Amongst other things, the valve holder had to be moved, and whilst the fitting-in part of the proceedings was going on I had to have a valve in it to see that I was allowing plenty of room all round. Naturally, I removed my pet detector valve and put in the holder an old "dud," which would not be harmed if one did accidentally drop a heavy tool upon it. The alterations having been finished, I tried out the set, obtaining heaps and heaps of complete silence. Must have made a wrong connection somewhere, thinks I, proceeding to de-wire the batteries and to make a further examination of the set's interior. There was absolutely nothing wrong with the wiring. Mystery. A fresh trial. More silence. Yes, dear reader, I had left the old "dud" valve in the detector holder, and it was quite a long time before it dawned on me that its presence was responsible for that horrid silence.

A Queer Coincidence

Chatting with a fellow-enthusiast the other day, I mentioned that I had just come across a rather unusual fault in a set brought round to me to examine by its perplexed owner. The reason why the thing would not work was found at length to be a breakage between one of the valve legs of one holder and its terminal. The holder was of the springy type, and as the said connection was underneath it could not, of course, be seen until the valve holder was removed and turned upside down for inspection. "That's funny," said the friend: "I had exactly the same thing on the very same day in a set brought to me by a fellow. Which valve was yours?" I told him that it was the detector. "So was mine!" he said. The strange part of it is that I can only remember on one previous occasion having come across such a thing, and my friend had never had a case before. Funny—isn't it?—that we should both have struck the same thing in other people's sets on the same day.

A Noble Earth

I have just installed an earth connection of which I am more than a little proud. I used to swear by the 7-lb. biscuit tin buried as near the bowels of the earth as might be before blistered hands and an aching back proclaimed that the hole was deep enough. But the worst of biscuit tins and such like is that, in some soils at any rate, they don't last very long.

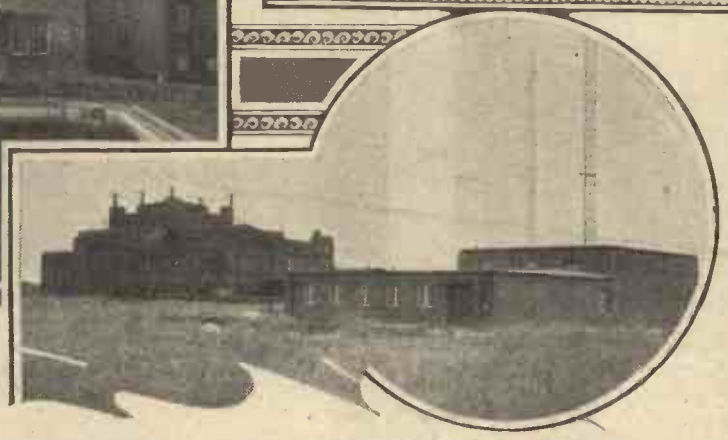
Making All Ship-shape

Here is the way in which I have dealt with my new earth plate. The plate itself is a piece of sheet copper measuring three feet in length by one foot in breadth, which is buried vertically, its top being about a foot below the surface. Its lower half rests in what I can certify to be real genuine clay. The earth wire is not a wire at all, but a piece of copper strip ¾-in. in width, insulated at its upper end by winding it with rubber tape. It is not soldered to the plate, but is firmly fixed with copper rivets. When I came to try out the new earth I found that it gave distinctly better results than the old, there being a noticeable increase in signal strength from weak and distant stations. An earth of this kind does not cost much to construct, and I believe that it is well worth the trouble.

Neat Condensers

One of the problems facing the set designer when he wants to make a compact piece of receiving apparatus used to be that of fitting in the variable condensers, for these had a way of requiring an unconscionable amount of space behind the panels. I am very much impressed with some of the neat little condensers that are being turned out nowadays. A pair of .0005-microfarad that I have just put into a new set occupy a total width, with the vanes in the zero position, of only 3½ in. and the depth needed behind the panel is just 2 in. This compares pretty favourably with a width of 5¼ in. and a depth of 3¼ in., the space required by a pair of condensers of similar capacity that I acquired a couple of years ago. And the little fellows are quite as efficient and just as pleasant to work with. There seems to be a growing movement towards compactness in components

THERMION.



NAUEN IN 1929

An Account of a personal visit to the Famous High-power Station by Dr ALFRED GRADENWITZ

NAUEN, the huge station situated about thirty miles from Berlin, is a mirror of historic development, and an example of the present. In fact, no better means of investigating the history of radio engineering in Germany, nor of acquainting oneself with the most modern practice could be imagined than a visit to this world-famous high-power radio station.

When, therefore, the Transradio Company, an offspring of Telefunken, the other day, invited me to an inspection of Nauen, I gladly availed myself of this opportunity of seeing what there was new in its installations. Many a time during the last twenty years have I been a guest at Nauen, and each time there has been a lot that was new and interesting.

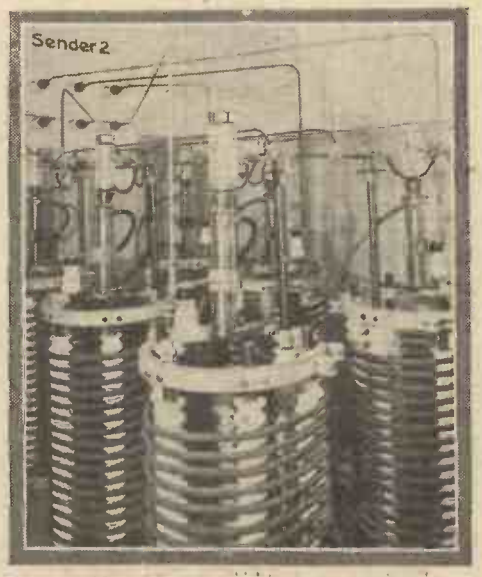
Founded as far back as 1906 by the Telefunken Wireless Telegraph Company, Nauen was originally intended to serve mainly as an experimental station, where machinery and apparatus for the wireless transmission of telegrams were to be tested. It then comprised merely a spark transmitter of 10 kilowatts, one mast 100 metres high, and an umbrella aerial.

Rapid Progress

Ranges of transmission then were rather modest, though rapid progress was made. Already in 1910 there were bridged distances of 3,000 kilometres, which by 1912 had grown to 4,700, by 1914 to 8,300, by 1916 to 11,000, and by 1918 to 20,000 kilometres, or half the circumference of the earth.

Radio telegraphy in other countries, particularly in Great Britain and the United States, had in the meantime been passing through a similar development, and a corresponding station was in 1911 installed at Sayville. During the War Nauen was, of course, mainly used for military and political purposes, wireless telegraphy then affording the only means of communication Germany had with overseas countries.

However, in 1919, even before the conclusion of peace negotiations, the radio-telegraphic connection with the United States was resumed upon a suggestion coming from the other side. The Transradio Company of Wireless Overseas Traffic, which had been founded in the foregoing year and assumed ownership of Nauen, concluded a thirty years' agreement with the Radio Corporation of America, while the Reich at the same time granted the company for the same period a licence for the transmission of commercial and political telegrams.



The rectifier plant of Short-wave Station No. 2

The technical development of the station had in the meantime been keeping pace with the extension of its task. As far back as 1911, Nauen's original equipment was replaced by a 100-kilowatt transmitter operated on the "musical spark" system. In 1916 there began the high-power development. In 1920 the construction of the new main building was completed, a beautiful architectural creation by Muthesius, which had been commenced four years before.

Apart from the Nauen transmitting station, there is the Geltow, near Potsdam, receiving post and the Berlin central service office, which is located in Oranienburgerstrasse, on the premises of Post Office 24. From this central service office the transmitters installed at Nauen are operated at a distance by means of morse keys, while any telegrams arriving at the Geltow receiving station are, by means of special cables, led on to the central service office.

The Various Transmitters

The Nauen high-power wireless telegraph station at present comprises the following transmitters:

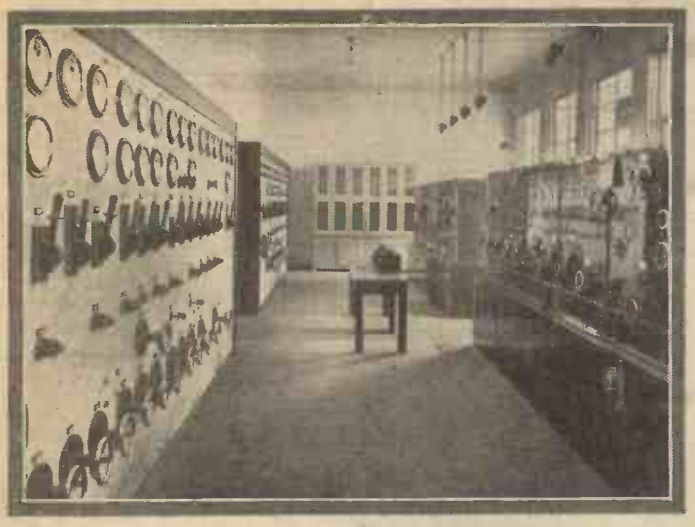
One transmitter of 400-kilowatt aerial output, working on a wavelength of 18,000 metres; this mainly serves for traffic with the Far East, as well as for the press and time services. One transmitter of the same output on a wavelength of 13,000 metres; this, in the first place, serves for communication with North America. Two transmitters, each of 50 kilowatts, working on wavelengths of 6,500 and 5,600 metres respectively, used for the European service.

South American Service

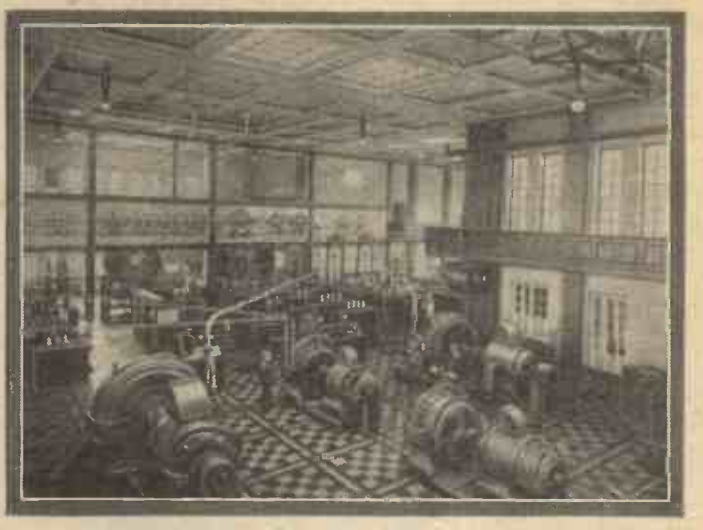
Plans were made in 1921 to develop the station even further for communication with South America. A gigantic aerial system was provided, which comprises: Two masts each of 260 metres, each weighing 360 tons; seven masts, each of 210 metres, each weighing 120 tons; and three masts, each 150 metres, each weighing 100 tons.

Transmission on long waves between Nauen and the Monte Grande (near Buenos Aires) wireless station only proved possible

NAUEN IN 1929—*By Dr. Alfred Gradenwitz* (*Continued from preceding page*)



The transmitting apparatus and switchboard of No. 2 Short-wave Station



The generators of the Nauen High-power Station

during certain hours of the day, and short waves very opportunely came to the rescue. In fact, Nauen was in rapid succession equipped with no less than seven short-wave transmitters, a wave of about 15 metres serving for the day and one of about 25 to 30 metres for the night service. Each of these transmitters has an aerial output of 20 kilowatts and frequencies intermediary between 20 million and 7.5 million cycles. They are each controlled by quartz crystals and built up in seven stages.

Beam Aerials

Beam aerials are used in connection with these short-wave transmitters, and larger

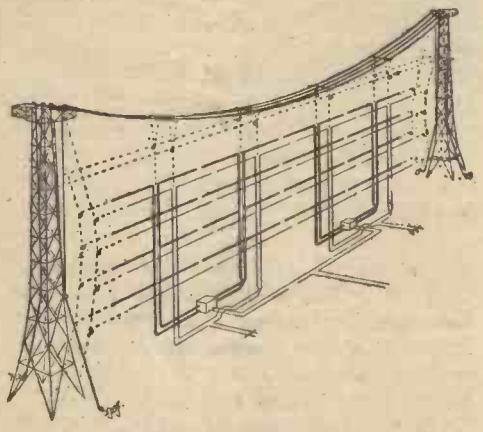


Diagram of the aerial system

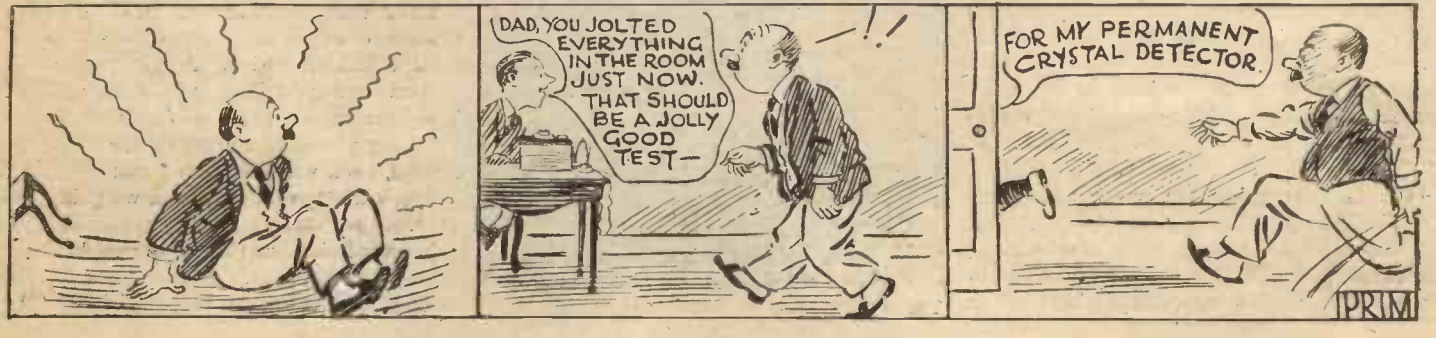
"beams" suspended from towers 75 metres high are in course of building.

Apart from their use for wireless telegraphy, the transmitters also lend themselves to telephony and picture broadcasting. A wireless telephone system between Germany and Buenos Aires has been in existence since December last, working most satisfactorily. Telephone tests have also been made between these short-wave transmitters and Sydney, Australia, and Bangkok, Siam.

A private broadcasting station, a small replica of Radio LL, Paris, has been installed at Chatelineau, a suburb of Charleroy (Belgium).

YOUNG FLEX IN TAKING A CHAIR—

—APPEARS TO TAKE A MEAN ADVANTAGE



WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

IT gives me pleasure to start off the week's chat by handing out a very sincere bouquet. Fred Duprez is the recipient, and he gets the award for stepping into the breach.

Do you remember when he did it? It was when a certain opera broadcast (I forget which) didn't come off, and the B.B.C. were not aware that it wasn't to come off until the last moment. Duprez, I understand, happened to be at Savoy Hill when officials were beginning to fret and fume, and without a moment's notice this most competent comedian helped to fill the forbidding gap in the evening's entertainment.

His turn was extraordinarily good, and

Ann Suter—A Lissenden impression

although some of us were probably disappointed because the opera was not broadcast, I am sure Fred gave us all a jolly time.

◆ ◆ ◆

We have been treated lately to programmes which have been particularly well thought out. One in particular was "Suitable Songs—a light-hearted programme." It was quite good. Out of a most talented cast I think Jack Morrison deserved the most praise.

◆ ◆ ◆

Miss Spielman, who is giving most interesting talks on the problem of "Household Fatigue," should not be allowed to broadcast so early as 10.45 a.m. Why remind housewives that the work they are doing is fatiguing? I can see all our good ladies laying down tools before long if things go on like this!

◆ ◆ ◆

Ann Penn gave us a fine turn from the London Coliseum not many moons ago. She is essentially the type of performer who is bound to be effective on the wireless.

She needs no facial contortions or physical mannerisms to get over. Her voice is all that is necessary. It does the trick. All her impersonations were excellent; but the one which scored, in my opinion, was that of Nellie Wallace.

◆ ◆ ◆

Although I agree to a certain extent with the correspondent whom I quoted last week as saying that Sunday programmes are over-religious, I must say that the parts devoted to lay music are at times worth running five miles to hear.

The Wireless Military Band programmes, for instance, are always full of musical plums, aided as they are by good vocalists. All the following splendid numbers were included in a recent broadcast: Liszt's Rhapsody No. 2; "Ah fors e lui," from *Traviata*; Introduction to Act III and "Bridal Chorus" from *Lohengrin*; and MacDowell's "Sea Pieces."

And, like a ghost that cannot be laid, "The Londonderry Air" crept plaintively into the scheme!

◆ ◆ ◆

How music-lovers must have shuddered when they heard 5GB's attempt to "jazz the classics"! And rightly. The classics should not be hacked about by second-rate dance-melody merchants. Probably a dance band consisting of good musicians could have carried it out without disgracing themselves very much; but to select a purely "straight" orchestra to syncopate the music was fair neither to highbrows nor lowbrows.

◆ ◆ ◆

There must be a general feeling of regret that the B.B.C. Popular Orchestral Concerts from the People's Palace are over. They were excellent, and the final performance was a fitting ending to a memorable series.

The enthusiastic burst of applause at the opening notes of Doris Vane's encore, "Down in the Forest," was due to the fact that Sir Landon Ronald was accompanying at the piano.

◆ ◆ ◆

By the way, weren't you a little disappointed with Sir Landon Ronald's setting to "Adonais," Shelley's lament on the death of Keats? It didn't seem dramatic enough, and at times was almost "pretty."

However, the performance as a whole was really enjoyable.

◆ ◆ ◆

Were you fortunate enough to hear the Wireless Military Band play "Wee Macgregor Patrol" one day last week? I have heard "Wee Macgregor" played by all sorts and conditions of bands, but never have I heard it played with such a swing and a lilt. Walton O'Donnell is to be congratulated.

◆ ◆ ◆

A correspondent from Northfields writes me a plaintive note. He wants to know when "The Foundations of Music" series will come to an end. In his own words, he is "bored stiff."

Well, I am not in a position to give the exact date of the expiration of this series, but I understand that they will go on until we know all there is to be known about music!

Leonardo Kemp—Conductor of the Piccadilly Hotel Orchestra

The HOLIDAY

WHAT do you expect when you get a portable set? Do you expect for the same outlay as necessitated by your home set, to get the same results wedded to the advantages of portability? If so, you are probably disappointed. To the many who have not yet seriously turned their attention towards taking radio out of doors it may be asked: Why don't you work a portable? The aspects of the answer to this latter question are manifold.

Perhaps you have one home set already, and this may not be very suitable for taking on picnic and river trips, and you hesitate to spend more money in making up a portable. Or perhaps two or more years ago you heard a friend's portable set working and the reproduction was so put to shame by that of your own home set that you said "No portables for me." Well, now is the time to reconsider all such early decisions.

Three Valves Only

Here we present the "Holiday Portable Three." It is a very worthy candidate in

The set is of particularly neat appearance

the number of portables which AMATEUR WIRELESS is putting forward this summer for selection by readers. In AMATEUR WIRELESS No. 354 we described the "Arcadian Portable," an entirely self-contained set in box form. Then we have the "Five Guinea Portable," described in AMATEUR WIRELESS No. 358, which is a simple two-valver needing an external aerial and loud-speaker. Again in No. 361 we have the "Talisman Portable" which fills a niche of its own.

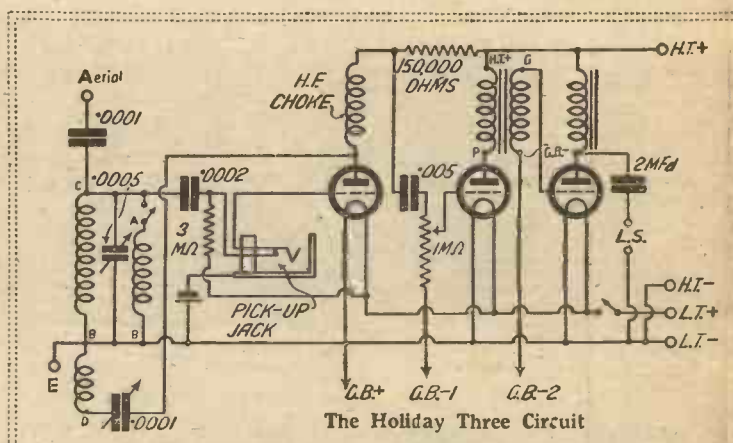
These three preceding portables have, of course, not supplied *all* needs, and in this new "Holiday" set we are striking out along a new line. Briefly its salient points may be summarised as follows:

The "Holiday Portable" has been designed so that it can be used either as an indoor or outdoor set. As an indoor set you will find it the very latest and most up-to-date of "threes." It has provision for a gramophone pick-up, has one R.C. stage, a volume control and a choke output circuit. Altogether, as you can see, a proper set for purity. The same purity is obtained when the set is worked out of doors.

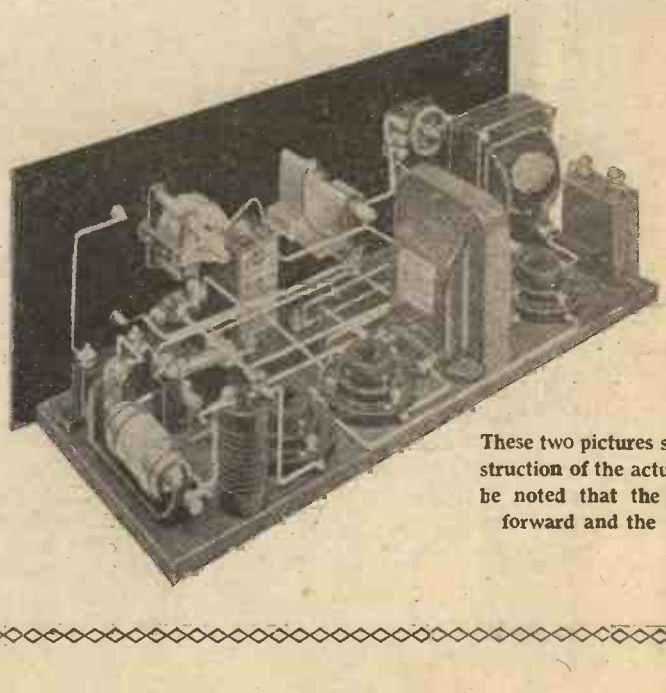
It is unnecessary to disguise the fact that this holiday set is ideal for indoor use, and that many of the amateurs who make it up will find it used extensively for ordinary programme reception at home. In fact this is bound to be the case, and unless the constructor is the possessor of a very modern set incorporating those refinements which are given in this portable set, he will find this portable a convenience indoors. To thousands of amateurs the following query may be addressed: Would you not care to have an up-to-date and efficient three-valver which includes every device to give purity, which allows you to operate your gramophone electrically and yet which is quite a self-contained unit complete with batteries and aerial?

The Circuit

If you care for technicalities and are not concerned only with wielding a soldering



The Holiday Three Circuit



These two pictures show c struction of the actual rec be noted that the layou forward and the wiring

PORTABLE THREE

iron and screwdriver, just glance at the theoretical circuit diagram. The frame aerial is wound on a wooden former, which slides inside the cabinet. On this former are three windings; one is the reaction section and the other two sections are for aerial tuning. The two tuning sections are placed in parallel for the short waves and only one is used for the long waves. The wave changing is effected simply by a push-pull switch on the panel and the tuning section is shunted simply by a .0005-microfarad fixed condenser.

There is provision for an external aerial and earth. This can be effected without seriously affecting the tuning range of the aerial circuit because a small fixed condenser is in the lead from the aerial terminal to the grid end of the frame windings.

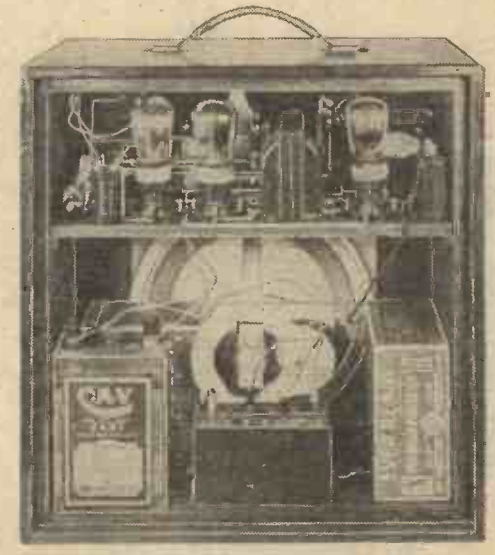
The grid circuit of the detector incorporates a .0001-microfarad grid condenser, a 3-megohm grid leak, a jack switching arrangement to allow the inclusion of a gramophone pick-up and a 1½-volt dry cell, which places a slight negative bias on the detector valve grid when this stage is used as the first L.F. amplifier after the pick-up.

The values of the components in the R.C. coupler are as follows; anode resistance 150,000 ohms, coupling condenser .005-microfarad, and the grid leak 1-megohm. It will be seen that this latter component is the winding of a potentiometer, the arm of which is connected to the grid of the first L.F. valve.

This potentiometer is, of course, the volume control on the panel and by connecting it in this way the volume can be varied from maximum down to a mere whisper, without any tonal change. This is rather an important point because in many sets, wherein the volume control is wrongly connected, cutting down of the signal strength also means cutting out the bass notes, and as the volume decreases the reproduction becomes tinny and unsatisfactory.

L.F. Couplings

It will be seen that the coupling between the L.F. valve and the power valve is a "super" transformer. In practice it is found that a three-valver of this description gives most satisfactory results with one stage of resistance and one stage of transformer coupling. Particularly is this the case in a portable receiver where two transformer-coupled stages need careful designing if they are to work properly (though there should be no difficulty about this and both the "Arcadian" and "Talisman" portables have the L.F. couplings arranged in this way), and two resistance-coupled stages may not give sufficient volume.



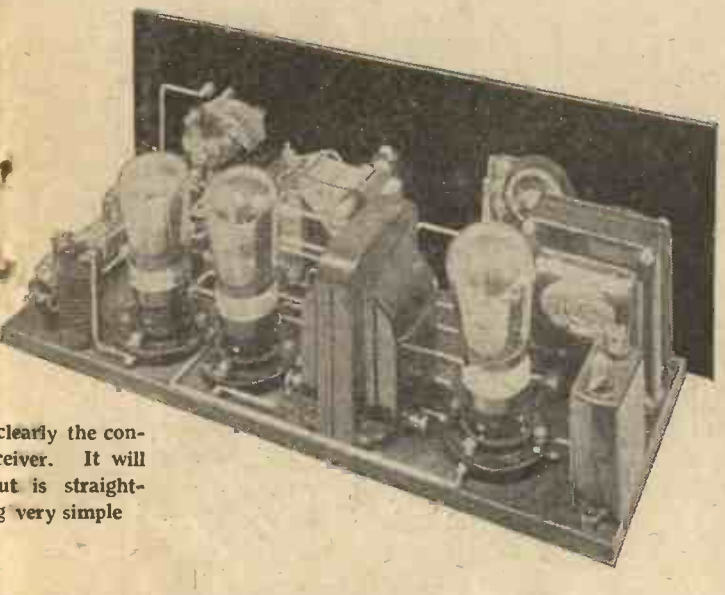
A back view of the Holiday Portable

In the plate circuit of the power valve is a choke output arrangement which although perhaps adding a little to the weight of the whole portable is nevertheless a great advantage, particularly if the set is used at full volume on a near-by station, or with external loud-speakers.

The receiver itself is built up in a more or less conventional fashion with the panel at right angles to the baseboard. This

LIST OF COMPONENTS

Ebonite or bakelite panel, 18 in. by 6 in. (Raymond, Becol, Ebonart, Paxolin).
.0005-mfd. reaction condenser (J. B., Formo, Lissen, Igranic, Peto-Scott, Burton).
1-meg. vol. control (Rotor Electric).
Two push-pull filament switches (Bulgin, Trix, Lissen, Benjamin).
Single-circuit-closed jack (Lotus No. 2).
Three valve holders (Wearite, Lotus, Benjamin, Lissen, Trix).
.0001-mfd. fixed condenser (Dubilier type 620, Lissen, T.C.C., Mullard).
.0002-mfd. fixed condenser with series clip (Dubilier type 620, Lissen, T.C.C., Mullard).
.005-mfd. fixed condenser (Lissen, Dubilier type 610, T.C.C., Mullard)
3-megohm grid leak (Lissen, Dubilier, T.C.C., Mullard).
High-frequency choke (Peto-Scott, Trix, Igranic, Burndept, Wearite).
150,000 ohms resistance with holder (Varley, Ready Radio, Mullard, Lissen, Dubilier).
Low-frequency transformer (Lissen Super, Ferranti, R.I., Philips, Mullard, Igranic).
Output choke (Ferranti B1, R.I., Igranic).
2-mfd. fixed condenser (Dubilier, Lissen, Mullard, T.C.C.).
1½-volt dry cell (Siemens).
Connecting wire (Glazite).
Three yards of thin flex (Lewcoflex).
Two red and three black wander plugs (Clix). Two spade terminals (Clix).
Cone chassis complete (Squire P.W. 77, White Spot).
Loud-speaker unit (Blue Spot, Triotron, Hegra).
Portable cabinet (Lock).
No. 24 enamelled wire (Lewcos).
Two 60-volt H.T. batteries (Ever Ready, Popular Portable).
2-volt accumulator (C.A.V., type 2A.N.7, Ever Ready).



clearly the con-
ceiver. It will
ut is straight-
g very simple

"THE HOLIDAY PORTABLE THREE" (Continued from preceding page)

complete unit then slips inside the cabinet and is supported on wooden fillets, on the inside of the wooden former carrying the frame aerial windings. The loud-speaker is mounted on the front board of the cabinet, and connections are made thereto by means of flex from the components on the receiver shelf.

The list of parts as shown on page 803 will be required for building the "Holiday Portable Three." As usual the first mentioned component in each case is that used in the original receiver and illustrated in the accompanying photographs. Following these are a number of alternatives having, as near as possible, the same electrical value, and these alternatives can be used without serious modification of the original layout. A word of warning is perhaps opportune when building a high-class receiver such as this. Do not be tempted to buy cheap parts of obscure make or even well-known parts if offered at a cut price. Cut-price articles are frequently factory throw outs and the few shillings saved may utterly spoil results. Therefore, adhere to the list on the preceding page.

Construction

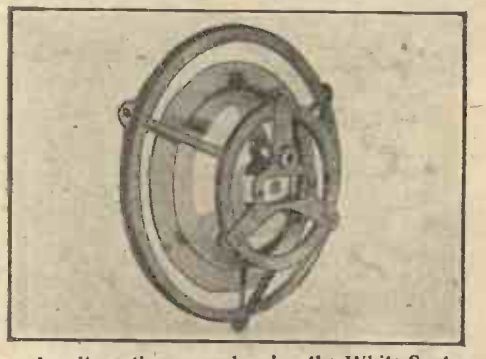
The first operation is to drill the panel for the components, but they should not all be mounted right at the start. As in most portables there is not a great deal of room to spare and so the construction cannot be carried out in a haphazard manner. For safety's sake adhere to the following scheme.

With the blueprint as a drilling template (the print is available, price 1s. post free, from Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4), drill the holes for the aerial tuning condenser and reaction condenser, the volume control, the two push-pull switches, the pick-up jack, aerial and earth sockets and the fixing screw holes. Mount only the two switches and pick-up jack, and attach the panel to the baseboard.

Wiring

Now place in position the following parts, from left to right of the baseboard, viewed from the back of the panel: Anode resistance clips, H.F. choke, grid condenser and leak clips, R.C. coupling condenser, and the three valve holders. As you will see from the list of components it is recommended that rigid insulated wire, such as Glazite, should be used for connecting up and when the foregoing parts are mounted, with the blueprint used as a guide to the exact positions, there is no reason why they should not be wired up so far. You will see that the layout is such that very short and direct wires are possible in most cases. For the connections to the batteries below and the loud-speaker and frame aerial, flex leads are taken from the components.

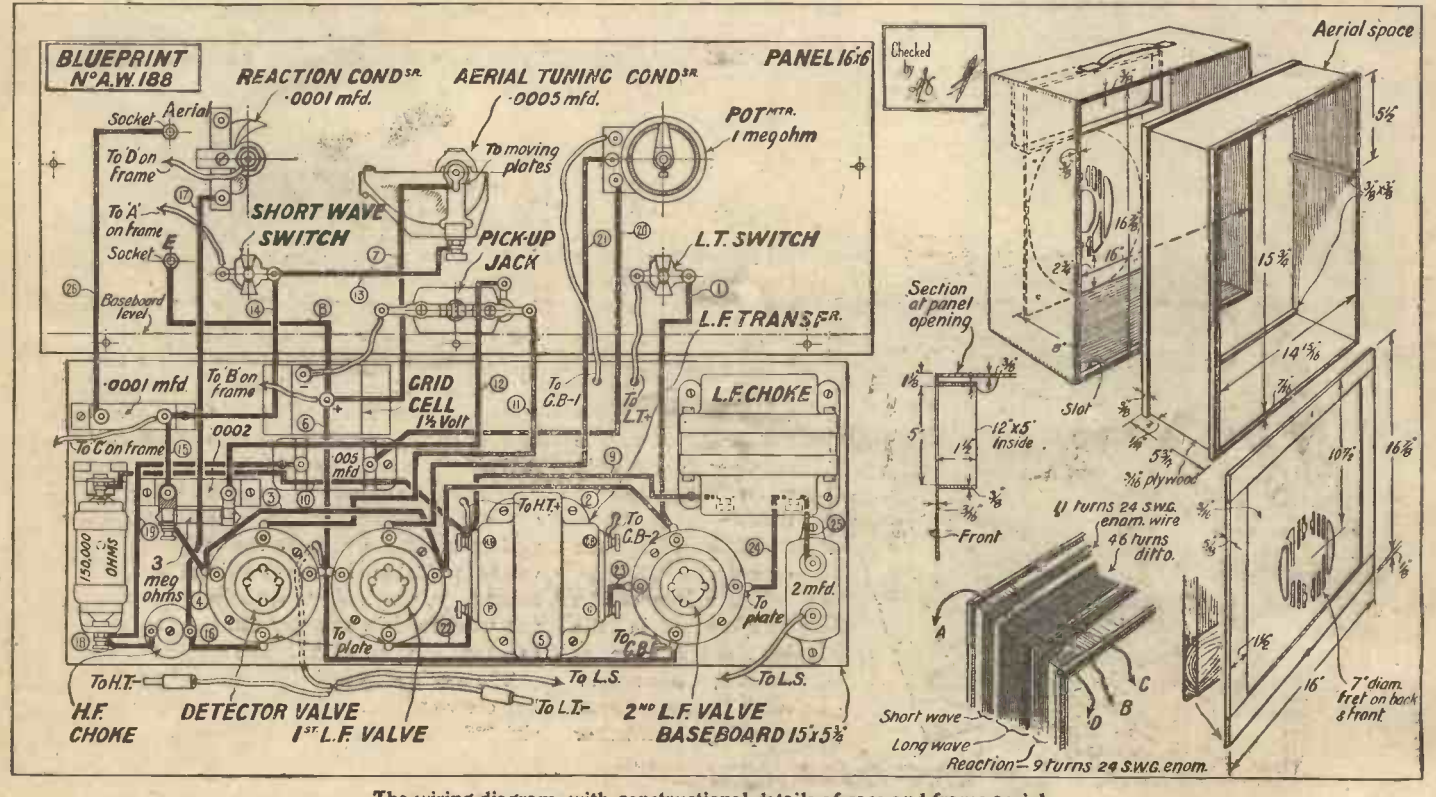
When the foregoing parts have been connected the remainder may be added in turn, starting with the reaction and aerial variable condensers and volume control and finishing up with the output choke and condenser, which should be the last two components to be wired up. In this way you will find that there is no difficulty in making proper soldered joints owing to restricted space in which to handle the iron; and whatever one's feelings may be about soldering in a house set it is an undeniable advantage in a portable.



An alternative cone chassis—the White Spot

Endeavour to copy as nearly as possible the original layout of the wiring as is clearly shown on the blueprint. This is important because towards the left-hand side of the set, looking from the back, there are a number of wires running parallel. Some of these carry H.F. currents, some L.F. currents and some D.C. currents and unless the spacing is correct interaction may be set up.

This "Holiday Portable" is being shown at Messrs. Selfridge's Radio Department, in the Somerset Street windows. Next week the frame aerial will be described, and instructions will be given for working the receiver.



The wiring diagram, with constructional details of case and frame aerial

VALVES—A GUIDE TO ASSIST YOUR CHOICE

HOW do you choose your valves? When fitting up a new set, do you go solely by the advice of your local dealer? When you are unlucky enough to burn out a valve, do you take the old box to a dealer and ask for a valve of a similar type?

These are haphazard ways of choosing. In the following tables you will find catalogued all 2- and 4-volt valves of the most prominent manufacturers available. If you use these tables correctly you will never have any trouble in picking the right valve—and that means that you will get the best results from your set, for results depend so much on the valves you use.

Take the 2-volt table, for example, which is first. You will see that the valves are graded in order of their impedance, and even the least technical listener knows that the components connected to the anode of a valve have to match the valve electrically.

This means that there must be a certain relation between their impedances, and it is this which determines in which position a valve must be used. As a general rule, the higher the impedance, the greater the amplification factor; but there are other factors to be considered.

Valves with high impedances are used in resistance-coupled stages, those with impedances of the order of 50,000 ohms sometimes as R.C. valves, but more frequently as high-frequency amplifiers, while those with impedances of the order of 25,000 ohms are usually general-purpose valves, and are suitable either for high-frequency amplification or detection. There are, however, general-purpose valves with impedances so low as 14,000 ohms, and these are used as detectors, sometimes with anode-bend rectification, and in some sets as the first L.F. stage.

Valves with impedances of about 5,000 ohms are power valves, while super-power valves have impedances so low as 2,000 ohms. These remarks apply equally, of course, to 2-, 4-, and 6-volt valves. Screen-grid valves and pentodes are available now for all voltages, and details of these will be given next week.

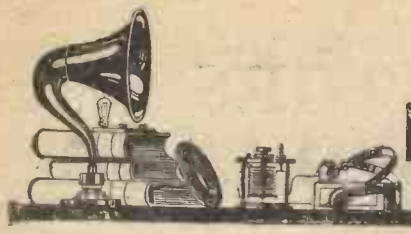
TWO-VOLT VALVES: Three-electrode Types

Make.	Impedance.	Amp. Factor.	Fil. Current.	Type.	Make.	Impedance.	Amp. Factor.	Fil. Current.	Type.
Cleartron ...	250,000			CT215H	Cossor	12,000	10	.1	210LF
Dario ...	150,000	50	.06	RC	Marconi	12,000	11	.1	DEL210
Ediswan ...	150,000	30	.1	RC2	Mullard	12,000	11	.1	PM1LF
Mazda	86,000	40	.1	RC210	Osram	12,000	11	.1	DEL210
Cosmos ...	70,000	35	.09	SP16B	Triotron... ...	11,400	8.5	.06	TD2
Six-Sixty ...	68,000	35	.1	210RC	Mullard	10,700	13.5	.25	PM2DX
Ediswan ...	67,000	40	.1	RC210	Cosmos	10,000	9	.09	SP16R
Cossor	60,000	40	.1	210RC	Six-Sixty ...	7,300	6.4	.15	215P
Mullard... ...	51,000	36	.1	PM1A	Mazda	7,000	7	.15	LF215
Marconi	50,000	35	.1	DEH210	Ediswan ...	6,600	8	.15	PV215
Osram	50,000	35	.1	DEH210	Triotron... ...	6,250	5	.1	ZD2
Triotron... ...	46,000	46	.07	WD2	Cleartron ...	5,000	3.5	.3	CT15X
Mazda	28,000	20	.1	HF210	Cossor	5,000	5	.2	220P
Six-Sixty ...	27,000	13	.1	210HF	Marconi	5,000	7	.15	DEP215
Ediswan ...	25,000	20	.1	HF210	Osram	5,000	7	.15	DEP215
Marconi	23,000	20	.1	HL210	Cosmos ...	4,500	6.5	.2	SP18RR
Osram	23,000	20	.1	HL210	Dario ...	4,500	9	.18	SP
Mullard	22,500	18	.1	PM1HF	Mullard	4,400	7.5	.2	PM2
Cossor	20,000	15	.1	210HF	Cossor	4,000	8	.3	220P
Dario	20,000	12	.05	GP	Six-Sixty ...	4,000	3.9	.3	230SP
Triotron... ...	20,000	9	.2	T10	Triotron... ...	3,750	6	.2	UD2
Triotron... ...	20,000	16	.07	HD2	Mazda	2,900	4	.27	P227
Cleartron ...	18,000	7.5	.15	CT15	Ediswan ...	2,700	3	.25	PV225
Six-Sixty ...	18,000	8.5	.1	210LF	Mullard	2,600	5.4	.3	PM252
Cosmos	17,600	16	.09	SP16G	Marconi	2,500	4	.4	DEP240
Triotron... ...	15,000	20	.12	SD2	Osram	2,500	4	.4	DEP240
Mazda	14,000	13	.1	GP210	Cossor	2,000	4	.3	230XP
Ediswan ...	13,000	13	.1	LF210					

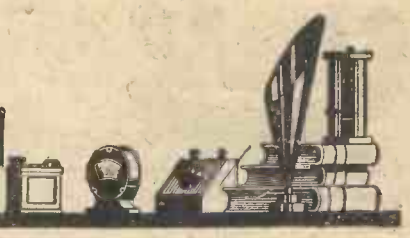
FOUR-VOLT VALVES: Three-electrode Types

Make.	Impedance.	Amp. Factor.	Fil. Current.	Type.	Make.	Impedance.	Amp. Factor.	Fil. Current.	Type.
Dario	150,000	50	.07	RC	Osram	8,500	15	.1	DEL410
Mazda	100,000	40	.075	RC407	Cleartron ...	8,000	4	.15	CT10X
Six-Sixty ...	64,000	34	.075	4075RC	Six-Sixty ...	8,000	7.3	.1	410P
Ediswan ...	61,000	40	.1	RC410	Triotron... ...	7,700	15.5	.14	SD4
Cossor	60,000	40	.1	410RC	Mullard	7,500	15	.1	PM4DX
Marconi	60,000	40	.1	DEH410	Mazda	5,700	8	.075	LF407
Osram	60,000	40	.1	DEH410	Ediswan ...	5,500	5.5	.1	PV410
Mullard	55,000	38	.075	PM3A	Marconi	5,000	7.5	.1	DEP410
Triotron... ...	46,000	46	.07	WD4	Osram	5,000	7.5	.1	DEP410
Ediswan ...	22,000	25	.1	HF410	Dario	4,500	9	.1	SP
Mazda	21,000	18	.075	HF407	Ediswan ...	4,500	9	.1	LF410A
Cossor	20,000	20	.1	410HF	Mullard	4,450	8	.1	PM4
Dario	20,000	12	.05	GP	Cossor	4,000	8	.1	410P
Six-Sixty ...	16,500	13	.075	4075HF	Triotron... ...	3,750	6	.1	UD4
Cleartron ...	15,000	7.5	.1	CT10	Six-Sixty ...	3,600	3.2	.25	425SP
Mazda	14,000	14	.075	GP407	Mullard	3,500	3.15	.25	PM254
Mullard	13,000	14	.075	PM3	Mazda	2,900	5.5	.15	P415
Triotron... ...	13,000	13	.07	AD4	Marconi	2,250	4.5	.25	P425
Ediswan ...	10,500	13	.1	LF410	Osram	2,250	4.5	.25	P425
Triotron... ...	9,000	9	.07	RD4	Triotron... ...	2,200	6	.15	XD4
Cossor	8,500	15	.1	410LF	Cossor	2,000	4	1.5	415XP
Marconi	8,500	15	.1	DEL410	Ediswan ...	2,000	3	.25	PV425

Details of Six-volt Three-electrode, Screen-grid and Pentodes of all types will be given in our next issue



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

Frame-aerial Types.

Q.—*I am about to make up a portable set, but before deciding upon the type of cabinet, I wish to know which is the most efficient type of frame aerial, the box type or the pancake type? I ask this question because there seems to be a diversity of opinion among my acquaintances.—G. H. (Wrotham).*

A.—From the theoretical point of view, the box-type frame aerial is the more efficient type, inasmuch as in this type all turns of wire in the frame aerial accept energy from the stations it is desired to receive when the frame is arranged in the direction of the transmitting station. In the case of the pancake or multi-layer frame aerial, the outside turn of the winding is the only one that actually presents a surface to the wave-front and the turns behind it are more or less shielded from the wave-front by the first turn. In actual practice there is very little to choose between the two types of frame winding, owing to the fact that with most portable sets the dimensions of the frame windings are so small.—C. L.

Neutralising Your Set.

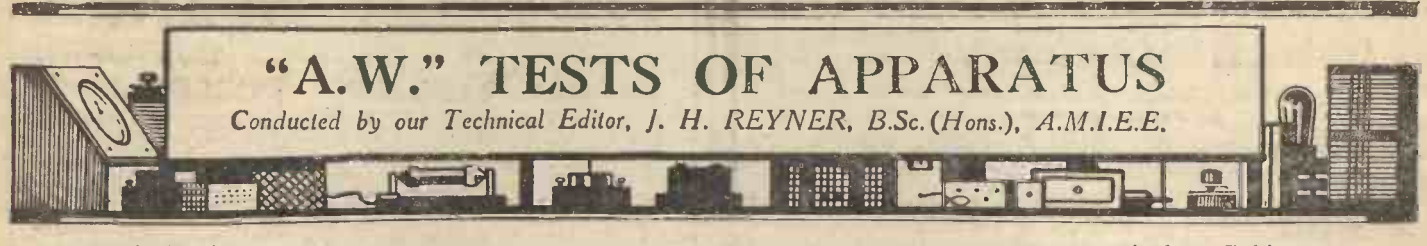
Q.—*I have worked a neutralised receiver for some time, but not knowing the correct procedure to adopt to neutralise the set, I am afraid I have never obtained the results of which the set must be capable. Can you advise me how best to neutralise?—J. K. (Middlesex).*

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.

A.—The first thing to do is to tune in the local or nearest station to maximum strength. Keep the reaction control set to minimum. If the set tends to oscillate disregard this, but see that the tuning controls are arranged so that the station being received is at the maximum point of strength. Now either switch off the filament current to the H.F. valve or, if there is no rheostat, disconnect one of the filament wires going to the H.F. valve holder. Signals from the local station will still be heard, but much weaker of course. Turn the knob of the neutralising condenser until these signals are either completely eliminated or reduced to the minimum strength. The filament lead to the H.F. valve can now be connected up once more or the rheostat turned on and the receiver will be properly neutralised for the band of wavelengths which the tuning coil covers. If another tuning coil is inserted, then the procedure of neutralising must be again carried out with the different coil. If there are more than one H.F. stage, then, when the first valve is neutralised, its filament circuit should be completed and the filament of the second H.F. valve switched off and this valve neutralised in the same way as the first valve.—C. L.



"A.W." TESTS OF APPARATUS

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

Ready-Radio Resistance

THE importance of filter circuits in the high-tension leads of high-frequency amplifiers has already been discussed in these columns. It was stated that such a filter functions in a similar manner to the type used in a low-frequency amplifier, the difference being that in the former case it is used to prevent high-frequency oscillations, and in the latter low-frequency oscillations being produced.

Ready Radio 500-ohm fixed resistance for filtering. It is wound with Eureka wire

This week we have tested a neat little filter resistance made by the Ready Radio Co., of 159 Borough High Street, S.E.1. This consists of a cartridge similar in size and appearance to the normal grid leak. The base is mounted in a special holder, which comprises two pins mounted on an attractively finished insulated material.

The resistance of this cartridge is labelled as 500 ohms; actually we found that it had a value slightly exceeding 500 ohms. The difference is immaterial in practice.

A dissection of the cartridge showed that the material employed comprises a length of Eureka wire wound inductively on a wooden former having a diameter similar to that of a match-stick. It should be almost impossible to burn the component out or to change the resistance value by burning off the insulation, due partly to the fact that No. 42 gauge wire is employed and that the winding is placed in a single layer without any covering. In our experiments we actually passed over 50 milliamps through the resistance without causing any change in its value or any sign of breakdown.

This component may be recommended.

Langmore Wireless Cabinets

MANY constructors of sets do not consider the question of a suitable cabinet to house their receiver when built. After spending a considerable amount of time and trouble making a good set it surely deserves to have a good home. We think the need is met by the Langmore wireless cabinets, made by the Miscellaneous Trading Co., Ltd.

A typical Langmore receiver cabinet with a shelf for batteries

These cabinets are extraordinarily well made and finished, and are made in four

(*Continued on page* 812)

RADIOGRAMS

THE thanksgiving service for the King's recovery, to be relayed from Westminster Abbey on June 16, at 11 a.m., will be transmitted from all B.B.C. stations as well as from 5SW (Chelmsford).

On June 21, 2LO and 5XX will transmit an excerpt from the musical comedy, *Mr. Cinders*, as performed at the Adelphi Theatre. The cast includes Jack Melford, Basil Howes, Lorna Hubbard, and Binnie Hale.

The Covent Garden opera season terminates on June 28, when the B.B.C. will relay an act of whatever opera has been chosen for the occasion.

A revival of Oscar Wilde's brilliant comedy, *The Importance of Being Earnest*, is promised by the Birmingham studio for relay to 5GB on June 20.

Apart from early-morning concerts from some studios, the German transmitters have fixed the following late musical entertainments for the month of June: Hamburg (6th), Berlin (8th), Breslau (12th), Koenigsberg (14th), Munich (18th), Frankfurt-on-Main (22nd), Stuttgart (26th), and Leipzig (28th). The broadcast starting on the above dates at 12.30 a.m., lasts for a full hour; it will be transmitted by both main stations and their respective relays, and will consist of light popular vocal and orchestral music.

According to the latest statistics, there are now 16,928 licensed amateur transmitters in the United States of America.

Japan, at the end of 1928, had 532,000 licensed listeners, of which roughly 280,000 resided in the Tokio district, a further 138,000 being served by the Osaka broadcasting system.

A vaudeville programme arranged for transmission from 2LO and 5XX, on June 17, will feature a famous up-river cabaret. Amongst the artistes to be heard on that evening are Keith Wilbur, the New Zealand mimic, and possibly Melville Gideon and Tommy Handley.

As in previous years, the B.B.C. will relay a portion of the Aldershot Command Searchlight Tattoo, which opens at the Rushmoor Arena on June 18. The transmission will be made from 9.35 to 9.55 p.m., and again from 10.47 to the end of the grand finale. In the musical part of the programme some twenty-two bands, drummers of eleven regiments, and a whole "battery" of bugles will take part.

Tests with the Baird television apparatus in Berlin, which had been discontinued for some weeks, have now been resumed, and it is expected that a public demonstration may shortly be made through the Witzleben broadcasting transmitter.

PHOHI (Huizen) is the call sign of the high-power short-wave Dutch transmitter erected on the borders of the Zuyder Zee. The initials stand for Philips-Holland-Indien-Rundfunkgesellschaft. The power of the station is 60 kilowatts and transmissions are made on 16.88 metres. PCJ (Hilversum) was erected by the same firm.

In the course of thirteen months the Detroit (U.S.A.) police authorities effected six hundred and five arrests through the assistance of eight mobile radio transmitting and receiving stations. In some instances the capture of the criminals was carried out within a few minutes of the reception of orders sent out by Central Headquarters.

The Soviet authorities formally opened on May 8 last a powerful telephony transmitter at Khabarovsk on the borders of Manchuria (Asia) for the purpose of broadcasting propaganda programmes in the Chinese, Korean, and English languages.

The Universal Broadcasting System of Philadelphia has made an application to the Federal Radio Commission at Washington for short-wave channels for the reproduction of French and German programmes in America. WCAU, Philadelphia, would be the key station for the oversea service. It was stated that there would be no attempt to cover England, which is already sending through the National Broadcasting Company in New York.

Following the winding up of the Radio Peredacha and the taking over of all broadcasting stations by the Soviet Posts and Telegraphs, the power of the Leningrad transmitter has been gradually raised to 20 kilowatts. No interval signal is used, but the broadcast may be identified by a call frequently repeated, namely: "*Sloochaite ! Sloochaite ! Govorite Leningrad dlina volny teeseeatcha metrov*" ("Listen ! Listen ! This is Leningrad calling on 1,000 metres").

It is seldom that an English composer is called to a foreign broadcasting station to conduct his own works, but on June 4, according to the P.T.T. Lyons programme, Mr. Ketelbey will personally direct at that studio a rendering of his most popular melodies.

According to the new Prague Plan, Belgium is to be granted an additional exclusive wavelength, namely, 208 metres, which may eventually be used for broadcasts in the German language, destined to the inhabitants of Malmedy, Eupen, and other German-speaking districts, conceded to Belgium after the Great War.

Following the example set by Berlin, the Hamburg broadcasting studio has resumed its early week-end musical entertainments. A concert may now be picked up from that station, or through one of its relays, on Sunday mornings at 6 a.m. B.S.T.

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
248.9	1,230	Newcastle (5NO)	1.0
258.6	1,160.1	*Leeds (2LS)	0.13
288.5	1,040	*Sheffield (6LF)	0.13
288.5	1,040	*Bournemouth (6BM)	1.0
288.5	1,040	*Edinburgh (2EH)	0.35
288.5	1,040	*Hull (6KH)	0.2
288.5	1,040	*Dundee (2DE)	0.13
288.5	1,040	*Liverpool (6LV)	0.13
288.5	1,040	*Stoke-on-Trent (6ST)	0.13
288.5	1,040	*Swansea (5SX)	0.13
288.5	1,040	*Plymouth(5PY)	0.13
294.1	1,020	*Bradford (2LS)	0.13
302.6	991.1	Belfast (2BE)	1.0
311	964	Aberdeen (2BD)	1.0
323	928	Cardiff (5WA)	1.0
358	838	London (2LO)	2.0
378	793	Manchester (2ZY)	1.0
401	748.3	Glasgow (5SC)	1.0
482	622	Daventry Ex. (5GB)	17.0
1,566.5	191.5	†Daventry (5XX)	25.0
* Relay stations.		†Relays 2LO.	
AUSTRIA			
250	1,200	Linz	0.5
283	1,060	Innsbruck	0.5
354.2	847	Graz	3.0
456	694	Klagenfurt	0.5
520	577	Vienna	20.0
BELGIUM			
230	1,300	Chatelineau	0.25
249	1,203	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,070	Liége	0.5
512	586	Brussels	10.0
CZECHO-SLOVAKIA			
265	1,128	Kosice	2.0
278	1,080	Feriby (testing)	12.0
306	980	Bratislava	4.0
343	873	Prague (Praha)	5.0
432.3	694	Brunn (Brno)	2.4
DENMARK			
339	883	Copenhagen (Kjobenhavn)	1.0
1,158	259	Kalundborg	7.5
ESTHONIA			
408	735	Reval (Tallinn)	1.3
FINLAND			
374	800	Helsingfors (Helsinki)	0.8
1,500	200	Lahti	20.0
FRANCE			
175	1,714	St. Quentin	0.25
212	1,415	Fécamp	0.3
211.3	1,420	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
248	1,219	Lille (PTT)	0.8
250	1,196	Juan-les-Pins	0.4
254	1,180	Rennes (PTT)	1.0
255	1,175	Toulouse (PTT)	1.0
268	1,118	Strasbourg	0.3
274	1,092	Limoges (PTT)	0.5
285	1,050	Montpellier	1.5
292	1,028	Radio Lyons	1.5
300	996	Bordeaux (PTT)	0.5
305	982	Agen	0.3
309	970	Vitus (Paris)	2.0
318	943	Marseilles (PTT)	0.5
336	892	Petit Parisien	0.5
352	850	Algiers (PTT)	2.0
368	815	Radio LL, Paris	1.0
384	784	Toulouse (Radio)	9.0
413	725	Radio Maroc (Rabat)	2.0
429	699	Grenoble (PTT)	1.5
436	687	Radio Flandre Lille	0.5
446	672	Paris (Ecole Sup., PTT)	0.7
468.8	640	Lyons (PTT)	5.0
1,350	222	Tunis (testing)	
1,473	203	Eiffel Tower	8.0
1,749	171	Radio Paris	8.0
1,825	164	Radio Carthage (Tunis)	
GERMANY			
219	1,370	Flensburg	1.5
240	1,250	Nurnberg	4.0
250	1,200	Kiel	0.7
250	1,200	Cassel	0.7
263.2	1,140	Cologne	4.0
267.8	1,120	Muenster	1.5
275	1,090	Kaiserslautern	1.5
280.4	1,070	Königsberg	4.0
283.1	1,058	Berlin (B)	0.7
283.1	1,058	Stettin	0.7
283.1	1,058	Magdeburg	0.7
317.5	945	Dresden	0.75
320	937	Breslau	4.0
326.4	919	Gleiwitz	6.0
329	910	Bremen	0.75
361.9	829	Leipzig	4.0
374.1	802	Stuttgart	4.0
391.6	766	Hamburg	4.0
427	711	Frankfurt	4.0
455.9	654	Danzig	0.75
456	651	Aachen	0.75
462.2	649	Langenberg	25.0
476	630	Berlin	4.0
538	558	Munich	4.0
566	530	Augsburg	0.5
566	530	Hanover	0.7
577	520	Freiburg	0.7
1,651	181.7	Zeesen	20.0
1,651	181.7	Norddeich	10.0
GRAND DUCHY OF LUXEMBOURG			
1,220	245	Radio Luxembourg	0.5
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
336.3	891.5	Huizen (until 5.40 p.m. B.S.T.)	5.0
1,076	278	Hilversum (ANRO)	5.0
1,846	162.5	Huizen (after 5.40 p.m. and on Sundays	5.0
1,846	162.5	Scheveningen-haven	5.0
HUNGARY			
548	548	Budapest	15.0
ICELAND			
333.3	900	Reykjavik	1.0
IRISH FREE STATE			
222.2	1,350	Cork (5CK)	1.5
411	730	Dublin (2RN)	1.5
ITALY			
278	1,078	Turin	7.0
333	900	Naples (Napoli)	1.5
387	775	Genoa (IGE)	3.0
442	677	Rome (Roma)	3.0
450	666	Bolzano	0.3
503.5	596	Milan	7.0
JUGO-SLAVIA			
308.3	973	Zagreb (Agram)	1.25
450	668	Belgrade	4.0
582	515	Ljubljana	5.0
LATVIA			
529	567	Riga	2.0
LITHUANIA			
2,000	150	Kovno	15.0
NORWAY			
242	1,240	Rjukan	1.0
297	1,010	Notodden	0.7
365	820	Bergen	1.0
387	774	Fredriksstad	1.0
456	657	Tromso	1.0
456	657	Aalesund	1.0
456	657	Porsgrund	1.0
496	604	Oslo	1.5
577	519.9	Hamar	0.7
POLAND			
314	955	Cracow	1.5
337	890	Posen	1.5
415.5	722	Kattowitz	10.0
456	658	Wilno	1.5
1,397	214	Warsaw	10.0
PORTUGAL			
317.5	945	Lisbon CTIAA (Wed' and Sat.: 10—midnight)	
ROUMANIA			
395	757	Bucharest	4.0
RUSSIA			
492	609	Kharkov (NKO)	5.0
825	363.6	Moscow (PTT)	25.0
925	323	Homel	2.5
1,000	299	Leningrad	20.0
1,440	208	Moscow	30.0
1,684	178	Kharkov	15.0
SPAIN			
277.8	1,080	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
324	926	Almeria (EAJ18)	1.0
340.8	865	Barcelona (EAJ1)	10.0
369	811	Seville (EAJ5)	0.5
400	750	Radio España	1.0
405	740	San Sebastian (EAJ8)	0.5
428.7	703	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
261	1,150	Horby	10.0
265	1,130	Trollhattan	0.4
333	900	Falun	0.5
350	858	Goteborg	6.0
437	686	Stockholm	1.5
550	546	Sundsvall	1.0
770	390	Ostersund	2.0
1,200	250	Boden	2.0
1,345	223	Motala	30.0
SWITZERLAND			
406	739	Berne	1.0
496	604	Zurich	0.6
680	441	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,200	250	Stamboul	5.0
1,809	164	Angora	5.0

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

June 10 Vaudeville programme.
„ 11 Covent Garden opera.
„ 12 *Minna Von Barnhelm*, a comedy by Lessing.
„ 13 "The Cabman's Shelter," by A. J. Alan.
„ 14 A light symphony concert.
„ 15 "More Djinn and Bitters."

DAVENTRY EXPERIMENTAL (5GB)

June 12 "Micro-Phun," a song and laugh show, by Edmund Wynschenk.
„ 13 *The Island Princess.*
„ 15 Vaudeville programme.

MANCHESTER

June 9 *In a Persian Garden*, a song cycle: music by Liza Lehmann.

NEWCASTLE

June 14 A concert from the North-East Coast Exhibition.

On the roof of a community house in Moscow some fifty aerials have been erected for the use of the tenants. Of these, forty-six are owners of simple crystal sets for the reception of the local programmes, and it is stated that their reception is not hampered by the other four possessors of valve receivers!

In the summer-term broadcasts to Scottish schools a prominent feature will be a series of concerts under the general title of "Music We Should Know." Concerts are set apart for the works of Mozart, Grieg, Brahms, Tchaikowsky, and Sullivan, while one will deal with "Music of To-day" and another with "Favourites."

"A.W." TESTS OF APPARATUS"

(*Continued from page* 808)

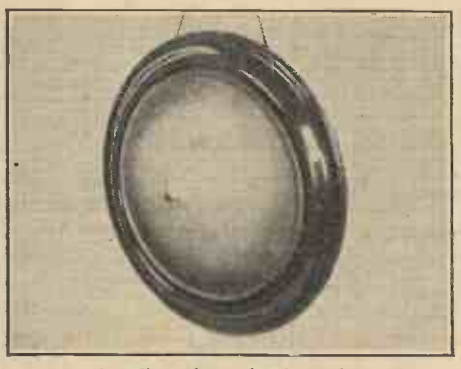
different panel sizes and two heights, and we understand that any slight difference in construction and size can be undertaken at a small extra cost. It should be noted that, in addition to the one illustrated, the Langmore cabinet can be supplied with the battery shelf enclosed back and sides and double doors in front for 10s. extra to the prices of the standard models.

All cabinets are fitted with the necessary baseboard, hinged tops, and so on, and ample accommodation is afforded for the batteries. They are highly finished in Jacobean style, and are packed and sent carriage paid to any address in Great Britain.

Manufactured and sold by the Miscellaneous Trading Co., Ltd., samples can be inspected at their 143 High Holborn, London premises.

New Amplion Loud-speaker

THE name Amplion has always been associated with high-class wireless apparatus: Messrs. Graham Amplion have used their vast experience in reproducing



A new Amplion plaque loud-speaker—the Guinea model

equipment to produce not only specialised features such as the Amplion Lion, but also good-quality inexpensive types, such as the one-guinea cone speaker shown above.

This speaker, as its name implies, is sold at 21s., but bears no semblance either in appearance or reproduction to a "cut-price" article. A 10-in. cone of the reinforced type is fitted, and is attractively finished in gold, tapering to a dark colour at the periphery. The outside framework of the speaker is one complete moulding in a brown material, somewhat resembling polished wood. The complete ensemble is distinctly pleasing in appearance.

A simple electric-magnetic unit is employed to drive the cone, with a single knob adjustment. From our tests this appears to be up to standard as regards strength for cone speakers. The quality of reproduction is also commendable, there being no marked resonance at any particular audible frequency.

At a price of 21s., we consider this speaker is excellent value for money,. It is manufactured by Messrs. Graham Amplion, of St. Andrew's Works, Slough, Bucks.

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.)

1929 Crystal Receiver	AW165
A Daventry-Local Crystal Set	AW185

ONE-VALVE SETS (1s. each)

Beginners' One-valver	AW140
Reinartz One	WM127

TWO-VALVE SETS (1s. each)

East to West Short-wave Two (D. Trans.)	AW159
Beginner's Two (D, Trans)	AW170
Auto Two (D, Trans)	AW174
All-Mains Two (D, Trans)	AW180
1929 Favourite Two (D, Trans)	AW186
Key-to-the-Ether Two (D, Trans)	WM107
Meteor Two (D, Trans)	WM114
Clipper Two (D Trans)	WM135
Twinflex (Reflex)	WM138

THREE-VALVE SETS (1s. each)

All-wave Mains Three (HF, D, Trans, Rectifier)	AW144
All-purpose Short-wave Three (D, RC, Trans)	AW147
Screen-grid Q Coil Three (HF, D Trans)	AW150
All-Britain Three (HF, D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Hartley Dual-range Three (D, RC, Trans)	AW166
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
Everyday (D, 2 Trans)	WM52
All-wave Screen-grid Three (HF, D, Trans.)	WM110
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2LF-dual Imp.)	WM118
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

FOUR-VALVE SETS (1s. 6d. each)

Overseas Short-waver (HF, D, 2Trans)	AW133
The Ranger (SG, D, RC, Trans)	AW145
Broadcast Picture Four (HF, D, 2RC)	AW163
Orchestra Four (D. RC, Push-pull)	AW167
All Europe Four (2 HF, D, Trans)	AW173
Stability Four (H.F, D, RC, Trans)	AW182
"Q"-coil 4 (HF, D, RC, Trans)	WM70
Five-pounder Four (HF, D, RC, Trans)	WM90
Touchstone (HF, D, RC, Trans)	WM109
Reyner's Furzehill Four (SG, D, 2Trans)	WM112
Economy Screen-grid Four (SG, D, RC, Trans)	WM113
Binowave Four (SG, D, RC, Trans)	WM119
Standard-coil Four (HF, D, 2 RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
The Drum Major (HF, D, RC, Trans)	WM137

FIVE-VALVE SETS (1s. 6d. each)

"Q" Gang-control Five (2HF, D, 2Trans)	AW160
Empire Five (2 SG, D, RC, Trans)	WM96
Fidelity Five (HF, D, 2 RC)	WM130

SIX-VALVE SETS (1s. 6d. each)

Short-wave Super-6 (Super-het, Trans)	AW67
Eagle Six (3 HF, D, RC, Trans)	WM106

AMPLIFIERS (1s. each)

Screened-grid HF Amplifier	AW138
"A.W." Gramophone Amplifier (3RC)	AW162
Searcher Unit (HF)	AW176
Gramophone Amplifier (3 v.)	AW187
Gramo-radio Amplifier (2v) (Trans.)	WM72
Signal Booster (HF Unit)	WM128
Auditrol Amplifier	WM132

MISCELLANEOUS (1s. each)

H.T. Eliminator for A.C. (200 v. output)	AW102
L.T. and H.T. Mains Unit (D.C.)	AW123
Listener's Speaker, price 4d. free with copy of "AW"	AW170
Arcadian Linen-diaphragm Loud-speaker (Full-size)	AW177A
D.C. Unit (HT)	AW178
Short-wave Adaptor (1 v.)	AW183
Universal Short-wave Adaptor	WM83
Buzzer Wavemeter (6d.)	WM121
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

PORTABLE SETS

House Portable (SG, D, RC, Trans)	AW163	1/6
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
Holiday Portable Three	AW188	1/-
Chummy 4 (with modifications for LS and HT)	WM321	1/6
Wayfarer Portable (Super het)	WM139	1/6

Send, preferably, a Postal Order (stamps over sixpence in value unacceptable) to Blueprint Service

AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4.

LETTERS TO THE EDITOR

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

The "Favourite Two"

SIR,—My object in writing this letter is that I feel pleased to think that, after twelve months have elapsed, you were still prepared to recommend the "Favourite Two," and it is gratifying to feel that one has not made a mistake in making up the original set.

Only last week two of my friends asked my advice, as they were thinking of having receivers; I advised them to follow my example. M. (Battersea).

Condenser Defects

SIR,—I heartily agree with B.F. (Raleigh) about the above. I am also an amateur, and also must express surprise that the manufacturers do not consider the square end spindle, for I have spent pounds on all kinds of dials and even new condensers; but it all ends the same. All have the same fault: the knob will lose its hold. You can twiddle away before it catches. Wake up, manufacturers, and help us! H. K. (Sunderland).

Sunday Programmes

SIR,—With reference to my previous letter on the above subject and the reply of M.E.P. (Coventry), may I ask the courtesy of your columns once more to reply to M.E.P.

As far as I can remember I wrote that I must be one of thousands who thoroughly dislike the present Sunday programme arrangements, and I repeat that statement now. To give an example outside wireless, may I quote the simple example of Sunday music in the parks in Liverpool. The "thousands" in Liverpool argued for twenty years before they got their wish in that respect, but M.E.P. would have us believe that the majority are against it.

Again, Mr. Moseley and at least one other writer in AMATEUR WIRELESS have repeatedly written on the point of view which I uphold, as have many leader writers in the daily press.

The satire on my vast circle of acquaintances was quite wasted, since I made no such claim; and even if I had said that my views are held by thousands, I would in all probability have been correct, for I do not so flatter myself as to believe that, in a country of over 40 million people, there are not several millions who have already thought, many times before, everything my brain is ever likely to rise to.

The "majority" of M.E.P. is infinitesimal. Read the daily press and listen to others talking, and see if you can find even "thousands" who are satisfied with the present Sunday broadcasts; then perhaps M.E.P. will realise that it is his turn to

LETTERS TO THE EDITOR

(*Continued from page 813*)

bow with better grace to the wishes of the majority. S (Bebington).

Organ Music

SIR,—I was interested to notice in a recent issue a letter from W.E.C. in support of Mr. Edward O'Henry's playing of the cinema organ.

Since my experience, in this case, is founded only on reproduction by means of wireless, I am prepared to admit the possibility of some slight quality of tone being detracted from the original, in process of transmission; but I do not consider that the sounds upon which my criticism is based are to any important extent different from those audible in the theatre. That being so, my listening can be quite as effective and quite as critical as that of W.E.C.

I fully agree that Mr. O'Henry is "a very clever performer"; that, in fact, was the principal cause of my dissatisfaction; but even he appears to have overlooked the fact that it requires special skill to play effectively for a microphone.

J. B. I. (Hawick).

An Appreciation

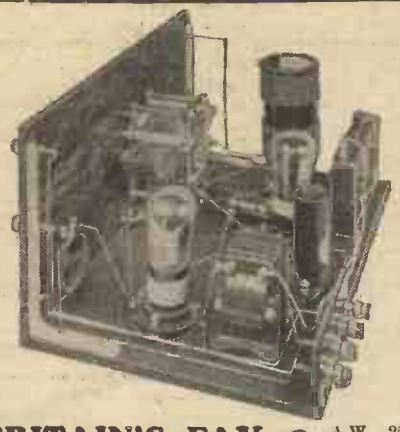
SIR,—Having constructed your "1929 Britain's Favourite Three," which I use with a linen-diaphragm speaker, I am forwarding you a list of stations I have received up to date for the benefit of those readers who contemplate building the new "Favourite." All the undermentioned are received at loud-speaker strength: London, Daventry 5XX, Daventry 5GB, Cologne, Hilversum, Radio Paris, Breslau, Frankfurt, Langenberg, Brussels. The above are received in daylight. One morning last week at 1.30 a.m. I tuned in Radio Belgrade on the loud-speaker. A woman announcer gave the call sign "Radio Beograd." Thanking AMATEUR WIRELESS for a fine circuit.

E. L. (Stoke Newington).

A microphone has been installed in the office of the principal of a school at Racine, Wis., so that he may make his announcements simultaneously throughout the school while educational broadcast programmes are being received.

The Berlin studio now contemplates an alternative service of daily broadcast programmes. The Witzleben transmitter and the Berlin-East relay stations in future will transmit a different entertainment to that given through Königswusterhausen.

Mr. George Paton, M.I.Mech.E., A.M.I.E.E., is resigning his position with the B.T.H. Co., Ltd., with which firm he has served for nearly 6½ years.



BRITAIN'S FAV. 2

A.W., 25th May, 1929

COMPONENTS

Ormond .0005, 6/-; .00025, 5/6; 7 ohm Ormond, 2/-; 2 W.B. V.H., 2/6; 6 pin Base, 2/-; .0003 and Series Clip, 1/6; 2 meg. leak, 1/-; H.F. Choke, 5/6; L.F. Transformer, Lissen 8/6; Push Pull, 1/3; Tunewell Dual Range Coil, 7/9.

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(Applies to this Set ONLY).

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1 Aluminium Panel (ready drilled to carry tuning condensers, switch, reaction condenser, rheostat, and panel brackets) Colvern, 5/6; Juno Piano-board, 2/-; Bebe .0003, 8/-; 2 J.B. Log, left and right, 19/-; Sovereign 50 ohms, 2/6; 2 Drum Dials, pr. 21/-; 2 Six-pin Bases, 4/-; Benjamin Switch, 1/3; 2 H.V Valve Holders, 3/6 pr.; B.B.C. Aerial Coil, B.B.C. Anode Coil, 9/6 pr.; 1 W.B. Valve Holder, 1/3; 2 Junit Mounts for 1/3; 4 B. Lee Terminals 2/-; Climax H.F. Choke, 7/6; G.B. Clip, 6d. 2 Mullard Permacore, 25/-; Metal Screen, 10/6; Panel, Brackets, 2/6; 25, T.C.C., 2/3; Mullard .01, 3/-; 7 Plugs, 1/2; 2 Spades, 6d.; Flex and Screws, 1/9; Set of Links, 1/3; Exact to Mullard specification. Long-wave Coils, 10/6 pr. EXTRA.

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A.W. 6/4/29

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14x7 Ebonite Panel. Screen, 8½8. 8 Engraved Terminals. Push-pull Switch, Flex, Plugs, 16-g. Wire, 2 S.M. Dials.

THE LOT 70/-

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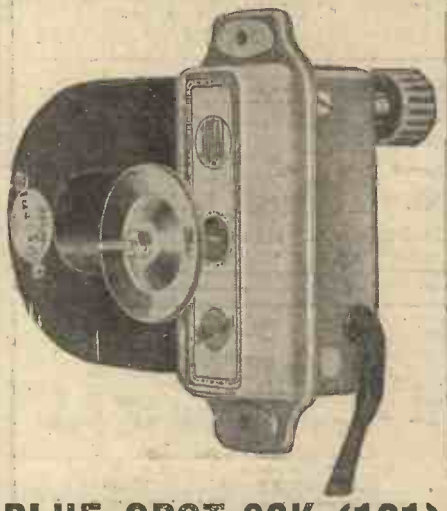

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"A.W.," May 5, 1929

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A SET FOR HOME AND HOLIDAY

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XIV. No. 366 Saturday, June 15, 1929

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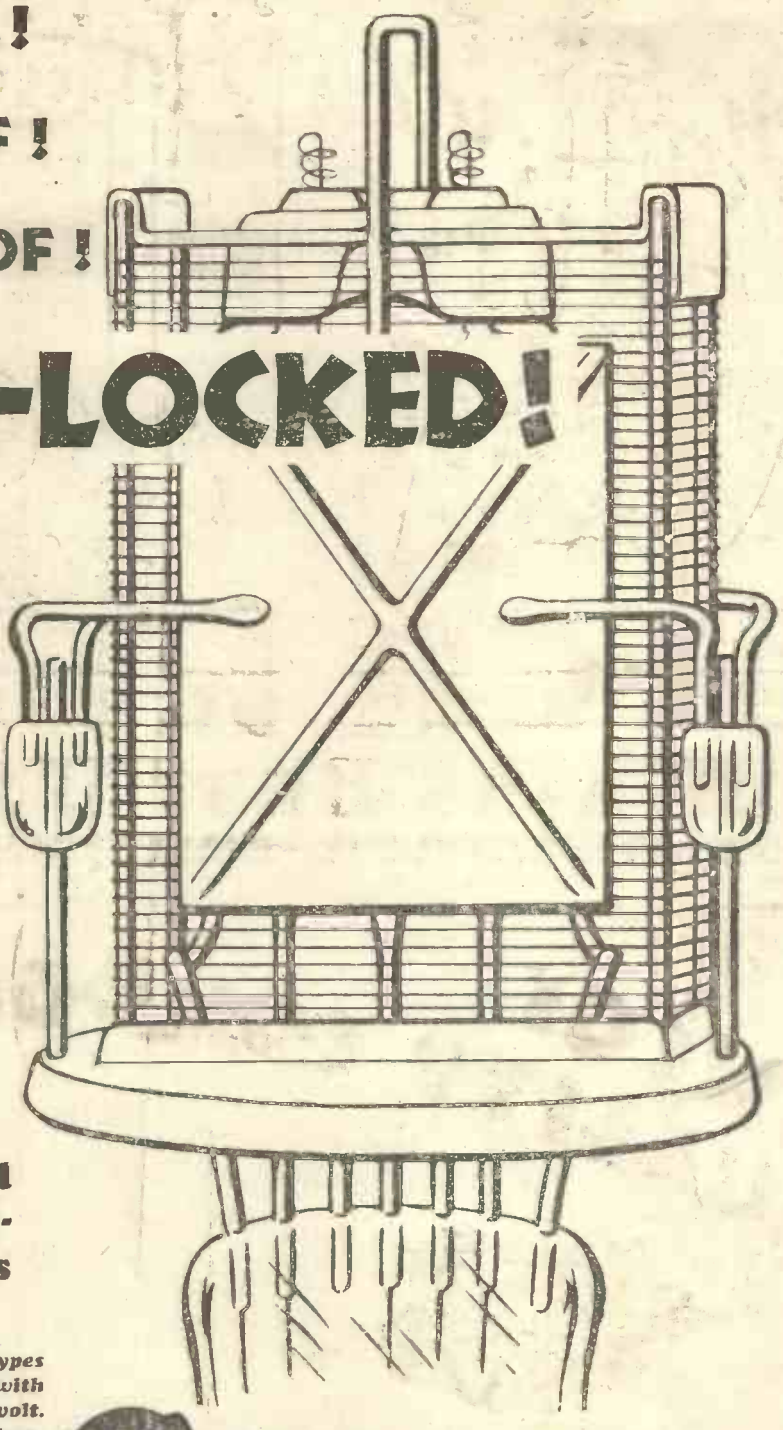

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Screened Grid

BRITAIN'S FINEST S.G. VALVE

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JUNE 15, 1929 No. 366. Vol. XIV

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

Capt. Eckersley—His Successor—The "Well Done"—Other Resignations—A New B.B.C. Suggestion—Election Night

Capt. Eckersley—The resignation of Capt. P. P. Eckersley from his office as chief engineer of the B.B.C. was not unexpected, and there is no reason to suppose that he resigned in anything but happy circumstances, the fact that he carries with him the office of consultative engineer being sufficient to reassure everybody on that point. The Engineering Department has lost many good men in recent months, among them being Capt. A. D. G. West, who has joined the engineering staff of H.M.V., and some nine or ten other members of staff, practically all of whom have been absorbed by the "talkies."

Giving out the news. An Election-night scene in the apparatus room at Barkers of Kensington, where, by means of Philips apparatus, the results were broadcast to a waiting and anxious crowd.

The "Well Done" — Capt. Eckersley has done fine work for the B.B.C. He had just the right personality for just the right occasion; his experience, initiative, his zeal, his humour and his energy, his eloquent, persuasive and forceful talk, all helped him to do great things for broadcasting in its early years, and his name will ever be associated with the initiation and growth of broadcasting not only in this country, but throughout the world. He was broadcasting before there was a B.B.C. He was a wireless officer in the Royal Air Force during the war, and it was his position later in Marconi House that made possible in 1923 the initiation of an occasional broadcasting service which soon evolved into the British Broadcasting Company. All honour to a pioneer who has earned the "well done," and from whom much will yet be heard in other and allied spheres. The public will be very glad to know that the B.B.C. will still have the benefit of his advice in a consultative capacity.

His Successor — There remains after Capt. Eckersley's departure a fine engineering staff at the B.B.C. Mr. Noel Ashbridge is an efficient and competent engineer who knows his job, and we are rather expecting that Capt. Eckersley's technical mantle will fall upon him.

Other Resignations—By the way, a well-known B.B.C. announcer, Mr. Eric Dunstan, has resigned in what the newspapers have told us are "dramatic circumstances," since last we went to press. We rather think, though, that the papers made too much of the affair. The going of Mr. Eric Dunstan was simply the fading out of a "golden voice" to which the public had grown happily accustomed, but it will soon fade in again somewhere—probably in the "talkies." On the subject of these B.B.C. resignations generally, a well-informed writer in the *Wireless Magazine* this month contributes, under the interesting title "The Trek to the Talkies," an article in which he attempts to account for the sudden rush of B.B.C. officials after outside jobs. He makes the point that until quite recently there was no alternative job open to most of the B.B.C.'s trained men, and the coming of the "talkies" has given them an opportunity of earning salaries which were impossible at the B.B.C., which, after all, must be run rather on Civil Service lines.

A New B.B.C. Suggestion—Writing in a recent issue of the *Sunday Pictorial*, Shaw Desmond suggests that the B.B.C. should do the transmission only and that programme-making should be thrown open to competition. Well, there might be something in the scheme, but now that the B.B.C. is a Corporation and not a Company it is rather late to come forward with new proposals. The B.B.C., like most other Government Departments, is "a sure thing" and is thus a safe thing at which to grumble!

Election Night—The excitement in connection with Election night is now, perhaps, being forgotten, but it will be some time before we forget radio's part in giving out the election results with the least possible delay. A number of technical folk assisted by putting up public-address equipment at convenient points and broadcasting results through loud-speakers as soon as they were received. An accompanying photograph shows the microphone and equipment at a well-known London stores. Radio dealers found that outside loud-speakers proved very popular and crowds collected like magic whenever there was any news!

PRINCIPAL CONTENTS

ON THE ROAD WITH RADIO

By KENNETH ULLYETT

Listening to radio music on Bury Hill. The batteries and loud-speaker are separate from the set, as advised in this article

Reproduced by permission from "The Motor"

HERE we are in the middle of June, with dust, flies, and police traps to make the open road objectionable! Yet it is the most opportune time to consider the advantages of radio out of doors and in the car.

Forgetting the Motorists

Portables are more than ever popular this year, but, to be truthful, in my own small sphere of motoring acquaintances I do not find any greater anxiety to combine the pleasures of radio and the road. I think perhaps the reason is that motorists have been largely overlooked by the manufacturers of commercial portable sets, and it is up to home-constructor motorists to make their own portables suitable for the job in hand.

I myself cover quite a deal of country in the car in company with a portable set which is used exclusively for motoring, and there are quite a number of points which force themselves upon one after a little experience of this kind.

Two snags which one finds right at the start are, first, the liability of the average set to put out of action by road vibration and, secondly, the difficulty of keeping dry H.T. batteries constantly "up to scratch."

Battery Bothers

This battery business is quite a bother in winter time, when the car may be left unattended for several days on end and the damp air causes a short-circuiting film of moisture to spread over the battery surface; the result is that the H.T. "juice" mysteriously disappears. What is wanted, of course, is a rotary H.T. converter to operate from the starter battery. I have tried a home-made gadget of this description, but the best solution of the H.T. problem for the average man is to use triple-capacity batteries (weight is of no importance in a car portable) in a case lined with thin rubber sheet.

I find it a good plan to keep the H.T. batteries wrapped in thin rubber balloon sheet in an attaché case, with tappings at 60 and 120 volts, brought out to a small socket at the side. The case is stored in the dickey until required; and one such "box of high-tension" lasts about six months if used frequently with a four-valve portable.

The receiver itself is stored down by the passengers' feet; that is, on the inside of the scuttle dash. There is generally plenty of space to spare here, and the only slight disadvantage is that one corner has had to be "knocked off" the case so that it is not fouled by the floor boards. The set is supported by four springs about 3 in. in length. This insulates the whole receiver from vibration and, of course, anti-microphonic valve holders are employed. In my opinion, it is not a practical proposition to have the frame aerial incorporated in a car portable; that is, if the set is to be used extensively while the car is running. In nine cases out of ten an improvised external aerial, consisting of only a few feet of rubber-covered cable, is more effective and less directional. An earth connection can always be made to the car chassis frame or to one pole of the electrical system.

External Loud-speaker

Neither should the loud-speaker be an integral part of the receiver. It is wise to have the receiver itself more or less attached to the car, as I have mentioned, and to string the aerial over the hood sticks or over the body top in the case of a saloon, and to carry the loud-speaker, attached to a length of flex, to the scene of operations.

L.T. can be obtained from the starter battery, but as the voltage of this battery varies somewhat it is wise always to "float charge" a small battery in the set in the manner I described in AMATEUR WIRELESS No. 353 in my test of the "House Portable" in a car.

So far as circuit arrangements are concerned, many AMATEUR WIRELESS portables can be slightly modified to suit the scheme of things necessitated by a car. A screen-grid stage is an asset, though, of course, not a vital necessity. At the present state of development it is hardly wise to use more than one H.F. stage, though probably another twelve months will see the introduction of an efficient system of ganging. There should be at least two L.F. stages, because plenty of "punch" is needed in portable reception.

All portable-set operators, motorists or otherwise, will forgo a big DX "bag," provided that the strength on one or two locals is equal to that given by a portable gramophone.

Finally, I favour a switching arrangement to cut out one of the L.F. valves and to allow phones to be used. The number of portables one comes across which can be operated successfully while a car is in motion can be counted on the fingers of one hand if loud-speaker reception is needed. But with phones this is quite a different thing, and, uncomfortable as they are, there is much to be said in their favour if they allow a set to be used successfully while the car is travelling.

According to the percentage of the 15,000 post cards and letters from broadcast listeners arriving monthly at the United States Department of Agriculture, women contribute at least 80 per cent. of this mail.

TAKE WIRELESS WITH YOU!

A good place for the set is down by the passenger's feet, in front, on the inside of the scuttle dash.

H.T. batteries can be carried separately in an attaché case, and wrapped in rubber sheet to keep out the damp.

The accumulator can be charged, while the set is working, from the starter battery. Don't work direct from the starter battery.

Shielding is bad if the car is metal-panelled. Don't rely on a frame aerial, but use an outside aerial strung over a tree or round the hood sticks or saloon top.

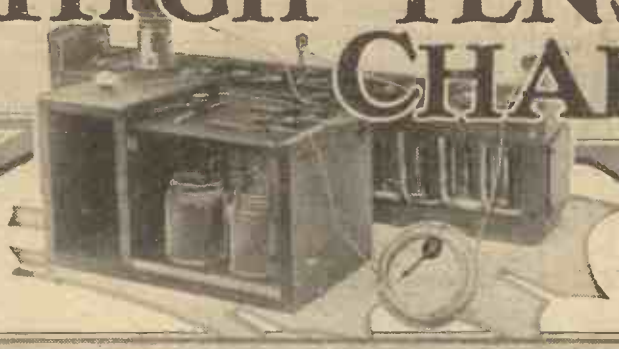
Earth the set by a connection to the chassis or to one pole of the electrical system.

Anti-microphonic valve holders are needed, and be wise and support the whole receiver on springs.

Two L.F. stages will generally be needed to give enough "punch."

Phones are useful for working when the car is in motion.

A New HIGH-TENSION CHARGER



ECONOMICAL, RELIABLE AND CHEAP

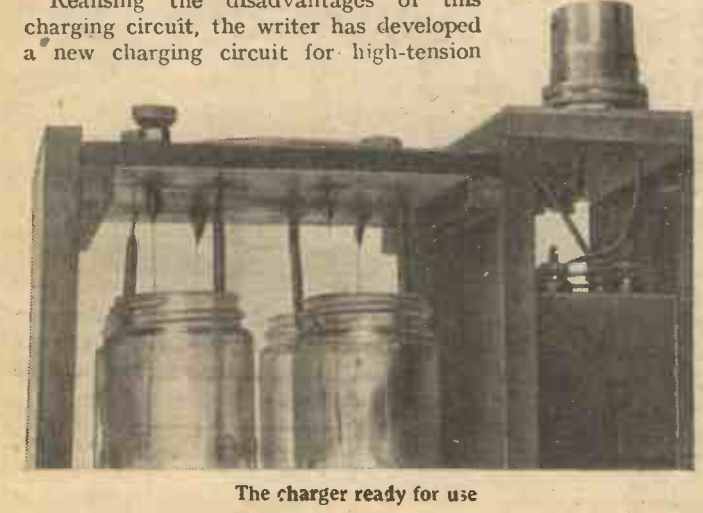
By W. W. WHIFFEN

THE tantalum electrolytic rectifier has proved itself entirely suitable when working at low voltages as in the charging of low-tension accumulators from alternating current. When handling high voltages, however, the system cannot be said to have been altogether satisfactory. The chief difficulty lies in the comparatively low breakdown voltage of the metal. This is the voltage at which the desired rectifying action ceases, allowing current to flow in both directions. One way out of the difficulty is to increase the number of cells in a series arrangement. This has practical limitations and the disadvantage of increasing considerably the resistance of the circuit.

A Standard Circuit

A standard high-tension rectifying circuit is illustrated in Fig. 1, where eight cells are employed in the charging of a 100-volt accumulator. The course of each positive charging cycle from the mains supply A B is indicated by the arrow marks. The positive cycle from B to A is shown by tailed arrows for distinction. The drawback to the circuit arrangement is that the two cells at C (when A is positive with regard to B) or D (during the opposite half-cycle) must withstand the whole mains voltage if rectification is to continue.

Realising the disadvantages of this charging circuit, the writer has developed a new charging circuit for high-tension work which has certain unique advantages. The circuit is shown in Fig. 2. Only half the number of rectifying cells are required to do the same work, all cells being joined in series, and then connected to the positive and negative terminals of the accumulator to be charged. The mains supply is applied at the electrical centre of the accumulator and to the centre of the rectifying cells. Thus the circuit is divided into two branches, each cycle choosing the path which offers the less resistance. In this circuit the resistance is approximately halved to that shown in Fig. 1, as the accumulator voltage is virtually halved. It follows that any reduction in the resistance of one half of the circuit will lighten the load on the other half. Again, as the back E.M.F. is reduced, so can the charging voltage be lowered.



The charger ready for use

Low-voltage Charging

An interesting feature of the circuit is that the apparently impossible is attained, for an accumulator, retaining its series arrangement, can be successfully charged from supply mains of lower voltage than the accumulator itself. This is easily explained from Fig. 2, where it will be seen that, although the accumulator cells are all in series, only half of them are being charged at one time.

The only practical considerations to be made to the circuit are the means for fixing or regulating the charging current, a suitable safety fuse, and an "on-off" switch. The most convenient means for limiting the mains voltage is by a fixed condenser placed in either of the mains leads. A variable resistance could be used, but there is little to recommend it. In the first place, a resistance of suitable type would be expensive and, further, would not provide the same economy of operation as a reactance due to capacity or induction. The writer has used the latter successfully in the form of a choking coil with a withdrawable core and having an inductance of 5 henries. This method gives a fine control over the charging current, but to keep the latter steady constant adjustments must be made to allow for the increase in back E.M.F. of the accumulators, as their voltage rises in charging.

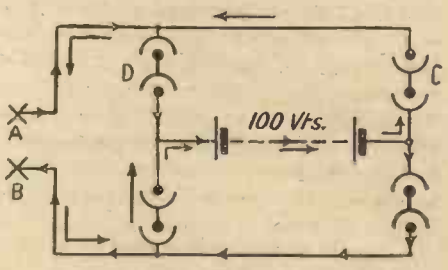


Fig. 1. A standard circuit

Description

The high-tension charger to be described and illustrated by the photographs employs capacity reactance, the fixed condensers, the values of which may be chosen to provide the charging rate required, being housed in the small compartment to the left of the illustration. It was not considered necessary to incorporate a double-pole switch in the instrument. The charger will be used only occasionally, as a fully charged accumulator will run for a considerable time. Instead, a flush-mounting lamp-holder is screwed to the top of the instrument, connection to the mains being made by inserting a standard lamp plug. Any convenient fuse may be used, that shown consisting of a pocket flash-lamp bulb mounted in a small screw holder adjacent to the lamp-holder. If the charging current exceeds 50 milliamperes, a higher current bulb may be necessary or a cartridge type fuse used instead. A fuse of this type can quickly be made with a

"A NEW HIGH-TENSION CHARGER" (Continued from preceding page)

fixed resistor and base. The resistance wire is removed and in its place is arranged a piece of "silver paper" of about $\frac{3}{16}$ in. in width.

Construction

There is no reason why the charger should not be made to any desired shape

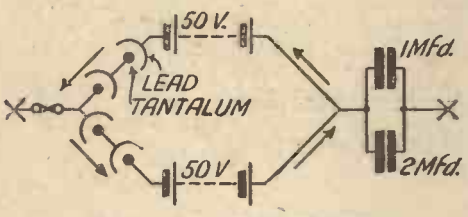


Fig. 2. The circuit employed

or design. Working drawings and measurements have been purposely omitted. It is probable that the constructor will prefer to use measurements enabling him to use material to hand and possibly to occupy a certain space. It is necessary, however, to keep the acid fumes or spray well away from the wiring or metal parts of the charger. This is accomplished in the charger illustrated by providing a separate compartment for the rectifying part of the apparatus.

It is advisable to follow closely the method of construction of this portion if the charger is to give lasting satisfaction. There would appear to be little difficulty in connecting the tantalum strips to the lead electrodes, although it is true that tantalum cannot be soldered, but in actual practice it is difficult to make this job permanently sound. If the main reasons for this are explained it will help the constructor to avoid the faults and to appreciate the reason for the particular design used. In the first place, with continued use the acid will collect at the top of the electrodes and will rejoice to find a resting-place at the junction of the tantalum and the other metal to which it is connected. The latter will soon corrode, if not of lead. This is not the main menace, however. A more serious one is that a direct path will have been created from one lead electrode to another in the next cell via the junction with the tantalum electrode. This will short-circuit the cell and throw upon the next cell a strain which it cannot stand. The rectifying action will then stop, serious sparking and overheating taking place.

Checking "Straying" Acid

Despite all precautions, the acid may in time get to the junction point of the tantalum and the metal connecting it to the next cell. It is important, then, that the whole of the electrode system should be rapidly accessible for cleaning or repair.

The eight electrodes hang from the underside of a piece of ebonite measuring, in the charger illustrated, 4¼ in. square by ¼ in. in thickness. The ebonite top is in turn screwed to two fillets attached to the inside of two upright sides, the latter being fixed to a larger base by wood screws passing through from underneath. The extension of the base at one end, with a third side-piece, forms the second and smaller compartment in which the condensers are housed. The wooden top to this compartment bears the fuse holder and the flush-mounting lamp holder.

The Jars

The jars for the electrolytic cells should be obtained before any wood is cut. Quite small jars, such as are used for honey or potted meats, will be suitable. Those illustrated have a capacity of one fluid ounce each and measure 2 in. high by 1½ in. diameter. The cells are kept in square formation by tacking four strips of wood on the outside and cross pieces in the centre, thus making four shallow trays. The trays are paraffin waxed and the jars set into position. These positions are retained permanently by pouring in more melted wax until the trays are filled. The wooden side pieces should be high enough to allow for a distance of 3¼ in. from the bottom of the jars to the underside of the ebonite top.

MATERIALS REQUIRED

Flush-mounting lamp holder and lamp plug.
Safety fuse.
Four terminals.
Ebonite strip, 4¼ in. × 4½ in. × ¼ in.
20 in. of single lead-covered wire
Piece of tantalum 3 in. × ⅜ in.
Four 1-ounce glass jars.
One 2-mfd. Mansbridge condenser.
One 1-mfd. Mansbridge condenser.
Small quantity of wood.

The Electrodes

About 20 in. of single lead-covered copper wire of about ⅛ in. in diameter is used for making the lead electrodes. A sample of this material will be quite easy to obtain, as it is largely used in outdoor electric wiring. Two parallel sets of four holes are now drilled through the ebonite top, of a gauge slightly larger than the diameter of the lead covering, to enable two electrodes to pass into each jar. Each electrode should clear the rim of its jar by ⅛ in., at the same time keeping them as far apart as possible.

The arrangement of the electrodes is clear from the illustrations. Choosing any one of the four corner holes for a lead electrode, and near it drill and tap a hole for a large-base terminal. Do not allow the hole to enter the underside of the panel. The second and third holes along the same line accommodate a tantalum and lead electrode respectively. The fourth and last hole in this line is for the second tantalum strip. From this hole connection is taken straight across to the nearest hole in the second line to join to a third lead electrode. And so on to the last hole, near which is another terminal to which the last electrode, a tantalum one, is connected. Fix another terminal midway between these two.

Lead-covered Wire

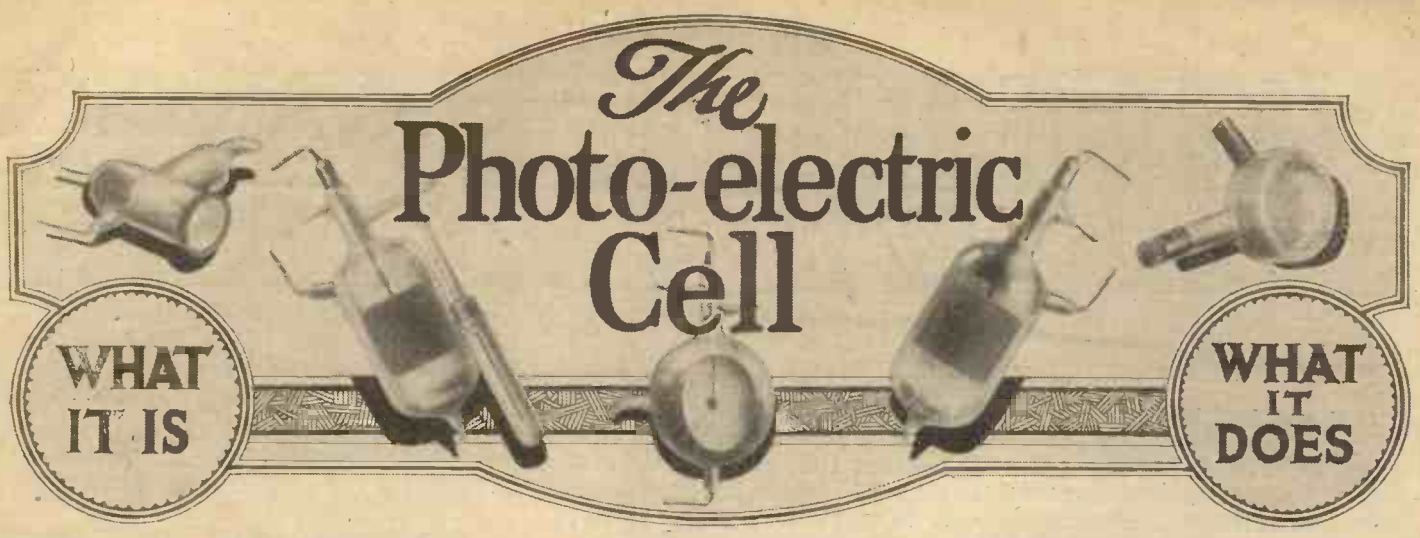
To remove the lead covering from the copper wire, mark off roughly the length required and score round with a knife. Two or three sharp bends will break the lead, allowing it to be drawn off the internal wire. Returning to the first hole, push the lead through until it clears the inside of the bottom of the jar by ¼ in. Bend the lead over at the top close to the panel and clamp under the adjacent terminal. A second lead is fitted in similar manner to the third hole. The free top end is then bent over and pushed through the second hole, and allowed to project only ¼ in. from the underside of the panel. The process is continued in this way for every hole, the ¼ in. projection being left for the tantalum strips. The lead strips from the fourth and fifth holes are connected together under another terminal centrally placed between these holes.

The tantalum metal was obtained from Messrs. G. G. Blackwell, Sons & Co., Ltd., The Albany, Liverpool. In next week's article will be given final constructional details, and some hints on working the charger from the mains. In the meantime it may be mentioned that the running cost is practically negligible, for the current taken is so small. Actual figures will be given.

Here are the components of the unit taken apart

The New South Wales Broadcasting Company has directed that all musical titles shall be Anglicised.

The Photo-electric Cell



By JOHN D. RANKIN

WHEN the first commercially-produced valve was introduced some years ago it was little realized how great an influence this device was to exert in the science of wireless. To-day the photo cell stands in the same threshold position once occupied by the valve; in its own sphere of application—a very wide sphere—the photo cell would seem to have a great future. In the February 23 issue of this journal, reference was made, on page 284, to a new photo cell and something of its nature and application was outlined.

Applications of Photo Cells

The introduction of the Osram photo cell serves to focus attention on the whole subject of photo-electricity, its application to the embryonic science of television and to the more advanced technique known as the "talking picture." The valve links ether waves with an electric current. The photo cell links light waves with the same medium.

The process of a "talking picture" is only indirectly achieved by first converting the voice into an electric current and by utilising this current to work a neon lamp, which is a current-to-light converter.

An application of the photo cell, familiar now to every newspaper reader, is picture telegraphy; in the majority of these systems a photo cell is required at the transmitting end to convert a projected image of successive sections of the original photograph into electric-current variations. The medium of transmission here is a telegraph line and by sufficiently amplifying the weak photo-cell currents, apparatus at the other end of the line can be operated; there the need is for a current-to-light converter, such as an oscillograph.

Other applications of the photo-cell are too numerous to detail; its function as a converter of light variations into current variations renders the photo-cell of immediate practical value in television, in optical science, and the wider field of industry.

Considering its importance, surprisingly little is known to the amateur about the photo-cell. Possibly this lack of knowledge can be attributed to the fact that, so far, the use of the photo-cell has not come within the scope of wireless enthusiasts.

Without taking the reader out of his depth, it is proposed to explain how the photo-cell works.

Three essential characteristics determine the nature of a photo cell, which can be modified in its action by the size and geometrical form of the bulb and electrodes, the material used for the cathode, and the gas filling.

Basic Principles

In the most elementary form of photo cell an evacuated glass bulb encloses two electrodes, the cathode or electron-emitter and the anode or electron collector. Sensitised by a special process, which need not be detailed here, the cathode usually takes the form of a metallic deposit, consisting of a thick layer on the bottom of the bulb. The cathode is a circular wire grid, arranged above the metalised inner surface of the bulb so that while it offers the least impediment to incoming light it is sufficiently close to attract the electrons emitted from the cathode.

An Osram red-sensitive cell

The peculiar action of a photo cell depends on the fact that when light is allowed to fall on certain metals, notably sodium and potassium, they liberate electrons. The simplest possible cell consists of an evacuated glass bulb, with anode and cathode electrodes arranged as explained. In such a cell the photo-electric current constitutes a minute electronic movement between cathode and anode; the value of this current is determined by the amount and nature of the light to which the cell is exposed. This type of cell has the most accurate "response-curve" because although the photo-electric current is very small, being of the order of a few micro-amperes, this current is directly proportional to the light intensity.

Current-to-light Ratio

Apart from accuracy of response, the most useful index of a photo-cell's suitability for any given application is its emission, or the ratio of current to light. Viewed from this aspect the simple evacuated cell is susceptible to improvement; in other photo-cells a gas filling replaces the vacuum, with a resulting increase in the emission, or the amount of current for a given light intensity.

In these gas-filled cells, argon, an inert gas, is pumped into the bulb at low pressure, so that when what is known as the primary current takes place, some of the argon molecules are ionised by collision with the electrons, thus releasing a secondary stream of electrons, which adds considerably to the initial stream.

It has been said that the material for the cathode affects the action of a photo-cell; in practice the variation in emission will be determined by the amount of light and the quality of light to which the cell is exposed.

The practical details will be fully explained in a concluding article.

WATCHING THE WAVES

Following last week's article on alternating currents our Technical Editor shows how these currents may be examined with an oscillograph

I HAVE explained in a previous article that there are many occasions on which some visible indication of the variation of current in an alternating current circuit is of assistance, and have shown that such an effect can be obtained by the use of an instrument known as an oscillograph. In this, a spot of light is caused to move over a suitable screen and to trace out a path corresponding to the variation of the current itself.

The Duddell Oscillograph

One form of oscillograph which is often employed is the type known as the Duddell. This consists essentially of a simplified moving-coil milliammeter. A very small coil of wire is suspended in a very strong magnetic field. Instead of a pointer, however, a small mirror is attached and a beam of light is reflected by this mirror on to a screen. If a current is passed through the coil, the mirror is deflected and consequently the spot of light is caused to move across the screen.

We have to deal with exceedingly rapid variations in the current if we are to observe such frequencies as occur in the higher audio range. In fact, even to follow a frequency of 1,000 cycles per second with a mechanical device is a matter

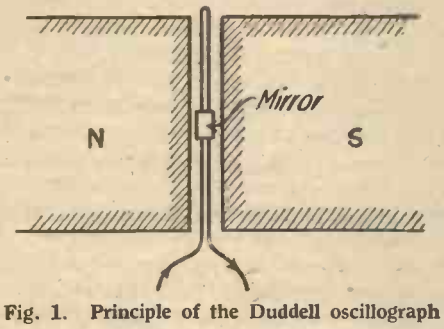


Fig. 1. Principle of the Duddell oscillograph

requiring most careful construction. Any resonance must obviously be avoided or the results obtained will be invalidated, and actually the moving coil becomes a single loop of very thin wire, somewhat as shown in Fig. 1. It will be seen to be relatively long and very thin, being suspended in a very narrow gap to obtain the greatest possible sensitivity.

By taking suitable precautions, it is possible to obtain adequate response from a device of this type, even at fairly high frequencies. If any fairly rapidly alternating voltage is applied to the oscillograph, however, it is obvious that the spot of light will move from side to side so rapidly as to appear merely as an elongated line, An arrangement such as this by itself will not tell us what we want to know. It is necessary to displace the path traced out by the spot of light in a direction at right

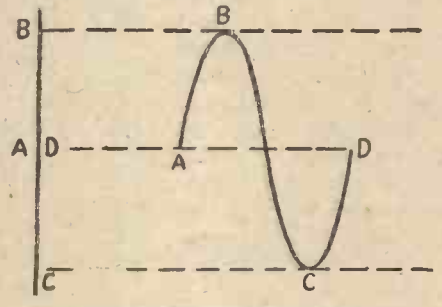


Fig. 2. Path of the light spot

angles to its normal travel as illustrated in Fig. 2.

In Fig. 2 we have a line traced out by an imaginary spot of light which has moved from A to B, from B down to C and then from C back to B again. As the point B coincides with A, the whole appears as a simple straight line. In the curve A B C D, we have caused the spot of light to move slowly from left to right while it is also moving up and down.

Tracing a Wave

This is the principle which must be adopted in tracing out an oscillograph record so that it appears as a wave form. One rather simple way of doing this is to allow a photographic plate to fall past an aperture through which the spot of light is visible. This automatically provides the movement along the time axis as it is called so that the movement of the spot of light will appar as a wave on the photographic plate when it is developed.

Where we are dealing with recurring or steady waves, we can arrange to produce a visible image of the wave form and observe the effect of this of making various alterations to the circuit. This in many cases is useful as, for example, where we wish to know what the wave form actually is like.

To do this we arrange to deflect the spot of light across the screen as just described. We then return it to its starting point again as rapidly as possible during which time we cut off the source of the light from the screen by some suitable means such as the interposition of a shutter. When the light next reappears on the screen, therefore, it is moving across in the same direction as on the previous occasion. We have to do more than this, however. It is necessary to arrange that the path traced out by the light on this second journey shall coincide exactly with that on the previous journey and so on for each succeeding instance.

Provided the wave is regularly recurring we can do this by arranging to synchronize the mechanism which we are using to deflect the spot of light across the screen finish every two or three complete oscillations. It then takes, perhaps, one further oscillation in returning to its starting point during which time the light is cut off, so that it starts on its second travel exactly four oscillations later coinciding with the previous path. The net result is that the successive paths traced out by the spot of light all build up and form a luminous line which is equivalent in shape to the current which is actuating the oscillograph.

If now we alter the value of the current, then the relative motion of the spot of light up and down will become greater or less

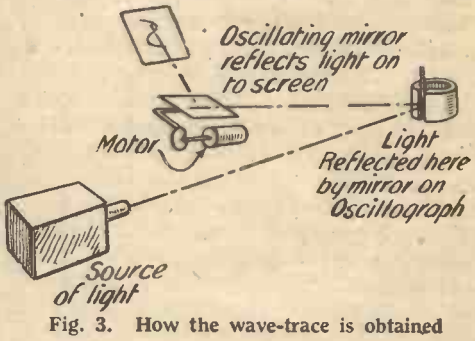


Fig. 3. How the wave-trace is obtained

and the wave form will appear to grow or to diminish. If we do other things to the circuit, we can observe the results in much the same way. We can even, if we like, arrange two oscillographs throwing a spot of light on to the same screen, one of which records the voltage across the circuit and the other the current. Another very popular oscillograph is the cathode ray type. In this a pencil of electrons is produced from a heated filament. I will describe this at length in a further article.

On Your Wavelength!

Proud of an Inventor

IT would be difficult to recall many cases where an inventor has been honoured by any form of memorial until long after he has passed away, so that I think Hastings is really doing something unique by deciding to put up a tablet to Mr. J. L. Baird, the inventor of television. This will be placed on the walls of the house at No. 8 Queen's Arcade, for it was here that Mr. Baird went early in 1921 after a breakdown in health following his activities in a jam factory in Trinidad. The problems of television had occupied his attention for some time prior to this, but the story of his single-handed struggles to reach a satisfactory solution—actually arrived at in October, 1921—make inspiring reading. Naturally, Hastings is justifiably proud of her Scottish adopted son, and when the history of television is written pride of place must undoubtedly be accorded to the town.

A "Talk" Suggestion

I wish I had been listening in the other evening to what must have been an intensely interesting American broadcast. Dr. Lee de Forest and Mr. W. F. Jenkins were "on the air" to discuss recent developments as far as television is concerned. Neither of these two workers needs any introduction to readers, the former achieving most fame for his addition of the grid to the previously existing two-electrode valve, while the latter is known for his contributions to the field of television, particularly in relation to the televising of films. During the course of this microphone discussion it was proved that television is well out of the laboratory experimental stage, with an early promise of a worth-while means of home entertainment. Another item of interest was that dealing with the obstacles overcome in order to increase the size of the image dimensions.

In advertising this broadcast I saw it mentioned that the first home televisor to be made was to be the prize awarded for the best essay on "What Television will do for the Home." The competition was open to boys and girls under eighteen years of age. Wouldn't the youth of this country welcome an opportunity to participate in a similar contest if such could be arranged by the B.B.C.! Sir J. A. Fleming, as the inventor of the valve, and Mr. J. L. Baird, as the inventor of television, would make an ideal combination for a broadcast of this character. Perhaps at some future date the Programme Committee of the B.B.C. could manage to fit this in, for I have no doubt in my own mind as to the talk being particularly popular.

A Gramo Puzzle

I did an amusing thing the other day. I had rather a good record which I wanted to demonstrate to a highbrow-ish friend —a rendering of "Father O'Flynn," by Norman Allin—so I ups and says, "Come and listen to this song, which is rather a good one"; whereupon I started the motor, switched on the amplifier, and placed the pick-up on the record. We were immediately greeted with strains of dance music!

Somewhat bewildered, I switched everything off and examined the record. Everything was O.K., so I switched on again, hoping that my friend had not noticed anything wrong. Exactly the same thing happened! I feverishly wiped my brow and asked my friend if he also heard dance music. "Why, yes," he replied. "I thought it was rather funny myself." Heaving a sigh of relief, I returned to the amplifier to see what was wrong. Of course, you will have spotted by now the reason of the trouble. I had the amplifier switched on to a radio set instead of the gramophone, and had not noticed it: a very simple and perhaps silly sort of mistake, yet it momentarily puzzled me.

British and American Sets

The lines along which wireless reception has developed on the two sides of the Atlantic form an exceedingly interesting study. In this country the most popular set for loud-speaker reproduction of both home and foreign stations is probably the three-valver consisting of one H.F. stage, a rectifier, and one note-mag. In the States the five-valver appears to be almost the smallest set that is widely used, while six- and seven-valvers are very popular. America, we know, is the land of big things, but that is not the reason why so many more valves are used in receiving gear. The fact is that we have gone in rather for few stages of high efficiency, whilst our transatlantic cousins prefer many of only moderate efficiency. We like the screen-grid valve or low-loss neutralised circuits on the H.F. side, whilst they are doing little with the former and low-loss is with them as unpopular as high-loss is with us. On the low-frequency side the pentode appeals to us, though they do not seem to be very much struck by it.

An Interesting Position

At one time reception conditions were very different in the two countries. In the States there was a multiplicity of low-powered stations, anything up to a score being found in one and the same time. Even nowadays the whole of Europe contains fewer stations than there were in America four or five years ago. The American listener, therefore, has always had a pretty useful supply of alternative programmes. To separate them he wanted selectivity; to bring them up to loud-speaker strength he required plenty of amplification. Since then the Federal Radio Commission has greatly reduced the number of broadcasting stations, but there has been a big all-round increase in the power. The listener can thus go farther afield for his alternative programmes, for stations such as WEAF, WLW, WGN, WJZ, WBBM, KDKA, and KMOX are all rated at 25 kilowatts, and they have large service areas. There is also the giant WGY, with 50 kilowatts, and numerous intermediate stations with ratings between 5 and 15 kilowatts. Conditions in America, then, nowadays are not at all unlike our own, for we have two high-powered stations at home and numbers of them within range on the Continent of Europe. In both countries the chief need at present is for sets selective enough to cut out unwanted transmissions and sufficiently powerful to be able to bring in numerous alternatives at loud-speaker strength.

The Prague Plan

The Prague Plan comes into force at the end of this month, and we are all hoping for great things from it. On paper it should be a complete success at the outset, for it has been most carefully thought out, and the re-arrangement of stations is in every way sensible and sound. We are reminded also that it scores over all previous plans in that it definitely has the backing of the various Governments concerned. So far so good, but there is one snag to which I have not seen attention called hitherto. This is that comparatively few stations possess appliances necessary for keeping their transmitters dead on the assigned wavelength. If you care to look up the chart showing the actual doings of stations which is published every month by the Brussels Laboratory you may be surprised to find how very few stations seem able to hold their wavelength accurately for any length of time. By far the best in this respect are our own stations and the Germans, though in other countries Vienna, Lyons PTT, Stockholm, Toulouse, Milan, and Brunn have fairly good records.

Some stations, of course, deliberately "wander" in the hope of finding quiet spots. During April, for example, Marseilles showed the following frequencies on various nights: 951, 955, 957, 954, 962, 968, 961, 939, 923, 915, 940, and 947. This corresponds approximately to wavelength wandering between 310 and 327 metres! Other stations, though, really

On Your Wavelength! (continued)

tried to keep their wavelengths, but could not do so. Berne, for instance, never once succeeded in exactly hitting his proper wavelength during the whole month of April, being generally a little above it and on two occasions somewhat below. Though by no means a bad offender, and keeping on the whole pretty near his assigned wavelength, Prague actually scored a bull's-eye on only seven evenings out of thirty during April. He was quite close to it on other nights, but just wasn't there; and in a scheme which requires such close packing of stations as does the Prague Plan the slightest error in the wavelength will be sufficient to cause trouble. I am looking forward very much to studying the reports of the Brussels Laboratory for July and the succeeding months.

Have We Been Rash?

I am rather wondering, as a matter of fact, whether the European authorities have been a little rash in throwing overboard the Brussels Plan and plunging bald-headed into that of Prague. We must admit that by the end of May there were no great numbers of stations working even approximately on their Brussels wavelengths; but in the four and a half months that have elapsed since the inauguration of the scheme things have shaken down pretty well, and most of the important stations have found positions which enable them to broadcast without interference. Actually it is years since I have been able to receive so many Continental stations free from interference as I could during March, April, and May. It seemed, too, that conditions were improving week by week, and there was quite a possibility that if matters had been left alone the European ether would, so to speak, clear itself. Time alone can show whether the Prague Plan will be a success. Personally, I have no doubt that it will be if—and it is a big "if"—all countries adopt a satisfactory means of abolishing "creeping" in transmitting plants.

Renewals That Pay

There are quite a number of little bits and pieces connected with the aerial-earth system that it pays to renew from time to time if one desires, as most people do, to maintain high efficiency. The cost of replacement is generally very small indeed, and it is well spread out, for renewals become necessary not all at once, but here and there at intervals. Aerial insulators don't last for ever. If yours have been up for four or five years you may be surprised to find, on lowering the wire, that the glazed surface has become badly cracked, or even that in places it has disappeared altogether. So soon as the surface "goes" the insulator becomes less and less able to do its job properly, for cracks or roughened surfaces provide numberless little cavities in which moisture and grime can collect.

I have long since abandoned big insulators on the aerial, using instead three small ones in series at each end. These cost only about a penny apiece, so that the expense of renewing them every year is neither here nor there. Lead-in tubes of ebonite also lose their insulating powers in time, owing to the effects of weather and exposure to light. The few pence spent on renewals at intervals are a good investment. The earthing switch may wear out in time, especially if it is in an exposed position—wobbly contacts here spell poor signal strength and most likely noisiness. Lastly, don't forget the earth plate. It is surprising to find how quickly a biscuit tin or a piece of galvanised iron will become corroded away in certain soils.

Broadcasting Figures

One of the German broadcasting companies has recently totted up the number of hours devoted during the year to various kinds of items by broadcasting stations throughout Europe and incorporated the figures in a report which makes very interesting reading. To those who are fond of saying how much more entertaining are the German programmes than our own, I have previously pointed out that much more talking is done and much less music given from the German stations than from our own. The figures referred to prove this to the hilt. In 1926 no less than 40 per cent. of the German programme time was devoted to talks! This has now dropped to something over 23 per cent., but in our own country it is under 20 per cent. Whilst London last year gave 70 per cent. of its working hours to music the all-in figure for the German stations is only 64 per cent. Actually, Rome, Hilversum, and Radio-Paris headed the list in the matter of musical broadcasting, whilst Rome is the smallest offender in the matter of talks, devoting only 5 per cent. of his time to them. On the whole, I don't think that we have very much to grumble about.

Second-hand "New" Goods

I am glad to see that attention is being called just now to a very bad practice on the part of some retailers. This is to sell as brand new valves which have been used (often pretty extensively) in demonstration sets or have been lent to experimenters so that they might "try them out." The dull-emitter valve of to-day, long lived as it is, is not everlasting. Every hour that it is used before it is sold means an hour of service life lost to the purchaser. And not infrequently it happens that in either the demonstrator's or the experimenter's hands a valve, afterwards sold as new, receives for a longer or shorter period an accidental overload of filament current. It takes very little of this kind of treatment to impair the subsequent performances of a valve and the characteristics may be entirely altered.

In the old days valves used to be sold in sealed boxes from which two contacts protruded so that the filament might be tested. I am sure that many of us would be glad to see a return to this practice. There could then be no tampering with valves before they were sold over the counter. Valves, as a matter of fact, are not the only part of the set which may be really second-hand though sold as new. I have more than once come across a high-tension battery which was offered for sale in a partly run-down condition as the result of its having been employed for demonstration purposes.

Mind Your Eyes!

When testing the specific gravity of his accumulators the other day a friend of mine accidentally splashed a spot of acid into one of his eyes. For the moment he was blinded and suffered intense pain. One of the family came along and steered him to the bathroom while somebody else 'phoned the doctor for special instructions. Meanwhile, bathing with boric acid dissolved in warm water seemed to do the eye some good. The doctor's advice followed a few minutes later and completed the cure. His antidote was oil—good oil of any kind, salad, olive, or any kind that happened to be handy. The injured eye was swamped with the oil and then the patient was made to lie down in a darkened room for half an hour or so. The eye was swollen for a day or so, but otherwise no damage was done. Don't go squirting acid in your eye because I've told you an effective antidote!

Acid and Tea!

Talking about acid, a B.B.C. engineer told me about an amusing incident which occurred in the early days of broadcasting. One of the most important events in the day at Savoy Hill was (and still is) the partaking of cups of tea which were brought to each office and workshop. The little room wherein the "Tea Lady" brewed her valued liquor happened to be situated underneath the one and only accumulator charging room, and there were large cracks in the floor and ceiling separating them. One fine day an enthusiastic engineer overstepped his zeal and spilled a large-sized "ship type." Of course, the acid made a bee-line for the crack and dripped steadily on to and into a large tea urn in the room below! Tea was "off" for that afternoon, the worthy lady and sundry engineers being occupied for some time with ammonia and washing soda, neutralising the ravages of the acid on floors and tea utensils. To be truthful, however, it is not often that the engineers make their presence so felt at Savoy Hill!

THERMION.

SOURCES OF H.T. SUPPLY

FROM THE MAINS

By R. W. HALLOWS

THERE is something enormously attractive about working from the mains, either through the medium of a battery eliminator or with a self-contained receiving set designed to operate straight from a wall plug and socket. There are no H.T. batteries, wet or dry, primary or secondary to be recharged or replaced at intervals; running costs are comparatively low and the simple turning over of a switch brings the set at once into action.

Like all good things, however, the battery eliminator has its weak, as well as its strong points and these should be duly considered by anyone who contemplates the installation of such equipment. For the set intended for the reception of the local and other powerful stations, the battery eliminator, provided that it is of suitable type, is ideal, for signal strength will always be sufficient to drown the very tiny amount of ripple that can seldom be entirely eliminated even by elaborate smoothing circuits.

Conditions

For long distance reception of weak signals, though, I personally feel that the H.T. battery in one form or another still holds its own. One of my chief reasons for saying this is that searching has often to be done with the aid of head telephones and that I do not very much like the idea of using headphones with an eliminator, unless very special precautions are taken to prevent short circuits and their unpleasant results.

Again, it is essential when one is trying for weak and distant signals that the set itself should give an absolutely silent background. Since it has frequently to be operated in its most sensitive condition, that is not far below the point of oscillation, the tiniest ripple noises are apt to be brought out with rather annoying results. Even a direct-current eliminator may show traces of ripple since the D.C. delivered by the mains is never perfectly smooth.

I must confess, though, that I am a long-distance enthusiast and probably the majority of wireless folk do not sit up for America or try for the less powerful and more distant European stations. My own scheme, which will probably appeal to readers, whatever their bent may be, is this. Have a "quality" set specially designed for giving the most perfect reproduction possible from very powerful stations and run this and its accompanying moving-coil loud-speaker from the mains through an eliminator. For long-distance work have a special set designed for sensitiveness and selectivity, rather than for pure quality, and work this from a high-tension battery. Any station that can be found and tuned in straight on to the loud-speaker may be regarded as within the province of the eliminator set. Those that demand head-phones and careful searching are better dealt with by the battery-operated receiver.

Good and Bad

The reader should not forget that there are eliminators *and* eliminators. I have seen in my time some terrible contraptions. One of these was home-designed as well as home-made by a man who knew very little about any department of electricity. Plain brass terminals, condensers designed only for low voltages and mains connections made of thin cheap flex rendered this affair a potential death trap, especially as it was housed in a scullery which was damp as often as not. If you want to make an eliminator, follow the designs that have appeared in AMATEUR WIRELESS and use only the best of parts. Should you purchase one complete, see that it is made by a reputable firm. The eliminator is then a perfectly safe piece of apparatus for anyone to use.

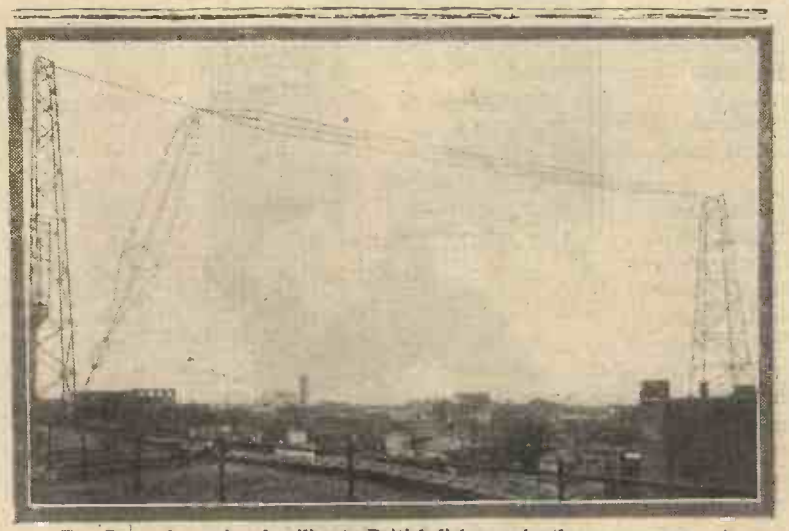
Selection

Before you acquire an eliminator you should most certainly measure the total current consumption of your set and you will be wise if you allow a fairly wide margin, for you may later on decide to fit in the last holder an output valve of lower impedance. Make certain that the eliminator under consideration is capable of supplying the current output that your set needs. What one often sees is an eliminator designed for, say, a 10-milliampere output yoked up to a set that needs a great deal more to operate properly. The result is that the terminal voltage shows a big fall. The output valve is starved in the matter of plate potential and overloading takes place, even with moderate signal volume. So long as the eliminator is up to its work you will get the full voltage from it, but you won't if you try to make it do more than it can.

The next thing to make sure of is that the eliminator is suitable for the mains supply in your own locality. Sometimes the mains current is comparatively steady; sometimes again it is exceedingly rough. It follows that a smoothing circuit which will serve admirably in some places may not be sufficient in others. Make certain, therefore, preferably by obtaining a demonstration in the locality and from the same source of current, that supplies your own house, that there is no undue amount of ripple in the output of the eliminator.

Running costs of an eliminator are very small, for

(*Continued on page 828*)



The Brussels station familiar to British listeners by the announcement, frequently repeated, "Ici Radio Belgique."

For the Newcomer to Wireless: THE ART OF SEARCHING

WHEN Robinson was trying out my set the other night I noticed that he was able to get a great many more stations than I could. Can you explain the secret to me?

Robinson, of course, is an old hand at the game, but there is nothing at all mysterious about it if you'll just remember one or two points that may seem small, though really they are very important. How do you set about making a search?

Well, I start with the condensers either at zero or with the dials at their maximum setting.

Hold on. That brings out point number one.

And what's point number one?

Always search upwards, that is from the lowest dial reading, and never go downwards.

Why?

You will find it a very great deal easier. One of the reasons is that reaction is so much more smooth to handle.

How is that?

If you are going upwards you bring the reaction coupling to a point which makes the set as sensitive as possible though still a good bit short of oscillation. Then without touching the reaction control you can work upwards for several metres with the set still sensitive.

I follow that.

When you find that it is becoming less sensitive a slight increase in the reaction coupling is made and the search is continued upwards.

Suppose one goes downwards?

Again the reaction coupling is adjusted to make the set fully sensitive, but as you descend you keep on finding that the coupling is too tight and quite unintentionally you make the set oscillate.

I see now. Let us take it that I start at the bottom of the scale and work upwards. Just what should I do?

Do your condensers go pretty well in step?

Fairly well, though I find that the one which tunes the grid of the first valve leads slightly on the other at the bottom of the scale and lags a bit behind it at the top.

That doesn't matter a bit so long as you know what the difference between the two should be approximately at any setting. The great point is to keep the two tuned circuits always in resonance, and that's where the expert searcher scores.

How does he do it?

He takes every opportunity of bringing the two exactly together. For example, if he comes across a station badly heterodyned or even a common wavelength, he does not pass straight over either.

What exactly does he do?

He tunes either in as sharply as possible with both circuits, for he then knows that he has his tuned circuits in step for a further move upwards.

And I suppose that one should not search too quickly?

Certainly not. You will get far more stations by covering a comparatively narrow waveband slowly and carefully than by rushing over a wide band. A good rule is to advance your second condenser—that which tunes the detector circuit—slowly and steadily and to make an upward advance with the other with a slightly backwards and forwards movement. Any signal within the range of the receiving set is then picked up and it is only a matter of care to tune it in properly. But always treat the reaction control with respect!

"SOURCES OF H.T. SUPPLY"

(*Continued from page* 827)

the amount drawn from the mains is really trifling. The most expensive item in one's annual accounts is likely to be the renewal of rectifying valves. This, however, does not amount to anything very serious for one should obtain at least a thousand hours of service life from a valve of good make. If the set is used on an average for three hours a day, this means that one rectifying valve should operate the eliminator for a year on the average. If a metal rectifier is used, there are, of course, no valves to give out. The reader must be guided by his own judgment in this matter and he will probably find the experiences of friends of considerable value when it comes to making a choice.

There is one point about eliminators which is not perhaps always realised. It is an excellent scheme if a portable is used to have it so arranged that an eliminator may be used as a general rule for high-tension supply, the batteries being employed only when the set is taken out of doors. The reason is that most portables impose a considerable current drain upon the high-tension battery and it is therefore much more economical to work whenever one can from the mains. This applies particularly to portables using pentode or very low impedance valves for the output.

WIRED WIRELESS IN U.S.A.

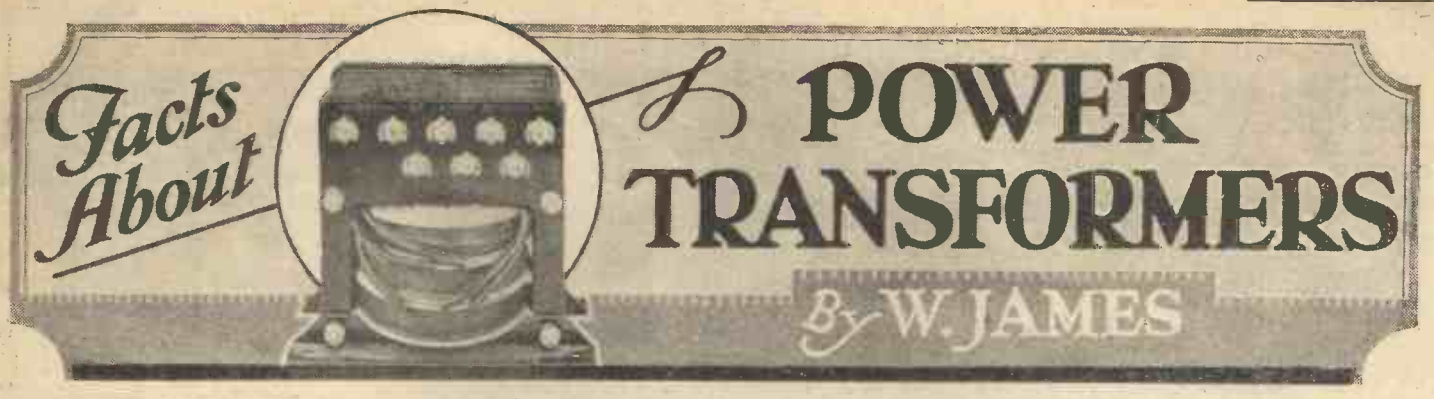
STEPS are now being taken to utilise the ordinary telephone wires for distributing broadcast programmes to American listeners. The problem of ether congestion and overlap is even more pronounced over there than here, whilst static is a decided bugbear, especially in the summer months. By feeding modulated radio-frequency currents into a telephone wire several alternative "programmes" can be distributed simultaneously to all telephone subscribers, with absolute clarity and freedom from all disturbance.

Harold Kimberley, through Roberts' eyes

All that is necessary to select any required programme is to switch over from one filter unit to another at the receiving end. In the new "monophone" system, as it is called, a comparatively inexpensive set consisting of a crystal rectifier followed by one stage of low-frequency amplification, is sufficient to give ample loud-speaker strength. This is due to the fact that "line radio" provides a relatively heavy input current as compared with the energy picked up by the ordinary aerial. The "monophone" does not interfere in any way with the ordinary point-to-point telephone service. B. A. R.

THE STENTORPHONE

IN this type of loud-speaker a stream of air under pressure is allowed to escape through an outlet valve, which is controlled by the speech vibrations. As its name implies, it is particularly suited for public-address systems where a large amplification of the original sound is required. The escaping air gives rise to a slight hissing sound, which is, however, hardly noticeable when the instrument is in full operation. As there is no mechanical diaphragm, distortion due to inherent resonance is avoided. M. A. L.

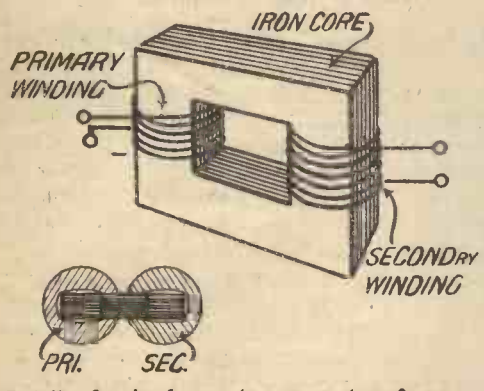


If your set takes its H.T. or L.T. from alternating-current mains, then it will include a power transformer. Here are some interesting details of transformers for the purpose

AS more and more houses that are wired for lighting are supplied with alternating-current electricity, the number of users of battery chargers, high-tension mains apparatus and filament power units is bound to increase. In fact, there has been for a considerable time a distinct tendency on the part of those desiring trouble-free reception to discard battery-operated sets, and to employ receivers that derive the whole of their current from the electric-light circuit.

Why Not Mains Drive?

Personally, I look forward to the time when practically all wireless users will have a mains-driven set. A great many of the troubles with which we now have to contend are undoubtedly the direct result of using for power purposes, batteries that vary in their electrical characteristics. As they discharge, their voltage falls off and their resistance increases; consequently, performance is affected.



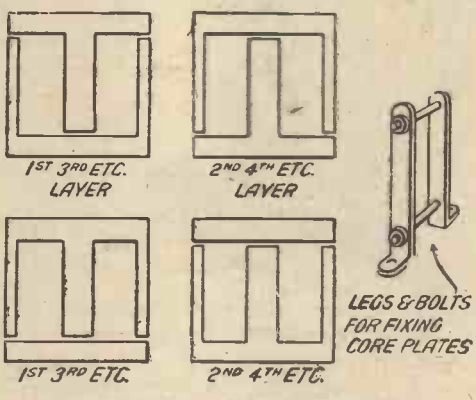
Details of a simple core-type power transformer

Mains units of all descriptions, on the other hand, provide power which is relatively constant. True, the actual voltage of the supply mains usually varies a little throughout the day, but only by a small percentage.

If an examination is made of the various mains units, you will notice that in every one of them a transformer is employed. A transformer must, therefore, be a most important component and actually it does play an important part.

What then is a transformer? It is a component for converting alternating current at one voltage into alternating current at another voltage.

Normally there are two distinct windings fitted over an iron core. One of these windings, termed the primary, is joined to the mains and the other winding, the secondary, is connected to the input terminals of the apparatus included in the mains unit.

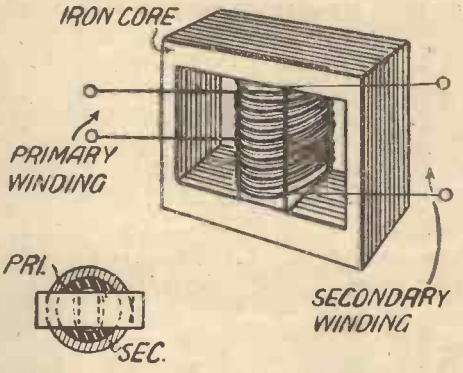


Stampings for shell-type transformer

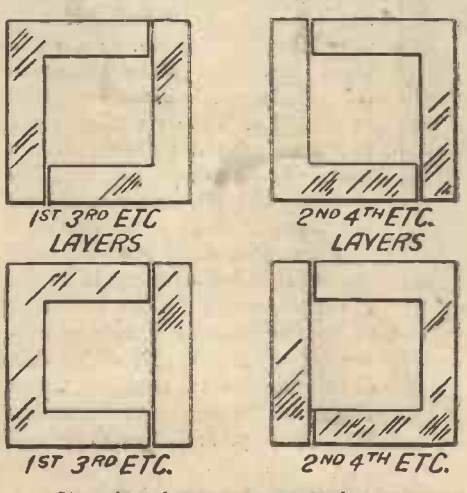
Now, when the mains supply of alternating current is connected to the primary winding, a current will flow through it. This current is, however, best kept small. It is not giving us a current in the secondary circuit.

What factors determine the magnitude of the current? If we take a certain transformer and measure the current which flows for various voltages and frequencies of supply, we shall find the current increases as the voltage is raised or as the frequency is reduced. The primary circuit of the transformer must, therefore, be so arranged that it is suited to the particular voltage and frequency of the supply with which it is to be used.

If now we connect to a given mains supply a winding arranged over an iron core, we shall find the current passed by this winding to fall off as the number of turns of wire are increased, or as the size of the iron core is made larger. The essential points that have to be remembered are, therefore, that the amount of the current is dependent upon the number of turns, the size of the core, and the frequency and voltage of the supply. The magnetic properties of the iron are of course also important.



A shell transformer. See how it differs from the core-type



Stampings for core-type transformer

Small transformers such as used in mains units for wireless purposes often have a core of iron having a cross section of from three-quarters to two square inches and the number of turns on the primary are arranged to suit the voltage and frequency of the mains.

On this page are shown details of cores for small transformers, of the core and shell types. The core dimensions depend largely on the windings, and in a concluding article I will give particulars of suitable primaries and secondaries.

More about The

HINTS ON TI
MAKING THE FRAME A
: : USING A PICK-UP

DID you read last week's article on the "Holiday Portable Three"—a new three-valve portable set produced by the AMATEUR WIRELESS Technical Staff and which fills a very definite niche?

Here is just a summary before continuing the constructional details necessary to complete the receiver. The "Holiday Portable" is a three-valver incorporating frame aerial, batteries and loud-speaker. It covers both wavelength ranges, has provision for a gramophone pick-up, embodies one R.C. and one "super" transformer stage, a volume control, and a choke output circuit. There is provision for using an external aerial and earth, and this converts the "Holiday" receiver into a very up-to-date *poste* for home work. Last week, full constructional details were given for making the receiver section.

It now remains to construct the frame aerial. The wooden former which carries the frame windings is supplied with the cabinet if this is bought ready made. There may be some amateurs, however, who are anxious to make the whole receiver themselves and for the benefit of these, the following dimensions are given.

The sides of the wooden former are of 5-ply wood, the dimensions being 14 $\frac{15}{16}$ by 15$\frac{3}{4}$ in. The ends of the box-like frame-aerial former are finished off with fillets of wood, $\frac{3}{8}$ in. by $\frac{1}{4}$ in. These prevent the frame windings from touching the inside of the cabinet, and also prevent any loose movement of the frame aerial former.

The loud-speaker unit in place in the cabinet

The Frame Windings

So far as the frame windings themselves are concerned, the reaction winding consists of 9 turns of No. 24 s.w.g. enamelled wire. The ends of the windings are finished off simply by threading through small holes. The reaction winding is spaced approximately $\frac{1}{4}$ in. away from the edge of the first aerial section. The long-wave aerial winding consists of 46 turns also of No. 24 s.w.g. enamelled copper wire and the short-wave winding is 11 turns of the same wire. The exact position of the windings is clearly shown in the blueprint No. 188, which can be obtained, price 1s., post free, from the Blueprint Department of AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4.

When the construction of the frame unit is complete the whole set may be assembled. Slide the frame aerial former into the cabinet, taking care that the supporting fillets for the baseboard are the right way up, that is leaving the larger space at the bottom. The receiver unit may then be slid in inside the frame aerial former from the front and there are two small holes in the panel through which wood screws are passed to make the assembly secure.

Connections

Next, connect up the loud-speaker and frame aerial by means of the flex leads which have been provided. Do not have the frame aerial leads unduly long. The leads need not be more than 6in. long at the most and if they are longer than this, they may foul other components and result in setting up undesired capacity effects. The same applies in a degree of lesser importance to the loud-speaker and battery leads, but it is wise to allow sufficient length of wire for the battery connections in case there shou be any loose movement of the batter

COMPONENT

Ebonite or bakelite panel, 18 in. by 6 in. (Raymond, Bec Ebonart, Paxolin).
.0005-mfd. reaction condenser (J. B., Formo, Lissen, Igranic, Peto-Scott, Burton).
1-meg. volume control (Rotor Electric).
Two push-pull filament switches (Bulgin, Trix, Lissen, Benjamin).
Single-circuit-closed jack (Lotus, No. 2).
Three valve holders (Wearite, Lotus, Benjamin, Lissen, Trix).
.0001-mfd. fixed condenser (Dubilier type 620, Lissen, T.C.C., Mullard).
.0002-mfd. fixed condenser with series clip (Dubilier type 620, Lissen, T.C.C., Mullard).
.005-mfd. fixed condenser (Lissen, Dubilier type 610, T.C.C., Mullard).
3-megohm grid leak (Lissen, Dubilier, T.C.C., Mullard).
High-frequency choke (Peto-Scott, Trix, Igranic, Burndept, Wearite).

HOLIDAY Portable THREE

UNING
ERIAL

themselves, which would cause trouble.

The cabinet is capable of accommodating two 60-volt H.T. units, an L.T. accumulator of generous capacity, and a grid-bias battery. This latter is placed at the back of the loud-speaker unit and allows of easy adjustment.

So far as the loud-speaker itself is concerned, it will be seen that in this receiver we have used a proprietory cone chassis with a well-known make of reed movement. The resulting assembly is quite light and compact and very suitable for portable set use.

Very attractive—the complete set in its cabinet

One of the photographs shows the receiver unit contained in the frame aerial former, but the whole assembly without the cabinet. Provided connection is made to the loud-speaker, there is no reason why this "skeleton" should not be used for a preliminary trial, but if all the joints are well soldered and there is no doubt whatever that the connections are correctly made, then time might just as well be saved by making the first test in the cabinet.

The valves should be H.F., L.F and power respectively.

S REQUIRED

150,000-ohm resistance with holder (Varley, Ready Radio, Mullard, Lissen, Dubilier).
Low-frequency transformer (Lissen Super, Ferranti, R.I., Philips, Mullard, Igranic).
Output choke (Ferranti B1, R.I., Igranic)
2-mfd. fixed condenser (Dubilier, Lissen, Mullard, T.C.C.).
1½-volt dry cell (Siemens).
Connecting wire (Glazite).
Three yards of thin flex (Lewcoflex).
Two red and three black wander plugs (Clix). Two spade terminals (Clix).
Cone chassis complete (Squire P.W 77, White Spot).
Loud-speaker unit (Blue Spot, Triotron, Hegra)
Portable cabinet (Lock).
No. 24 enamelled wire (Lewcos).
Two 60-volt H.T. batteries (Ever Ready Popular Portable).
2-volt accumulator (C.A.V. type 2A.N.7, Ever Ready).

So far as H.T. is concerned, two 60-volt units of the type specially designed for portable set use will be found to give satisfactory length of service. This is more than can be said with many multi-valve portables, the designers of which seem to expect midget H.T. cells, almost indefinitely to feed the anodes of a group of hungry tubes. Of course, it should be realised that for home use even the proper portable type batteries which can be enclosed within the cabinet of the "Holiday" set do not give the greatest economy. It is recommended that if this receiver is to be used extensively, both for indoor and outdoor working, then either an H.T. battery of the power type, an accumulator bank or a mains eliminator be employed, the portable type H.T. batteries in the cabinet being used only when the set is taken out of doors.

It is worth remembering that if the set is used continually indoors the accumulator may not be fully up to the mark when it is desired to take the set out for a trip. Therefore, if mains are available, it is a good plan to have a small trickle charger, such as that manufactured by the Regent Radio Supply Co., of 21 Bartlett's Buildings, Holborn Circus, E.C.4, in order to keep the accumulator properly charged so that it will be ready at a moment's notice for outdoor excursions.

Operation

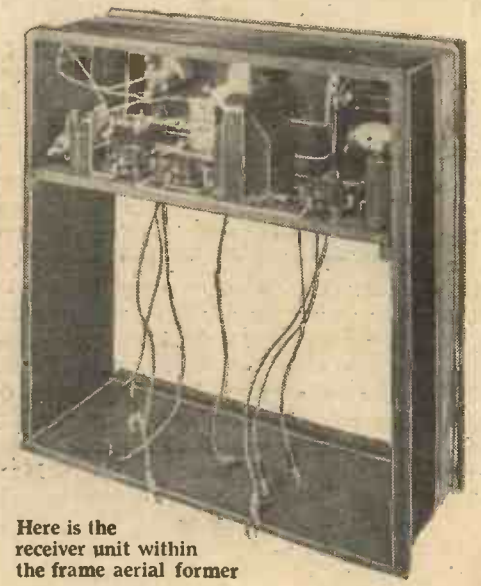
Operation will be found quite simple. Wave-changing is effected simply by the movement of a switch on the panel, and there is not very much that can be said about that! Tuning is remarkably simple, the controls being simply the aerial condenser (centre dial) and the reaction condenser, right-hand dial. The volume control (the knob of which is on the left of the aerial condenser dial) will be found a great advantage, because when working fairly close to a main station, the volume may be expected to be too great for "full throttle" working, and this is bound to be the case when advantage is taken of an external aerial and earth. Moreover when working this receiver with an electric sound-box, some control of volume is almost essential.

There is nothing very much that need be said about the addition of a pick-up. A magnetic movement of almost any type can be used and it should be noted that when the plug attached to the pick-up leads is inserted in the jack a 1½-volt cell is brought into circuit and this impresses a slight negative bias on the grid of the detector valve, which is then, of course, operating as an L.F. amplifier.

Tell us the Results!

When you have made up the "Holiday" set, give it a thorough trial and then let us know the success you obtain with it. The Technical Staff has carried out extensive tests, but with a receiver of this type there is not much object in publishing a station log, for results so obviously depend on locality, operating conditions, operating ability and many other factors.

So tell us of the success you obtain. We want all reports, good, bad or indifferent.



Here is the receiver unit within the frame aerial former

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

BERLIN seems to have got a hold on me, for I have flown to London and back in time for the inauguration ceremony of the laying of the foundation stone of the new German broadcasting building. The Under Secretary of State tells me that, strangely enough, they expect the new building to be finished almost at the same time as our own B.B.C. building in London.

An impression of James Kelleher, of the Piccadilly Hotel Dance Band

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I experienced considerable difficulty in picking up London even with the best five-valve set available. As my readers know, I am not much good at technicalities, but after consulting with some of the leading manufacturers in Germany, I realised that it was neither my fault nor the set, but simply technical difficulties.

◆ ◆ ◆

The political speeches, as it happened, came over extraordinarily well, and some of my German friends were able to follow every word of the speeches. It was a real triumph for British oratory.

◆ ◆ ◆

I am glad that my friend Seiveking has got over well at last. His last kaleidoscopic play was really good. Apart from my own opinion, I "sounded" a few friends as to their ideas about it, and they have borne out my bet with myself that this latest creation of Lance Seiveking will cause more controversy than any other feature. Some said it was silly; some thought it wonderful; others were just amused. Quite a few thought it an object lesson. The general verdict seemed to be that it was "rather clever."

◆ ◆ ◆

My opinion is that it was brilliantly conceived and excellently produced. It was a triumph for the men at the control panel. They had to handle three orchestras, singers, choruses, actors, and effects, and it went through without a hitch. *Kaleidoscope* may have been a little obscure in parts, and some scenes were slightly drawn out; one or two of the episodes were a little unpleasant; but taken as a whole it was a treat of the first order for those of us who enjoy something new and unusually clever.

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Not long ago I had something to say upon the subject of acoustics as applied to certain broadcast organ recitals. I have come across another instance where, as at the Bishopsgate Institute, the effect is none too pleasing. I refer to an organ recital by Gilbert Mills from the Church of the Messiah, Birmingham. Nothing but praise is due to Mr. Mills—I particularly liked his rendering of Norman Coates' "Tuba Tune"—but the echo was a source of annoyance. Surely these details could be gone into more thoroughly by the B.B.C. engineers?

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Those who like a romantic comedy accompanied by soft, seductive music must have found *Love Magic* from 5GB to their taste. It came rather as a surprise when it ended a quarter of an hour too soon, but the Midland Pianoforte Sextet filled up the spare time in a most capable manner. The selection from *Carmen* which followed was delightfully played by the Gershom Parkington Quintet.

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My apologies, or perhaps the printer's, are due to Rudy Starita, who was recently referred to on this page as "Ruby"!

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Cupid and Cutlets, a new burlesque operetta, was of the pleasant type which has nothing much new in it, but helps to pass the time away. Olive Groves, as the Cook General, was easily the best of a good caste. This operetta was preceded by an overture from *The Pirates of Penzance* and was followed by a selection from *The Show Boat*, both of which were played by the Birmingham Studio Orchestra.

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A delightful Sunday "plum" was the latest concert given by Tom Jones and the Grand Hotel (Eastbourne) Orchestra. Every item was so well selected and played that it is impossible to pick out any one for special comment. I am certain that no one can find fault with a programme including the selection from *Pagliacci*, Tschaikovsky's "Canzonetta," Liszt's "Rhapsody No. 2," and the "Valse Triste" by Sibelius.

The "noise factory" which is heard from WOR, Newark, is a machine driven by nineteen motors and is capable of making more than two hundred different sounds, among which are animal growls, musical notes and the creaking noises of a mediaeval drawbridge. The machine was developed for talking pictures and is said to duplicate noises with exactness.

Mabel Marks, the popular entertainer

VALVES—SOME FURTHER DETAILS OF VALVES FOR ALL PURPOSES

LAST week, on page 806, were given details of two- and four-volt valves of the most prominent manufacturers available. In the table below are particulars of six-volt three-electrode valves for H.F., detection, and low-frequency amplification, while screen-grid valves and pentodes are also shown.

Technical pointers to observe when buying new valves were given last week, and it remains only to be noticed that the rated impedance of pentodes is high as compared with the impedance of ordinary power valves. This does not mean, however, that the loud-speaker should match the impedance of the pentode's anode circuit. An output transformer is always advisable.

It will be seen that some very large power valves, some with impedances so low as 1,600 ohms, are included in the six-volt range of ordinary three-electrode valves and these must match the load.

SIX-VOLT VALVES: Three-electrode Types

Make.	Impedance.	Amp. Factor.	Fil. Current.	Type.
Mazda	90,000	40	.075	RC607
Six-Sixty	74,000	37	.075	6075RC
Cossor	60,000	50	.1	610RC
Marconi	60,000	40	.1	DEH610
Osram	60,000	40	.1	DEH610
Mullard	53,000	40	.075	PM5B
Ediswan	50,000	40	.1	RC610
Marconi	30,000	30	.1	HL610
Osram	30,000	30	.1	HL610
Marconi	25,000	20	.8	LS5B
Osram	25,000	20	.8	LS5B
Ediswan	21,000	25	.1	HF610
Cleartron	20,000	20	.25	CT25b
Cosmos	20,000	9	.09	DE50
Cossor	20,000	20	.1	610HF
Mazda	20,000	20	.075	HF607
Six-Sixty	20,000	20	.075	6075HF
Mullard	14,700	17.5	.075	PM5X
Mazda	12,500	14	.075	GP607
Cleartron	10,000	9	.25	CT25
Ediswan	10,000	15	.1	LF610
Mullard	9,000	18	.1	PM6D
Cossor	7,500	15	.1	610LF
Marconi	7,500	15	.1	DEL610
Osram	7,500	15	.1	DEL610
Marconi	6,000	5	.8	LS5
Osram	6,000	5	.1	LS5
Six-Sixty	6,000	7.2	.1	610P
Mazda	5,300	9	.075	LF607
Mullard	5,200	7.1	.1	PM6
Ediswan	4,200	5	.1	PV610
Cleartron	4,000	5	.5	CT25 X
Six-Sixty	3,600	3.2	.25	625SP
Cosmos	3,500	6	.25	SP55R
Cossor	3,500	8	.1	610P
Marconi	3,500	8	.1	DEP610
Mullard	3,500	3.15	.25	PM256
Osram	3,500	8	.1	DEP610
Ediswan	3,000	3	.25	PV625
Marconi	2,750	2.5	.8	LS5A
Osram	2,750	2.5	.8	LS5A
Mazda	2,600	6	.15	P615
Marconi	2,400	6	.25	P625
Osram	2,400	6	.25	P625
Cossor	2,000	5	.1	610XP
Mullard	2,000	5	.6	DFA9
Mazda	1,750	3.5	.5	PX650
Ediswan	1,600	4	.25	PV625A
Marconi	1,600	3.7	.25	P625A
Osram	1,600	3.7	.25	P625A

FOUR-ELECTRODE VALVES: Screen-grid

Make.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Current.	Type.
Mullard	230,000	200	2	.15	PM12
Six-Sixty	220,000	190	2	.15	215SG
Cossor		200	2	.2	220SG
Marconi	200,000	170	2	.15	S215
Osram	200,000	170	2	.15	S215
Dario	125,000	25	2	.18	SHF
Ediswan	140,000	140	2	.15	SG215
Mullard	230,000	200	4	.075	PM14
Six-Sixty	220,000	190	4	.075	4075SG
Cossor	200,000	200	4	.1	410SG
Dario	125,000	25	4	.1	SHF
Ediswan	115,000	140	4	.1	SG410
Marconi	175,000	110	6	.25	S625
Osram	175,000	110	6	.25	S625
Ediswan	100,000	140	6	.1	SG610

FIVE-ELECTRODE VALVES: Pentodes

Make.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Current.	Type.
Ediswan	65,000	80	2	.25	5E225
Six-Sixty	64,000	80	2	.3	230PP
Mullard	62,500	82	2	.3	PM22
Dario	55,000	100	2	.3	Pentode
Marconi	55,000	90	2	.35	PT235
Osram	55,000	90	2	.35	PT235
Cossor	20,000	40	2	.3	230QT
Dario	55,000	100	4	.15	Pentode
Mullard	28,600	62	4	.15	PM24
Six-Sixty	27,000	60	4	.15	415PP
Cossor	20,000	40	4	.15	415QT
Mullard	25,000	50	6	.17	PM26

MAGNETOSTRICTION

THE original Reis "telephon," now more than fifty years old, depends upon the expansion and contraction effects produced in a steel knitting-needle by the passage of voice-frequency currents. The needle is wound with insulated wire and mounted in a wooden box. When voice currents are passed through the wire the resulting vibrations of the needle are communicated to the box, which acts as a sound resonator.

The effect on the knitting-needle is known as magnetostriction. An American inventor, G. W. Pierce, has recently found that magnetic substances will expand and contract in this fashion even when the applied currents are of radio frequency. Magnetostrictive vibrations are, in fact, now being used instead of piezo-electric crystals to standardise the frequency of high-frequency carrier waves such as those used in broadcasting. B. M.

MUTUAL CONDUCTANCE

MUTUAL conductance is the most informative of the various valve characteristics, since it represents the "factor of performance." It varies directly with "mu" (the amplification factor) and inversely as the internal plate resistance. Obviously the greater the amplification factor, the better the response, whilst the higher the internal resistance, the lower the response, other things being equal. When expressed in units, the mutual conductance of a valve measures the change in milliamps in the plate circuit for a change of one volt applied to the grid. In other words, it equates applied grid voltage to current output. B.

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

A Surprise!

A FEW days ago I had a surprise when I opened a 50,000-ohm wire-wound anode resistance. I did not measure the diameter of the wire, so I cannot tell you its gauge, but No. 47 wire is two thousandths of an inch thick, and is therefore fairly thin. Even this seemed thick in comparison with the wire used in this anode resistance!

The wire was actually wound over thin string, and not very much of it was required for the 50,000 ohms.

The current-carrying capacity of resistance wire is remarkable. No. 47 Eureka will carry 50 milliamperes without becoming too warm. No. 40, which is nearly five thousandths of an inch in diameter, will carry 150 milliamperes when the wire is coiled in air; the temperature will approximate to 100 degrees centigrade.

Claims for Mains Valves

Some of the new mains valves of the shielded type have very large amplification factors and correspondingly high anode impedances. On one or two occasions I have heard the opinion expressed that with these new valves it will be possible to obtain much greater high-frequency amplification, simply because the valves themselves have large magnification factors.

This is, of course, not true. It will not be possible with the new valves to obtain more magnification than with the older *unless* the anode-grid capacity is smaller. At the moment no claims have been made of better shielding.

Compact Condensers

There are I notice now on the market a number of variable condensers having a mixed dielectric. They take the form of the usual sets of plates with sheets of insulating material between them. These condensers are, of course, relatively compact and suitable for portables.

One must remember, however, that these condensers have much greater losses than ordinary types, with the result that tuning will be broad and the signal strength rather less than normal.

There may be circuits in which tuning condensers having mica or other material for a dielectric are perfectly satisfactory, but one should be cautious. Such condensers would, so far as I can see, be entirely satisfactory in reaction circuits and there would be the advantage that the plates could not short-circuit. As a result, there would be no need to employ a protective condenser.

The movement should not be too stiff, or there may be some little difficulty in properly setting it, and the capacity at a given point should remain practically constant, even after the moving plates are moved too and fro about that point.

Is Your Tuning Good?

The worth of a receiver is dependent in no small degree upon its tuning curve. Is it pointed at the top and broad at the bottom, or does it approach a rectangular shape?

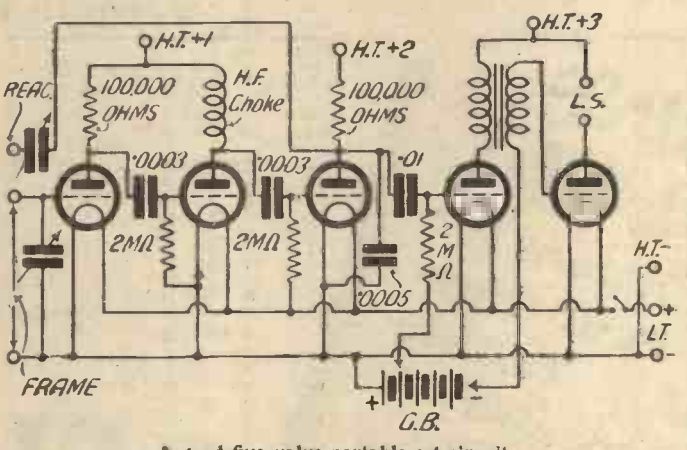
Many receivers, I am afraid, have poor tuners. Perhaps the coils are not very effective, or they may be so connected that the best results are not obtained. In an effort to improve selectivity a fixed condenser of little capacity, such as .0001 microfarad, is often included in the aerial circuit, and sometimes there is an alternative aerial terminal which may be joined directly to the coil or through a larger condenser.

Several tuned circuits have to be used in order to obtain a tuning curve which may approach the rectangular shape, and the inclusion of fixed condensers in the aerial circuit does not help very much towards reaching this ideal. But these condensers are a help and may properly be used in small and inexpensive receivers. Loss of signal strength should not be experienced with a medium condenser value.

Amplification in Portables

It is well known that very little high-frequency magnification is obtained from a resistance-coupled stage when the high-frequency valve is an ordinary one. The magnification is in certain circumstances quite useful, however, and for this reason many of the cheap self-contained receivers include a stage of this type.

A typical circuit of a five-valve set is given herewith and the values of the various components are indicated.



A good five-valve portable-set circuit

I have measured the amplification of a single-stage of resistance-coupled high-frequency at 400 and 2,000 metres, and it amounted to from two to three and from four to five respectively. A well-designed tuned stage will give approximately 40 with stability.

A Mains Indicator

Those who employ A.C. mains supply for filament heating through a suitable step-down transformer may usually, without difficulty, arrange for a small indicating lamp to light when the receiver is connected to the mains supply.

This lamp may be of the 4- or 6-volt pattern, depending upon the voltage of the secondary winding, and if one that takes a fairly heavy current is used, it should have a long life. Mains valves usually have 4-volt filaments, but when only the power valve or valves of a receiver are supplied with alternating current, the voltage is generally 5.5 or 6.

The indicating lamp may be mounted behind a small glass window fitted to the panel. A number of types having windows of various designs are available, and I consider a mains-driven set is hardly finished off unless a visual indicator of this type is fitted.

BROADCAST TELEPHONY

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

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (6SW)	15.0
243.9	1,230	Newcastle (5NO)	1.0
258.6	1,160.1	*Leeds (2LS)	0.13
288.5	1,040	*Sheffield (6LF)	0.13
288.5	1,040	*Bournemouth (6BM)	1.0
288.5	1,040	*Edinburgh (2EH)	0.35
288.5	1,040	*Hull (6KH)	0.2
288.5	1,040	*Dundee (2DE)	0.13
288.5	1,040	*Liverpool (6LV)	0.13
288.5	1,040	*Stoke-on-Trent (6ST)	0.13
288.5	1,040	*Swansea (5SX)	0.13
288.5	1,040	*Plymouth (5PY)	0.13
294.1	1,020	*Bradford (2LS)	0.13
302.6	991.1	Belfast (2BE)	1.0
311	964	Aberdeen (2BD)	1.0
323	928	Cardiff (5WA)	1.0
358	838	London (2LO)	2.0
378	793	Manchester (2ZY)	1.0
401	748.3	Glasgow (5SC)	1.0
482	622	Daventry Ex. (5GB)	17.0
1,564.3	191.7	†Daventry (5XX)	25.0

*Relay stations. †Relays 2LO.

AUSTRIA			
250	1,200	Linz	0.5
283	1,060	Innsbruck	0.5
354.2	847	Graz	3.0
456	694	Klagenfurt	0.5
520	577	Vienna	20.0
BELGIUM			
230	1,300	Chatelineau	0.25
249	1,203	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,070	Liége	0.5
512	586	Brussels	10.0
CZECHO-SLOVAKIA			
265	1,128	Kosice	2.0
277.8	1,080	Feriby (testing)	12.0
306	980	Bratislava	4.0
343	873	Prague (Praha)	5.0
432.3	694	Brunn (Brno)	2.4
DENMARK			
339	883	Copenhagen (Kjobenhavn)	1.0
1,158	259	Kalundborg	7.5
ESTHONIA			
408	735	Reval (Tallinn)	1.3
FINLAND			
379	791	Helsingfors (Helsinki)	0.8
1,500	200	Lahti	20.0
FRANCE			
170	1,750	St. Quentin	0.25
212	1,415	Fécamp	0.3
211.3	1,420	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
244	1,219	Lille (PTT)	0.3
250	1,196	Juan-les-Pins	0.4
254	1,180	Rennes (PTT)	1.0
255	1,175	Toulouse (PTT)	1.0
268	1,118	Strasbourg	0.3
274	1,092	Limoges (PTT)	0.5
285	1,050	Montpellier	1.5
292	1,028	Radio Lyons	1.5
300	996	Bordeaux (PTT)	0.6
305	982	Agen	0.3
309	970	Vitus (Paris)	2.0
318	943	Marseilles (PTT)	0.5
336	892	Petit Parisien	0.5
352	850	Algiers (PTT)	2.0
368	815	Radio LL, Paris	1.0
382	785	Toulouse (Radio)	9.0
413	725	Radio Maroc (Rabat)	2.0
429	699	Grenoble (PTT)	1.5
436	687	Radio Flandre Lille	0.5
446	672	Paris (Ecole Sup., PTT)	0.7
468.8	640	Lyons (PTT)	5.0
1,350	222	Tunis (testing)	
1,470.2	204	Eiffel Tower	8.0
1,749	171	Radio Paris	8.0
1,825	164	Radio Carthage (Tunis)	5.0
GERMANY			
219	1,370	Flensburg	1.5
240	1,250	Nurnberg	4.0
250	1,200	Kiel	0.7
250	1,200	Cassel	0.7
263.2	1,140	Cologne	4.0
267.8	1,120	Muenster	1.5
272.4	1,101	Kaiserslautern	1.5
280.4	1,070	Königsberg	4.0
283.1	1,058	Berlin (E)	0.7
283.1	1,058	Stettin	0.7
283.1	1,058	Magdeburg	0.7
317.5	945	Dresden	0.75
320	937	Breslau	4.0
326.4	919	Gleiwitz	6.0
329	910	Bremen	0.75
361.9	829	Leipzig	4.0
374.1	802	Stuttgart	4.0
391.6	766	Hamburg	4.0
421.3	712	Frankfurt	4.0
455.9	654	Danzig	0.75
456	651	Aachen	0.75
462.2	649	Langenberg	25.0
476	630	Berlin	4.0
538	558	Munich	4.0
563	532.8	Augsburg	0.5
566	530	Hanover	0.7
577	520	Freiburg	0.7
1,651	181.7	Zeesen	20.0
1,651	181.7	Norddeich	10.0
GRAND DUCHY OF LUXEMBOURG			
1,220	245	Radio Luxembourg	2.0
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
326.3	891.5	Huizen (until 5.40 p.m. B.S.T.)	5.0
1,076	278	Hilversum (ANRO)	5.0
1,846	162.5	Huizen (after 5.40 p.m. and on Sundays	5.0
1,846	162.5	Scheveningen-haven	5.0
HUNGARY			
548	548	Budapest	15.0
ICELAND			
333.3	900	Reykjavik	1.0
IRISH FREE STATE			
222.2	1,350	Cork (5CK)	1.5
411	730	Dublin (2RN)	1.5
ITALY			
278	1,078	Turin	7.0
333	900	Naples (Napoli)	1.5
387	775	Genoa (IGE)	3.0
442	677	Rome (Roma)	3.0
450	666	Bolzano	0.3
503.5	596	Milan	7.0
JUGO-SLAVIA			
308.3	973	Zagreb (Agram)	1.25
450	668	Belgrade	4.0
582	515	Ljubljana	5.0
LATVIA			
529	567	Riga	2.0
LITHUANIA			
1 935	155	Kovno	15.0
NORWAY			
242	1,240	Rjukan	1.0
297	1,010	Notodden	0.7
365	820	Bergen	1.0
387	774	Fredriksstad	1.0
456	657	Tromso	1.0
456	657	Aalesund	1.0
456	657	Porsgrund	1.0
496	604	Oslo	1.5
577	519.9	Hamar	0.7
POLAND			
314	955	Cracow	1.5
337	890	Posen	1.5
415.5	722	Kattowitz	10.0
456	658	Wilno	1.5
1,397	214	Warsaw	10.0
PORTUGAL			
317.5	945	Lisbon CTIAA (Wed' and Sat.: 10—midnight)	
ROUMANIA			
395	757	Bucharest	4.0
RUSSIA			
492	609	Kharkov (NKO)	5.0
825	363.6	Moscow (PTT)	25.0
925	323	Homel	2.5
1,000	299	Leningrad	20.0
1,440	208	Moscow	30.0
1,684	178	Kharkov	15.0
SPAIN			
263	1,141	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
324	926	Almeria (EAJ18)	1.0
346.8	865	Barcelona (EAJ1)	10.0
369	811	Seville (EAJ5)	0.5
400	750	Radio España	1.0
405	740	San Sebastian (EAJ8)	0.5
425.7	703	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
261	1,150	Horby	10.0
265	1,130	Trollhattan	0.4
333	900	Falun	0.5
350	858	Goteborg	6.0
437	686	Stockholm	1.5
550	546	Sundsvall	1.0
770	390	Ostersund	2.0
1,200	250	Boden	2.0
1,345	223	Motala	30.0
SWITZERLAND			
406	739	Berne	1.0
496	604	Zurich	0.6
680	441	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,200	250	Stamboul	5.0
1,809	164	Angora	5.0

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

June 17 Vaudeville programme.
" 18 The Aldershot Tattoo.
" 19 Covent Garden relay.
" 20 A band concert.
" 21 Spanish symphony concert.
" 22 "The Diary of a Nobody."

DAVENTRY EXPERIMENTAL (5GB)

June 16 Military band concert.
" 17 An orchestral and vocal programme.
" 20 *The Importance of Being Earnest.*
" 21 Vaudeville programme.
" 22 Symphony concert.

CARDIFF

June 16 An orchestral and choral concert
" 18 A Welsh programme.
" 20 *Many Happy Returns.*
" 22 *Les Vivandiers.*

MANCHESTER

June 16 Orchestral programme.
" 19 A band concert from Southport.
" 21 *Such is Life.*
" 22 Brass band concert.

NEWCASTLE

June 19 Orchestral concert from Whitby.
" 20 Recital on the New Zealand War Memorial carillon.
" 21 Sunderland programme.

GLASGOW

June 16 Military band concert.
" 19 Concert of Welsh music.
" 22 *Radiotics.*

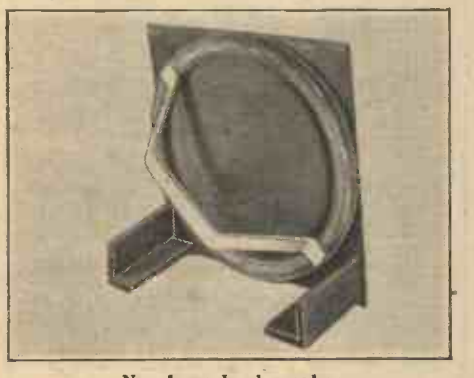
All Italian studios have received definite instructions to close down their transmissions by playing the Fascist hymn (*Giovinezza*), followed by the Royal anthem.

"A.W." TESTS OF APPARATUS

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

Neophone Loud-speaker

THE Neophone Engineering Co., 9 Little St. Andrew Street, St. Martin's Lane, London, W.C.2., have recently introduced a cone unit comprising an 11-in. diaphragm clamped securely to a massive wood frame fitted at the back with a metal support for holding an electro-



Neophone loud-speaker

magnetic unit. This assembly is primarily intended for mounting inside a cabinet, or alternatively a suitable baffle may be employed.

One of the interesting parts of the assembly is the diaphragm, which is made of an exceedingly rigid material and appears to be heavier than the normal cone speaker diaphragm. Although not attached to any leather or other supple substance at the periphery, it is fully floating and bears against a ring of felt.

Having attached a well-known balanced armature unit, we tested the speaker on a special power amplifier, capable of giving a large volume if required. During previous experiments we have found that the normal cone is liable to chatter if subjected to undue volume, but in this particular speaker, a large power output could be obtained without any sign of this trouble.

It is interesting to note that a perpetual guarantee is given with each loud-speaker.

Sinquers—for Testing Accumulators

IN order to obtain long life from accumulators it is essential to look after them. In brief, one must maintain specific gravity of the acid at the correct value, filling up with distilled water at frequent intervals, and never allow the voltage to fall below a certain value. Even the naturally careful individual will fail on occasions to observe these precautions, therefore, it is hardly surprising that accumulators do not always give the life with which they are accredited.

We have just tested a substance known as Sinquers, manufacturerd by Fiddian Bawtree & Co., of Gem Works, Oakhill Road, Sutton, Surrey. These are marketed as a number of red and blue cakes which can be rolled up into balls and inserted through the vent hole of the accumulator. When both the blue and the red ball are floating the accumulator is fully charged; when the blue ball sinks, it is only half charged, whereas when the red ball also sinks, the cell is right "down" and must be charged immediately.

Actually, during our tests, the red and blue floated at specific gravities of about 1220. At 1215, the blue ball had sunk, which is the condition of approximately half charge and at 1100 the red ball had sunk. This last value is somewhat below the recommended minimum for an accumulator and indicates that the cell requires immediate attention.

Bulgin Plug and Jack

THE plug and jack is by no means a newcomer to wireless or electrical engineering, yet its use in radio sets is not as great as one might expect. This may be due to the fact that during the past two or three years, sets have been constructed in which adjustments were limited to switching on and off and simple tuning.

We have recently tested a particularly neat plug and jack manufactured by Messrs. Bulgin, of 9-11 Cursitor Street, E.C.4, who have previously had considerable experience in components of this type. The jack itself occupies only one inch behind the panel and is one-hole fixed. Two terminals are supplied, one to fix to the metal framework and another to the spring clip which bears on the knob of the plug.

The plug, too, is different from the usual type, and is so arranged that even when stiff phone tags are attached to it, the plug does not occupy more than $\frac{7}{8}$ in. outside the panel, thus allowing sets fitted with doors to be closed up in the normal manner.

Hammarlund Short-wave Coils

THERE is never any waning in short-wave interest, for during these months, the long-distance stations are more often heard with greater clarity than is general in the winter months, whilst in addition, the hours of optimum reception do not always coincide with the hours of daylight.

This week we are reporting on Hammarlund short-wave coils manufactured by the Hammarlund Manufacturing Co., of New York City and marketed by the Rothermel Corporation, Ltd., 24-26 Maddox Street, W.1.

One would be liable at first glance to imagine that these coils were wound without any former; indeed, it has been the aim of the manufacturers to utilise the minimum amount of supporting material and in consequence to cut down dielectric losses. Actually, the coils are wound on a 3 in. diameter celluloid former with each turn spaced, which makes them extraordinarily robust and able to withstand rough treatment without any tendency to collapse.

The complete assembly includes a small socket holder and a six-turn aerial coupling coil mounted on a narrow piece of ebonite with tag connections. The sockets are spaced to a desirable extent in order to minimise losses and the aerial coil swivels on a horizontal axis for the purpose of altering the coupling and, therefore, removing any dead spots.

The three sets of coils which plug into the holder comprise a grid winding and reaction winding, both wound on the same former. Due to the special design of the coil pin, plugging in and out of the sockets can be accomplished without any force; at the same time, excellent electrical contact is ensured—an important point in short-wave reception.

On a standard aerial, the ranges obtained on the three coils are as follows:—

19 metres to 49 metres for the smallest
31 " " 89 " " " medium
54 " " 160 " " " largest

These coils are undoubtedly well designed and may be recommended to readers.

Hammarlund short-wave coil

According to the latest Polish statistics, in the first quarter of 1929 the number of registered licences increased from 189,481 to 202,561, but it is generally considered that a "roping in" of wireless pirates would contribute over 50,000 to this figure!

LETTERS TO THE EDITOR

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

The "Clarion S.G. Three"

SIR,—I am writing to thank you for such a successful circuit as the "Clarion Screen-grid Three." I think it would be a very good idea to publish it again in the winter, with a four-valver on the same lines, for those people who are unfortunate as regards reception. I made the set about a fortnight after it came out, and on one night I pulled in thirty-two stations at varying strengths on the loud-speaker and logged most of them. The medium waves have "gone off" now, but the long waves can be brought in at any time in the day.

L. J. R.

"Avoiding Saturation in Chokes"

SIR,—We have noted with interest the article under the above heading in AMATEUR WIRELESS No. 363, but there is one point with which we wish to take exception—namely, the statement that chokes having air gaps in their cores have not yet been in general use—and would therefore draw your attention to the fact that all Ferranti chokes, with the exception of the B3 type, in which the advantages of an air gap are relatively small, have been provided with air gaps ever since they were marketed about two years ago.

We do not consider that there is any particular merit in making a choke for this purpose having an absolutely flat curve, as to do so as a rule inevitably means a reduction of inductance at the lower plate currents, which is undesirable, seeing that small currents usually occur in circuits where the greatest smoothing, and therefore the greatest inductance, is necessary.

Another very important point with regard to the inductance of smoothing chokes to which attention, we think, ought to be drawn is that the inductance varies with the signal ripple, and under the conditions that are sometimes used for measuring this inductance—for example, when employing thermal instruments—the ripple voltage must be considerable, and therefore the inductance indicated is greater than the effective inductance under working conditions.

FERRANTI, LTD.

Two output valves of WTAM, Cleveland, to be installed in its new 50-kilowatt station, will be 5 ft. high. The power rating of the two will be 200 kilowatts, or four times the wattage of the station.

The Ohio School of the Air, broadcast for the State department of education by WLW, Cincinnati, has received the support of the state legislature. It recently appropriated £8,000 for two years operation of the school.

BURNING THE CANDLE AT BOTH ENDS!

Jottings from my Log

By JAY COOTE

DURING the bright and sunny days, if you hope for a good reception of the more distant foreign stations, you must try for them early in the morning or late at night; and the radio fan who wishes to test out a new receiver must needs burn the candle at both ends.

If advantage is not taken of the most favourable periods of the twenty-four hours, the daily log will show a considerable falling-off in the number of transmissions heard. To-day, with nearly close on two hundred different stations simultaneously on the air in Europe, much difficulty may be encountered if a weaker broadcast is to be picked out of the multitude, and it is fortunate for us that some of the most troublesome transmissions in this respect may be captured at a time when the ether is less congested.

Such an opportunity, for instance, is given on Sunday mornings, when it is possible to hear a concert from Berlin direct, its relays or from Königswusterhausen, as an alternative, at 6.30 a.m.; later, at 7 a.m. Prague and its associates take an orchestral programme from the Karlsbad Kursaal Gardens. At 7.30 a.m. Leipzig—an exceptionally tricky transmission to receive in London when 2LO is working—comes on the air with an organ recital, and fifteen minutes later Cologne and the Rhineland stations broadcast a course of jujitsu self-defence.

Realising also that during the warmer months many listeners abandon their wireless receivers for outdoor sports, the Germans have extended their concerts at the latter end of the day, and each in turn gives one night concert in June, July, August, and possibly September. As these transmissions are timed to start at 12.30 a.m., you are given an excellent opportunity of securing clear reception of any and all of them, for at that hour there is but little interference in the ether.

Believe me, you will find no difficulty in burning the candle at both ends!

LISTENERS to 2LO and 5XX on June 24 will be taken over to the Hippodrome Theatre for a relay of an excerpt from *The Five O'Clock Girl*, a musical revue in which the cast includes George Grossmith, Ernest Truex, Hermione Baddeley, Ursula Jeans, and Jean Colin.

Arrangements for the musical portion of the Canterbury Festival, to be held from August 19 to 24, and for which the B.B.C. is providing the orchestra, have now been completed. Listeners will be given a relay of a concert directed by Mr. Gustav Holst on August 21, in which the composer will conduct his own work "The Planets."

Up the Stairs, a thriller by J. Jefferson Farjeon, will be sandwiched between the two sections of the Aldershot Command Searchlight Tattoo to be relayed from the Rushmoor Arena on June 18.

Cardiff on June 28 will broadcast a concert given by the Band of the 2nd Somersets at Priory Park, Taunton. This is the first occasion on which an O.B. has been carried out from that town.

The Devil Among the Skins, a play from the pen of Ernest Goodwin and which recently gained the cup at the National Festival of Community Drama in London, is down for transmission from the Manchester studio on June 22. It will be performed by the members of the Liverpool Players' Club.

On June 29 Scottish, English, and Northern Ireland stations will relay a concert from the Atholl Palace Hotel, Pitlochry. The programme of vocal and orchestral music will conclude with a short play performed by the Scottish National Players. There will also be pipe music played on the terrace outside the hotel by the Vale of Atholl Pipe Band.

A new company, under the title of Radio Fer, has been formed in Paris for the installation of wireless receiving apparatus on the French railway systems.

At the annual general assembly of the International Broadcasting Union recently held at Lausanne arrangements were made to provide for the management and finance of the wavelength checking centre at Brussels, which now becomes the official centre for Europe.

The French Posts and Telegraphs, through its high-power station at Ste. Assise, experiments daily on a wavelength of 24 metres between midday and 2 p.m. B.S.T. with a relay of the Ecole Superieure (Paris) luncheon gramophone transmission. On recent occasions these broadcasts have been picked up in Algeria and Morocco, and fed to the local transmitters. Should the tests prove that a regular service is possible, it is hoped to effect an interchange of radio programmes between Radio Alger and Radio Maroc (Rabat) with the French official studios.

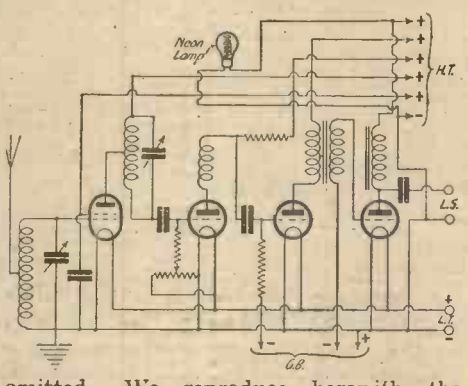
By means of the Fultograph system, Radio Barcelona proposes to establish a regular picture transmission service during the period of the Barcelona International Exhibition. It is possible that pictures broadcast from that city will be relayed to all the Union Radio transmitters.

According to a report from the United States, American engineers have arrived at Rome with a view to the proposed erection of a high-power broadcasting station to be controlled by the Vatican.

Radio Luxembourg, having increased its power to 2 kilowatts, now carries out tests on 1,220 metres every Sunday between 12.30 and 4.30 p.m. and transmits a musical concert every Tuesday and Friday between 9.20 and 11.20 p.m. B.S.T.

In the last two years Saturday afternoon relays of concert-party performances from Glasgow parks have proved so popular with listeners to the local station that it has been decided to make them available this year for the Edinburgh and Dundee stations also.

"An Inexpensive Distortion Detector."—In AMATEUR WIRELESS No. 364, page 764, there appeared under the above heading some notes on the use of a neon tube as a distortion tester. Owing to the block becoming broken during printing, some of the circuit connections were



omitted. We reproduce herewith the diagram showing the complete connections. The neon lamp should be connected directly across the H.T. positive terminal to the last valve and H.T. negative, as shown in the accompanying diagram.

VARLEY COMPONENTS LISTED

VARLEY components, manufactured by the Oliver Pell Control Ltd., are catalogued in an interim list, a copy of which has been received. The catalogue describes and illustrates the range of Varley components, including gramophone pick-ups, bi-duplex wire-wound R.C. couplers, anti-mobo units, anode resistances, power resistances, H.F. chokes, rheostats, potentiometers, and so on. Some interesting technical details are given, and readers may obtain a copy on application to the Oliver Pell Control Ltd., 103 Kingsway, W.C.2, and mention of AMATEUR WIRELESS.

The new Graz (Austria) transmitter is to be officially opened on June 15. As its power is some six times that of the original, the transmissions should be heard at good strength in the United Kingdom. An interesting part of the broadcast will be the carrying out of experiments with radio apparatus made by Dr. Alois Nussbaumer, in Salzburg, twenty-five years ago. The opening ceremony and the ensuing programme will be relayed from 6.30 p.m. onwards to the Vienna Rosenhuegel high-power station.

BRITAIN'S FAV. 2

A.W., 25th May, 1929

COMPONENTS

Ormond .0005, 6/-; .00025, 5/6; 7 ohm Ormond, 2/-; 2 W.B. V.H., 2/6; 6 pin Base, 2/-; .0003 and Series Clip, 1/6; 2 meg. leak, 1/-; H.F. Choke, 5/6; L.F. Transformer, Lissen, 3/6. Push Pull, 1/3; Tunewell Dual Range Coil, 7/9.

PLEASE ADD POSTAGE

OR READY TO USE including **DUAL RANGE COIL, POWER & DET. VALVES** in Handsome **CABINET.** All parts enclosed on Baseboard. (SET IN WINDOW).

£3.12.6

Deduct 10/- if Cabinet not required

UP-TO-DATE.

If your order for Fav. 2 parts exceeds 32/- you can buy

for 1/- extra

14x7 Ebonite Panel, Pair Panel Brackets, Baseboard, Battery Clips, Engraved Terminals, Wire, Flex, Plugs.

MULLARD S.G.P. 3

SEE OUR EXCHANGE OFFER
(Applies to this Set ONLY).

KIT OF PARTS (IN STOCK)

1 Aluminium Panel (ready drilled to carry tuning condensers, switch, reaction condenser, rheostat, and panel brackets) Colvern, 5/6; Juno Piano-board, 2/-; Bebe .0003, 8/-; 2 J.B. Log, left and right, 10/-; Sovereign 50 ohms, 2/6; 2 Drum Dials, pr. 21/-; 2 Six-pin Bases, 4/-; Benjamin Switch, 1/3; 2 H.V. Valve Holders, 3/6 pr.; B.B.C. Aerial Coil, B.B.C. Anode Coil, 9/6 pr.; 1 W.B. Valve Holder, 1/3; 2 Junit Mounts for 1/5; 4 B. Lee Terminals 2/-; Climax H.F. Choke, 7/6; G.B. Clip, 5d.; Mullard Permacore, 25/-; Metal Screen, 10/6: Panel Brackets, 2/6; 25 T.C.C., 2/3; Mullard .01, 3/-; 7 Plugs, 1/2; 2 Spades, 6d.; Flex and Screws, 1/9; Set of Links, 1/3; Exact to Mullard specification. Long-wave Coils, 10/6 pr. EXTRA.

Total £6 : 16 : 7 POST 1/6

VERY IMPORTANT NOTICE. In order to popularize the above set, I am willing to **ACCEPT EXCHANGE, in RADIO, GRAMOPHONE or PHOTOGRAPHIC GOODS** (provided Kit of Parts as above are purchased). Such exchange in value not to exceed one-sixth of total. Send your cheque less amount you value your goods at. Post your old parts separately with name and address.

Mullard S.G. 22/6. D. 10/6. Pentone 25/- 2- and 4-volt. Mullard Speaker Unit 38/6. All H.T. Units, H.T. Batteries and L.T. Batteries stocked. Table Cabinet, 18 in. x 7 in., oak, hinged lid, 16/11, (post 2/-) for 2/6 with order exceeding £10 : 0 : 0 retail. Above Special Offer for CASH ONLY.

HANDSOME POLISHED OAK SPEAKER CABINETS

13 x 13 x 6

The Lot Carr. Paid U.K.

12/11 Post 1/3

BLUE SPOT 66K (101) 25/-

GENUINE ADJUSTABLE 4 POLE BAL. ARMATURE

OR CABINET BLUESPOT 12" CONE 35/-

With Triotron Unit 27/6

Tunewell Dual

250/2000 6-pin Base, 1/6 **7/9**

PANEL MOUNTING PUSH PULL 10/6

TUNEWELL COILS for MULLARD S.G.P.3 Aerial or Anode, BBC or Long-wave, **7/10** pair.

DUAL C. TAPPED with reaction **AERIAL ANODE 10/6 each.**

FOR CLARION (post extra)

WEST END DEPOT for TUNEWELL COILS TRADE SUPPLIED

EXIDE

H.T. and L.T. TRICKLE CHARGER £5

Illustrated Catalogue (144 pages). 1/- refunded on first 10/- order.

ULTRA SHORT-WAVE COILS FOR COSSOR Per pair, 4-pin **7/6** Post 6d.

GRAWOR UNIT

with CONE for Talisman Portable **16/6** Post 1/-

BLUE SPOT

Metal Chassis With fitted Cone **12/6**

Philips' Type 3002. High-Tension Supply Unit for A.C. Mains, £7. Type 3003. High-Tension Supply Unit, with Grid Bias, for A.C. Mains, £8 15s. Type 3005. High-Tension Supply Unit for D.C. Mains, £3 17s. 6d. Type 450. Low-Tension Battery Charger for A.C. Mains, £3 10s.

Philips' 2-Valve All-electric Receiver for A.C. Mains. Price complete, £12 10s.

Philips' Loud-speaker (Type 2026 or 2016), price £2 10s.

Ferranti Anode Resistances, 3,000 ohms, 5/-; 20,000, 4/-; 40,000, 4/- each; 50,000 5/-. Complete with Holder, 2 Mfd. Mansbridge, 3/6. AF3L.F. Transformer, 25/-. AF4, 17/6. Post 3d. each.

SPECIAL "A.W."

CASH VOUCHER

This Voucher is worth (retail)

On £2 Order (and over) 2/- Cash
On £5 " " " 5/- Cash
On £10 " " " 20/- Cash

This Voucher CANNOT be used at same time as Coupon—and is only available at Raymonds. (H.P. excluded).

CLARION 3

SCREENED GRID
A.W. 9/3/29

KIT OF PARTS

Any other Condenser, H.F. Choke, or L.F. Transformer, supplied by adding balance.

2 Polar .0005, No. 3 at 5/9. .0001 Reaction 4/-. 2 Dual range C.T. Coils, with Reaction (Tunewell), Anode 10/6; Aerial, 10/6. 3 Lotus or W.B. V.H. at 1/3. Formodenser, "J." 2/-. Dubilier .1 mfd., 2/6. .01 Fixed, T.C.C., 1/9. 3-meg. Lissen or Edison Bell, 1/-. S.G. H.F. Choke, Peto-Scott, 5/-. H.F. Choke, Lissen, 5/6. L.F. Transformer, R.I. and Varley, 15/-. Ebonite Strips.

14x7 Ebonite Panel. Screen, 8½x3. 3 Engraved Terminals. Push-pull Switch, Flex, Plugs, 16-g. Wire, 2 S.M. Dials.

THE LOT **70/-**

POST FREE U.K.

.0002 Fixed and Series Clips 1/6 extra. 1/6 EXTRA C.O.D.

VALVES for CLARION 3

Screened Grid, Marconi, Mullard, Six-Sixty, 22/6 each Detector, 10/6. Power, 12/6.

CLEARTRON S.G., 2-v., 12/6. C.T.15, L.F. or H.F., 4/-. C.T.15X., P. 6/-

DEFINITELY CUTS OUT 2LO AT 1 MILE and obtains 5GB, 5XX and Continental Stations with 2LO working. This actual test has been made by the designer of set at our premises.

14 x 7 x 9 American Type **CABINET,** hinged lid, Oak finished with Baseboard,

12/6 15/- 17/11

PORTABLE CABINETS for "ROADSIDE" FOUR

in real Rexine, made to Mr. Percy W. Harris's specification. Post 1/- U.K. **39/6**

OR with AERIAL WOUND and SWITCH FITTED ... **12/6 extra**

SIMILAR DESIGN IN LEATHERETTE FOR

TALISMAN 25/- Post 1/- U.K.

WORLD RECEPTION On Your Set

.00015 Short-wave Condenser with S.M. movement or Dial, 12/- (Ormond or Polar); Reaction, Polar, 5/6; 7-ohm Panel Rheo, 2/6; 6-pin Base, 2/-; Spring V. Holder, 1/3; .0001 fixed, 5-meg. Leak and Holder, 2/6; Valve Holder, Plug Clip, 2/-. Total, including Short-wave Choke. Connecting Wire, A. and E. Terminals, Flex, Screws, Baseboard, and Panel.

The Lot **30/-**

Post free U.K. (1/3 C.O.D.).

Lewcos AMS4, AMS9, for above, 7/6 each.

VALVES

10/6 each.

Cossor 210RC, HF, LF. Mullard PM1A, HF, LF. Six-Sixty RC, HF, LF. Marconi DEH210, HL, DEL. Osram DEH210, HL, DEL. Ediswan RC, HF, LF.

12/6 each.

Cossor 220P. Mullard PM2. Six-Sixty 215P. Marconi DEP215 (Osram same). Ediswan PV215.

15/- each.

Cossor 230P. Mullard 252. Six-Sixty 230SP. Marconi 240 (Osram same). Ediswan PV225. Screened Grid, 22/6. Pentodes, 25/-

VALVES

DARIO RADIO-MICRO

2-v. or 4-v. G.P. 5/6
Super Power 7/6
Super H.F., 2-v. or 4-v. .. 7/6
Post 3d. (3 Post Free).

TRIOTRON

H.F., Det., R.C., 5/2 each; Power 6/9. 2-v. or 4-v. Post 4d. & post free.

CLEARTRON

SCREEN GRID

2-volt, 12/6; usual types, 4/-. R.C. or Power, 6/-. Post 3d.

LEWCOS

Lewcos C.A.C.5, 10/6; C.A.C.20, 12/6; C.S.P.5, 10/6; C.S.P.20, 12/6; P4 to 14, 3/- each; P16 to 22, 4/- each. Touchstone Coils, 30/- pair. CT. Coils, 3/6, 5/3. Q Coils: Q.A., 15/-; Q.S.P., 21/-; Q.A.R., 21/-; Q.A.A., 15/-; Q.S.G., 21/-. All Lewcos Products.

WATES' Three in One Radio TEST METER

Readings :—0-150 volts. 0-30 milliamps. 0-6 volts. Res., 5,000 ohms. **8/6**

ORMOND

Midget Log all brass, .0005, 8/-. .00025, 7/6. .00013 Shortwave, 7/-, complete with Dial. Also with S.M. (friction) 5/- extra.

Send direct to us for ALL ORMOND GOODS. Wholesale and Retail.

Be sure to mention A.W.

RAYMOND'S for WIRELESS

27 & 28a, LISLE ST., LONDON, W.C.2
Come to LEICESTER SQUARE TUBE.
This address is at the back of Daly's Theatre. Phones: Gerrard 4637 and 2821

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ALL DAY SATURDAY
ALL DAY THURSDAY
ALL DAY EVERY DAY
Hours 9 a.m. to 8p.m
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QUOTATIONS for SETS OF PARTS
SPECIAL PRICES on LISTS of 25/- and over
CALLERS or POST.

Oak American Type, Hinged Lid,

BEST QUALITY. Panel and Dial NOT included.

14x7, 14/11 16x7, 16/11 18x7, 18/11 21x7, 21/-

Post 1/6. (C.O.D. Extra). Advt. May 11, error in prices.

Cabinet to specification, £2 9s. 6d. (30/- with parts). Carriage extra.

HOLIDAY PORTABLE

SPECIFIED PARTS

.0005, 6/6; 1 meg. vol. control, 6/6; 2 P.P. switches, 3/-; S.C.C. Jack, 3/6; 3 Lotus V.H., 3/9; .0001, 1/10; .0002, S/P 2/4; .005, 1/6; 3 meg. 2/-; Peto-Scott H.F. choke, 5/-; 150,000 ohm anode and holder, 6/6; Lissen Super L.F., 19/-; Output choke, Igranic, 15/-; (Add balance any other) 2 mfd. Mansbridge 3/6. Ebonite Panel, Screws, all Wire, Plugs, Spades, Flex, and Kit of Parts, 82/-.

SQUIRE 77 PORTABLE CHASSIS AND CONE, 18/6.

For this set all batteries in stock.

PORTABLES

SHOP SOILED ONLY

£15 ORMOND, One only **£11.11.0**
5-v.
£15 NATIONAL, One only **£12.0.0**
5-v.

Complete ready to use.

Personal Shoppers Only.

ORMOND

S.M. Drum Dial, 5/-; Rheostats, 6, 15, 30 ohm, 2/-; Midget .0001 max., 4/-; Log .0005 and 4 in. Dial, 6/-; Log .0003 and 4 in. Dial, 5/9. S.L.F. No. 3 same price. We always stock all ORMOND PARTS.

ALL STANDARD COMPONENTS, wholesale and retail.

SQUIRE CRADLES

P.77. The Squire Universal model complete with latest type vellum cone and cradle, suitable for taking Blue Spot, Triotron and other units. 2½ in. deep 18/6

No. 97. For general use (9½ in. cone), standard fitting for Blue Spot, Triotron units, complete with latest vellum cone, 15/-.

Baffle board, 12 in. fitted.

DR. NESPER TRICKLE CHARGER 200/240 v. for 2 or 4 volts **29/6**

TALISMAN PORTABLE

A.W. 11-5-29

LIST OF COMPONENTS

2 Ormond Log Midget	16/-
.0002 Variable	5/6
4 Lotus V. Holders, 1/3	5/-
2 Screens, pair	6/-
Dual Range Coil (W.W.)	7/6
15-ohm Rheostat	2/-
Dubilier, 2 mfd.	3/6
2 do., 1 mfd.	5/-
T.C.C. .0003 S/P	2/4
McMichael H.F. Choke	4/6
30,000-ohm Anode & Holder	3/6
2 Igranic "J" L.F. (17/6)	35/-
2 H.F. Stoppers, 5/6	11/-
"Grawor" L.S. Unit (as specified)	16/6
Tuning Chart	2/-
Valves—S.G., 22/6; H.F., 10/6; L.F., 10/6; S.P., 15/-. Please add Carriage (over £5 Free U.K.).	

IF YOUR ORDER for TALISMAN PARTS EXCEEDS £3

for 2/- extra

YOU CAN BUY

All necessary Plugs, Spades, Screws, 100 ft. Frame Aerial Wire, Switch, L.T. do., Terminals, Connecting Wire, Ebonite Panel (14x6, drilled) (Any other size at extra charge). 2 Slow-motion Dials, Red and Black Flex, 32 d.s.c. Copper Wire, 2 Grid Bias, 9 volt, Plug and Socket

A.W. SPECIAL COUPON (80)

FOR EVERY 30/- you spend retail YOU CAN buy ONE of the following for 3d. each extra (on this Coupon)

H.F. Choke, Silk Loud-speaker Cord, 9-volt Grid Bias, Pair Panel Brackets, .0001 Reaction, 2 mfd. Mansbridge, 100 ft. Insulated Aerial, 4- or 5-way Battery Leads, 30 ft. Coloured Connecting Wire, S.M. Dial, 12 yds. Lead-in, Fuse and Holder, 12 Nickel Terminals, 60X Coil, Permanent Detector, Battery Switch, .0003 and 2-meg. Leak, 6-pin Coil Base, 12 yds. Twin Flex, 100 ft. Indoor Aerial, .0005 Variable, Set of 12 Plugs and Sockets (red or black), Set of 3 Coil Plugs with Terminals, Wave Change Switch, .01 Fixed Condenser, 1 mfd.

R.E.P.T.A. Members allowed discount, except where already reduced.

MORE RADIOGRAMS

In the desire for nothing less than the "real thing" in its atmosphere, the Glasgow station has arranged for a programme entitled "Sea Ways" to be presented by an ex-naval officer, who has also had considerable experience in producing shows on board ship.

Sir James Barrie has given his consent for the broadcast of *The Old Lady Shows Her Medals* by the Ardrossan and Saltcoats Players from the 5SC studio as a special play broadcast to schools. This item is regarded as the most interesting and attractive to have been put on solely for the benefit of schools listeners since the introduction of separate broadcasts for Scottish schools.

About one call a day was made to Europe on the transatlantic phone from Washington last year. Some calls originated at the State Department, but a good percentage was put in by Embassies and Legations.

A new £9,000 transmitting plant is being erected for WGR at Amherst, New York. The installation is expected to be ready for operation in June.

The Belmont Dramatic Society, one of Aberdeen's most successful amateur dramatic organisations, has come under the lure of the microphone and is to broadcast a J. J. Bell comedy from 2BD. This and similar broadcasts provide interesting opportunities for comparing the work of outside dramatic organisations before the "mike" with that of the Radio Players, who are accustomed to studio conditions.

The Dayton Westminster Choir, heard so frequently in the United States, has dropped the "Westminster" in its present tour of England. It is known here as the Dayton Choir of the United States.

Our Information Bureau.—We regret that pressure upon our space has compelled us to hold over this week a selection of readers' queries published under the above heading.

"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.

In view of the increased power of the two Barcelona (Spain) broadcasting stations, namely, EAJ1 and EAJ13, the studios have decided not to transmit simultaneously, in order that Spanish listeners may be given a better service. Radio Barcelona will work from 1.30 to 2.45, from 5.30 to 6.30, and from 9 to 11.30 p.m. daily, whilst Radio Catalana (EAJ13) will only be on the air from 6.30 to 9.30 p.m. B.S.T.

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WHAT YOU CAN HEAR ON THE SHORT WAVES

Amateur Wireless

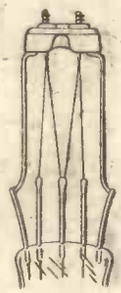
and Radiovision

Every Thursday 3d

Vol. XIV. No. 367 Saturday, June 22, 1929

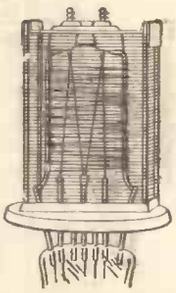
Registered at the G.P.O. as a Newspaper

ONE!



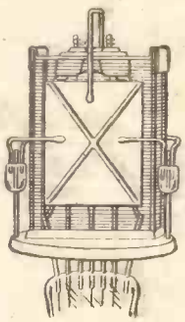
The double length Cossor filament famed for its colossal emission. Note the seonite bridge holding it rigidly in position. Around the two stout grid supports is wound the first grid, electrically welded at twenty-five points.

TWO!



Note the strength and rigidity of the screen. Built on four stout supports, and anchored to seonite insulator.

THREE!



Finally, observe the construction of the anode. Two rectangular nickel plates are used ribbed for greater rigidity.

—AND

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JUNE 22, 1929 No. 367. Vol. XIV

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

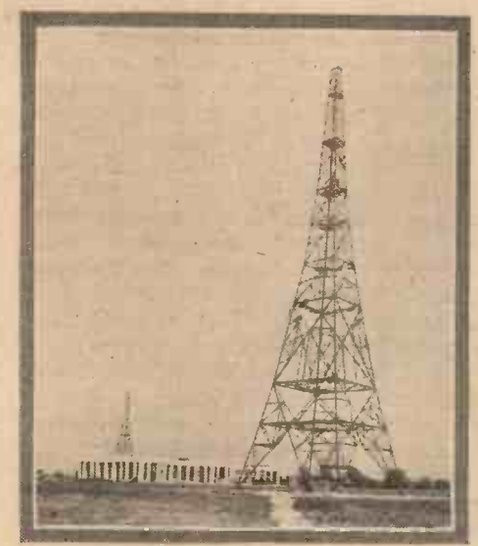
Telephone Fires—Radio in Parks—Gentlemen, "The King"—History Found—A Derby Aftermath—For the Housewife—A Speaking Sign—The B.B.C.'s Clock

Telephone Fires—It was unfortunate that owing to a recent telephone cable fire on the Thames Embankment every provincial station of the B.B.C. was cut off from the London studio. It is almost impossible to guard against this kind of thing, and it must be admitted that many of the other Post Office lines damaged by the outbreak were probably of more vital importance than those used for broadcast entertainment. The B.B.C. made very satisfactory efforts to keep the flag flying, and an emergency relay was contrived.

Radio in Parks—The London County Council is out to economise and is fitting microphones in certain park bandstands and loud-speakers in parks where no band is engaged. Recently a programme was relayed from the County Hall to Brockwell Park, Herne Hill.

Gentlemen, "The King"—A correspondent has suggested that the B.B.C. should complete each night's broadcast by playing the National Anthem, as is done at very many Continental stations. True, there is no obvious reason why this should not be done, if only out of a feeling of patriotism. It is surely foolish to suggest, as has been done by some musical fans, that the anthem will be "cheapened" by repetition every night in the year. It is the patriotic sentiment that counts.

A Derby Aftermath—On Derby night, pictures of the race broadcast at 6 p.m. were picked up by means of a Fultograph receiver, on a train travelling at between fifty and sixty miles per hour. A McMichael portable was used for receiving and, apart from the picture difficulties, the radio side presented a number of difficulties, owing to interference from the train electrical equipment. The coaches were fitted with a good deal of electrical apparatus in the way of dynamos, cookers, heaters, and so on, and it was feared that interference from these would spoil the picture. Actually there was very little distortion, and interferance from the sources mentioned was not very noticeable.



The new "London"—a view of the station buildings and the aerial masts which are now completed

History Found—An interesting bit of history has just been disclosed in connection with a talk given by a Mr E. A. B. Barnard from 2LO, in November, 1927. This talk was on destroying history, and as a result of it he was invited to visit a London paperworks. This resulted in the discovery, among waste paper waiting to be pulped, of eighteenth-century American documents full of historial interest to New York. Indeed a useful talk!

For the Housewife—The B.B.C. certainly seems to be taking a great interest in domestic affairs at present, if one is to judge by the number of household talks broadcast In justification, it must be said that the broadcast recipes and home hints are valuable and helpful to those who have not time to experiment in such things for themselves. It must be hoped, though, that those who make up the recipes will not indulge in any experimenting, by which innocent male listeners might suffer!

"Ghosting" for Talkies—It is now generally asserted that some of the people who appear in talkie films and are advertised to have amazing voices, frequently have doubles who sing for them while they mouth voiceless notes. For instance, a certain lady asserts that it is she, and not the famous film star Miss Laura La Plante, who sings the songs in *The Show Boat*. The difficulties of "ghosting" in such cases are enormous, because apart from the synchronism needed, there are acoustic and electrical difficulties to contend with. Anyway, listeners will hope that no such "ghosting" is ever resorted to in broadcast programmes—where, of course, it would be quite easy.

A Speaking Sign—Yet another use has been found for talkie films for an enterprising Californian music publicity agent has erected a movie signboard on which films can be shown in the daytime and, moreover, talking films are used. At present the signboard is being used only to demonstrate music and gramophone records, but the idea is catching on.

The B.B.C.'s Clock—An addition to the list of broadcasting clocks will shortly be made, as the B.B.C. is to install a microphone in the clock tower of the Assembly Buildings, Belfast. The clock possesses a carillon of eleven bells, which play a well-known tune, secular or religious, after the hours of twelve, three, and six.

PRINCIPAL CONTENTS

Constructors' Notes

THE advantages of the all-metal cabinet for a radio set are well known. Effective screening of the various stages is possible without incurring the large high-frequency losses met with when small copper screening cans are used. In addition

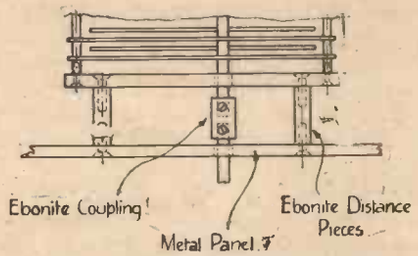


Fig. 1. Condenser mounted on ebonite stand-off insulators

direct pick-up of signals from the local broadcasting station and also possibly interfering signals are avoided. The usefulness of metal cabinets can be gauged by the number of proprietary constructors' kits and complete receivers which include one of them. The disadvantages of the all-metal panel are not so well-known and it is only when one attempts to design and construct

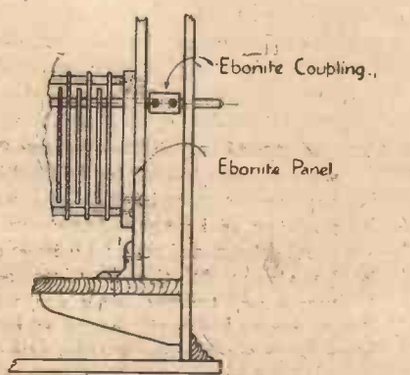


Fig. 2. Condenser mounted on small secondary ebonite panel

a receiver employing them that their peculiar drawbacks are realised.

Insulation of Spindle

Condensers, volume controls, and filament rheostats (fitted as volume control, H.F. stage) all require insulating at the spindle and the fixing screws. If the schematic diagram of many standard sets be examined it will be seen that in many cases it is necessary to insulate both sides of the variable condensers. A typical example is the reaction condenser of a tuned-anode screen-grid receiver in which one side of the condenser is terminated at the anode of the detector valve and the other side is attached to the anode coil. In some cases the spindle of the condenser can be earthed, although the mounting will still require insulating. It would appear that manufacturers have not changed their design to suit metal panels. A new design of insulated mounting would be popular as at present all the odd pieces of ebonite required for fixing existing types of components have to be made separately. Some components are suitably insulated. Jacks, for instance, are usually made with an insulated sleeve and nut to fit straight on to a metal panel and the trouble of making special ebonite bushes and washers is avoided.

Suggested Methods of Construction

There are four well-known methods which enable a condenser to be mounted on a metal panel. They are shown in the accompanying diagrams Figs. 1, 2, and 3. The first employs small stand-off insulators of ebonite rod, with an insulated ebonite coupling. It is not always easy to screw the ebonite rod on to the end plates of the condenser, and in this case the method shown in Fig. 2 may prove more suitable. This method requires a small subsidiary mounting panel of ebonite supported by brass angle brackets. In this, as in the first method, an insulating ebonite coupling can be used. Messrs. Ormond make a small universal coupling designed primarily for ganging condensers which can quite well be used for this purpose. The method shown in Fig. 3 is a variation of that of Fig. 2 and is more economical as regards space taken up in the receiver but has the disadvantage that the spindle is not insulated and hand capacity effects can be experienced. The fourth method is to use a drum control on the condenser (Fig. 4). This last is a very satisfactory solution, the only disadvantage being that a fair amount of space is taken up by the condenser and also that it is still possible to experience hand effects to a limited extent.

Hand-capacity Effects

Every experimenter has at some time or other experienced the annoying phenomenon of having a carefully tuned in distant station disappear or drop in volume when

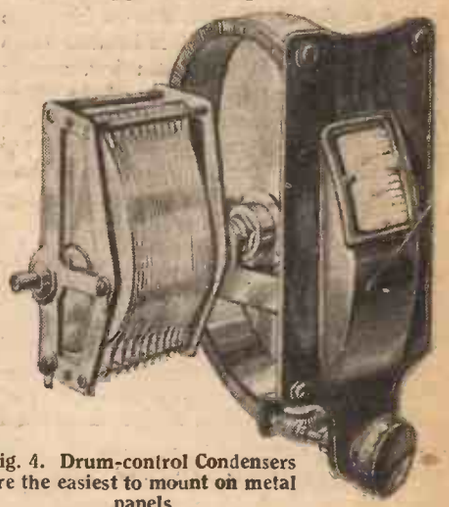


Fig. 4. Drum-control Condensers are the easiest to mount on metal panels

the hands are removed from the control knobs. This effect, which is due to alteration of the capacity to earth of some portion of a tuning circuit, thus altering the tune of the receiver, can be cured by using a metal cabinet. With short-wave receivers such a cabinet is necessary. The methods of mounting shown in Figs. 1 and 2 obviate all hand-capacity effects, but if that of Fig. 3

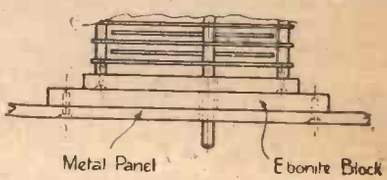


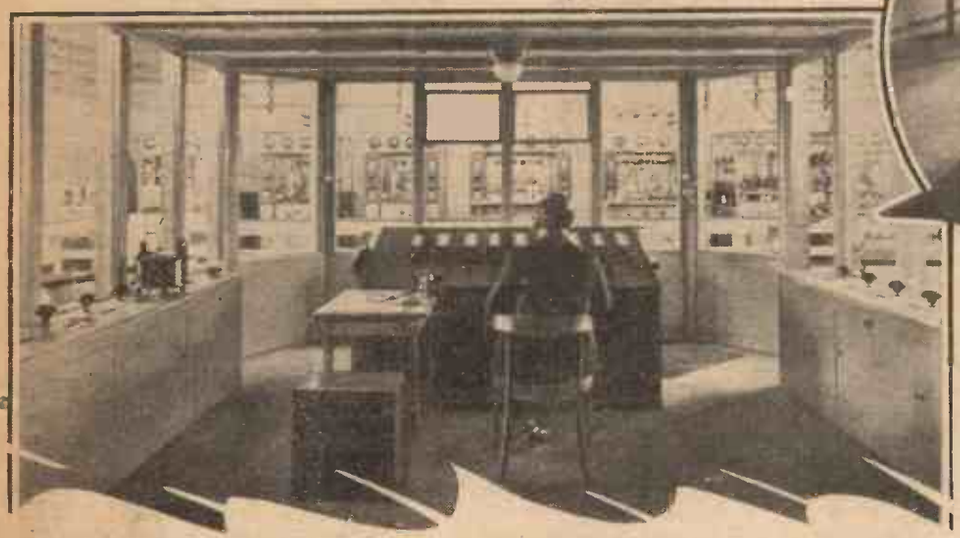
Fig. 3. Condenser secured to ebonite block

is used the spindle is not entirely inside the screen and a variation of tune may be noticed as the hand is removed from the control knob. This effect is more noticeable where a slow-motion dial having a large circular metal plate driven by a small wheel as the reduction mechanism, is used. Although generally speaking hand-capacity effects are avoided when a drum control is used, slight variations may be noticed if the drum used is metal and is in contact with the condenser spindle.

A. G. McD.

WHAT'S ON BELOW 100 METRES

Showing What You Can Hear on the Short Waves



The control room and (right) amplifier desk of Huizen—the new 16.8-metre broadcasting station

WITH the advent of the long evenings, those who used to boast of wonderful DX reception on the medium and long waveband are finding that things are not "all honey." In justification, however, it must be said that things are no worse this year than they have been on previous occasions and that screen-grid valves and other distance-getters now available make up for the deficiencies of Mother Nature in the summer.

Short waves are not so affected by daylight range theories as are their greater-length companions, and quite a number of ordinary listeners are attracted in summer time towards short-wave working, first, because it opens up such a new and wide field of stations and, second, because a short-wave set is very easy to make or, alternatively, it is easy temporarily to convert a broadcast set for short-wave reception.

In this latter connection you may remember the short-wave adaptor which was described in AMATEUR WIRELESS, No. 360. If it didn't interest you overmuch at the time, just read through the following list of the stations available for those folk who are vulgarly known as DX hounds — and then turn your attention towards ways of getting these stations for yourself.

American Stations

Right at the top of the scale on 70 metres we have our old friend, WBZ, Springfield; and, if you please, as the people over there are American and not English, the call sign is pronounced WB *Zee*. On the same wavelength also is Vienna, which works on Sundays only, from 6 p.m. till midnight. The transmissions are rather irregular.

A prolific short-waver, but one which will probably be received only on very efficient sets since the power is but half a kilowatt is W2XBA, New Jersey, on 65.18 metres. He works between 12 midnight and 5 a.m., Tuesdays, Thursdays, and Saturdays. A wavelets-emitter much nearer at hand, is Radio LL in France, with a wavelength of 61 metres, while dropping a little, we have our old friend Nauen (AGJ) which works occasionally on 56.7 metres in the evening times. I have never heard him before 6 o'clock.

A little lower still we have Cincinnati W8XAL on 52.02. I am, however, leaving out many of the Americans because their short-wave transmissions are so many and are to be found in many broadcast lists. The continental transmitters do not appear to be so well catalogued.

On the Continent

There is quite a powerful *poste* at Bergedorf in Germany. This is AFL, which, with a power of 3 kilowatts, works on 52 metres. Karlsborg (Sweden) and Moscow (between 1 and 2 p.m.) on occasional week days (50 metres) are two Continental companions. Jumping over 6GA, the well-known Perth (Australia) 42-metre broadcaster, we have Radio Vitus, which makes occasional tests on 41 metres, and our old friend the Eiffel Tower, which, on 32.5 metres, sends out a time signal twice a day at 8.56 in the morning and evening.

Now for two big noises, namely, W2XAF and a closer acquaintance, Hilversum in Holland. W2XAF is a 10-kilowatt broadcaster of the G.E.C. at Schenectady and works on 31.4 metres. As a matter of interest, here are his exact transmission times. Mondays, 11 p.m. till 5 a.m.; Tuesdays, 11 p.m. till 4.30 a.m.; Thursdays, 11 p.m. till 5.30 a.m.; and Saturdays, 11 p.m. till 5 a.m.

Hilversum which is on the same wavelength, is owned by the Philips people and is quite the stock in trade of many short-wave enthusiasts in this country. For this must be thanked his giant power of 25 kilowatts. He has just overhauled his transmission schedule and the new times are as follow: Thursdays, 7 to 9 p.m., and 12 midnight to 1 a.m.; Fridays, 1 a.m. till 4 a.m., and 7 p.m. to 9 a.m.; Saturdays, continuously from 1 a.m. till 7 a.m. The transmissions are made in many languages, including, English, French, Spanish, Portuguese, and Dutch.

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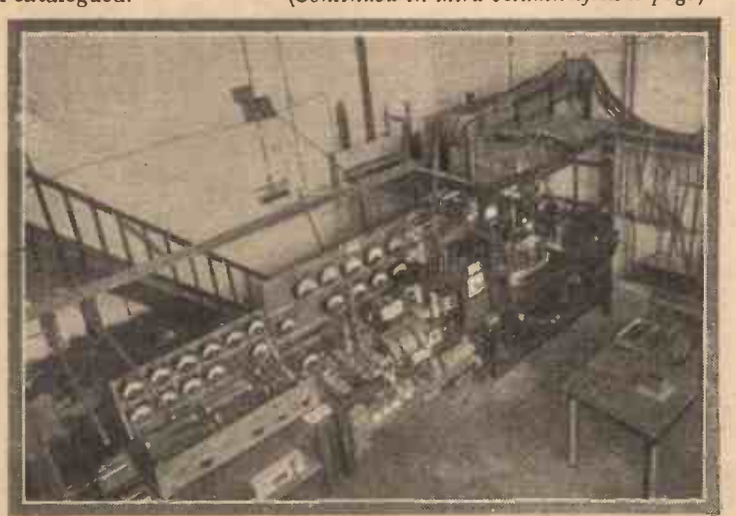


Looking down on the PCJ transmitter—often heard on 31.4 metres

THE B.B.C.'s NEW CHIEF ENGINEER

THE APPOINTMENT OF MR. NOEL ASHBRIDGE

CAPT. ECKERSLEY'S resignation occupied many listeners' minds recently, and there were many discussions as to the whys and wherefores of his leaving.

It is now certain that Mr. Noel Ashbridge, B.Sc. (Lond.), A.M.I.C.E., will take his place. In official circles it is rumoured that Mr. Ashbridge, who since the end of 1925 has been assistant to our old friend "P.P.E." as Chief Engineer, is going to be a worthy successor. Probably also, so far as B.B.C. policy and development is concerned, Mr. Ashbridge thinks along similar lines to those of Capt. Eckersley, and at the present stage of the B.B.C.'s career it is essential that its policies should go forward unhampered.

Mr. Ashbridge received his engineering training in the early days at King's College, London, and underwent practical training subsequently with two very well-known electrical companies.

Then came the critical period of the War, and he served as a wireless officer in the Royal Engineers, both in France and in England. He collaborated with a well-known scientist, Mr. R. D. Bangay, in the authorship of a textbook, "Wireless Valve Receivers and Circuits," a work very well known, particularly to amateurs in the early days, when valves were somewhat of a mystery.

At the close of the War Mr. Ashbridge entered the service of Marconi's, and for several years was head of the experimental section at Writtle, the Marconi experimental station near Chelmsford. He was thus closely identified with the programmes which were transmitted from this station. It will be recalled, too, that Capt. Eckersley took a prominent part in the Writtle transmissions, and, indeed, it is true to say that it was through the bright weekly programmes from "Two Emma Toc"—long before broadcasting was thought of—Capt. Eckersley first attracted the public eye.

Towards the end of 1925 Mr. Ashbridge was appointed Assistant Chief Engineer to the B.B.C., and he has continued in that position, working steadily behind the scenes and with his name seldom in the limelight, until his appointment as Chief Engineer.

We wish him luck!

A recent photograph of Mr. Noel Ashbridge

THE BEST OF THE BUNCH

Jottings from my Log

By JAY COOTE

IF, as I do, you listen regularly to a number of foreign stations nightly, you must inevitably now possess a preference for some of them over others. No doubt, again, as I do, you turn to them in the first instance, when searching for alternative programmes to those vouchsafed to us by our home stations.

Personally, if I have at any time during the day a few minutes to spare, I make a bee line for Hilversum or Kalundborg, both favourites for I have found from experience that from these studios—in particular the former—I can always rely at any odd time on receiving pleasant light orchestral programmes, and thus by-pass a sequence of uninteresting talks of doubtful general educational value.

Hilversum, as you know, is but a 5-kilowatter, yet its position on the mainland of Europe appears to be such a favourable one that in most parts of the United Kingdom it can be received at greater volume than many of its much higher-powered competitors. And then, again, you must have noticed how good is its modulation and with what excellent acoustic properties its studio is blessed.

A small orchestra performing at the Hilversum station would appear to attain a better result than a much greater number of musicians elsewhere. As regards the programmes, if you care to dissect them, you will find, I think, that they contain a higher percentage of light music than those of any other Continental—or, for the matter of that, home broadcaster—and on Sundays in particular, if you desire entertainment, you are always safe in switching over to this Dutch station.

Generally speaking, except for certain evenings on which plays are given in the Dutch language, there are but few talks. On alternate Sundays a special programme is broadcast to British listeners, on which occasions the announcer gives out full explanations in our language.

An impression of Renee Tapponnier, Conductor—Carlton Hotel Octet

"WHAT'S ON BELOW 100 METRES"

(*Continued from preceding page*)

On 30.91 metres is another well-received short-waver, W2XAL. He works on Tuesdays, Wednesdays, and Saturdays, and is rarely to be heard before 12 midnight. Dropping quite a bit down the tuning scale is our home and Empire station 5SW at Chelmsford. He works daily, except Saturdays and Sundays on (officially) 25.53 metres. But do not be surprised if he does not come in with a roar, for the wavelets are fickle things and there is what the scientists term a jump effect. Just a shade lower still is East Pittsburg, W8XK, the well-known relayer of KDKA.

Rocky Point on 22.48 metres is, of course, a regular broadcaster, while W2XAO (Schenectady) is often to be heard on 19.56 metres. Frequently on Mondays he is to be heard quite early in the evening, and about 6.30 p.m.

A giant in power, but a long way distant is Bandoeng (Java) which pushes out 32 kilowatts on the very short wavelength of exactly 17 metres. Finally, close at hand, is another Dutch friend, Huizen, which boasts of a power of 60 kilowatts. The wavelength is 16.8 metres, a good trial of the efficiency of a receiver, and he usually transmits from 3 p.m. till 5 p.m. daily.

This by no means completes the list of short-wavers which you may hear when you become accustomed to the operation of your receiver for the wavelets. It will be realised, of course, that tuning is very critical at these rapid frequencies.

SECRETS OF THE TEST ROOM

The third of a new series of articles which will appear 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 low-frequency chokes and transformers

LOW-FREQUENCY chokes have inductances ranging from 10 to 100 henries in the general course of events, while in some cases the inductance may be several hundreds. The measurement of such large values of inductance demands special arrangements for, of course, the inductance bridges used for coils, H.F. chokes, etc., do not have to measure values above about 0.5 henry.

Apart from this, however, we have another factor to take into consideration, and that is the presence of the steady current which also flows through the winding of the choke. This saturates the iron circuit to an increasing extent with the ordinary type of choke, although the saturation may to some extent be avoided by the use of a gap choke. Even so, however, it is necessary to measure the inductance under the actual working conditions. A choke measured on a bridge without any D.C. flowing may show an inductance of 200 henries, whereas its actual inductance in the circuit for which it is intended may be only 20 henries.

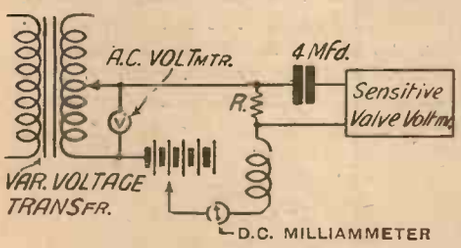
Many Complications

One would imagine that this in itself introduces sufficient complication into the testing, but this is not the whole of the story. A low-frequency choke is usually employed in a portion of the circuit carrying a fairly heavy alternating current. The current in a choke output circuit may be anything from 0.5 to 2 milliamps, even with a reasonable volume of sound. The current supplied to a moving-coil loudspeaker driven by a power amplifier reaches 10 milliamps or more. The alternating current component in a smoothing circuit is of the order of 1 milliamp, and if the eliminator is delivering a large direct current, the alternating component increases correspondingly.

All of which would cause no trouble except for the fact that the value of the alternating component influences the inductance obtained. If the inductance is measured with 2 milliamps A.C., the value will be anything from 50 to 100 per cent. more than if a very small A.C. was used. The actual extent of the variation depends upon the iron circuit of the choke, the properties of the iron having considerable effect, but the fact remains that it is necessary to use a specified value of alternating current if any real comparison is to be obtained.

We require, therefore, a circuit which tells us the alternating component, the direct current component, and the inductance. After many tests carried out at various frequencies and with numerous arrangements, some complex, some simple, with various degrees of accuracy and ease of manipulation, it was finally decided to adopt a circuit of the type shown by the diagram. The A.C. mains are used for the supply, these being of essentially pure wave form.

It will be seen that we have a transformer capable of giving a variable output. This in itself is not an easy matter to arrange, for the variation must be continuous. The instrument is shown simply as a variably tapped secondary, although there are one or two refinements in addition which were found to be necessary in practice. Across this transformer is a voltmeter reading the actual voltage delivered to the circuit. Across the transformer is the choke to be measured in series with a small resistance and a source of direct-current supply. A D.C. milliammeter (or ammeter in the case of an L.T. choke) is included to read the polarising current.



Circuit for Measuring Choke Inductance

Now if we apply a voltage across the choke and we know the alternating current flowing through it, we can quite easily calculate the inductance. The alternating current, however, will be quite small—in the neighbourhood of 1 milliamp or less—while the polarising current may be as much as 100 milliamps for an ordinary choke or several amperes if an L.T. choke is being measured. Clearly, therefore, we cannot put a sensitive meter reading only 1 milliamp in the circuit and at the same time pass 1 ampere through the same circuit! We must have an arrangement which is capable of indicating the alternating current without responding to the D.C.

The Moullin Voltmeter

A Moullin voltmeter is such an arrangement, for a rectifying valve will not respond to steady voltages, but only to alternating or fluctuating ones. Across the resistance R, therefore, we connect a Moullin voltmeter, isolating this from the direct current by means of a large 4-microfarad condenser. This voltmeter is calibrated to read in terms of milliamps alternating current flowing through the resistance R.

The method of taking a reading, therefore, is to switch on the alternating current and adjust the voltage until the Moullin voltmeter indicates that, say, 1 milliamp is flowing in the circuit. The value of the voltage is then read off on the voltmeter V and the inductance is then calculated from the formula

$$L = \frac{V}{0.315}$$ henries (assuming a frequency of 50 cycles).

The test may then be repeated with a different value of steady current flowing through the choke, and so the customary curve connecting the inductance with the polarising current may be obtained. It is necessary at frequent intervals to check the calibration of the Moullin voltmeter. This may be done by cutting the D.C. apparatus out of circuit and substituting a sensitive A.C. meter so that the accuracy of the indications given on the Moullin voltmeter may be checked up.

The value of alternating current used for the measurement is chosen according to the circumstances. For an L.F. choke, the value of 1 milliamp is taken, as experience shows that this is a good average value under practical conditions. Results

(*Concluded at foot of next pag*)

For the Newcomer to Wireless: SHORT-WAVE RECEPTION

WOULD you advise me to build a short-wave receiving set?

Most certainly I would if you are interested in long-distance work, for there are few more fascinating fields in wireless throughout the year.

Is a short-wave set difficult to operate?

Not in the slightest.

But how about the fine tuning needed?

Slow-motion dials or geared condensers make this a perfectly simple business. Anyone who can use a medium- or long-wave receiving set will get the hang of a short-waver straight away.

Aren't body-capacity effects rather a nuisance?

In the well-designed short-wave receiver of to-day they simply don't exist.

How is that accomplished?

The circuit is so arranged that the moving vanes of each variable condenser are earthed, whilst simple filter circuits and decoupling arrangements keep high frequencies out of the note-magnifying part of the set. Years ago short-wave sets used to scream if one winked an eyelid; to-day they are as docile as can be.

Is the necessary equipment elaborate?

Far from it: all that you need is a detector valve followed by one good note-magnifier, or two if you want to be able to put a big number of stations on to the loud-speaker.

What is the best kind of circuit?

A grid-leak-and-condenser rectifier, with one of the many modifications of the Reinartz tuning circuit, in which reaction is capacity controlled.

And the note-magnifying part?

Couple the detector to the first note-magnifier by means of a transformer. Between the first and second note-magnifiers use either transformer or resistance coupling.

Why capacity-controlled reaction?

Because this method has the very big advantage that alterations in the reaction coupling have only the smallest effects upon the wavelength to which the set is tuned. You can use a swinging reaction coil, but if you do you will find that any alteration in the coupling necessitates retuning the aerial-grid circuit.

Aren't short-wave coils expensive?

Not at all. You can buy them quite cheaply ready made, or you can make your own for a few pence apiece.

What is there to hear with a short-wave set? I am not interested in morse.

On any night you can pick up half a dozen American programmes and hear them really well. You can also obtain good reception from Canada, Java, Nairobi, and Australia.

Aren't there any European short-wave stations?

Any number of them, and very good they are. Spend an hour with the short-wave set in the evening and you may count on hearing Italian, Spanish, German, French, Austrian, Dutch, and Danish stations—and probably a good many more.

But doesn't it mean sitting up until uncanny hours?

Not a bit. Java comes on in the afternoons, Australia is to be heard on Sunday evenings between 8 and 9 p.m., Nairobi is an afternoon transmission, and the American stations are usually to be heard at quite reasonable hours during the evening. You will find European stations at work hours before your bedtime. There is one other point I want to mention.

What is that?

If this is your first short-wave set, follow carefully one of the designs given in AMATEUR WIRELESS or *Wireless Magazine*, and don't try until you have had more experience to evolve a design of your own or to "improve" others.

"SECRETS OF THE TEST ROOM"

(*Continued from page* 849)

obtained by this means will be somewhat higher than the values obtained from a bridge measurement, but this does not matter, since they are truly representative of actual conditions. At the same time, they do not over-emphasise the effect of the A.C. component, as is the case with some chokes where a value of 5 milliamps is used.

For L.F. transformers, the value of the alternating component is usually considerably less. In a first-stage transformer the A.C. is very small, although in the later stages it may have an appreciable value. In general, however, it is found desirable to choose a value of 0.25 milliamp for the measurement of transformer inductances. With the average transformer the difference between the readings obtained with an alternating current of this order and those obtained on a bridge measurement, where the A.C. is very small, can hardly be noticed. It is only when the value of the A.C. rises above 1 milliamp that the inductance begins to rise rapidly.

These are the general principles utilised in the measurement of L.F. inductances generally. In a brief discussion such as this a number of technical details must, of necessity, be omitted. The method, however, has proved accurate and reliable in use now that the various troubles have been successfully located and overcome.

E. M. Stephan—as Lissenden sees him

THE "MYSTERY" OF RECTIFICATION

IN spite of prolonged research, the actual "mechanism" of the crystal detector is still largely a matter of conjecture. In point of fact the crystal is only one example of a large class of "rectifiers," all more or less mysterious in their action. So far as electrolytic rectifiers are concerned we know that a layer of oxide is formed when the current passes in one direction so as to obstruct any further flow, while no such layer occurs when the current is reversed.

The theory of crystal rectifications most widely accepted depends upon thermo-electric action and the setting-up of a potential difference in one direction across the point of contact due to a combination of the Joule, Seebeck, and Peltier effects. It is claimed, however, that this explanation can no longer hold good in view of the discovery that crystals are capable of rectifying alternating currents of a frequency of over ten million cycles a second, and of the order of micro-amps. It is hardly conceivable that thermo-electric or even chemical changes could take place at such a rate.

M. B.

On Your Wavelength!

Those Resignations

THERE has been an attempt in the lay press to stir up quite a little "sensation" over the crop of resignations amongst the B.B.C. officials that has occurred during the last few months. As a matter of fact, there is nothing startling about it, nor anything that need worry you or me. The talking film people will probably always be able to pay bigger salaries than the B.B.C., for men that they specially want; the B.B.C. cannot and ought not to try to compete with them by offering bigger and bigger "screws," for those that it already pays are quite sufficient to ensure a supply of talent as good as it needs. Don't forget, too, that a great number of the B.B.C.'s people are young men with ambitions. This being so it is quite natural for them to move on when they see any opportunity of bettering themselves. As a matter of fact, I think that a certain amount of change periodically is no bad thing, especially in a Government department, such as the B.B.C. now is. It is the finest of all preventatives of fossilisation.

The Sane View

Though most of us rely for the major part of our broadcast entertainment upon the local station, or one or other of the high-powered fellows, it is undoubtedly a very great pleasure to be able to listen at times to the best of the foreign transmissions. And some of them are so astonishingly good nowadays that in signal strength, quality, and everything else they can be received with almost the same perfection as the home stations. Nuremberg, Turin, Stuttgart, Brussels, Hilversum, Kalundborg and Radio-Paris, to mention but a few, are regarded by many listeners as splendid stand-bys from which they can obtain music of genuinely pleasing quality whenever they want a change from the home stations.

An Interesting Experiment

An exceedingly interesting test was carried out on Derby day by Wireless Pictures (1928), Ltd., who installed Fultographs on both the up and down parts of the Flying Scotsman and received pictures of the race that were broadcast. The receiving set used for the purpose was a McMichael portable, which gave excellent service. It wasn't by any means plain sailing, for the Flying Scotsman is one of the most up-to-date trains in the world and includes a very comprehensive electrical equipment. The Fultograph is rather sensitive to A.C. interference and when you have to receive pictures in the midst of dynamos, electric heaters, electric cookers and so on and so forth, it is rather a big order. Still, things went exceedingly well and the pictures came through clearly enough to show some very thrilling moments during the great race.

Some Queer Results

Readers who go in for long-distance work may have noticed some rather weird happenings, particularly upon the medium broadcast band, of late. With the exception of the last ten days in May, signal strength from distant stations has been wonderfully good on the whole for the time of year. But the curious point is how enormously individual stations may vary in their performances from night to night. Budapest, for example, completely vanished during the last few days of May. He reappeared again as soon as June was in, but his signal strength is a distinctly variable factor. On some nights you will find him roaring in like the local station; on others his strength is just moderate; on others, again, he is on the weak side. Langenberg, Frankfurt, Vienna, Berne, Breslau and Flensburg are amongst other stations that are showing big variations just now. It is exceedingly interesting to keep a record of the performances of stations such as these on succeeding nights.

Daylight Listening

Even the best of receiving sets with a generous reserve of high-frequency amplification can make very little of the majority of Continental stations in broad daylight on the medium waveband. It is not until dusk brings out the reflecting properties of the Heaviside layer that they begin to come in well. But there are many stations on the upper waves which can be picked up at almost any time during the day if one has even a single stage of H.F. amplification. Long-wave stations are not nearly so dependent upon the Heaviside layer for ranging powers. If, therefore, one wishes to hear foreign stations at an early hour it generally pays, when quality is a consideration, to confine one's efforts to the long waves. Fortunately there are many excellent stations in this region to choose from. Huizen migrates to the upper band each evening at 5.40 p.m. and a little below him is Radio-Paris, who, ever since he began to broadcast, has been one of the best received of the Continental stations.

Those who live at some distance from 5XX will be able to receive Koenigswusterhausen, who is always to be relied upon for good programmes. Unfortunately, 5XX's wipe-out is so great at short range that reception of the German station is impossible to many listeners. Motala has not quite the strength that he had when he first began to broadcast, but the transmission is a good one and it is always worth trying for. Kalundborg also is a first-rate station.

French Colonial Wireless

Though her Empire is nothing like so big as ours, France is wide awake to the desirability of keeping in touch with it by means of short-wave broadcasting. On June 11, a great meeting was held in Paris, presided over by the Minister of the Colonies and the Under-Secretary of State for Posts and Telegraphs, to further the cause of Empire broadcasting. The meeting was organised by various important bodies including the French Colonial Institute, the Radio-Agricole, the African Committee and the French Maritime and Colonial League. The proceedings were a great success and there is no doubt that they will bear fruit. I would like to see a movement of the same kind in this country, for I am quite sure that we need it.

Transmitting Tests

I have just heard from a friend who has passed the morse test for his transmitting licence. My morse, I fear, has got rather rusty and I cannot say that I should like to undertake to-day the kind of thing that he had to do. The first part of the test is five minutes' transmitting and five minutes' receiving plain language at twelve words a minute. Then comes transmitting and receiving groups of figures, five figures going to the group and eleven groups (or 55 figures in all), having to be received or sent in one minute. A stiffish test for anyone who has had to teach himself morse, though, of course, comparatively easy to an old hand!

A Useful Acquisition

Morse is a curious business. Some people seem to find it as easy to learn as can be, whilst to others it is astonishingly difficult. Nearly everyone, though, finds receiving much harder than transmitting. If any reader wants to pick up morse quickly, I would strongly recommend the use of the gramophone records containing groups and messages of various kinds which are obtainable. The great thing about these is that you can run them quite slowly at first and then gradually increase the speed. Also, if one misses a letter or two the record can be stopped and made to repeat the missed passage. As soon as you have made a little progress you will find some excellent practice in very slow morse available, if you tune your set down to about 200 metres. There you will discover the direction-finding service for trawlers at work at almost any time at a very slow rate and all numbers are spelt out in full instead of being sent in figures. A knowledge of morse is a very

On Your Wavelength! (continued)

desirable acquisition, especially to the short-waver, for it enables amateur transmissions from all parts of the world to be picked up and identified.

Short-wave Condensers

I have been examining lately some very neat little variable condensers especially designed for ultra-short-wave work. In order to get anything like a full-dial spread for the short-wave amateur bands a very small variable capacity is required. The smallest capacity available in the average type of variable condenser is not lower than .0001 microfarad, and that actually needed is only about .00003. The condensers of which I am writing are arranged in two parts. There is a main semi-variable capacity with a maximum of about .0001 microfarad and an auxiliary variable capacity of .00003. The bigger capacity is used only when coils are changed to go from one waveband to the other. Actual tuning is with the smaller part of the condenser. These little instruments are remarkably well made and I can testify to the fact that they give excellent results on the wavelets.

Television in Germany

By all accounts, very great interest in television is being evinced in Germany. Denes von Mahaly has for some time been working from a Berlin broadcasting station in his tests on the tele-cinema he has designed, while shrouded in secrecy, Dr. Karolus has been developing his system of television. Quite recently this latter inventor gave a press demonstration and it is interesting to note that his system exhibits radical differences from the methods employed by Baird in this country. For scanning the object or person to be televised, a wheel with fifty small mirrors mounted around its periphery is used, each mirror being fixed at a slight angle to the preceding one. A beam from the light source is thrown upon the revolving mirrors and it is then reflected on to the object to be lighted. The object in turn has its own reflected light picked up by a photo-electric cell where the usual conversion to electrical impulses takes place. These cells are specially designed by the Telefunken Co., and are claimed to be particularly free from inertia.

At the receiving end, the amplified impulses eventually control what is known as a Kerr cell. The construction of this cell is based on the electric double refraction of polarised light passing through nitro-benzol. A revolving mirror wheel is used in conjunction to reconstruct the picture, the reflected light being projected on to a square foot screen.

A High-priced Receiver

The synchronising arrangements are rather complicated and delicate, depending for their operation upon tuning fork buzzers kept at constant temperatures. The inventor states that his system is only adaptable to the shorter waves, that is, between 50 to 100 metres, but quite apart from the capabilities of the apparatus the receiver is stated to be priced at a high figure, namely, £400.

For ordinary broadcasting, therefore, the scheme in its present state would appear to be ruled out, especially when we remember that the Baird Co. propose to market a portable television receiver for about twelve guineas.

The Baird System in Germany

Engineers of the Baird Co. have been in Berlin for the purpose of demonstrating the Baird system and according to reports I have heard, these tests have been highly successful. Other Continental countries have displayed far more than a passing interest in the English system and it certainly would be distinctly advantageous if they took it up and sent out regular television broadcasts. The possessor of a Baird receiver would then be in a position to tune in, not only the proposed B.B.C. transmissions, but foreign ones as well, and interest in television as a form of home entertainment would be still further stimulated. Let us hope that the steps taken in this direction will come to fruition at an early date.

Manufacturing Marvels

While down at Woolwich the other day I had the opportunity of going over a portion of the vast works of Messrs. Siemens Bros. and Co., Ltd. It would take bigger phrases than I can muster to describe the enormity of the actual buildings and the variety of electrical goods manufactured there. The battery shops form but a small section of the whole factory, and yet, after a morning's trudging, I had not covered this one section. I was surprised to find that probably 75 per cent. of the work on each dry battery is done by hand and not in the American mass production fashion. Everything is done very thoroughly and at a rough guess I should say that an ordinary H.T. battery necessitates about eighty different processes before it is complete.

When I had seen as much of the factories as was possible in the time I covered the whole ground again, much more at my ease, with a private view of a film which Messrs. Siemens have had prepared, showing the story of manufacture of a battery. I was told that arrangements have been made whereby this film can be sent out in the company of a lecturer to wireless societies, and in my opinion it is just the thing which is needed to make a very interesting evening. Club secretaries should write to Messrs. Siemens to make arrangements for the showing of the film.

Under-worked Accumulators

A good many of us who have been interested for several years in wireless reception are probably using accumulators that are nowadays really too big for the work that they are called upon to do. In the old bright-emitter days we reckoned about .7 ampere per valve or 3½ amperes for a five-valve set. Early dull-emitters drew about .25 ampere, making 1.25 amperes for a set of the size mentioned. Nowadays, when the "point one" valve has become pretty well the standard thing, the five-valver requires not more than half an ampere. But with the development of the screen-grid valve and the pentode heaps of people are using three valves where they had five before, so that the total consumption for a long-range set is often not more than from .3 to .35 ampere, or roughly about one-tenth of what it used to be.

Necessary Conditions

To keep accumulators in their best condition they should be given plenty of work by being regularly discharged and recharged, and the discharge rate should be high enough in proportion to the ampere-hour capacity of the battery to make the service periods fairly short. There is a distinct danger that those who possess sixty or eighty actual ampere-hour accumulators may illtreat them to-day by having them recharged only at intervals of months. The soundest plan if you want to keep your accumulator in good condition is to send it to the charging station once a month, or at any rate not less often than once every two months.

A Suggestion

Turning to those "high lights." You know what I mean. The special "high lights" are those items that you talk about on the 8.20 up to town in the morning. "I say, Brown," you say, "did you hear that top-hole play from 2LO last night?" "No," he says, "I didn't happen to switch on last night. Tell me about it." Like many people, Brown had probably perfunctorily looked at the broadcast programme in his evening paper and had not been attracted by the name of the play to be broadcast. If the B.B.C. had broadcast a small excerpt from the play on one or two previous evenings, after the style of the advance "trailer" of the cinema film, Brown would have known that a specially exciting play was due and would have told his friends.

THERMION

The Photo-electric Cell

WHAT IT IS

WHAT IT DOES

Continued from last week

OF the several metals useful for photo-electricity, namely sodium potassium, rubidium, calcium, and potassium-on-copper, the one most prolific in electron emission is potassium. With normal white light a potassium cell will give the greatest possible current. In the commercial cells referred to the cathodes consist of thick layers of one of these metals.

The size and geometrical form of the photo cell, excepting the vacuum type, has a considerable effect on its action. The gas-filled cell has been found to give best results with a bulb about 5 cm. in diameter, containing electrodes that are approximately parallel planes.

An Osram Vacuum-type Cell

This construction is favoured where the object is to derive the greatest possible photo-electric current, with the maximum proportionality between light and current, and where the cell illumination is between the limits of .01 and 1 lumen (light is usually reckoned in lumens).

Just as in a thermionic valve, the filament determines the emission and the anode potential controls the extent of it, so in a photo-cell the potential applied to the anode determines the operating emission value of the sensitised metal cathode. With a small constant illumination the emission increases progressively with increases of anode potential. With a given light source, the limit to the increase in the emission as conferred on the cell by an increase in anode potential is set by what is known as the glow potential. As its name implies, this is the potential at which the cell becomes filled with a purple glow. At this point the current rises suddenly to a high value and ceases to be dependent upon the anode potential. The cell is in its most sensitive working condition just below the anode potential causing the glow to start.

Another important point in a study of the behaviour of a photo-cell is the variation of the emission with different light intensities. Providing that the maximum light intensity is sufficiently small, the current is proportional to the light; stated more generally, the photo-cell then has an accurate response curve. With greater illuminations this strict proportionality does not hold good and the current tends to increase more rapidly than the light.

To make practical use of the photo-cell it is necessary to amplify the minute photo-electric currents; the valve plays an indispensable part in modern photo-electricity, for by its aid the current of a photo-cell can be increased.

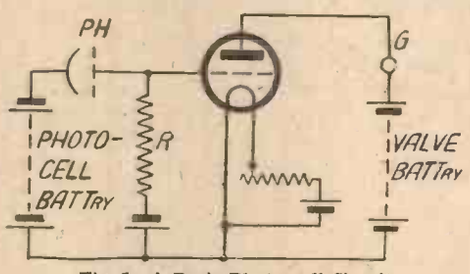


Fig. 1. A Basic Photo-cell Circuit

Photo-cell Circuits

A basic circuit of a photo-cell and one-valve amplifier is shown by Fig. 1. Here the cell can be made to operate a relay G, when light falls on the cathode. For this simple function the resistance R may be omitted. Before light falls on the cell, the grid of the valve, in the absence of the resistance R, is insulated and assumes a slightly negative potential, such that no grid current would flow. With the grid in this condition the valve, which may be a normal super-power type with 150 volts H.T., will pass an anode current of about 20 milliamps.

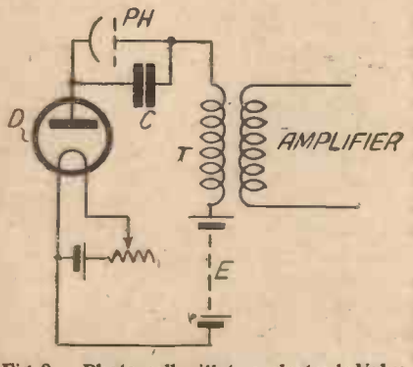


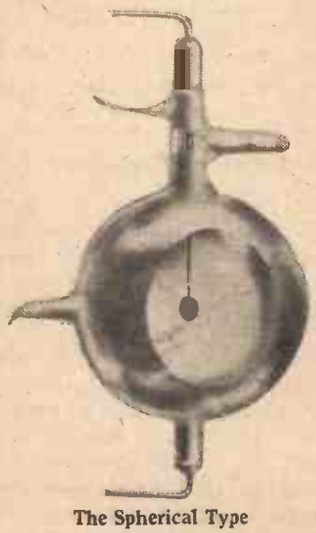
Fig. 2. Photo-cell with two-electrode Valve

When light is allowed to fall on the cell, the photo-cell passes current from the photo-cell battery and this charges the grid negatively; the negative grid potential increases until it reaches a value corresponding to the potential of the cathode of the cell. Before this potential is reached, the anode current of the valve will have ceased entirely. Thus the effect of light on the cell will be to stop the current in the relay G. This simple illustration serves to show how the valve is used to link the photo-cell with the relay mechanism; its application is limited to simple stopping and starting actions.

For more complicated applications, involving the measurement or detection of slowly varying lights, the circuit shown by Fig. 2 has been patented by the G.E.C. Here the photo-cell Ph (which must be of the gas-filled type) is connected in series with a two-electrode valve D, a transformer T and a source of potential E. The action of this circuit can easily be understood by those conversant with wireless practice. In brief, the incidence of light on the cell renders the circuit inoperative, whereas in the absence of light an alternating current is developed.

The peculiar action of the circuit depends upon the condenser C across the photo-cell. The average current flowing round the series arrangements is determined entirely by the current that the two-electrode valve will pass. The current passed by the valve charges up the condenser C until the glow potential of the cell is attained. A current will then flow across the cell, whereupon condenser C will be instantaneously discharged. The glow potential, since it is only maintained by the accumulated charge of the condenser, ceases when the condenser discharges and consequently the glow also

(*Continued in 3rd col. of next page*)



The Spherical Type

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

Improving Transformer Tone

THERE are a number of intervalve transformers which appear to emphasise the higher frequencies. A simple correction may be effected in many instances by connecting a condenser across the primary winding. When such a transformer is employed to couple a detector valve to the first low-frequency amplifying valve advantage may be taken of the tendency to emphasise the higher frequencies by including a stopper circuit as in Fig. 1. It will be seen that a small condenser is connected between the grid and filament in addition to the usual fixed resistance included in the grid lead.

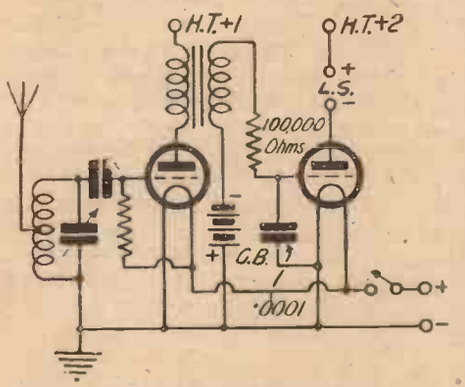


Fig. 1. Where to insert an H.F. stopping resistance

Use a Stopping Resistance

A stopping resistance is employed in many circuits. The function of this little resistance, which may have a value of up to 100,000 ohms is to stop H.F. currents from entering the low-frequency amplifier, and it does this partly by offering a high-resistance in comparison with alternative paths.

Its stopping action may on occasions be improved, however, by connecting a tiny condenser across the grid and filament of the first L.F. valve. This condenser may have a value of from 50-micro-microfarads to .0001-microfarad. A larger value may normally not be used for fear of weakening the higher musical frequencies and, indeed, the combination of fixed resistance and condenser proves so effective that there is little need for greater capacity.

A Novel Volume Control

Receivers of the detector-and-two-low-frequency type that are not fitted with an effective volume control may not provide good quality of reception from the local station because of the amount of magnification.

The chances are that the last valve in the set is being hopelessly overloaded, and the beginner may wonder how best to reduce the signal strength. If a spare valve having a fairly low magnification factor is fitted in the second stage the tendency to overload will be reduced, and I know one or two listeners who use such a valve when listening to a powerful station.

They put back the normal amplifying valve when they wish to receive the more distant stations. This scheme is simple enough, but care must be taken that the grid bias is adjusted when the valve is changed. If this small point is overlooked the anode current will be excessive when a valve having a low magnification factor is used.

Shielding Condensers

In order to obtain a reasonable amount of high-frequency amplification from a stage including a shielded valve it is necessary that the anode and grid circuits connected to the valve be properly screened one from the other.

For this reason, coils having the minimum stray magnetic field are employed; but, unfortunately, it is sometimes thought that, having chosen suitable coils of this type, there is no need to take further precautions. But, as a matter of fact, it is of vital importance so to arrange the circuit that the capacity of the coils and condensers connected to the anode and grid respectively be the minimum. Very often a simple sheet of metal is sufficient to reduce the capacity to so small an amount that no serious troubles are experienced. When very good coils are used, however, the simple screen may not suffice; then it is necessary to thoroughly shield the tuning condensers as well as the coils.

I have proved on many occasions that merely by altering the position of tuning condensers, the set that was liable to oscillate will stabilise. There are one or two types of shielded tuning condensers on the market, and to me it seems they should be more widely used.

Saving a Choke

It is often possible to dispense with one of the high-frequency choking coils used in a two-stage choke-coupled amplifier by connecting the valves as indicated in Fig. 2. The circuit shows one choking coil tapped at its centre. This point is taken to the high tension and the two ends of the choking coil are taken to the anodes of the two valves. Tests show that the magnification obtained from a portable receiver using this arrangement for the high-frequency stages is not very different from

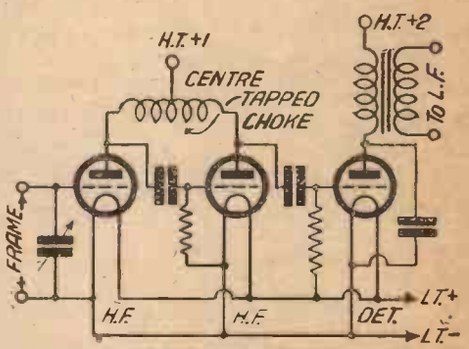


Fig. 2. Simple way of saving an H.F. choke

that provided by the more usual combination.

"THE PHOTO-ELECTRIC CELL"

(*Continued from preceding page*)

ceases. The condenser then starts to recharge. So long as no light falls on the cell this process continues, resulting in a series of current impulses through the primary of the transformer, which passes them on to the secondary.

When no light falls on the cell it cannot pass appreciable current—except during the glow period—but the incidence of light on the cell enables it to pass some current before the glow potential on the condenser, in shunt with it, is attained; this glow potential *will never be reached* if the cell can pass the maximum current of the two-electrode valve, because the cell will discharge the condenser as quickly as the valve charges it.

MODERN ENGLISH MUSIC IN A FRENCHMAN'S EARS

A Critical Comparison—By JEAN SURAC

THE music of to-day, whatever may be thought of it in years to come, does now certainly suffer from a prejudice created by the essential differences in national tastes. For instance, the average Englishman cannot, for the present, find or hear anything melodious or uniform in, what he prefers to term the "ravings" of Bartok and Stravinsky. In what light, then, is modern English music looked at by the foreigner? Is it as incomprehensible to him as Debussy's work was several decades ago and Bartok and Stravinsky are now to the Englishman? Perhaps not quite so pronounced, but nevertheless, different from what the average Englishman would think.

The Effect of Wireless

I, as an average foreigner, a Frenchman, can look upon English music of the modern type and probably throw a sidelight on a subject that is often looked at merely full-face by the English themselves. We in France are often said to be Chauvinistic about our music. This is largely true and especially applies to our provincial towns. Previously, we had been content with our own Gounod, Saint-Saens, Massenet, Bizet, Delibes and the rest, but now with the coming of wireless and the two Daventrys in particular, the veil, which had previously hidden the majority of modern English music from the eyes of the foreigner in his own country, has been lifted and a definite criticism can be formed.

I have made a voluntary and prolonged—for the last four years—business of listening to, one might say, every type of music from all parts of Europe, and so what I write with reference to modern English music may prove valuable as the catalogue of mere personal reactions, which, after all, is what musical criticism is. Frankly, then, I find it difficult to listen to your modern English music when composed on a large scale. Your famous "Planets" Suite by Holst seems but noisy and tawdry, and the works by Vaughan Williams, of whom you think a great deal, dull and sombre. Sir Edward Elgar orchestrates very finely, and has much more vitality than the other composers. Of your big masters, I infinitely prefer Delius, who lives in France, and whose music seems more continental than English. I believe you think of John Ireland as a master, but he seems incomprehensible to me, as if he wrote in a closed cell where there is neither sunshine nor air. Of your younger men, many seem to be imitating our Poulenc and Milhaud, who are only considered as *rigolos*, or clowns, by the French. Honegger is a far bigger master, and it is the fashion to bracket the above three together, hence this mention of his name.

But it seems that the English composers excel in two branches, song-writing and light music. First, Roger Quilter whose muse seems to mirror the English countryside. Then Martin Shaw, who always seems to have something to say and says it beautifully and artistically. Peter Warlock sounds like Delius, which is high praise. A composer, known on the Continent, is Becket Williams, whose simple music is beautiful in its simplicity, and abounding in character. Mention of his name brings to mind a violin sonata of his which I heard broadcast, the last movement of which was like a real breath of fresh air after the introspective meanderings of the moderns. (Have we lost the faculty of writing melodies now?) Both Vaughan Williams and John Ireland seem to succeed better when writing on a small scale, and "Linden Lea" by the former is even better than "Sea Fever" by the latter.

Of the real light music writers, there is no one better than the famous Edward German. Eric Coates in his three Suites, "From the Countryside," "Summer Days," and "Miniature Suite" is very tuneful, and to a somewhat lesser degree is that other comparatively large composition of his, "The Selfish Giant." Alec Rowley is very pleasing, in that he reveals a great amount of English boisterousness and humour; but possibly he tries to write too much on the grand scale, for which he does not seem fitted. Cyril Scott, whose work is well-known in France, was, it is recorded, pronounced by Debussy as being a genius; to me he seems self-conscious. Perhaps, since the recent death of Messager, the French gift for light music writing will cross the Channel.

Is It Environment?

The reader will probably have noticed that in this criticism, my own national prejudice has, quite unconsciously, asserted itself, inasmuch as I apparently invariably appreciate those composers who lean toward the Continental style, which only constitutes further proof that this prejudice, born of environment and those other countless influences, besides language is a force to be reckoned with. My impressions related in this article will undoubtedly change as, with the passing of the months, I seize increased opportunities of acquainting myself still further with typical modern English music.

Among the many branches of the Army, the Signal Corps is one of the most important. The photograph shows recruits being instructed in the mysteries of field wireless

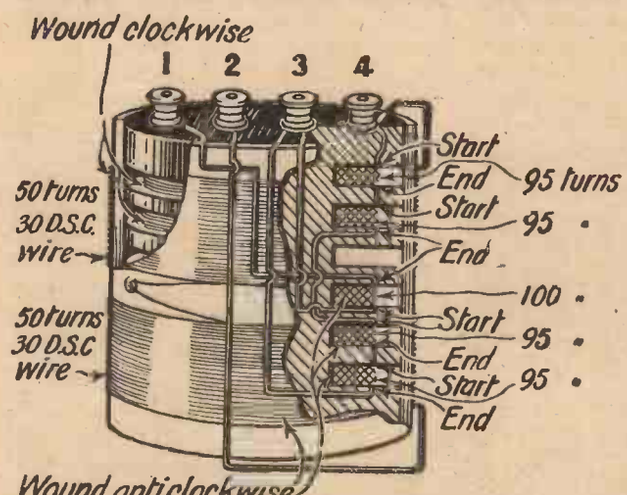
THE START OF BROADCASTING HOUSE

A SYNDICATE is erecting Broadcasting House on behalf of the B.B.C., and very shortly the preliminary work in connection with the excavation and foundations for the new building will be commenced, in the good hands of the well-known firm of contractors, Messrs. Holland & Hannen & Cubitts, Ltd. An interesting engineering feature of the work will be the construction of a great retaining wall enclosing the boundaries of the site. The architect, Lieutenant-Colonel G. Val Myer, F.R.I.B.A., has somewhat modified the external design of the building from the drawing which was published last autumn. The new design makes fuller use of the space afforded by the site. The whole of the studios will be arranged as originally conceived, enclosed within their insulating brick tower. Some idea of the outside appearance of the building may be gained from the accompanying illustration. The new Broadcasting House will incorporate a super-studio or concert-hall, with its large floor space, orchestra, and gallery, capable of accommodating nearly a thousand people.

The modified design of Broadcasting House upon which work is to be commenced immediately

WINDING THE COIL FOR THE "ARCADIAN PORTABLE"

MANY readers made up the "Arcadian Portable" with the special dual-range coil incorporated therein, or have used this coil in other receivers such as the Daventry-Local crystal set described in AMATEUR WIRELESS, No. 361. For proper working it is essential that this coil should be made up as originally described on page 462, No. 354, and to prevent any confusion it is considered advisable to give here fuller constructional details.



This diagram shows all the necessary constructional details

To begin with it will be seen that the coil consists of two coils mounted concentrically, both windings being placed in parallel for the short waves, but only one being used for the long waves. The external former is simply a small solenoid wound on Paxolin or similar insulating material, while the inner former, which carries the long-wave winding, is a grooved bobbin on which the terminals are mounted.

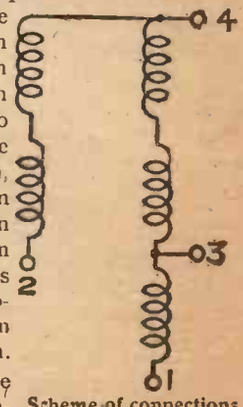
The Paxolin former should have an outer diameter of 1¾ in. and an inner diameter of 1⅝ in., the total length being 2 in. It carries the short-wave winding in two halves, and the extreme ends are secured by being threaded through two small holes at the ends of the former.

Wind on in a clockwise direction, starting from the end of the former which, for sake of reference, we will term the top end, fifty turns of No. 30 d.s.c. copper wire. This will bring the winding to about the middle of the length of the former, and the last turn should be secured with a spot of sealing wax. Then, reversing the direction of winding and starting about a quarter of an inch away from the end of the first winding, put on another fifty turns of the same wire. Leave about 4 in. of wire to spare at each end of the whole winding.

Now turn your attention to the long-wave coil. Again, for the sake of reference, the terminal end of the bobbin will be referred to as the top end, and the slots will be numbered 1, 2, 3, 4, 5, and 6 from this end. Connect terminal No. 4 to a spool of 28 d.s.c. wire and wind ninety-five turns, clockwise, in each of the first and second slots. Now carry the wire through two slots and, in an anti-clockwise direction wind ninety-five turns in the fifth and sixth slots. Finally, carry the end of the winding back to terminal No. 3.

Solder a further length of 28 d.s.c. wire to this terminal and then proceed to wind 100 turns in the fourth slot, in the same direction as the windings in the fifth and sixth slots.

The long-wave bobbin should now be slipped inside the outer former, so that the two top ends correspond. It is for this purpose that a note should have been kept of the direction of the winding. On the slots nearest to the terminals on the long-wave bobbin, the windings are in a clockwise direction and the windings on the former, which is slipped over this bobbin, should also be in a clockwise direction.



Scheme of connections

It is a very simple matter finally to complete the coil by making connections to the terminals at the end. One end of the reaction winding has already been connected to terminal No. 3, and the other lead should be connected to terminal No. 1. Terminal No. 3 already has two connections to it, and terminals No. 2 and 4 should be connected to the end and start respectively of the outer former. The loose wire from the first slot of the long-wave bobbin should also be connected to terminal No. 4.

This completes the construction of the coil. An accompanying sketch shows the foregoing details in pictorial form, while a second diagram shows the actual connections of the windings.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

MABEL CONSTANDUROS deserves a whole page of AMATEUR WIRELESS to herself, and I wish I could give it to her. At the time of writing, the latest sketch I have heard is *Mrs. Hamblett Insures Herself*, and it was a "fair treat."

The best part about our Mabel is that she never repeats herself, and each new sketch is better than the last. I had many hearty laughs over the insurance interview. Mrs. Hamblett's deduction that if she had a fire she would get six months and if she didn't she would lose her two shillings was excruciatingly funny.

◆ ◆ ◆

"The Hour of Requests" from Birmingham via 5GB should be repeated very soon and *ad lib*. It must have been encouraging to the artistes to know that they were rendering music which was actually wanted, and the encouragement was evident in the fine manner in which Robert Easton and the Birmingham Studio Augmented Orchestra sang and played respectively.

Robert Easton has a particularly good bass voice. His "Myself When Young" was masterful.

◆ ◆ ◆

Here is a short list of artistes who have been heard to advantage recently. There are too many for me to deal separately with them.

Clara Evelyn, Gershom Parkington Quintet, Norman Griffin, Victor Olof, Billy Mayerl, Chief Os-Ke-Non-Ton, J. H. Squire Celeste Octet.

A bouquet to each!

◆ ◆ ◆

You will remember that in answer to a Northfields correspondent I told him that I expected "The Foundations of Music" would go on until we knew all there is to be known about it.

"Sostenuto," of Chertsey, has taken me to task about it. He accuses me of flippancy regarding a serious matter and, what is more, says that I was merely having a "sly dig."

◆ ◆ ◆

Although my answer to "Northfields" may have read flippantly, I can assure "Sostenuto" that what I said was meant seriously. In setting out to give us the foundations of music the B.B.C. have set themselves an enormous task. Even though we are given recitals six times a week, the amount we have still to learn is immense. There is no limit to the scope, and that is why I held out no hope for the correspondent who looks forward to the end of the series.

◆ ◆ ◆

There is great justification for anyone who may say that the second act of *Tosca* is too much for them. *Tosca* is one of the heaviest of the Italian operas, and the second act is about the heaviest portion of it all.

The sounds which issued forth during the beginning of the broadcast must have been rather puzzling—and startling—to many. "E.B.," of Putney, wants to know "how many people can call those agonised yells, music." As a matter of fact, those sounds of anquish were meant to sound like agonised yells. We miss a lot by only listening to an opera, because, unless we have the *libretto* before us or are acquainted with the "story," many of the vocal effects do indeed sound like nothing on earth.

◆ ◆ ◆

Gordon McConnel's *Wallah! Wallah!* was at least unusual. Nevertheless, it was a bright show, and passed the time away pleasantly.

◆ ◆ ◆

I was going to mention that the running commentary on the Derby was thrilling, but there is no need to revive painful memories. I wonder how many punters stamped on their loud-speakers when the result was announced!

◆ ◆ ◆

"Charles K.," of Acton, is an earnest student of broadcast dance music, and he pays so much attention to it that he has noticed—I wonder how many others have?—that there has been a subtle difference in Jack Payne's Band of late. He asks me if he is hearing aright, and if so—what is it?

The fact of the matter is that Payne has added three more players to his combination—the instruments being two violins and a viola, making the "string section" no less than seven strong. The result is that more symphonic effects can be introduced, and the subtle difference my correspondent noticed is, no doubt, an improvement.

◆ ◆ ◆

Mr. A. Lee, of Leytonstone, is getting "rather tired of the Bach cantatas." He uses stronger language than this, and I do not propose to quote his letter.

I would say to him—and many others who want their pet aversions cut out of the programmes—that in a big communal undertaking, like national broadcasting, everybody's tastes must be taken into account.

◆ ◆ ◆

Some of us loathe the sob-stuff which is sent across the ether by American nasal singers; but there are doubtless thousands of listeners who drink in every word and note of these silly songs. The B.B.C. cannot please everybody all at the same time.

The average value of each receiver sold in the United States during the first quarter of 1929 was £33.

Jack Melford, Binnie Hale and Bobby Howes who broadcast an excerpt from "Mr. Cinders" at the Adelphi, on June 21

The LO CONT

HERE is a good idea. If you are out in search of an up-to-date three-valver for the reception either of the local station or a number of foreigners at reasonable loud-speaker strength, then this novel scheme should appeal to you.

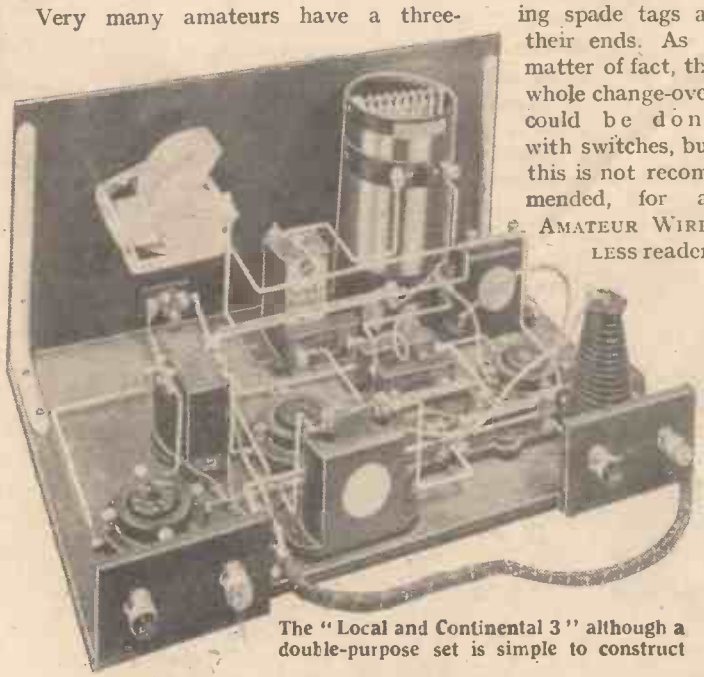
In brief, in this "Local and Continental 3" matters are arranged so that it is possible in about a couple of minutes to change from a three-valve circuit employing a screen-grid H.F. stage, an anode-bend detector, and one transformer-coupled L.F. stage, to another three-valve circuit having a detector and two L.F. stages.

Two Different Receivers

This, you must admit, is an idea which has much to commend it. It means that you have at your command really two entirely different receivers, and this at the cost of but one extra valve and of one or two small components. It means that instead of endeavouring to design one receiver to be efficient for the dual purposes of local-station purity and distance-getting sensitivity (always a very hard job to achieve with success), the circuit is altered in its essentials for each separate task.

Very many amateurs have a three-valver with one screen-grid stage and find it quite a good thing when they want to impress their friends with the extent of the DX bag available. But, and this is a snag, purity is not always equal to that given by the rather simpler detector and two L.F. three-valver. This latter circuit, however, is generally not capable of putting up so fine a performance of reaching out to the Continental stations.

Here in this one simple receiver we have all the essentials of the good points of these two entirely different three-valve circuits.

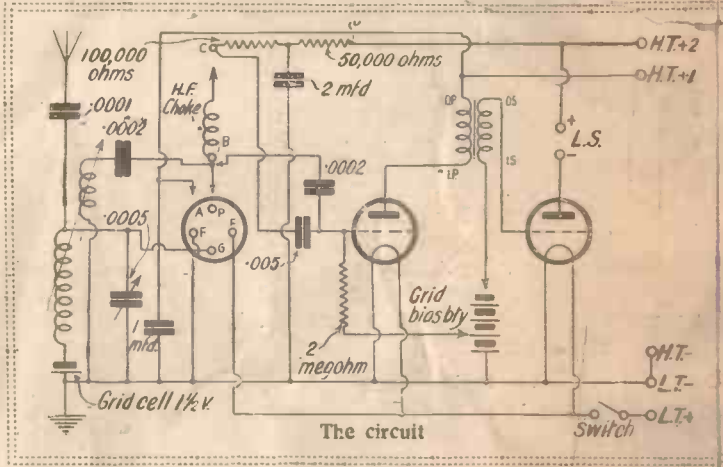


The "Local and Continental 3" although a double-purpose set is simple to construct

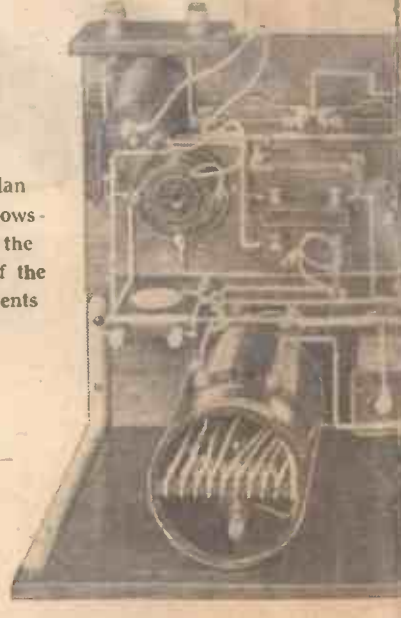
TWO RECEIVERS IN ONE:—

The change-over from one to the other is extremely simple and is effected without altering any of the standard wiring. All that has to be done is to change the screen-grid valve for a normal three-electrode valve or vice versa and to shift the positions of two or three short flex leads carrying spade tags at their ends. As a matter of fact, the whole change-over could be done with switches, but this is not recommended, for as AMATEUR WIRELESS readers will know, switching is never to be advised in the H.F. stage. The fact is mentioned, however, simply to show that the changing over of the flex leads is no difficult task.

You will at once want to know how it is that this rather complicated metamorphosis can be effected so simply. A glance at the circuit diagram will make this quite clear. It will be noticed that a 1½-volt biasing cell is included in the aerial circuit. This ensures efficient working of the screen-grid valve as an H.F. amplifier, and when the screen-grid valve is replaced by a three-electrode valve of correct characteristics, ensures its proper working as an anode-bend detector. There is a flex connection from the H.T. + 1 tapping which is taken to the screen-grid electrode of the S.G. valve and is left hanging when a detector valve is employed. A further tapping allows a .0002-microfarad grid condenser to be used when the middle valve is acting as a detector, while a .005-micro-



The circuit



This plan view shows clearly the layout of the components

CAL & INENTAL 3

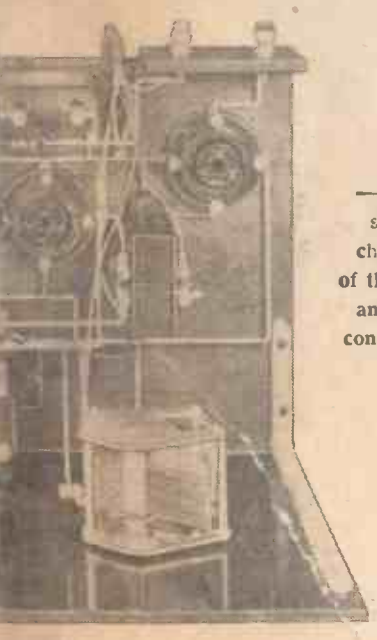
S.G., DET., L.F., or DET., R.C., TRANS.

farad condenser is in circuit when this valve is acting as the R.C. amplifier. Another flex connection allows an anti-motor-boating unit to be put in or out of circuit, according to whether the first valve is acting as an H.F. amplifier or as a detector.

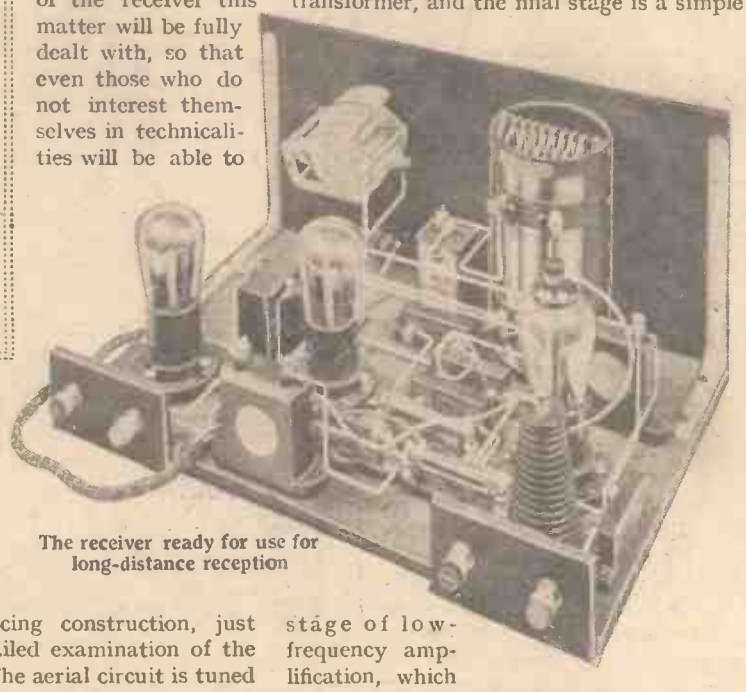
It is unnecessary to stress the fact that the change-over needs no skill whatsoever, nor tools of any kind. The wiring diagram (page 860) shows how the change-over is effected, and in the notes on the operation of the receiver this matter will be fully dealt with, so that even those who do not interest themselves in technicalities will be able to try out the advantages of both circuits available, and to make the receiver suitable for home or abroad reception.

LIST OF COMPONENTS

Ebonite or bakelite panel, 14 in. by 7 in. (Raymond, Trix, Becol, Ebonart, Paxolin).
Two ebonite strips, 3½ in. by 2 in. (Raymond, Becol, Ebonart, Paxolin).
.0005-microfarad variable condenser (Polar No.3, Lissen, Burton, Igranic, Cyldon, Ormond, Utility).
All-wave tuner (British General).
Push-pull switch (Bulgin, Lissen, Trix, Benjamin).
Panel brackets (Bulgin, Camco).
Baseboard, 14 in. by 9 in. (Pickett).
Three anti-microphonic valve holders (W.B., Lotus, Benjamin, Lissen, Wearite).
.0001-microfarad fixed condenser (Lissen, Dubilier, T.C.C., Trix).
Two .0002-microfarad fixed condensers (Lissen, Dubilier, T.C.C.).
.005-microfarad fixed condenser (Lissen, Dubilier, T.C.C.).
1-microfarad fixed condenser (Lissen, Dubilier, T.C.C.).
2-microfarad fixed condenser (Lissen, Dubilier, T.C.C., Ferranti).
100,000-ohms resistance, 50,000-ohms resistance (Graham-Farish, Varley, Lissen, Dubilier, Mullard).
2-megohm grid leak (Graham-Farish, Lissen, Dubilier, Mullard).
Three resistance holders (Graham-Farish, Lissen, Dubilier, Mullard).
High-frequency choke (Tunewell, Varley, Trix, Peto-Scott, Wearite).
Low-frequency transformer (Igranic type J, ratio 6 to 1, R.I., Ferranti, Philips, Mullard).
Eight-way battery cord (Lewcos).
Four terminals marked Aerial, Earth, L.S. +, L.S. − (Belling-Lee, Eelex, Igranic, Burton).
1½-volt grid cell (Siemens, type G.T.)
Connecting wire (Glazite).
One yard of thin flex (Lewcoflex)



—and the simple character of the wiring and panel construction



The receiver ready for use for long-distance reception

The Circuit

Before commencing construction, just make a more detailed examination of the circuit diagram. The aerial circuit is tuned by means of a composite tuner, the connections of which are shown in the diagram, and it must be borne in mind that the aerial circuit is tuned by a composite tuner, the connections of which are shown in the circuit. This is a tapped tuner and covers a wide wave range, and it will be noticed also that it incorporates a moving reaction coil. To ensure smooth control of reaction this coil is placed in series with a .0002-microfarad fixed condenser, thus providing reaction in the semi-Reinartz manner. A .0001-microfarad condenser is placed in series with the lead to the aerial terminal on the tuner, and this results in a satisfactory degree of selectivity. There is an H.F. choke, which is used either as the H.F. stopper for the detector valve or as the anode choke when this first valve holder is occupied by a screen-grid valve. There is a 100,000-ohm resistance in series with a 50,000-ohm resistance, the former being the normal anode resistance and the latter the resistance forming part of the anti-motor-boating unit. The junction of these resistances is connected to a 2-microfarad condenser to earth. There is a .005-microfarad condenser which forms the grid coupler when the middle valve acts as an R.C. stage and (as mentioned) a .0002-microfarad condenser for this valve, when it is acting as a detector.

The grid of this valve is taken through a 2-megohm grid leak to a variable tapping on the grid-bias battery. As will be explained in further detail in the operating notes, this tapping is made a few volts negative when the valve is acting as an L.F. amplifier and slightly positive when it is acting as an anode-bend detector. In its plate circuit is connected an ordinary L.F. transformer, and the final stage is a simple stage of low-frequency amplification, which remains constant, despite the alterations in the H.F. and aerial circuits. The components as shown in the list above will be required for the construction.

Constructors would be wise to get the blueprint, which is obtainable for this receiver, price 1s., post free, from Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. In this particular instance it is of the greatest convenience because, apart from facilitating construction, it shows how the leads

"THE LOCAL AND CONTINENTAL 3" (Continued from preceding page)

are changed round to alter the circuit as required. It should be hardly necessary to point out that the print also shows the exact position of the components and of the wiring and can be used both as a drilling template and a guide to making the connections.

The Layout

For the benefit of those who are not quite *au fait* with the components included in this receiver, we may describe their positions on the baseboard.

The panel carries the tuner, with its aerial tapping and reaction control, the aerial tuning condenser, and a simple filament switch which is in circuit with all three valves. It is an advantage to have this switch on the front of the panel, so that the set can be turned on and off without any fumbling with the batteries at the back. On the baseboard and grouped round the tuner we have the 1½-volt grid-bias battery and the 1-microfarad condenser, which is connected between the screen grid and earth. There are three small baseboard-mounting fixed condensers, these being the .0002-microfarad condenser in series with the reaction coil and the two grid condensers for the middle valve. Just in front of these (that is, nearer to the back of the baseboard) are three resistance holders carrying the grid leak, anode resistance, and anti-motor-boating resistance. At the extreme right-hand corner of the baseboard, near the strips supporting the aerial and earth terminals, are the H.F. choke and .0001-microfarad condenser in series with the aerial lead.

Construction

The first constructional operation should be to drill the panel for carrying the components and also to drill the small holes through which wood screws and bolts are passed to attach the panel to the front edge of the baseboard and to the L-shaped supporting brackets. The aerial condenser and filament switch are one-hole mounting components, and the tuner is very simple to mount, because it necessitates only two holes, and the positions of these can readily be located. When the holes are drilled the panel should be attached to the baseboard and to the "L" brackets before the components are mounted.

There is no reason why all the baseboard components should not be mounted all at once, for there is plenty of space to allow easy soldering.

It will be noticed that for convenience terminals are provided only for aerial, earth, and loud-speaker. All the battery connections are made by means of a long multi-cable, carrying wander plugs and battery tags at the extremities.

In a concluding article, next week, the wiring will be described and full operating details will be given, together with instructions for changing rapidly from one circuit to another. Do not forget that, as with all AMATEUR WIRELESS sets, this "Local and Continental 3" is on show in the Somerset Street windows of Messrs. Selfridge & Co., Ltd.

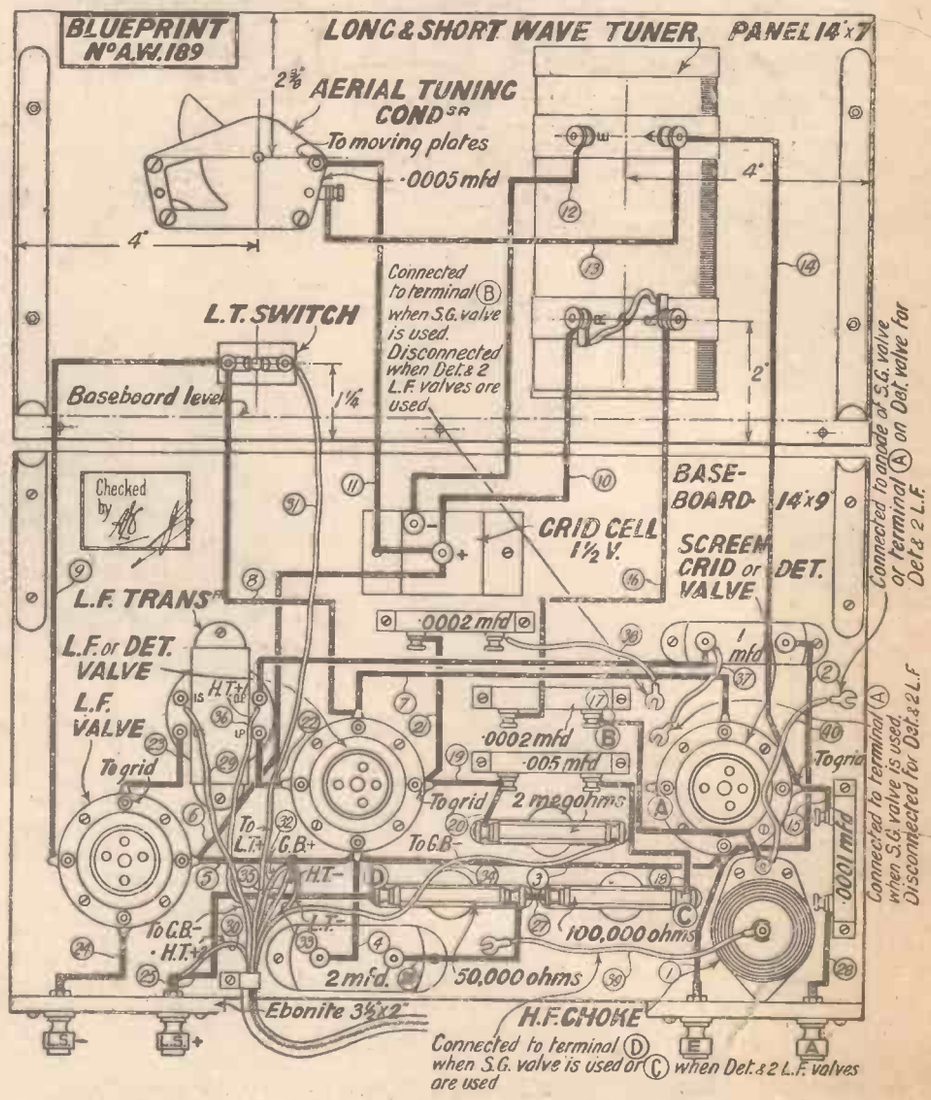
A new wireless communication company utilising short-wave channels has just been incorporated in Canada. The new concern is Trans-Canada Communications, Ltd., and operates one short-wave station in Winnipeg (CJRX) on 25.6 metres.

After a year's trial the wireless transmission from Berlin, to the larger German cities, of the thumbprints of criminals has proved so satisfactory that the service is now to be supplemented by the establishment of Lorenz-Korn transmitters in a further six cities. These will be followed by other similar plants.

CONDENSER MICROPHONES

A NEW type of condenser microphone is described by Professor Foley, of Indiana University, in a recent paper read before the National Academy of Sciences. It consists of two rigid metal plates separated by an air space. The plates do not vibrate. They are initially charged with a biasing voltage so as to form a condenser with an air dielectric.

The sound waves from the speaker's voice are impressed upon the air between the plates so as to set up differences in the normal air pressure. As the dielectric value of air alters with its density, corresponding differences of voltage will appear across the condenser plates. These voltages are used to modulate the carrier wave in broadcasting. As there is no solid vibrating diaphragm, there can be no distortion due to inherent resonance effects. M. A. L.



The wiring diagram of the "Local and Continental 3." A full-size blueprint is available, price 1/- from these offices

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"A.W." TESTS OF APPARATUS

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

Philips Lightning Arrestor

WITH the vagaries of the English climate, the wireless user naturally wishes to be well protected against possible damage to house and property caused by lightning striking his aerial. The simplest form of protection is perhaps to connect the aerial to earth, but in order that this scheme may be truly protective, the switch should be placed outside the house, thus providing the shortest possible path between aerial and earth.

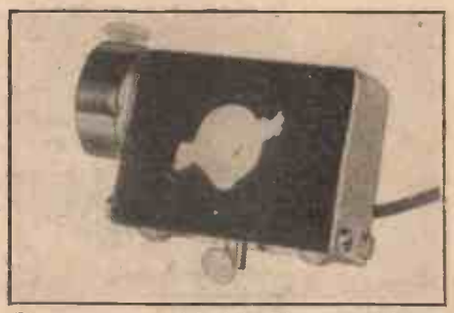
One disadvantage of a switch to connect aerial to earth is that the personal factor enters into the question, that is to say, the householder must remember to switch the aerial to earth after using the set; and during the day, should he happen to be away, there is always anxiety, in the event of a thunderstorm occurring, as to whether the aerial has been earthed.

Probably the most convenient safety device is the automatic spark gap which, when placed outside a house between aerial and earth, provides a rapid path to earth for any powerful electrical discharge but does not interfere at all with the operation of a radio set. The success of this scheme depends wholly on making this gap as attractive as possible to an electric discharge. The presence of air in the gap causes a large electrical resistance to a

Philips Lightning Arrestor, having the electrodes in a gas-filled bulb

discharge, therefore it is preferable to fix the two electrodes of the gap in a tube containing certain gases having less resistance to high-frequency currents.

We have tested this week a lightning arrestor marketed by Messrs. Philips Lamps, Ltd., of Philips House, Charing Cross Road, W.C.2. The massive electrodes of this component terminate in two sets of pointed teeth placed approximately 1/32 in. apart and enclosed in a glass gas chamber. This device forms a particularly attractive path to the lightning and should form a suitable protective device when fitted in the aerial and earth circuit. The top of the device is covered by a bell-shaped porcelain insulator which serves to keep all dirt and moisture from forming an alternative high resistance. The capacity between the electrodes was 3 micro-microfarads. The component is well-made and can be recommended.



The tone-arm model of the Blue-spot pick-up, which gives a wide frequency response

Blue-Spot Pick-up

ELECTRICAL pick-ups for use with gramophones have now been in use for many months, during which time the earlier types, which served more as experimental models, have improved to such an extent that they bear no comparison to the latest forms of pick-up, both as regards their reproducing and record-wearing qualities.

Amongst the new types of pick-up recently introduced is the Blue Spot Ideal, marketed in this country by F. A. Hughes and Co., Ltd., of Great Portland Street, W. In this model the needle causes a reed to vibrate between the poles of a powerful magnet on which a winding is placed. The mechanism is enclosed in a rectangular metal case and can either be obtained with a tone arm and volume control or obtained separately with an attachment for fixing to a standard tone arm.

We were quite impressed with the results obtained after the pick-up had been connected to our standard purity amplifier. The tonal balance was satisfying to the musically inclined and did not over-accentuate, to any serious extent, any particular section of the audible range. The low audible frequencies were in evidence as were also the middle frequencies. Scratch was hardly noticeable, thus indicating a cut off in response to the higher frequencies. This, however, was not serious enough to cause drumming in reproduction.

This pick-up is moderately light and should not cause serious record wear. It can be recommended as an efficient electrical reproducer.

Novel M.C. Loud-speaker

ALTHOUGH moving-coil loud-speakers have changed little in design since their inception some years ago, considerable attention has been paid to details such as the electro-magnet and coil suspension. In consequence their sensitivity to weak input has increased almost beyond comparison.

Such improvements have not been attained by the use of unwieldy magnet pots, for special steels are now employed, giving a higher flux density in the gap. Then, again, the development in suspension systems has made possible the use of a narrower gap.

An interesting moving-coil speaker marketed in this country by Messrs. Rotor Electric, Ltd., of 2-3 Upper Rathbone Place, W.1, has just come into our hands for test and report. In appearance this speaker resembles a reed-driven cone, so compact is the magnet pot. A 9-in. cone is suspended by a thin fabric surround to a metal framework, the top of which stands 11 in. from the base of the magnet pot. The 1¼-in. coil is suspended in a narrow

Rotor moving-coil loud-speaker of novel design

gap by a fool-proof centering device clamped to the pot, and has a high-resistance winding.

The performance of the speaker could fairly be described as above the average, for its sensitivity and uniformity of response throughout the audible register were noticeable features. Some moving-coil speakers have a reputation for unduly accentuating the bass, even when the coil impedance is correctly matched to the preceding valve or valves; in this speaker, however, the treble and bass appeared well matched.

RADIOGRAMS

THE vaudeville entertainment to be given at the 2LO studio on June 29 will include turns by Will Evans, Nora Emerald, Florence Oldham, Geoffrey Gibson, George Morgan, and a relay from the London Palladium.

The Swallows, a little-known opera by Puccini, is down for broadcast from the London station on June 26.

Lord Brute, a play by William Gerhardi, specially written for broadcasting, will be transmitted from 5GB on July 10, and from 2LO, 5XX and other stations on the following evening.

On July 5, through 2LO and 5XX, listeners will be given a studio performance of *Betty in Mayfair*.

To celebrate France's National Fete Day on July 14, a special French programme will be broadcast from 2LO on the following day.

Every Sunday morning, the Hamburg station broadcasts a musical concert from 7 to 8.15 a.m. B.S.T. The entertainment opens with a relay of chimes followed by an orchestral programme relayed from one or other of the German trans-atlantic liners which may happen to be in port.

In view of atmospheric disturbances during the summer months, the German stations have suspended their weekly rebroadcasting of foreign programmes.

Gaelic is taking a prominent place on Scottish broadcast programmes, thanks largely to the efforts of Mr. Neil MacLean, director of the Aberdeen station, who is himself a Gaelic enthusiast and a favourite singer at Highland gatherings.

It is a novelty to find the town dweller turning to the village for his entertainment. Yet that is what is being done in an Aberdeen broadcast programme, with an attempt faithfully to portray the lighter side of life in a present-day rural community in the north of Scotland.

Listeners in and around Innsbruck, Austria, are bitterly complaining that the 500-watt station is not "getting out" properly, and nothing but relays of Graz and Vienna are being transmitted. Hence the listeners have just refused to pay the yearly tax on their receivers. It has now been decided that Graz is to be increased in power and modifications are to be made to the Innsbruck station, although the engineers claim that the bad results are due to the mountainous nature of the country.

While radio broadcasting is but eight years old, laws relating to wireless have been in operation for twenty years. The first law on radio was the Wireless Ship Act of June 24, 1910, which specified that any ship carrying over fifty persons must be equipped with a wireless transmitter and receiver capable of sending and receiving messages at least 100 miles.

The Federal Radio Commission has granted an experimental licence to the General Electric Company for its station, W2XAG, at Schenectady, New York, to use 200,000 watts from midnight to morning. Experiments will be carried on five frequencies—550, 660, 790, 1,150 and 1,500 kilocycles.

The requirement that all American ocean liners must be equipped with automatic devices for receiving signals of distress should be included in any radio legislation enacted by Congress was advocated before the Senate Interstate Commerce Committee at Washington recently. Reference was made to the sinking of the *Vestris*.

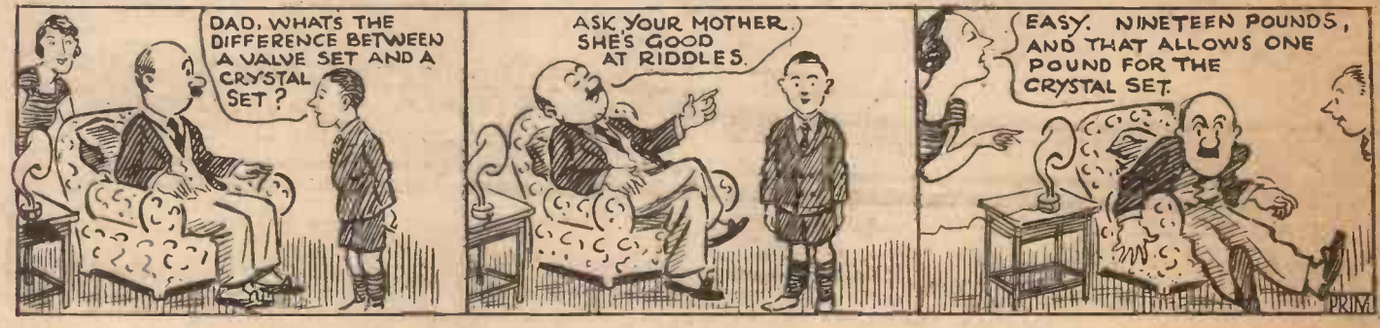
Less jazz and more church services, as well as good orchestral music, are what the Swedish radio public wants, the Royal Board of Telegraphs, which has charge of broadcasting in Sweden, has learned from a country-wide questionnaire.

Mr. O. H. Calwell, former Federal Radio Commissioner in America, stated that the broadcasting stations in the United States represented £5,000,000 in plant equipment.

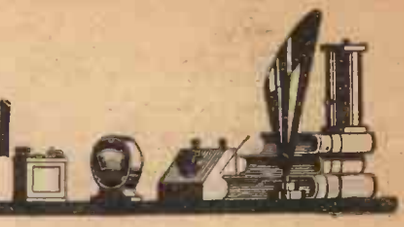
The United States Department of Labour has estimated that the average weekly wage in the radio industry is £5. Multiplying this by the 350,000 persons employed by the industry and the pay roll amounts to £1,750,000 a week, or more than £90,000,000 a year.

MRS. FLEX KNOWS THE DIFFERENCE—

—BETWEEN A VALVE SET AND A CRYSTAL SET!



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

Transformer Design.

Q.—*Can you advise me where I can obtain data relating to the design and construction of small-power transformers? We have alternating current supply here and I wish to experiment with the construction of a mains unit for H.T. supply.—S. K. (Notting Hill).*

A.—The issue of the *Wireless Magazine* dated June, 1929, now on sale, contains just the data you require. We refer you to the notes on the construction of a low-tension battery charger. Although the transformer design as given will not be suitable for H.T. supply purposes, the principles involved in the design of this transformer, and as so clearly explained, will enable you to arrive at a suitable design of transformer to meet with your needs.—C.L.

A TECHNICAL NOTE

The Lightning Risk.

A number of the letters we have received during the past two weeks have dealt with a somewhat topical question, to wit, that of lightning. The point at issue has been the earthing of the aerial, either during a lightning storm or during the time the receiving set is not in use. Quite recently Thermion discussed this subject briefly in "On Your Wavelength," and in doing so advised the use of a double-pole switch for disconnecting the aerial altogether from the receiver when switching the aerial to earth. There is no doubt that this is the best course to follow, but there is very little point in disconnecting the aerial from the receiving set and connecting it to earth if the earth lead runs through the house before reaching earth proper. If the best earth obtainable is one remote from the aerial then a second earth should be used near to the aerial so that this can be used for earthing the aerial when not in use. The best earth can be retained for when the receiver is actually in use. In this way the aerial can be connected directly to earth without the earth wire running through any part of the house. A suggestion from one reader, an electrician at that, to the effect that "Leaving the aerial dangling in mid air, without being earthed, appears to be a satisfactory solution to the difficulty" should not be considered at any cost. An aerial left dangling thus can store up an appreciable amount of static energy, even though a lightning storm is not or has not been in progress, and as soon as the aerial is touched by any person the static electricity will discharge to earth through the body. In some cases this would be fatal. In any case, it would mean a nasty shock for the person touching the aerial. The advice we tender is, use a double-pole switch for earthing the aerial and see that this switch has a fairly substantially insulated handle to permit safe handling of the switch, if necessary, during a lightning storm.

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.

LETTERS TO THE EDITOR

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

The 420-480-metre Gap

SIR,—Regarding "Thermion's" remarks *re* the weakness of signals on the 420-to-480-metre portion of the broadcast band, has he or any of your correspondents ever noticed how comparatively sharp tuning is between these wavelengths? My tuning is very flat, and further down the band Cologne, Kaiserslautern and Stuttgart, and higher up Munich and Budapest, often require about nine degrees of the condenser to be tuned out, whilst Langenberg and Frankfurt, which I sometimes get even more strongly, can be completely eliminated in about two degrees.

G. A. K. N. (London, N.W.).

"A New Dry-plate Rectifier"

SIR,—Our attention has been directed to the fact that in an article entitled "A New Dry-plate Rectifier," which appeared on page 772 of the issue of AMATEUR WIRELESS, dated June 1, you stated that a high-tension rectifier connected up as a double-wave unit and capable of delivering from 60 to 100 milliamps costs 27s. 6d. only, but we would like to point out that this price is incorrect.

The high voltage rectifier is supplied at the list price of £1 17s. 6d.

IGRANIC ELECTRIC CO., LTD. (London).

5GB in Ireland

SIR,—In your issue of June 1, a Dublin reader states that "5GB is one of our worst stations here in Dublin," and that a recent issue of your paper also contained a paragraph stating that in the south of Ireland, Toulouse is heard better than 5GB It may interest the B.B.C. to know that such is not the case here as 5GB is our *best* station on the medium waves (and gives equally as good results as 5XX on a moving-coil speaker) whilst perhaps Toulouse or London may be called our next best. KILOWATT (Donegal).

5GB and Fading

SIR,—My experience of 5GB with a four-valve set, 160 volt H.T. and a non-screened aerial *average* height 60 ft., in the West Riding of Yorkshire, twenty miles from Lancaster, was that it was not worth listening to, fading being acute and even at maximum strength not up to Newcastle, Radio Paris, Kalundborg (lovely there!), and, of course, Manchester, together with various other foreigners.

From experience, I can say divil the bit of good it does asking the B.B.C. to cut out evening talks from 5XX; according to their own report, these are very popular.

Thank goodness that the grasping foreigners can't collect fees for the entertainment we get from them.

Honestly, though, regarding the old query: "Does 5GB fade?"—the answer is "I should shay sho."

One question for those living at a distance from local stations and relying on 5XX: Why are outside broadcasts purer than studio transmissions? And, again, on 5XX, why do transmissions from (apparently) different studios vary so tremendously in the same evening—bands will be crisp and bright and yet speech and songs will tear the soul out of anyone with an ear? P. C. D. (Christchurch).

The Regional Stations

SIR,—I wonder whether you or any of your readers would give me an answer to what I hope is a plain question, but to which everybody I have asked is either unable or unwilling to reply.

It is this: When the Regional Scheme is completed will it mean that spaced round our sets' dials there will be powerful English stations that will completely obliterate all foreign stations? If this will be so, what will be the use of any but simple sets?

So far as I personally am concerned such an occurrence will be the end of at least half the interest I take in wireless. I have put this point of view to various people and find among them a considerable proportion

(*Continued on page* 868)

LETTERS TO THE EDITOR

(*Continued from page* 866)

who scoff at foreign broadcasts and say that even when one has picked them up they are not worth listening to. I deny that this is so if one has a sufficiently good set; and if we are to be shut off from Barcelona, Milan, Rome, and others, I maintain that the dog-in-the-manger state of things will do great damage to the wireless industry. The fact that the sale of wave-traps seems to be swelling surely proves that there are many like me who, finding that the B.B.C. output has its dull moments, welcome the present possibility of tuning in to what the Continental stations have to give us.

L. S. (London, W.).

Lightning Risks

SIR,—In the issue of AMATEUR WIRELESS No. 365, I notice an article which is entitled "Lightning Risks," and the author advises me to earth the aerial when a thunderstorm is in the vicinity of the receiver. Yesterday evening there was a thunderstorm in this district and the announcer at Edinburgh stated that the transmitter would have to be shut down for a short period and advised listeners to earth their aerials.

In an issue of the *Electrical Review*, published about the middle of 1925, was an article on "Lightning Conductors," and the author detailed results of researches carried out *re* the functioning of lightning conductors, and a statement was definitely made that conductors *attract* lightning with varying degrees of efficiency according to the number of aigrettes (or points), run of conductor, etc.

The reason given is that there is a potential difference between cloud and earth, top of conductor and earth, and cloud and top of conductor. It would take up too much space to give all the details, but I am quoting only the salient points.

I would like to hear other readers' opinions as to which of the two conditions is the safer: (1) The aerial earthed and acting as a conductor or (2) the aerial disconnected at the earth end and hanging free *outside*, the lead in and the aerial-earth potential nil.

The following is a quotation from Fowlers' Electrical Engineers pocket book: "To ensure the lightning taking the arrestor path to earth an *inductive resistance must* be placed between the lightning arrestor and the instruments to be protected." The italics are mine and I shall not comment further upon this condition.

G. B. H. (Musselburgh).

Said to be the only broadcasting station in the world devoted to the development of aeronautics, radio station KTAT, Fort Worth, Texas, has been formally opened as an official station for Texas Air Transport, Inc.

A NEW H.T. CHARGER

(Continued from Last Week)

THE tantalum obtained measured 3 in. by ⅜ in. The sheet is quite thin and can be cut into four long strips with a pair of scissors. Each piece is $^{3}/_{32}$ in. wide, and is mounted by forcing one end into the open end of the short projecting leads. When about ½ in. of the metal has been pushed in, the lead is closed to hold it firmly. This pressure will flatten the lead tube, thus increasing its width. The edges are then bent round to overlap each other and pressed tightly again. Serve all the electrodes in this manner.

The short projecting lead lugs to which the tantalum strips are joined must now be completely covered with pitch or other sealing compound. An old high-tension battery, if available, will provide this material. The whole of the underside of the ebonite panel is now covered with paraffin wax or candle grease, extending the wax for a distance of one inch down each electrode. This waxing is important, as it tends to prevent the formation of a film of acid.

With the most difficult part of the construction thus completed, the mounting and wiring of the condensers and lamp holders will soon complete the work.

On 50-cycle mains at a voltage of 200 to 250 a charging rate of 40 to 80 milliamperes is obtainable with two condensers, of 2-microfarad and 1-microfarad capacity, wired in parallel. The actual charging rate will depend upon the voltage of the accumulators. On 100- to 110-voltage mains of the same periodicity the capacity must be double this value to obtain the same charging rate. On the other hand, if the periodicity or frequency is higher, then condensers of smaller value will provide adequate current.

Connections

The two condensers are screwed to the baseboard side by side, a flat brass strip making contact with the outside terminals of each. With the brass strip connected to both terminals, 3-microfarad capacity is obtainable, and by removing the strip from one of the terminals either 1-microfarad or 2-microfarad capacity is provided. The illustration of the finished charger shows two flexible wires, one joining the electrodes in the centre and the other connected to the blind terminal. These wires are intentionally flexible, so that the complete rectifying panel may be raised quickly for inspection. Before leaving the subject of condensers the question may arise as to whether a mains type of condenser is essential. In the writer's opinion it is not necessary. Good quality condensers of the kind used in wireless for shunting across H.T. batteries are suitable. Those illustrated are Mansbridge-type condensers made by the Telegraph Condenser Co. They have been found consistently reliable for this purpose.

The electrolyte is accumulator acid of 1.200 S.G. To it is added a small quantity of ferro-sulphate crystals in the proportion of ⅛ oz. to 1 oz. of acid. To obtain uniformity, dissolve the crystals in a vessel containing the amount of acid required for the four jars. The terminal connecting to the lead electrode is marked negative and the tantalum terminal positive.

Operation

When using the charger for the first time, it is advisable to cut down the charging rate by using the smaller capacity condenser and to charge an accumulator of low voltage. This enables the electrodes to form properly without sparking. A photograph last week showed a 20-volt accumulator on charge. From the circuit diagram (Fig. 2) and this illustration it will be seen that the terminal between the positive and negative ones connects one side of the condensers to the electrical centre of the accumulator. The charging meter shown is a Sifam milliammeter, reading 0-150. It was intended at first to build this into the

(Continued on page 872)

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
243.9	1,230	Newcastle (5NO)	1.0
258.6	1,160.1	*Leeds (2LS)	0.13
288.5	1,040	*Sheffield (6LF)	0.13
288.5	1,040	*Bournemouth (6BM)	1.0
288.5	1,040	*Edinburgh (2EH)	0.35
288.5	1,040	*Hull (6KH)	0.2
288.5	1,040	*Dundee (2DE)	0.13
288.5	1,040	*Liverpool (6LV)	0.13
288.5	1,040	*Stoke-on-Trent (6ST)	0.13
288.5	1,040	*Swansea (5SX)	0.13
288.5	1,040	*Plymouth (5PY)	0.13
291.8	1,028.8	*Bradford (2LS)	0.13
302.6	991.1	Belfast (2BE)	1.0
311	964	Aberdeen (2BD)	1.0
323	928	Cardiff (5WA)	1.0
358	838	London (2LO)	2.0
378	793	Manchester (2ZY)	1.0
401	748.3	Glasgow (5SC)	1.0
482	622	Daventry Ex. (5GB)	17.0
1,562	152	†Daventry (5XX)	25.0

* Relay stations. †Relays 2LO.

AUSTRIA			
250	1,200	Linz	0.5
283	1,060	Innsbruck	0.5
354.2	847	Graz	3.0
456	694	Klagenfurt	0.5
520	577	Vienna	20.0
BELGIUM			
233	1,300	Chatelineau	0.25
249	1,203	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,070	Liége	0.5
512	586	Brussels	10.0
CZECHO-SLOVAKIA			
265	1,128	Kosice	2.0
277.8	1,080	Feriby (testing)	12.0
306	980	Bratislava	4.0
343	873	Prague (Praha)	5.0
432.3	694	Brunn (Brno)	2.4
DENMARK			
330	883	Copenhagen (Kjobenhavn)	1.0
1,158	259	Kalundborg	7.5
ESTHONIA			
408	735	Reval (Tallinn)	1.3
FINLAND			
379	790	Helsingfors (Helsinki)	0.8
1,500	200	Lahti	20.0
FRANCE			
170	1,750	St. Quentin	0.25
212	1,415	Fécamp	0.3
211.3	1,420	Bezlers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
245	1,219	Lille (PTT)	0.8
250	1,196	Juan-les-Pins	0.4
255	1,175	Toulouse (PTT)	1.0
268	1,118	Strasbourg	0.3
274	1,092	Limoges (PTT)	0.5
274.5	1,092.4	Rennes (PTT)	1.0
285	1,050	Montpellier	1.5
292	1,028	Radio Lyons	1.5
300	996	Bordeaux (PTT)	0.5
305	982	Agen	0.3
309	970	Vitus (Paris)	2.0
318	943	Marseilles (PTT)	0.5
336	892	Petit Parisien	0.5
352	850	Algiers (PTT)	2.0
368	815	Radio LL, Paris	1.0
382	785	Toulouse (Radio)	9.0
413	725	Radio Maroc (Rabat)	2.0
429	699	Grenoble (PTT)	1.5
436	687	Radio Flandre Lille	0.5
446	672	Paris (Ecole Sup., PTT)	0.7
468 8	640	Lyons (PTT)	5.0
1,350	222	Tunis (testing)	2.0
1,470.2	204	Eiffel Tower	8.0
1,744	172	Radio Paris	8.0
1,825	164	Radio Carthage (Tunis)	5.0
GERMANY			
213	1,370	Flensburg	1.5
240	1,250	Nurnberg	4.0
250	1,200	Kiel	0.7
250	1,200	Cassel	0.7
263.2	1,140	Cologne	4.0
267.8	1,120	Muenster	1.5
272.4	1,101	Kaiserslautern	1.5
280.4	1,070	Königsberg	4.0
283.1	1,058	Berlin (E)	0.7
283.1	1,058	Stettin	0.7
283.1	1,058	Magdeburg	0.7
317.5	945	Dresden	0.75
320	937	Breslau	4.0
320.4	919	Gleiwitz	6.0
329	910	Bremen	0.75
361.9	829	Leipzig	4.0
374.1	802	Stuttgart	4.0
391.6	766	Hamburg	4.0
421.3	712	Frankfurt	4.0
455.9	654	Danzig	0.75
456	651	Aachen	0.75
462.2	649	Langenberg	25.0
476	630	Berlin	4.0
538	558	Munich	4.0
563	532.8	Augsburg	0.5
566	530	Hanover	0.7
577	520	Freiburg	0.7
1,651	181.7	Zeesen	20.0
1,651	181.7	Norddeich	10.0
GRAND DUCHY OF LUXEMBOURG			
1,220	245	Radio Luxembourg	2.0
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
336.3	891.5	Hulzen (until 5.40 p.m. B.S.T.)	5.0
1,071	279.8	Hilversum (ANRO)	5.0
1,846	162.5	Huizen (after 5.40 p.m. and on Sundays	5.0
1,846	162.5	Scheveningen-haven	5.0
HUNGARY			
548	5.8	Budapest	15.0
ICELAND			
385.3	900	Reykjavik	1.0
IRISH FREE STATE			
222.2	1,350	Cork (2CK)	1.5
411	730	Dublin (2RN)	1.5
ITALY			
278	1,075	Turin (Totino)	7.0
333	900	Naples (Napoli)	1.5
387	775	Genoa (IGE)	3.0
442	677	Rome (Roma)	3.0
450	666	Bolzano	0.3
503.5	596	Milan (Milano)	7.0
JUGO-SLAVIA			
308.3	973	Zagreb (Agram)	1.25
450	668	Belgrade	4.0
582	515	Ljubljana	5.0
LATVIA			
520	567	Riga	2.0
LITHUANIA			
1 935	155	Kovno	15.0
NORWAY			
242	1,240	Rjukan	1.0
297	1,010	Notodden	0.7
365	820	Bergen	1.0
387	774	Fredriksstad	1.0
456	657	Tromso	1.0
456	657	Aalesund	1.0
456	657	Porsgrund	1.0
496	604	Oslo	1.5
577	519.9	Hamar	0.7
POLAND			
314	955	Cracow	1.5
337	890	Posen	1.5
415.5	722	Kattowitz	10.0
456	658	Wilno	1.5
1,397	214	Warsaw	10.0
PORTUGAL			
317.5	945	Lisbon CTIAA (Wed' and Sat.: 10—midnight)	
ROUMANIA			
395	757	Bucharest	4.0
RUSSIA			
492	609	Kharkov (NKO)	5.0
825	363.6	Moscow (PTT)	25.0
925	323	Homel	2.5
1,000	299	Leningrad	20.0
1,440	208	Moscow	30.0
1,684	178	Kharkov	15.0
SPAIN			
263	1,121	Barcelona (EAJ13)	10.0
314	955	Oviedo (EAJ19)	0.5
324	925	Almeria (EAJ18)	1.0
346.8	865	Barcelona (EAJ1)	10.0
369	811	Seville (EAJ5)	0.5
400	750	Radio España	1.0
405	740	San Sebastian (EAJ8)	0.5
427.7	703	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
261	1,150	Horby	10.0
265	1,130	Trollhattan	0.4
333	900	Falun	0.5
350	858	Goteborg	6.0
437	686	Stockholm	1.5
550	546	Sundsvall	1.0
770	390	Ostersund	2.0
1,200	250	Boden	2.0
1,345	223	Motala	30.0
SWITZERLAND			
406	739	Berne	1.0
483	613.4	Zurich	0.6
650	441	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,200	250	Stamboul	5.0
1,802	164	Angora	5.0

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

June 24 Covent Garden Opera.
" 25 A request programme.
" 26 *The Swallow*, an opera by Puccini.
" 27 A vaudeville programme.
" 29 A musical comedy programme.

DAVENTRY EXPERIMENTAL (5GB)

June 24 *The Swallow*, an opera by Puccini.
" 26 Vaudeville programme.
" 27 Covent Garden opera.

CARDIFF

June 23 A programme of favourites from oratorio.
" 25 The Super Six in "Salad."
" 28 A concert from Priory Park, Taunton.

MANCHESTER

June 24 Scenes from *A Midsummer Night's Dream*.

NEWCASTLE

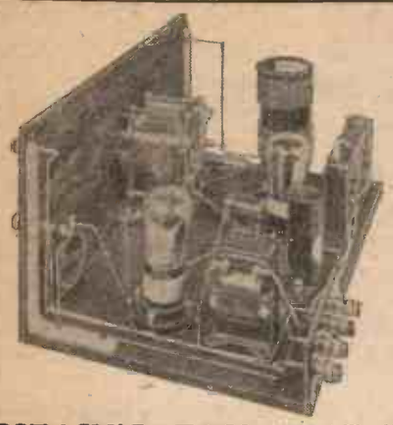
June 26 A running commentary on the Northumberland Plate.

GLASGOW

June 24 *Wee MacGregor*, Acts I and II, a comedy by J. J. Bell.

ABERDEEN

June 28 A National Gaelic concert.



BRITAIN'S FAV. 2

A.W., 25th May, 1929

(UP-TO-DATE)

COMPONENTS

Ormond .0005, 5/-; .00025, 5/6; 7-ohm Ormond, 2/-; 2 W.B. V.H., 2/6; 6 pin Base 2/-; .0003 and Series Clip, 1/6; 2-meg. leak, 1/-; H.F. Choke, 5/6; L.F. Transformer, Lissen, 8/6; Push-Pull, 1/3; Tunewell Dual Range Coil, 7/9.

PLEASE ADD POSTAGE IF YOUR ORDER FOR FAV. 2 PARTS EXCEEDS 32/- YOU CAN BUY

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14x7 Ebonite Panel, Pair Pan l Brackets, Baseboard, Battery Clips, 8 Engraved Termina s, Wire, Flex, Plugs

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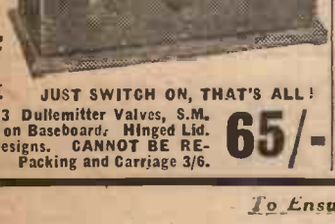

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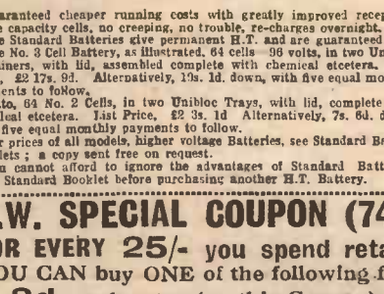

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(*Continued from page 869*)

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10

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Vol. XIV. No. 368 Saturday, June 29, 1929

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Converting Your Set to Work from the Mains

An Article Showing How an Existing Set Can be Converted to Work from A.C. or D.C. Mains

By W. INKLE

TO obtain all the necessary current for the wireless receiver from lighting mains has always been the ideal of most amateurs. Unfortunately, up to a very short time ago the difficulties and expense entailed in building the necessary eliminators have proved to be a most effective barrier between the amateur and this idea.

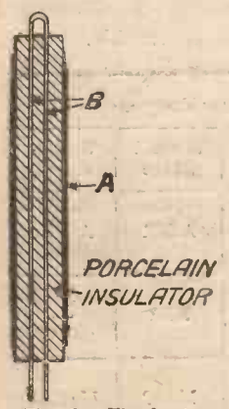


Fig. 1. The heater element of an indirectly-heated valve

With the advent of the indirectly-heated cathode valve this barrier should have disappeared, but the idea still persists that the successful use of these valves is beyond the average home constructor.

The writer hopes in this article to dispel any such ideas and show how easily any existing set can be converted for operation from either A.C. or D.C. mains at moderate cost and without any particular ability or previous experience.

The Indirectly-heated Valve

A brief description of the indirectly-heated valve will not be out of place here.

It is, of course, essentially an ordinary triode with the usual anode, grid, and cathode of the battery-operated valve; in place of the filament, however, we have an arrangement as shown in Fig. 1. This comprises a cylinder A (the cathode) which is coated with a metal oxide to ensure electronic emission at low temperature. Inside this cylinder is a porcelain insulator, and threaded through this insulator is a further element B. When a suitable potential is applied across B it becomes red hot and heats the coated cylinder.

It will be realised that if the heater element is fairly thick it will take a considerable time to heat up and cool down, so that a constant temperature will be obtained whether it is heated from alternating or direct current. This is a great advantage, as when the supply is A.C. it is only necessary to step this down through a suitable transformer to obtain low-tension current from the mains, no smoothing device being necessary.

Converting a Typical Four-valve Set

Fig 2 shows a circuit of a typical four-valve set comprising one stage of neutralised H F. amplification, cumulative-grid detection, and two stages of low-frequency amplification, R.C. and transformer coupled.

In the first place we shall consider converting this set for operation from A.C. lighting mains. Reference to the valve data table will show suitable valves of four prominent makes which will be required for the modification described.

These valves are fitted with a five-pin base, consisting of three long banana pins to which are connected grid, anode, and cathode and two short pins which feed the heater element. The existing standard valve holders in the set can, however, remain, as the makers provide a small adaptor disc which can be fitted to the base of the valve before insertion in the valve holders. These discs are drilled to receive the pins and have two copper brushes which make contact on to the two short heater pins; flex leads are provided from these contacts for connection to the mains transformer.

Circuit Alterations

A few minor alterations are necessary before the valves are inserted in the holders and the power switched on. These should be done in the following order.

(1) Short circuit the existing L.T. terminals on the set. This is done to ensure that the cathodes, which are only inserted on one side of the old filament circuit, are at earth potential and also, of course, that all connections that were made to both L.T.+ and L.T.— are connected to the cathodes and earth. The filament switch and all rheostats must either be short circuited or left permanently at the "on" position.

(2) Negative grid bias at 1½ to 3 volts must be applied to the grids of all H.F. valves. This is shown clearly in the rearranged circuit Fig. 3.

(3) Positive grid bias of 1½ volts must be applied to the detector grid where cumulative-grid detection is employed.

(4) The usual 2-megohm grid leak must be replaced by one having a value of ½ megohm.

(5) The R.C. coupling components should have the following values: Anode resistance, 100,000 to 250,000 ohms; grid leak ½ to 1 megohm; coupling condenser, .005 microfarad.

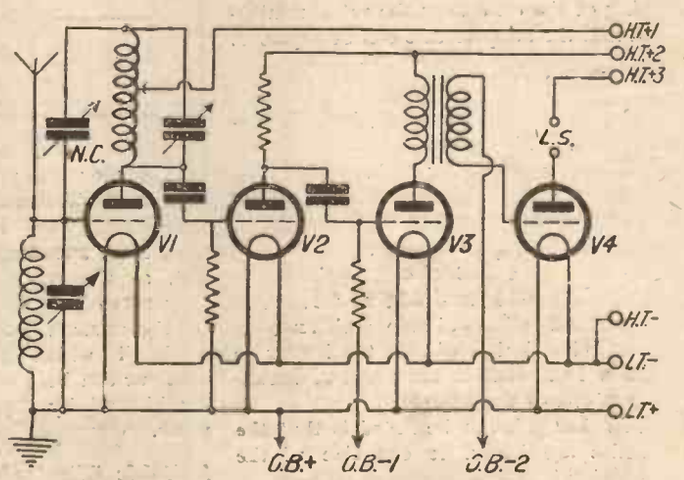


Fig. 2. Typical 4-valve circuit

(6) Wherever possible the grid bias for the last valve should be taken from the H.T. eliminator, while the bias mentioned in (2) and (3) and bias for the first L.F. stage should be taken from separate batteries.

Having carried out these alterations, it is now only necessary to insert the valves in the holders, parallel the heater leads to the secondary winding of the mains transformer, and switch on at the main.

Owing to the nature of the valve heaters they will take about 30 seconds to attain working temperature and, of course, until this temperature is attained no signals will be heard.

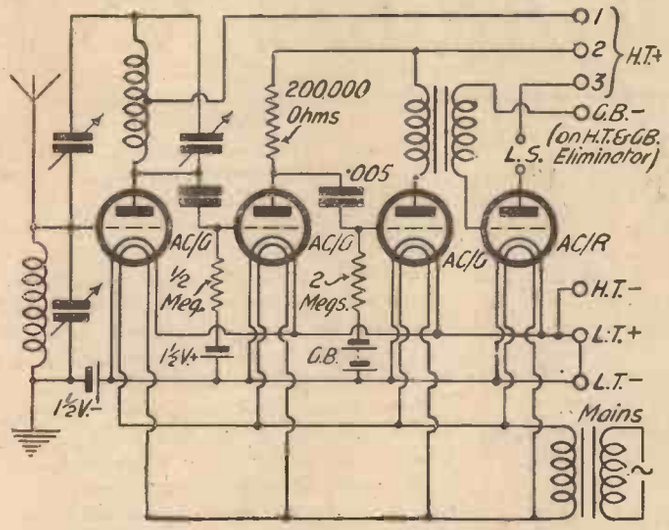


Fig. 3. Diagram showing the necessary modifications

Neutralising

Neutralising the H.F. valve is a simple operation. Tune in the local station at full strength in the usual way on the phones. Take out the H.F. valve and remove the adaptor disc. Insert the valve again and retune slightly to maximum signal strength. Slowly adjust the neutralising condenser until no signals are heard, and at this setting of the condenser the set is neutralised and the adaptor disc can be replaced.

D.C. Mains

Where it is desired to obtain L.T. current from D.C. mains the same circuit alterations apply as for A.C., except that the heaters are wired in series and a suitable resistance is employed to drop the mains voltage to the required value.

A three-valve D.C. circuit is shown by Fig. 4. It should be noticed that the heaters are shunted with suitable resistance to prevent electrical strain on the heater to cathode insulation in the event of breakdown of one of the heaters.

A further point to be noted is that the cathodes are joined to one side of the heater circuit.

In view of the fact that the set is in this case directly coupled to the mains, a number of precautions against short circuit or shock should be observed. Aerial and earth series condensers must be employed and choke output feed for the loud-speaker should be fitted. In any case, when operating from A.C. or D.C., the mains supply should always be switched off before making any internal adjustment to the set, as high voltages are liable to be developed. Metal tuning dials must be insulated, as in H.F. circuits these will be at high potential.

It will often be found where the set to be converted has a stage of unneutralised H.F. or two stages of transformer-coupled L.F. amplification, that the Cosmos AC/G or Marconi KLI valve cannot be used without instability.

This is due to the extremely efficient characteristics of these valves and consequent high magnification per stage. In such cases the Cosmos AC/X valve should be employed, either as the H.F. or first L.F. valve, as the case may be.

For those who are using a stage of screen-grid H.F. we would mention the new AC/S screened-grid valve. This valve can be used in practically any existing circuit without any alteration to the wiring beyond provision for the heater supply.

The best intervalve coupling to use is probably a straightforward tuned-anode or low-ratio H.F. transformer, but, as the valve has only recently appeared on the market, this is a detail which the amateur can best solve for himself by experiment.

Suitable Eliminators

Any reliable make of H.T. eliminator can be employed, providing sufficient output is available: the four-valve set under consideration with the AC/R valve in the last stage will consume about 30 milliamperes, with 180 volts on the last valve. It should be noted that the maximum H.T. voltage rating for indirectly-heated valves is somewhat greater than that given for corresponding battery-operated valves and at least 150 volts should be applied to the last stage amplifier.

The value of the resistance required when working off direct-current mains naturally varies according to the number of valves employed. In any case it should be capable of carrying 1.25 amperes without becoming unduly hot.

Results Obtained

If the foregoing remarks are carefully followed and the necessary circuit alterations properly carried out, the set will be found in almost any case to be as silent in operation as the average battery-operated receiver, even on the worst of fluctuating mains. If, however, the set is inclined to be noisy, a 300-ohm potentiometer connected across the heater secondary and the adjustable contact connected to the cathodes (in the case of A.C. only, of course) will remove effectively all traces of interference.

Apart from the economy and convenience of driving the receiver from the mains, a further benefit will be found in the increased over-all amplification obtainable.

	High Frequency			Detector	Low Frequency		
	Screen-Grid	Neutralised	Unneutralised		First Stage	Second Stage	Super-Power
Cosmos ...	AC/S	AC/G	AC/X	AC/G or AC/X	AC/G	AC/R	AC/P1
Marconi ... Osram ...	—	KH1	KH1	KH1	KH1 or KL1	KL1	—
Cossor ...	—	M41HF	M41HF	M41RC or M41HF	M41LF	M41P	M41XP

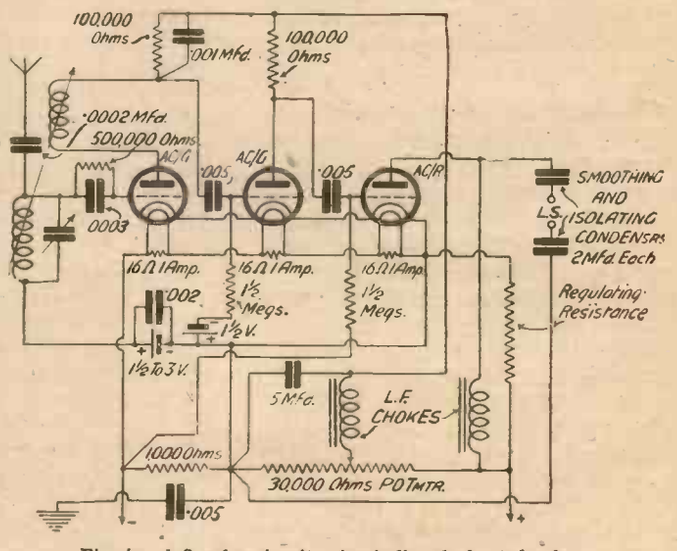


Fig. 4. A 3-valve circuit using indirectly-heated valves

One of the Baird laboratories on the outskirts of London

BAIRD TELEVISION FROM GERMANY

By a Special Correspondent

IT was expected that the report published three months ago by the British Postmaster-General regarding the television tests between the Post Office and the Baird Television Development Co., Ltd., would have ensured that England was to be first in the field with a regular broadcast television service. Recent developments on the Continent, however, go to show that the initiative and enthusiasm of Germany may enable her to beat England "on the post." As a result of the German Government's intention to do everything in its power to stimulate the development of television, Dr. H. Bredow, and his chief engineer Dr. Reisser, and Dr. Banneitz paid a visit to England with the primary object of seeing for themselves the Baird system. They were particularly impressed with the demonstrations they witnessed, and an invitation was extended to the Baird Company to install a transmitter in Berlin, and naturally the invitation was accepted. Trial transmissions have been put on the air for some time past via the Witzleben broadcasting station, and undoubtedly the results have been entirely satisfactory.

A Wonderful Achievement

Active co-operation between the Baird Company's laboratories in London and the Berlin transmitting station was effected, and a few nights ago one of the transmissions was picked up successfully in London. Definitely recognisable images were obtained, the movements of the televised human face being watched on the screen of the Baird television receiver, although the movements actually took place nearly six hundred miles away. This is "seeing at a distance" in every sense of the word and is the first time that successful television transmissions have taken place between England and Germany.

Of course, during the tests from the Berlin station local reception was excellent, as was to be expected after the successful P.M.G. tests in this country, but distance lends enchantment and the possibility of being able to both see and hear what is going on in a Continental broadcasting studio opens up wonderful potentialities and will whet the appetite of all interested in wireless.

A Company Formed

In any case, a powerful combination has been formed to work the Baird system of television in Germany. It has been announced that together with the Baird Company itself, three other firms will participate, the Loewe-Radio Company, of Steglitz, the Zeiss-Ikon Works, world famous in optics, which is to supply the necessary optical components of the machines, and the Bosch Company, of Stuttgart, which will make the motors.

The initiative of the Germans, backed by an impartial Government determined to get the best as far as television is concerned, is in striking contrast to the apparent official apathy at home. Britain should have been proud of the opportunity to be the first with a regular television service, especially when the inventor of true television is one of its own countrymen, and it is to be hoped that it is not too late to make up the leeway.

The Fruit of Their Labours

The interest of other nations is plainly in evidence, for in France a number of stations are preparing to install the Baird transmitting apparatus. To this must be added the fact that South Africa is very shortly to have an opportunity of witnessing demonstrations on its own soil, while in Australia and New Zealand the same progress is being made. The months of hard work on the part of the Baird Company's experts are beginning to bear fruit!

IT'S ALL RIGHT IN THE SUMMER TIME

Jottings from my Log

By JAY COOTE

ALTHOUGH during these bright summer days our daily bag may be smaller than during the winter months, there are still many stations from which programmes may be captured with ease. From entries in my log, I find that Kalundborg on almost every night has been a station on which I could rely. It has not a high power, but its transmissions come over exceptionally well, even in full daylight. From this station you may hear all the Copenhagen programmes, the bulk of which consist of light musical entertainments, and if you listen regularly you will agree with me that its studio orchestra is second to none.

Generally speaking, at present, except for transmitters working on the lower part of the wave band, many stations within the 300-450 metre limits are less satisfactory, and for that reason, following a short run round which may result in my picking out two or three exceptions on certain nights, I devote my time to more reliable broadcasts. Motala during the past few weeks has weakened considerably, except towards the latter part of its transmissions; unfortunately, the Swedes are early birds, and by 10.30 p.m. they close down.

But it's an ill wind, etc., for on such occasions Warsaw is given a clear channel, free of interference, and from the Polish capital there are many excellent late concerts to be captured.

Neither Leningrad nor Moscow, in London at least, are at their best until darkness has set in; but do not neglect them, for from both you will frequently hear relays of operatic performances as good as any you may pick up from Vienna, Budapest, or Milan.

Some difficulty may be experienced at times with Moscow, owing to the neighbourhood of Eiffel Tower, but the latter does not work late.

One visit during the evening should be made to Berlin, via Koenigswusterhausen, for quite by chance on a recent date I picked up from that transmitter a relay of a German military torchlight tattoo, outside President Hindenburg's palace in the Wilhelmstrasse, in connection with an official reception to King Fuad of Egypt. It held my interest for some forty minutes. No mention of it was made in the programmes; it was an eleventh-hour stunt.

If a frame aerial be used it will be found that no difficulty exists in separating the German transmitter from 5XX, except perhaps in the immediate vicinity of the British high-power station.

Then, again, Radio Paris is always available as a stand-by.

The Cathode-ray Oscillograph

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

The first two articles of this series have shown how alternating currents of low frequency may be examined. The cathode-ray oscillograph enables us to extend our range of examination

WE saw in a recent article that we can examine the actual method of variation or, as we term it, the wave form of any alternating current by causing the current in question to move a spot of light across a screen. If the impulse is regular and periodic we can cause the spot of light to go over the same ground again and again, and so build up a steady picture which we can examine and cause to vary as we wish.

A mechanical method of carrying out the required results has been described. This, however, has its limitations, which become more severe in the higher frequencies. If we can avoid mechanical methods altogether in our examination we immediately overcome the greater portion of the difficulties. This is done in the cathode-ray oscillograph, which utilises a beam of electrons.

Such an arrangement is shown in the diagram. We have first of all a filament of wire giving off electrons. Secondly, there is an anode in the shape of a tube to one side of the filament. The electrons emitted are attracted to the anode, but due to its formation they do not stop there, but are shot through and continue in a thin beam or pencil. The filament is made as nearly as possible in the form of a circle, and by suitable adjustment of the filament current and the anode voltage it is possible to focus this pencil of electrons so that the beam produced is practically a parallel one and does not diverge at all.

The Oscillograph Picture

This beam of electrons, of course, is not visible; but at the end of the tube, which is, of course, highly evacuated like an ordinary valve, there is placed a screen covered with a fluorescent material, which has the property that any electrons striking it cause it to glow brightly. Where the pencil of electrons strikes this screen, a tiny bright spot of light appears. If, therefore, we can cause the electron stream to move from side to side we have an excellent means of producing an oscillographic picture.

Fortunately, this is fairly easily accomplished. We place two parallel plates one on each side of the stream. Then, if we apply a voltage across these plates the stream of electrons will be attracted to one or the other, and thus deviated from its normal path. If the voltage is alternating, the spot of light will move from side to side, just as in the mechanical oscillograph.

We have an additional advantage here, for we can place a second pair of plates at right angles to the first, and so cause the spot of light to move in a direction at right angles. The second pair of plates can be used as a deflecting source, causing the spot to move across the screen and back again, while the current variations are recorded by the first pair of plates, causing the up-and-down motion. This is

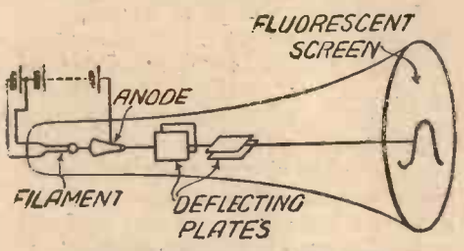


Fig. 1. Cathode-ray Oscillograph

a distinct advantage, for in the previous case we had to cause our deflection from side to side by mechanical means, and we were therefore limited to low frequencies. In this case it is possible to cause the deflecting force to occur at any frequency we like. Thus, if we wish to examine a

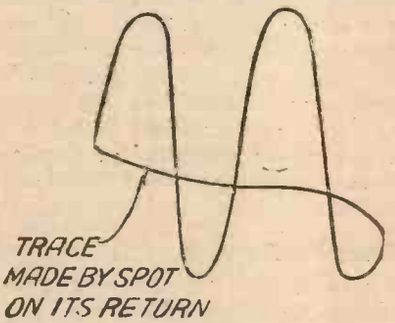


Fig. 2. Typical Oscillograph Tracing

current at a frequency of 10,000 cycles per second, we can arrange our deflecting force to have a frequency of, say, 2,500 cycles per second, giving us four complete oscillations without any difficulty. Consequently, by the use of an arrangement of this sort, we are able to examine periodical variations of frequencies up to the highest audible frequency, and even radio frequencies if special precautions are taken. This, of course, is provided that the variations are periodic, so that we can cause the successive movements of the spot of light to come into line and to build up into a continuous figure.

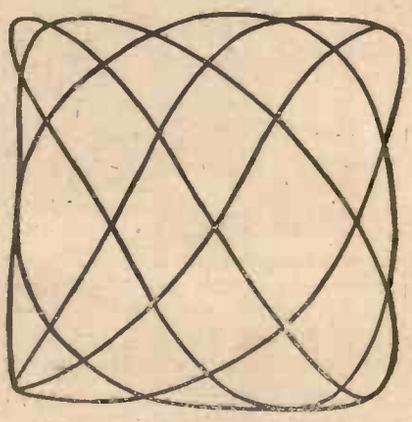


Fig. 3. Typical Lissajou Figure

It is not possible to cut off the source of light here, as in the mechanical case, and therefore it is necessary to devise some special circuit on the deflecting plates so that the spot is moved relatively slowly across the beam in one direction and allowed to return very much more rapidly. If the two frequencies are synchronised as has already been pointed out, the time taken by the spot to travel slowly across will enable two or three complete oscillations to be pictured, while on the return trip a thin and not very well defined line will be all that is seen. This will not interfere with the picture we wish to observe to any appreciable extent, leaving us with a substantially clear picture (FIG. 2).

Other Uses

This is only one of the ways in which a cathode-ray oscillograph may be used. It is not always practicable or convenient to use the simple methods just described, and other methods have to be adopted in which curious figures, known as Lissajou figures (FIG. 3), are obtained. These vary in form from a simple circle to all sorts of more or less symmetrical arrangements, which can be analysed and interpreted in terms of the more conventional wave form.

Another use to which this form of oscillograph has been put is that of observing atmospherics. These are of a low-frequency character in many cases and cause a sudden flicker of the spot which traces out a very thin line on the screen. The fluorescence persists after the electron pencil has passed over the screen, so that, although the movement of the spot may only last a very small fraction of a second, the luminosity remains for a sufficient length of time to enable one to see the trace.

In the case of atmospherics, Watson-Watt, of the Radio Research Board at Slough, has observed many hundreds of atmospherics in this manner by watching the screen and immediately afterwards making a rough pencil sketch of the shape of the transient effect produced by the atmospherics. Although this is a fairly crude method it has served its purpose in that it has enabled the general types of atmospheric to be classified, thereby contributing greatly to our knowledge of this bugbear of long-distance radio.

On Your Wavelength!

The Sunday Programmes Again

FOR some time past I have been taking the side of the B.B.C. in the morning up-town train when the inevitable discussion of "last night's programme" has cropped up. With a feeling of expansive broad-mindedness I have countered attacks on talks, symphonies, jazz—and even the Sunday programmes. But I have now withdrawn my defence of the last mentioned! If anybody can find me a duller day's broadcasting than that Sunday a week or so ago, *don't* lead me to it! I may have said harsh things about some of the modern composers, but these opinions were never provoked by acute boredom.

Many musical people have told me that there is much more "fun" in the singing of Handel's oratorios (or should it be "oratoria"?) than there is in listening to them; and I can quite believe it. Handel and company are like Stravinsky, Scriabin, and Holst in one respect: they can sometimes be digested if taken in small slices. To use a more liquid simile, Stravinsky has the flavour of a cocktail of which *three* "portions" are too many; whereas Handel is too frequently like a never-ending drink of barley-water.

Broadcasting and Religion

The over-abundance of religious matter in the Sunday programmes defeats its own object. Short broadcast Church services are essential and are attractive to the majority of listeners, but the contemplation of hour upon hour of such broadcasts deters many a listener from using his set at all on Sundays. Religious broadcasts ought to be the same as any other type of broadcasting: they should cease before the listeners are satiated and have to switch off in self-defence. As regards the acute dullness of the rest of the Sunday's programmes, this may be the B.B.C.'s reply to the attacks made on them for the broadcast of *Hassan* and other plays on Sunday afternoons! Whoever complained dropped a "brick." Please sir, it wasn't me!

We've Had It For Years

I see that one American station is making a special feature of a "Slumber Hour." There is nothing very new about that. We've had one as long as I can remember between 6 and 7 p.m., when the topical talkers were about, with another half-hour thrown in later in the evening. Still, we haven't yet got as far as the "Waking-up Hour" in the cold grey dawn, and whatever the B.B.C. may do about it, I am quite sure that I never shall. WLW, at Cincinnati, starts its day at 6.30 a.m. with a feature entitled "Top o' the morning." A horrible idea.

They Want More Talks!

Professor Druffner (yes, that really is his name), who functions at the university at Cincinnati, has made the alarming discovery that Americans want to be educated by wireless. Well, one man's meat is another man's poison. We've been trying over here for more than five years to instil into the B.B.C. that we do *not*. But in the States they do really seem to take radio very seriously. One correspondent writes in: "You have no idea how much I appreciate your topical talks. To me they are the only feature worth while on the air." It seems to me that we might, to the mutual advantage of both great nations, export a liner load of topical talkers—so long as they would refrain from retaliating by sending us in return a cargo of nasal syncopaters burning to tell us that her eyes are bleeoo and that their hearts are treeoo.

"Mayday"

I do a good deal of listening to Croydon, Lympne, St. Inglevert, Le Bourget, and other air stations, as well as to 'planes in flight. Never, though, have I had such a thrilling moment as when the 'plane recently involved in the terrible accident in the Channel sent out the air equivalent of S O S. This is "*M'aidez*," the French for "Come and help me," which has been internationalised as "Mayday." The pilot gave his position as fifteen miles out from our coast when he sent the call. Instantly all other telephony on the air routes was closed down so as to clear the ether for further messages from the striken 'plane. "I am turning round and trying to get back," he said, giving his height as 2,000 feet. Then very faintly came the last signal, "I can't do it. I am coming down." Nothing more was heard after that, for the trailing aerial was soon in contact with the water. It is largely due to wireless that this terrible disaster was not worse than it was, for as soon as the first message was received warnings were sent to all ships and shore stations in the Channel to be on the lookout and to render aid if possible.

Poor Reception Conditions

Reception conditions are curiously patchy just now. The first week in June was poor, the second extraordinarily good, and the third only fair to moderate. The reason, I think, is that we have not yet got over the baleful influence of the sun spots which played such havoc with wireless reception over long ranges last year. Thunder has been hanging about, and though there have been no actual storms, atmospherics have made their unpleasant presence felt. I have a feeling that these curiously uneven conditions will not last for long and that we shall presently settle down to quite good summer conditions for both short- and long-distance reception. One curious thing at the present time is the ups and downs experienced by different stations on consecutive evenings, or even during different hours of the same evening. You may, for example, find Hamburg quite strong at 10 p.m., weak at 10.30 p.m., and roaring in shortly after 11 o'clock. All this, though, adds to the interest of the game. Long-distance wireless would not be half such fun if one were always certain of being able to get any station whenever one tried for him.

The Prague Plan

By the time that these notes appear in print we shall be on the eve of the inauguration of the Prague Plan. After a very careful examination of the wavelength allocations, I think that the scheme is, on the whole, exceedingly good, though there are several places in the waveband where I rather anticipate that interference may be experienced. One not very satisfactory arrangement would seem to be the arranging of London and Stuttgart as wavelength neighbours with a separation of only 9 kilocycles between them. Under the Brussels Plan the next station above London was Leipzig, who is not nearly so strongly received in the south of England as Stuttgart, and the separation between the two was a full 10 kilocycles. It would, I think, have been better to put Stuttgart up to 364 metres and bring Bergen down to 360. Certain alterations will undoubtedly have to be made after the plan has been tried out, and I rather fancy that this or something like it will be amongst them. I must say that I am sorry to see that France has insisted on retaining the Eiffel Tower as a broadcasting station with a wavelength of 1,444 metres. There is no point in having two high-powered stations in Paris, and for some time past the Eiffel Tower has been rather a nuisance, for ever since it dropped down from the neighbourhood of 2,600 metres it has caused heterodynes galore. As I have previously pointed out, Paris is already one of the best provided cities in the world in the matter of broadcast programmes. I am sure that half the French stations could go with no great loss to French or other listeners.

Every Chance

Anyhow, the Prague Plan has every chance of being a complete success; first of all, because it has the official backing of the Governments of the countries concerned and, secondly, because for the first

On Your Wavelength! (continued)

time in the history of broadcasting every European nation has subscribed to a plan for the regulation of the ether. The famous Brussels Laboratory has been officially placed in charge of wavelength checking. This has been carried on for many months now, as readers doubtless know. The wavelengths of the great majority of European stations are accurately measured every night and the results embodied in a monthly chart.

Unfortunately, there has hitherto been no way of penalising stations which wandered, but it is now hoped that the Government concerned will take strong action against any of their stations which deviate appreciably from their allotted wavelengths. Just what can be done to an offending station I don't know, but I hope that the authorities will think out something pretty beastly. In the States they have a system of ether policing run on much the same lines. When a station is found wandering it is warned the first time and closed down if it sins again, either temporarily or permanently. Let us hope that Brussels will prove to be an efficient ether "cop."

This Year's Exhibition

The Wireless Exhibition this year opens on September 23 and lasts until October 3. It is to be both bigger and better than last year's, for there is an increase both in the number of firms exhibiting and in the number of stands. I need hardly mention that two of the most popular of the latter will be Nos. 19 and 20 on the ground floor, belonging to AMATEUR WIRELESS and the *Wireless Magazine*. I am not going to give away any secrets at this stage, but readers may look forward to some *very* special sets on Stands 19 and 20. On the other stands, too, there are going to be a good many surprises, but I don't think that there will be anything quite so thrilling as the screen-grid valve and the pentode of former years. The keynote of the exhibition will be steady progress, increased perfection in components, and still greater simplicity in receiving sets.

What is a Farad?

I have often wondered why such an enormous unit as the farad was adopted for capacity. In wireless we seldom go beyond the microfarad—the millionth part of a farad—though electrolytic condensers with a capacity of 3,000 microfarads or 3 millifarads are sometimes used. In measuring stray capacities, such as those within the valve, we have to use the micro-microfarad, or the billionth of a farad. How large would a fixed condenser have to be to have a capacity of one farad? It is not hard to work out the answer roughly. Using the best ruby mica, .002 in. thick, two plates overlapping by one square centimetre give a capacity of almost exactly .0001 microfarad. An overlap of 10,000 square centimetres thus produces a capacity of one microfarad, and ten thousand million square centimetres are needed for a whole farad. Thus, if there were but two plates they might each measure one kilometre square, or roughly 1,100 by 1,100 yards. The area would be approximately 240 acres—the size of an average farm. If you want to obtain some idea of the bulk that a one-farad condenser would have, supposing that it were made up in "compact" form, you have only to think that it would be a million times as big as a one-microfarad condenser or 100,000,000 times as big as a .01-microfarad clip-in. Our wireless dens would need enlargement if we had to use one-farad condensers.

Germany and Television

It would appear that I hit the nail on the head recently when I mentioned that great interest in television was being evinced by Germany, for on another page of this issue will be found details of what must be regarded as an indication of German sagacity. As had been previously mentioned in these columns, transmissions from a Berlin broadcasting station (Witzleben) have been taking place for some time past and good reception was possible within the normal local range of the station. When ether-raking late at night on a powerful set I had heard a peculiar note which I could not really account for, but undoubtedly it was the television note from this station, for it tuned in on the Berlin station's wavelength.

However, the Baird engineers in London went much farther than "hearing a note," for they successfully resolved the signals into recognisable images at their receiving laboratories and thereby marked another milestone in progress for this wonderful science. I can imagine their enthusiasm when they first saw the movements of their brother engineers so many miles away. Baird television had previously bridged the Atlantic, now it has brought Berlin within optical range.

Is Television Embarrassing?

Can television be kept within the bounds of a good servant or will it eventually become a bad master? This is the humorous vein adopted in an Australian paper, and is provoked by the work of Major MacLulich and some Baird engineers who are engaged in demonstrating the television system in Australia. The writer in his article goes on to ask just how far the system will go. Will one be able to ring up a person and see him or her on the screen, just as the possessor of a telephone can call anyone to-day? It is one thing to be called, but another to be seen; for, whereas one may compose the voice over the wire, it may on occasions prove both embarrassing and undignified to be seen in one's *deshabille*. Of course, television is more likely to destroy one's privacy, but its possible application to the ordinary telephone would certainly produce incidents which, even in these enlightened days of scientific marvels, would border on the marvellous.

Test Voltages

You certainly have to pay for your volts nowadays. Working with A.C., it is quite easy to design an input transformer to step up the voltage or to step it down, but the snag comes in the shape of smoothing and reservoir condensers, which for safety must often be made with a tested voltage three times that of the working voltage; and, believe me, these high-insulation condensers are far from cheap.

Most people are inclined to favour the use of an output filter circuit to the loud-speaker, for this not only insulates the speaker from direct current, but also allows a single extension lead to be attached to the set. When it is desired to work the speaker some distance away, the return lead only needs to be earthed.

One is rather liable to overlook the fact that the 2-microfarad or similar capacity forming part of the filter has, as a rule, a very severe strain imposed on it, for it has not only to stand up to the D.C. output potential, but also to the A.C. fluctuations, which in the case of sets working with LS5A valves is no small matter. The "powers that be" inform us that the factor of safety for this condenser should be approximately three times the working voltage, but I must plead guilty on occasion to disregarding this advice.

THERMION.

Continued from No. 366

EFFICIENCY :: WINDING RATIOS :: OUTPUT

IN a theoretically perfect transformer the product of the voltage and current of the primary and of the secondary circuits would be equal and, further, the secondary voltage would depend upon the ratio of the turns. Thus, if the secondary winding had one-tenth as many turns as the primary, the secondary voltage would be one-tenth of the voltage applied to the primary. Further: when a load was joined to the secondary, the current flowing would be ten times that passing through the primary winding.

Transformers, as constructed, are not one hundred per cent. efficient. A good one of large size may have an efficiency in excess of 98 per cent., but an efficiency of 75 per cent. is considered quite satisfactory in the case of small transformers.

Losses

The losses and change of secondary voltage with load are due to several factors. In the first place a small amount of power is needed to magnetise the core. Currents are induced in the iron of the core and they represent waste. For this reason a solid piece of iron is not used as the core. Instead, special grades of iron or steel having a thickness of from ten to twenty thousandths of an inch are used and a number of pieces stamped out from the sheets are bolted together to form the core.

The second loss is due to what is termed magnetic leakage. In other words, the whole of the magnetic lines of force created by the current flowing through the primary winding do not link with every turn of the secondary winding. The magnitude of this loss is dependent upon the arrangement of the windings on the core, as well as upon the shape of the core and the load placed upon the transformer.

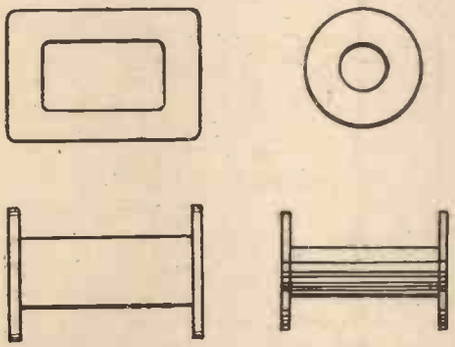
In order to minimise the falling off in the secondary voltage as the amount of the current taken from it increases, the windings are often sectionalised. Thus, instead of the transformer having one large primary winding and another single secondary winding, they may be divided and be sandwiched together.

Resistances

The third loss is due to the resistance of the wire in the coils themselves. It will be clear that this loss increases as the current taken from the secondary, for the actual power lost is the product of current squared, multiplied by the resistance.

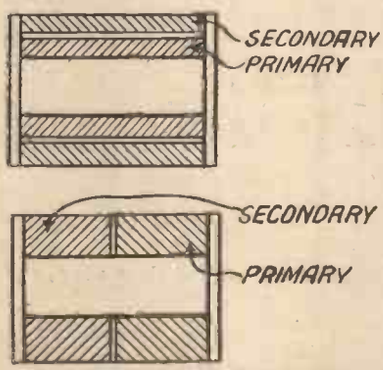
Thus, if the secondary winding had a resistance of 2 ohms and the current was 2 amperes the watts lost in this winding alone would be 2×2^2 or 8. There would be a further loss owing to the resistance of the wire used in the primary winding, and this is also calculated as in the case of the secondary.

Transformers that are used for mains units need not necessarily be highly efficient components, but in certain instances it is desirable that the voltage



Both rectangular and circular windings are used

of the secondary shall not vary by more than a small percentage from no load to full load. A particular example would be a filament-lighting transformer. There are components on the market at the present time which are said to be suitable for supplying the current to from one to four or five valves of the indirectly-heated cathode



Alternative arrangements of primary and secondary windings

type. These transformers must be well designed and although the average reader may not have instruments for measuring alternating voltages and currents, some idea of the worth of a particular model may be obtained.

Winding Resistances

The resistances of the windings may be measured with direct-current instruments and if they show that the voltage drop in them will not be very great over the range of currents it is expected will flow, the transformer will probably be satisfactory provided, of course, it is constructed for the correct mains voltage and frequency.

A transformer intended to give up to 4 amperes at 4 volts, for example, should have a secondary winding of which the resistance does not exceed about .1 ohm. With this value of resistance, the voltage drop in the secondary winding alone when carrying 4 amperes would be .4 volt and when carrying two amperes .2 volt.

The current flowing in the primary circuit may be reckoned, at full load, as being about 25 per cent. more than the current estimated according to the ratio. With a 100-volt primary and a four-volt secondary the ratio is 1 to 25; therefore the primary current resulting from the load is 1/25th of the secondary current.

Output

If then, the resistance of the primary is 50 ohms, the wattage lost in the primary will be approximate to $50 \times .2^2$ or 2 watts. This, in turn, is equivalent to a reduction in the secondary voltage of about .5. The total effective voltage drop, when the transformer is carrying its full load is therefore seen to be approximately 1 volt, which means that the secondary winding must be arranged to provide about 5 volts when not delivering current.

If this transformer were used to heat two valves taking 1 ampere each, the voltage of their filaments would be about 4.5; this voltage would fall to the correct value of four if additional valves to take 4 amperes altogether were connected. There seems to be an idea in the minds of some amateurs that a transformer provides a more or less constant secondary voltage, but the examples I have given will show that this may be very far from the truth.

In the immediate neighbourhood of Bruges the Belgian authorities are putting up a high-power short-wave transmitter for direct communication with the Congo and South America.

WTAM, Cleveland, has been granted an increase in power by the Federal Radio Commission from 3,500 watts to 50,000 watts, making it the second station in Ohio with such power. WLW, Cincinnati, is the other.

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

Safety and Lightning

DURING the past few days there have been one or two minor storms accompanied by a little lightning with the result that the question of the usefulness of aerial-earthing switches and lightning protectors has cropped up.

A lightning protector does, of course, tend to prevent high voltages collecting on the aerial and is, therefore, a component worth fitting, but I am doubtful of the utility of certain of the switches sometimes used. The single-pole type would appear of no real value at all and I do not put much faith in the small double-pole switches. But still, when the aerial is connected to the earth by one of these switches and the pair of wires for earth and aerial which pass to the set are disconnected, there is a measure of protection. The switch should, of course, be outside the house.

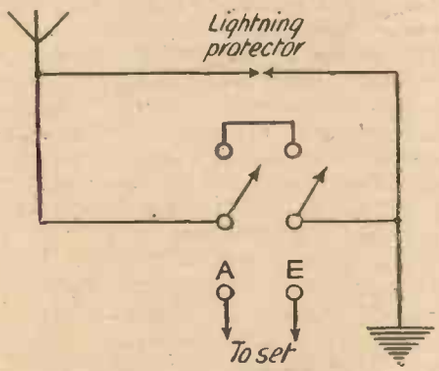


Fig. 1.—A lightning protector

A few years ago when a series-connected aerial tuning condenser was often employed I used occasionally to hear sparks passing from one set of plates to the other. A lightning protector would have prevented this from occurring and so would a suitable switch for earthing the aerial and disconnecting the receiver. This matter is made clear by Fig. 1.

Anode Circuit Matters

It is, I suppose, generally realised that the voltage of the anode of a valve is not necessarily that of the high tension. Thus, when a resistance coupling is employed, the anode voltage is clearly below that of the high tension and this is true whenever the part connected to the anode has resistance. One is apt occasionally to overlook this, however, particularly when a part is used instead of another, because its resistance is lower. An example that comes to my mind is the output circuit, which may include a loud-speaker by itself or an output transformer and the loud-speaker.

One of the claims made in favour of employing an output transformer instead of connecting the loud-speaker directly to the anode circuit is that the rather heavy voltage loss across the loud-speaker is avoided. The usual resistance is 2,000 ohms, giving a voltage drop of 20 for 10 milliamperes. But what is the resistance of an output transformer suitable for this type of loud-speaker?

One well-known transformer has a primary winding with a resistance of 600 ohms. When the current flowing through it is 10 milliamperes the voltage drop is therefore 6 which is, of course, much smaller but not quite negligible. This example illustrates how careful one must be in accepting the various statements that are made in favour of alternative components.

Don't Forget!

Momentary forgetfulness may, on occasions, be costly. I have in mind a recent experience when I nearly destroyed a perfectly good set of valves.

Three of them were of the 6-volt .1 ampere type, and the other passed a current of .8 ampere. I was testing a filament power unit and had adjusted it to provide the 6 volts for the filaments as indicated by a voltmeter. Having completed the tests, I thought I would fit a 6-volt .1 ampere valve in the place of the super-power valve.

Without considering the matter, I pulled out the .8 ampere valve and at the same time it occurred to me that as soon as this valve was removed from the circuit, the voltage applied to the others increased from 6 to 7 or 8. Fortunately, I switched the unit off immediately, and it would appear that no harm resulted. It is, however, quite clear that had I delayed the switching off, the valves left in the receiver would have been damaged.

One cannot be too careful when using power units of any description, for the voltage which they give invariably changes with the load, with the result that when a valve is taken from the set the voltage applied to the other valves increases.

Controlling H.F.

A convenient method for controlling the amount of the high-frequency amplification provided by a shielded grid or neutralised stage is by means of a filament resistance connected to the valve. When the resistance is short-circuited, the maximum magnification is usually obtained and it falls off as a resistance is included.

This is because the temperature of the filament decreases with the current passing through it and with ordinary valves a smooth control of volume is obtained. The scheme is, in fact, one that I have used on many occasions.

It is, however, not applicable to valves of the independently-heated cathode type. In these valves, a heater wire is employed to raise the temperature of a surrounding material, which is coated with a substance that readily emits electrons. The emission depends upon the temperature of the tube or other part used as the cathode and there is a lag of several seconds after switching on the current before the temperature reaches a steady value.

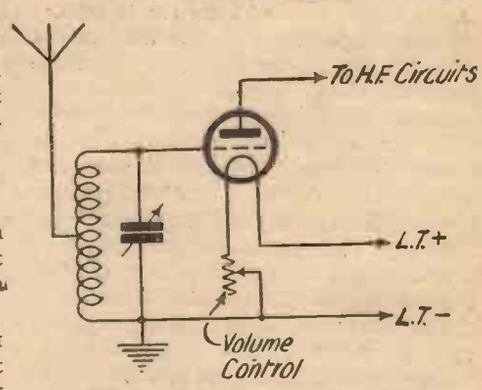
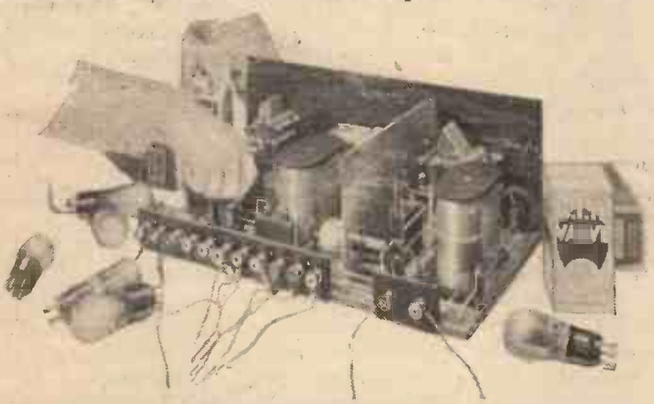


Fig. 2.—Method of controlling H.F.

Owing to this lagging effect, one is not able to control the magnification by varying the filament current, with any success. One is apt to move the filament resistance beyond the point where the desired volume will be obtained and several seconds must elapse before the steady state is reached. See Fig. 2.

Distorted reproduction may be due to many reasons. This article by R. W. Hallows will enable you to discover where the fault lies

THERE are so many possible causes of distortion in even the simplest wireless receiving set, that the wonder is that we ever succeed in bringing in speech and music in such a way as to make them fit to listen to. That we do succeed is quite evident, for even the trained ear can find little to criticize in the reproduction of a first-rate modern valve set used in conjunction with a well-designed loud-speaker of the moving-coil type. Other kinds of loud-speakers, too, may be completely pleasing to the ear, though for a number of reasons none of them can deal quite so faithfully with a wide range of audible frequencies as can the moving coil.



It may be necessary to install in the last holder a valve of lower impedance

Are Your Batteries All Right?

It sometimes happens that the reproduction of a set which has previously given good results begins to show a falling off; or it may be that a new set purchased or constructed at home just fails to please the ear because there is some little thing lacking in its rendering of broadcast items. In either case distortion is present, for distortion means failure to reproduce with reasonable exactness, and without adding anything to them or subtracting anything from them, the sounds that occur in the studio. A discussion of some of the commonest causes of distortion and of the ways in which they can be tracked down and rectified may be of service to readers.

Before anything else is done one should make certain when distortion occurs that it is not due to a defect in the batteries, or the eliminator if one is used. When the source of low-tension current supply is providing insufficient voltage, the whole shape of the curve of each valve becomes altered, making distortion inevitable. Too low a high-tension voltage moves the characteristic of each valve bodily towards the right, shortening the useful straight portion and causing a deformation of wave shapes. The effects of a reduction in the H.T. potential are most marked in the note-magnifying valves, for it is in them that we require a very long straight portion of the characteristic. Supposing that the plate voltage is falling whilst that of the grid battery remains up to the mark, each of the note-magnifying valves may be turned into a bottom-bend detector, suppressing or seriously mangling the negative halves of the waves.

Lastly, there is the grid battery which, contrary to *some* people's belief, does not last for ever and ever. Too often, having been built into the set, it is regarded as a component almost as permanent as the transformers or condensers. The life of a grid battery of first-rate quality is about nine months. It is not called upon to supply current, of course, but the cells gradually lose their original E.M.F. owing to minute leakages which are bound to take place and to the drying up of the moisture in the electrolyte. It is a safe and sound rule to test the grid battery at least once a month and to discard it as soon as any pronounced drop in the voltage is noticeable.

As the biasing voltage of the low-frequency valves falls owing to the ageing of the grid battery, the working point of each creeps far too high up the straight portion of the characteristic. When a wave of considerable amplitude arrives its positive half takes the working point up into the grid current area, with the result that this half cycle is mutilated.

Further, do not forget that run-down high-tension or grid batteries may be responsible for more "atmospherics" than Dame Nature ever produces.

One of the commonest kinds of distortion is that in which unpleasant harsh or cracked noises are heard whenever loud passages or certain notes occur. This type may be particularly noticeable during a piano solo, for there is nothing like this instrument for showing up any defects in the receiving gear. Distortion of this kind is invariably due to overloading. As a rule it is the valves that are overloaded, though sometimes it is the loud-speaker. To see whether overloading is occurring, reduce the volume of sound by detuning a little. If quality now improves you may be quite sure that you are asking your low-frequency

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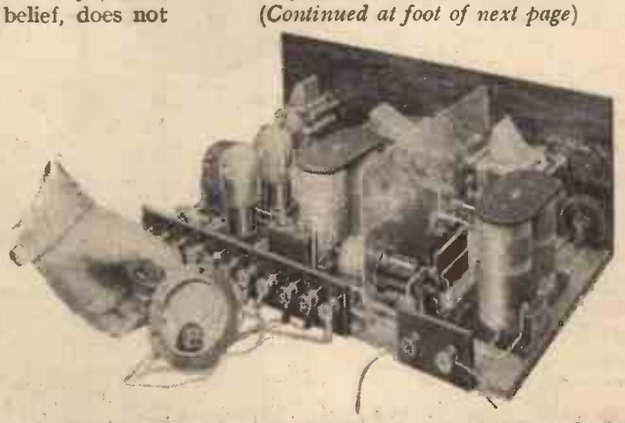

A milliammeter will show whether the valves are being overloaded

Marconi Royalties Confirmed

TWO cases of interest to listeners generally have recently occupied the attention of the High Court. In the first action, the Marconi Wireless Telegraph Company appealed against a decision of the Comptroller of the Patent Office granting the Brownie Wireless Company a compulsory license to use certain Marconi patents at a reduced royalty charge, namely, 5s. for the first and 2s. 6d. for each subsequent valve. The standard royalty charge prior to this decision was at the rate of 12s. 6d. for each valve holder used in a broadcast receiver.

The Brownie Case

The Brownie Company recently placed on the market a two-valve amplifier which, when used with a crystal detector did not infringe the Marconi patents, but which, if used with a valve detector, might be an infringement. When the firm applied to the Marconi Company for a license, they were told that they could have one on the usual terms. They refused this offer because, they said, the royalties were too high.

More than 2,000 Marconi licenses had previously been issued, but no other wireless manufacturer had come forward to say that the royalties were so unreasonable that he could not carry on his trade at a profit.

In answer to the argument that there was a large body of people who could not afford to pay more than 50s. for a valve receiver, it was pointed out that the Brownie Co. advertised a crystal set with note magnifier for 52s. 6d., which paid no royalty. Where was the evidence that that did not satisfy the demand?

Counsel for the Marconi Co. added that there were many people who would like to have the fancies they nourished satisfied at other people's expense, but the State did not step in to gratify their desires. Some people wanted to go to the pictures for nothing. Instead of providing facilities for them to do so, he was credibly informed that on the contrary the State taxed them for going.

For the Brownie Company it was argued that the case was important because it affected a large body of traders, and an industry which had grown up to be of national importance. There were no novel principles involved. Compulsory licenses had been part of the law for fifty years, and scores of them had been granted.

A patentee could no longer do what he liked with his own. Legislation tended to interfere more as years went by with a patentee's liberty of action because of the increasing complexity of commerce and the modern tendency to combine large businesses in a few hands. The danger that patents might become harmful to the public manifestly increased in such circumstances.

Broadcasting had become a public service of vital national importance. Its educational value was such that it should be available to the poorest classes of the community at the earliest moment. The Brownie Company were in a position to supply receiving sets at such a price as would reach a vast new section of the public, who had never before been catered for. It was the avowed policy of the Government to enable all sections of the

(*Continued on page* 898)

"TRACKING DOWN DISTORTION"

(*Continued from preceding page*)

valves or your loud-speaker to do more than they really can.

Perhaps the best test that one can apply to the loud-speaker is to try it in connection with a friend's set, which is known to be capable of producing large volume without distortion. By gradually increasing the volume, the maximum that the loud-speaker will stand without rattling or buzzing or zizzing is easily discovered.

Run-down batteries are a frequent cause of bad reproduction

If a loud-speaker of the horn or cone type has been in use for some little time, one may be surprised to find that it will stand nothing like the volume that it used to deal with. The reason is probably that the permanent magnet has become partly demagnetized. Send the instrument to the makers or to some firm which specializes in such jobs for remagnetization and it will return to its old form once more.

The only certain way of seeing that the low-frequency valves are not overloaded is to make use of a milliammeter. If you do not possess one, you will probably have no difficulty in borrowing. Wire the instrument in series first of all with the high-tension lead which serves the plate of the first note-magnifying valve. Tune in the local station to the volume that you habitually use and watch the needle. It should remain absolutely stationary. If it does not do so, adjustments of the grid bias of this valve may effect an improvement and a complete cure may be accomplished by increasing both the H.T. voltage and the grid bias. It is most important that the first note-magnifier, if there are two, should not be overloaded, for when this happens the distortion produced is made many times worse by the following valve.

Next test out the output valve in the same way. If no adjustment of its grid bias and no increase in its plate voltage within the powers of your H.T.B. or eliminator will produce perfect steadiness of the needle then you have two alternatives: either you must be content with smaller volume from the loud-speaker, or you must install in the last holder a valve of lower impedance.

At short range the detector valve may introduce distortion whether it operates on the leaky-grid or the anode-bend system. The first of these methods can deal properly with only a very small grid swing. For reception, therefore, from a powerful station at close quarters it will probably be found an advantage to change over to anode-bend. But unless the plate voltage is fairly high and grid bias adjusted to correspond, the anode-bend detector can also be overdone by a powerful signal. The cure here is to increase the plate voltage to, perhaps, 120 or more and increase the grid bias.

Distortion due to the action of high-frequency amplifiers is not very commonly met with in receiving sets, though it can undoubtedly occur. When the high-frequency circuits are made so "low-loss" that tuning is razor sharp, the set may be so selective that it actually suppresses a portion of the sidebands accompanying the broadcast transmission.

To return to the low-frequency side, the form of distortion which consists in the suppression of most of the very high or very low notes, or in the over-emphasis of certain parts of the register, is due as a rule to unsuitable intervalve couplings. Old-fashioned transformers have a very limited frequency range and the remedy when they introduce distortion is to replace them with modern components.

Resistance-capacity coupling, though once it used to be thought entirely above suspicion, can introduce distortion if the values of the anode resistance, coupling condenser, and grid leak are not exactly right.

Lastly, there is the problem of the output circuit. Many a loud-speaker has no chance of doing itself justice, since it is wired direct into the plate circuit of a valve whose impedance it does not match. The loud-speaker should always be chosen with regard to the impedance of the output valve, and if the two do not match an output transformer or a suitable filter circuit should be employed.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THE "talkies" have already shown that they are capable of "hitting listeners in the eye." I am referring, of course, to the exodus of certain members of the B.B.C. administration to more lucrative fields in the film world.

◆ ◆ ◆

And now another blow—of a different kind. Owing to the introduction of "talkies" at the Prince of Wales Picture

Angela Baddeley—an impression

House, Lewisham, we are not to hear Frank Westfield's Orchestra any more. I have often praised Frank Westfield on this page; I have always liked his orchestra and particularly the bright programmes he gave us. And now the relentless sound films have taken him from us.

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As a matter of fact, yet another of our popular cinema broadcasts is likely to be pushed off the ether by the "talkies" by the end of July. I shall not mention names; but prepare yourselves if you are growing too fond of these items.

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One gets tired of hearing the Yankee drawl—particularly when it is imitation—but I must confess that Burns and Allen, the American comedians who recently entertained us, were quite pleasant to listen to. One found their accents rather piquant and refreshing, and their cross-talk unusually funny.

All praise is due to the Victor Olaf Sextet. They give us fine concerts; the recent one in conjunction with the Gresham Singers was a musical treat. While mentioning the latter, I am afraid I cannot get used to the gentleman with the very *very* high voice.

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The new musical comedy, *The Island Princess*, was pleasant enough. The plot was not very deep, but was sufficient, and the music was, on the whole, pretty; but I found the chorus rather overpowering.

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Cyril Shields' "running commentary" on the studios was fairly funny, but I could not see much to laugh at in the rest of his turn. It sounded just as if he was making it up as he went along (and experiencing great difficulty as a result). I found his "magic" rather ineffective, too.

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Miss Cornelia Otis Skinner, who was featured in a recent surprise item, gave us some interesting sidelights on American home life. Her study of a little boy trying to do his homework while his mother made disparaging remarks about the state of his ears was intensely human.

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We have heard animal imitators of varying degrees of efficiency, but there was something fresh—and efficient—about Carl Lynn's turn from the Palladium. His cat impersonation was probably the best, but his imitation of a wireless set—although not an animal impersonation—was wholly delightful.

◆ ◆ ◆

Yvette Darnac is the type of variety performer who adds unexpected zest to a vaudeville programme. After an almost endless procession of "cuties" and "babies," it is a pleasure to hear her sing her pretty French songs. I have grown particularly fond of "Lisette."

◆ ◆ ◆

Another comment on the "Children's Hour" by one of my readers :—

"Although my children are nearly in their 'teens, I am sure they don't want to hear songs about 'oceans of love and kisses' and 'a girl waiting back there in Dixie for me.'"

I happened to hear the songs to which my correspondent refers, and I myself was surprised beyond measure to hear such sentimental tosh being served up to kiddies.

And while on the subject of the "Children's Hour," Clapham and Dwyer gave a good skit on it not long ago. It consisted of a lot of indescribable noise interspersed with an occasional cry of "Hallo, children!" A good many of us must have appreciated it.

◆ ◆ ◆

Clapham and Dwyer were certainly in form that night. They gave us an "outside broadcast" purporting to come from a cinema where a "talkie" was being shown. It was one of the best things they have done. And Clapham's imitation of a dance-band announcer was good, too—although I fancy I have heard it before.

◆ ◆ ◆

I wish we could have a little more of Pattison's Salon Orchestra from Birmingham. Only a little more, though, because it is human to grow weary of things we like. Congratulations must go to Mr. Norris Stanley for the delightful programmes which he arranged. The last time I heard them the programme was excellently thought out.

8FM (a Paris experimental amateur transmitter) broadcasts a concert regularly every Friday evening on 308 metres as soon as Radio Vitus has closed down.

Lawrence Anderson—as Roberts sees him

OPERATING "THE LO

THE CONSTRUCTIONAL DETAILS OF THIS REC A S.G., DET., L.F., FOR LONG-DISTANCE WORK I LOCAL STATION, WERE GIVEN LAST WEEK. OVER IS MADE, TOG

"TWO receivers in one" is the best description that can be given to the "Local and Continental 3," the receiver which was described in the centre pages last week. In the one cabinet are the essential components for a long-distance receiver, comprising a screen-grid stage of H.F., detector, and one stage of transformer-coupled L.F. amplification. By the simple changing over of the positions of three or four short flex leads, and without any actual re-wiring of the receiver, the circuit may be changed to another "three," ideal for purity reception of the local station, namely, a "det., R.C., trans. combination."

The Controls

On the panel are three controls and an on-off switch for the filament. One of the controls (that on the right above the filament switch) is the variable tuning condenser, while on the oval sub-panel are the selector switch for wave-changing and a moving-coil reaction control. This sub-panel is part of the tuner, which is a complete unit. These controls function in just the same way, so far as their purpose is concerned, no matter whether the long-distance or local-station circuit is in use, but the feel will be slightly different, and this will be dealt with at greater length in the instructions for operating.

Changing Over

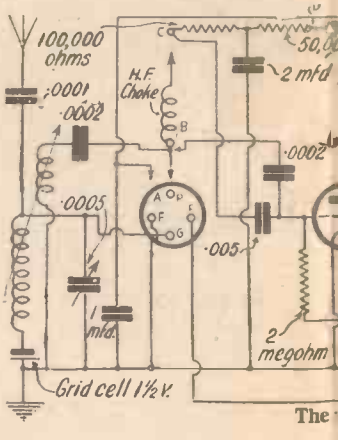
The following instructions for changing over from one circuit to the other should be closely followed, because it should be obvious that if the operation in either case is not made complete there is a possibility of a short-circuit. The circuit diagram reproduced herewith shows the actual valve-holder connections of the first stage, and it should be borne in mind that, apart from the four terminals shown, F, F, P, and G, there is a fifth terminal where the screen-grid valve is used and a flex connection has to be made to the terminal at the top. The wiring diagram given herewith will be seen to conform with the blueprint, from which most readers will doubtless have made up the receiver. On this diagram are lettered instructions for changing over the flex lead to effect the metamorphosis.

From these instructions the least technically-minded reader can carry out the alterations which, technically, are considerable, and this without knowing really what is effected by the changing over of the leads. It is much better, however, to have a good idea of just what happens when the positions of the leads are changed. This can be best obtained from the circuit diagram.

To change over from the long-distance to the local set, remove the four flex leads, leave two free and connect the others to the points indicated

Just see what happens when the detector, R.C., and transformer combination is in use. The detector valve is plugged into the first socket, the wire from one end of the H.F. choke is connected to the anode terminal on this valve holder, the other end of the H.F. choke is connected to terminal C at the end of the 100,000-ohm resistance, and all other leads are left free. This gives us the anode-bend detector, owing to the 1½-volt grid cell in the aerial tuner circuit, and, of course, a tuning arrangement incorporating moving-coil reaction, somewhat on Reinartz lines, with a .0002-microfarad fixed condenser in series with the reaction coil. In the anode circuit of the detector valve is the 100,000-ohm anode resistance, and an anti-motor-boating unit, comprising a 50,000-ohm resistance and a 2-microfarad stabilising condenser. The coupling condenser to the grid of the first L.F. valve is of .005-microfarad capacity, the .0002-microfarad condenser (one side of which is also connected to the grid of this valve) being out of circuit.

To the grid of this valve also is connected a 2-megohm leak the other end of which is connected to a variable tapping on the grid-bias battery. This tapping is adjusted according to whether the middle valve is acting as a detector or as the first L.F. stage. The final valve, which is transformer-coupled to the preceding stage,



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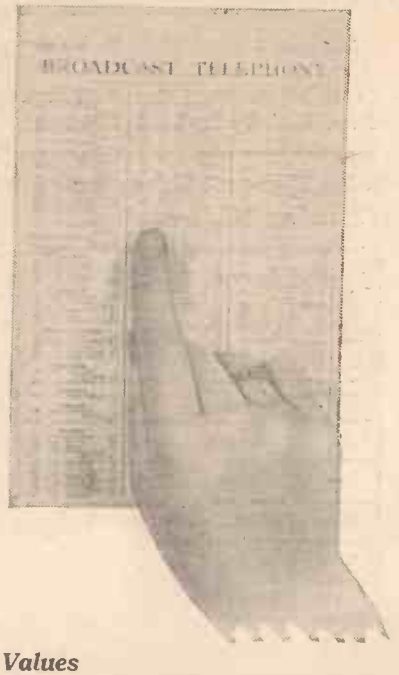
OCAL and CONTINENTAL 3"

EIVER, WHICH IN HALF A MINUTE CAN BE CHANGED FROM NTO A DET., R.C., TRANS, FOR PURITY RECEPTION FROM THE HERE ARE SOME NOTES DESCRIBING HOW THE CHANGE-ETHER WITH HINTS ON WORKING.



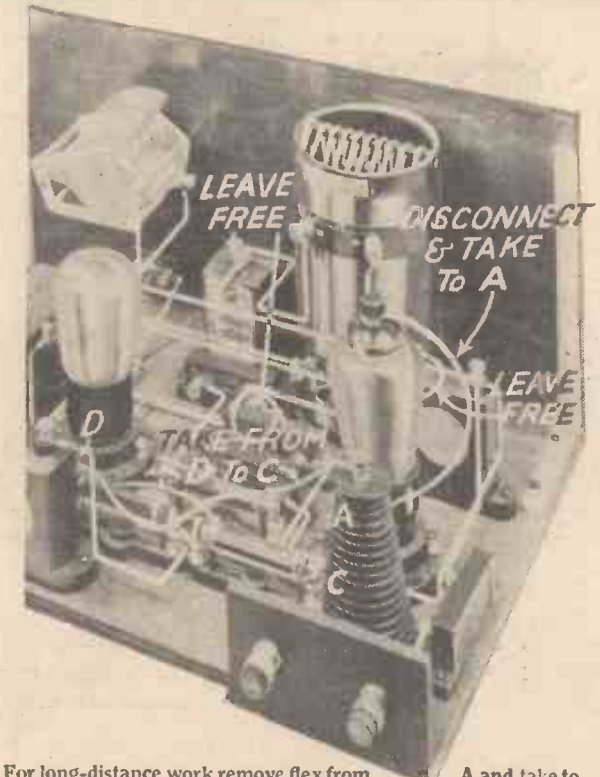
is a power valve and, of course, remains unaffected by the circuit changes in the aerial and first L.F. stages.

Now see what happens when the flex leads are changed to bring the screen-grid valve circuit into operation. The detector valve is removed from the first socket and a screen-grid valve is inserted. All flex leads should be disconnected and left quite free, so that one can wire up as from "zero." One end of the H.F. choke is then connected to the terminal at the top of the screen-grid valve, and the plate terminal on the valve holder is now connected to the H.T. + 1 tapping. This places the requisite potential on to the screening grid. The other end of the H.F. choke is then connected to terminal D, at the other end of the 50,000-ohms resistance of the anti-motor-boating unit. The free side of the .0002-microfarad grid condenser is then connected to terminal B of the H.F. choke. The grid-bias battery tapping is then suitably adjusted so that the middle valve operates as a detector. This completes the list of operations for transferring to the distance-getting arrangement. Before detailing the operations the foregoing, wiring particulars may be summarised.

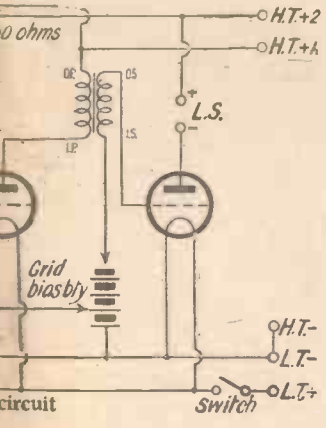
It is imperative to note that before changing from one circuit to the other *all flex wires must be left free and the H.T. battery should be disconnected.* Moreover, the wires which are left free and unused must be placed so that it is quite impossible for them to short to any other terminal or component. It is not a bad idea to bind a piece of tape around the free spade tags.

Quite Simple

For the benefit of those who do not wish to take interest in the theoretical operation of the two circuits here is all that need be done: connect lead 38 to terminal B when the screen-grid valve is used, and leave it disconnected for the other circuit; connect lead 37 to terminal A when the screen-grid valve is used and, similarly, leave disconnected for the detector and 2 L.F. combination; lead 40 should be connected to terminal A on the detector valve socket for the detector and 2 L.F. circuit, or taken to the anode on the screen-grid valve; lead 39 is connected to terminal D or C, according to whether the screen-grid valve or detector and 2 L.F. circuit is in use.



For long-distance work remove flex from A and take to terminal of S.G. valve; remove wire from C and take to D; connect wire No. 38 to B and wire No. 37 to A



H.T. Values

When the "distance" circuit incorporating the screen-grid valve is employed, the aerial tuning will not be particularly sharp, nor will the reaction be critical, for the H.F. boosting will be sufficiently great to render necessary only the minimum of reaction. About 120 volts H.T. should be applied to terminal H.T. + 2, which feeds both the H.F. and power valve, while terminal H.T. + 1, which supplies the anode of the detector valve and the screening grid of the H.F. stage should have applied to it a potential of roughly 80 volts. There is room for a little safe experimenting here.

It will be noticed that when the detector and 2 L.F. combination is employed, both the reaction and tuning controls are a little more critical as a rule. This is owing to the fact that the grid damping of the detector valve is not so much as that of the screen-grid valve, and also that, the H.F. amplification not being present, more reaction boosting is needed. Use about 120 volts on both H.T.+1 and H.T.+2.

In both cases a reasonable degree of selectivity is maintained by the presence of the .0001-microfarad condenser in the aerial lead. This has an incidental advantage in that a fairly lengthy aerial may be used without causing excessive damping and so flattening tuning.

Here are just a few final points to remember. Disconnect the H.T. battery and all flex leads before commencing to change from one circuit to another; carefully insulate disused flex leads so that they cannot foul other connections · do not forget to alter the battery values—the grid-bias battery tapping is particularly liable to be forgotten.

The tuning settings for each circuit on given stations will be found slightly

"OPERATING THE LOCAL & CONTINENTAL 3"

(Continued from preceding page)

different, and it is a good plan to put on one chart the two dial settings of each station that can be received on both circuit combinations. Usually the local station and

Suitable Two-volt Valves for the "Local and Continental 3"

Make	Screen-grid	Detector	Middle Valve	Power Valve
Cosmos	—	SP16/R	SP16/R	SP18/RR
Cossor	220SG	210HF	210HF	220P
Ediswan	SG215	HF210	HF210	PV215
Marconi	S215	HL210	HL210	DEP215
Mazda	—	HF210	HF210	LF215
Mullard	PM12	PM1HF	PM1HF	PM2
Osram	S215	HL210	HL210	DEP215
Six-Sixty	215SG	210HF	210HF	215P

5XX and 5GB, and perhaps one or two of the louder foreigners, can be received on both circuits, but the distance-getting properties of the screen-grid valve will be found invaluable.

UNCOMMON USES FOR VALVES

IT is known that certain diseases can be alleviated and even cured by the application of high-frequency currents. This form of treatment is called diathermy, and in the more modern appliances thermionic valve oscillators are now used to generate the necessary high-frequency currents.

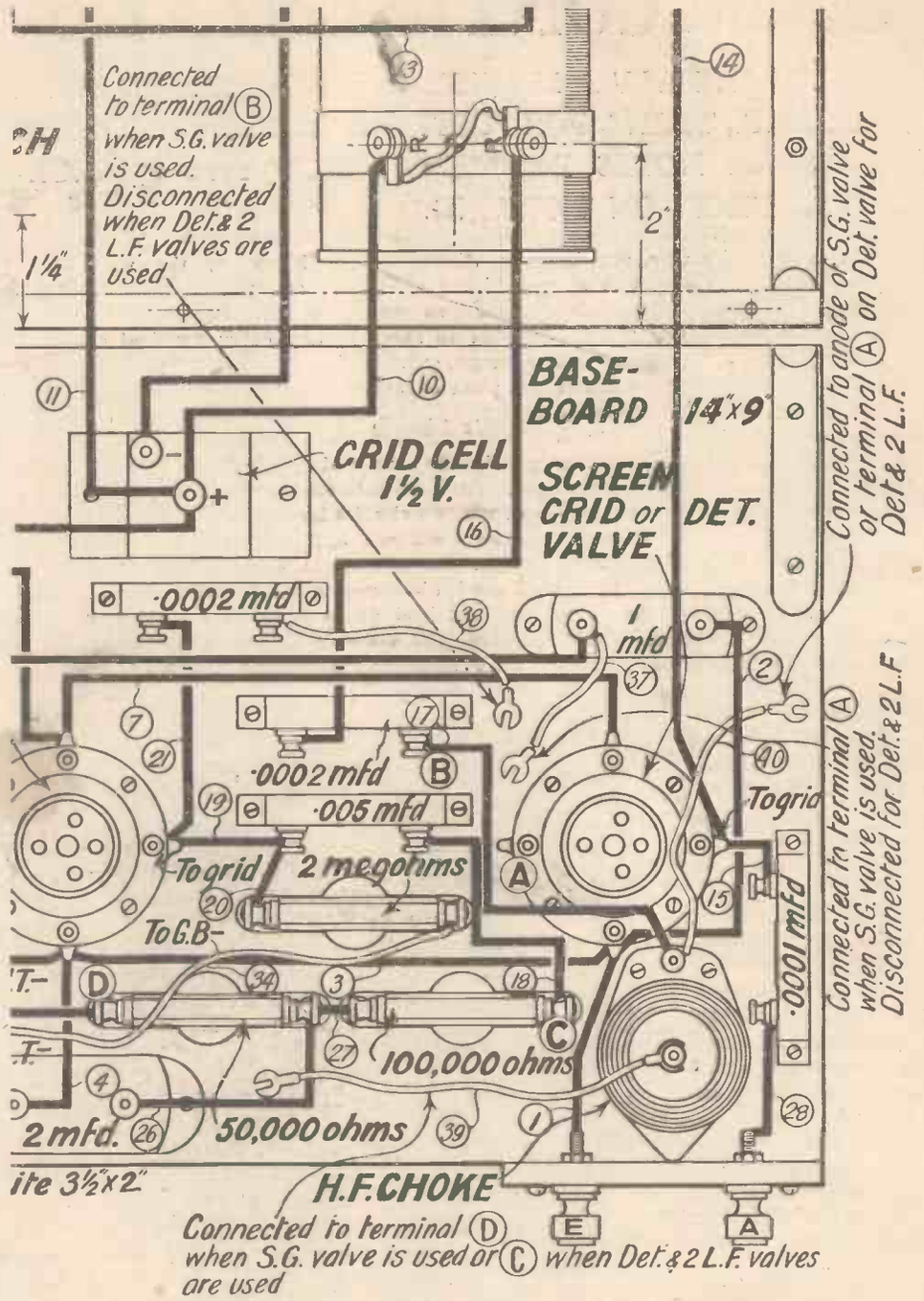
High-frequency currents can also be used for surgical operations. A point electrode, or electric knife, fed with current from a powerful valve generator, will cut through tissue and even bone, cauterising the wound as it cuts, so that the operation is practically bloodless.

Automatic "Lighting-up" Devices

There are many instances where the use of an amplifying valve enables the very delicate response of a selenium cell, or other photo-electric device responsive to variations in light intensity, to be used for the automatic control where it would otherwise be impossible.

For instance, a photo-electric cell can be inserted in the grid circuit of a valve, and the grid bias so adjusted that when daylight has faded to a certain point, street lamps and electric advertising signs are automatically lit up without requiring any form of manual control. At daybreak the light-sensitive combination automatically cuts off the supply current. Shop-window lights for display purposes may be similarly brought into play after working hours, during the summer months, and subsequently extinguished by a time switch.

M. A. L.



Portion of wiring diagram showing how the change-over is effected

WAVE INTENSITY

OTHER things being equal, received signal strength must depend upon the actual "pick-up" by the aerial. This will, of course, vary with the length or height of the aerial and with its distance from the transmitting station. In other words, the input to the set is determined by the intensity of the ether waves flowing past the aerial.

The strength of such a wave is measured in "volts per metre," i.e., the actual voltage induced across each metre length of the aerial as the wave cuts across it. At a distance of twelve miles, the field strength of the radiation from 2 LO may be taken as approximately 10 millivolts per metre. At a closer range, say within two or three miles of the transmitter, the field strength will vary from between 50 to 100 millivolts per metre, according to the screening effect of any intervening iron buildings. From 10 to 20 miles away the field strength varies from 5 to 7 millivolts per metre, the former value representing the minimum at which clear crystal reception is possible.

B. A. R.

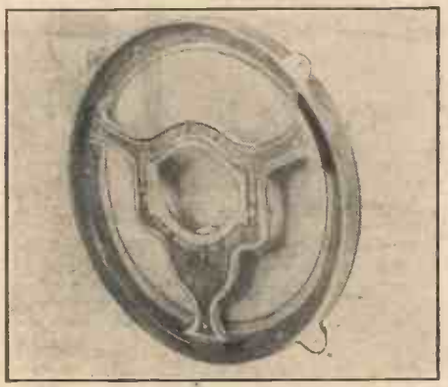
"A.W." TESTS OF APPARATUS

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

Squire Portable Cone Chassis

WE recently tested in these columns a specially large-type Squire loud-speaker. We have now tested a similar type of speaker made by Messrs. Squire, of Stoke Newington, but considerably smaller in size, having an over-all diameter of less than 1 ft. The 8½-in. cone of this speaker is flexibly attached round the periphery to an aluminium frame, which includes a special device for holding a number of different types of well-known speaker units, including the Blue Spot, the Triotron, and Bullphone units. Provision is made for connecting the speaker to a baffle board by the inclusion of four lugs, which form part of the metal framework.

In practice, we gained a most favourable impression of this speaker when used with one of our standard units. There is a distinction in tone which is pleasing and the volume is quite satisfactory. Speech could be heard with clarity and there appears to



Squire Cone Chassis

be no undue diaphragm resonances to mar the reproduction.

Altogether this is a well-made chassis unit, which may be recommended to readers.

Collett Connectors

THE man who hooks up and builds his own set is always interested in such items as soldering tags, spades and other forms of connector. Small components as they are, they play an important part in aiding the constructor to make a good job of his set. Owing to the differing types of terminal it is often necessary to have different sizes in tags and connectors and the keen amateur will like to have at his side a comprehensive assortment.

We have received for report, this week, a set of terminal tags, soldering tags and spade connectors of all sorts bearing the trade name of Excel, made by the S. H. Collett Manufacturing Co., of 60 Pentonville Road, London. There are three sizes of the normal spade tag from which to choose, whilst no less than 6 different types of soldering tags are also available, one of these terminates in a cylindrical portion through which the wire to be soldered can be inserted. There is also another form in which the small soldering tag ends in the form of a spade and may, therefore, be pushed under the terminal without first removing the nut.

Different finishes are available for the tags in bright brass, tinned brass or tinned copper. Altogether, this is a most attractive assortment and should appeal to the constructor.

Osram D8 Valve

VALVES deriving their low-tension current from the mains are becoming increasingly popular, and it is probable that in the near future all those who have A.C. mains at their disposal will utilise special valves with their filaments operating directly off the mains.

There are at present two definite types of mains valve, the indirectly-heated and the directly-heated; the former is better known and has been used in a number of AMATEUR WIRELESS sets. The directly-heated A.C. filament, although less common, is just as effective in use if properly designed. In brief, it relies for its successful operation on the use of a thick filament, which is insensitive to sudden changes of voltage; in consequence the filament electron flow does not fluctuate appreciably when working directly off the A.C. mains.

We have previously reported in these columns on the directly-heated Osram .8 valves, and it was shown that a combination of H.F., L.F. amplification, and anode-bend detector, using these valves solely, could be employed with success and hardly a trace of hum. With grid-leak rectification, however, a certain amount of hum was unavoidable.

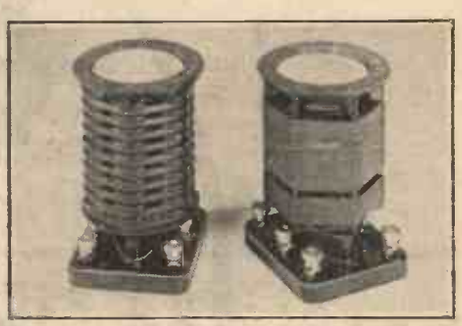
Recently the G.E.C. have brought out a new Osram D.8 detector valve which can be used successfully with grid-leak rectification. The thickness of the filament for this valve has been considerably increased, with the result that the current consumption at .8 volts is 1.6 amp instead of .8 amp. In consequence fluctuation in filament emission has been still further decreased. As a result the valve forms an efficient and silent grid-leak detector.

The characteristics of this valve obtained on the laboratory valve bridge are: Filament volts, .8; filament current, 1.6; H.T. volts, 90; A.C. resistance, 40,000; amplification factor, 17.

Tangent S.G.P. Coils

THE coils employed for the new Mullard S.G.P. circuit are essentially simple in design, but owing to the type of former and winding employed, they have a low high-frequency resistance and therefore a good performance. This week we have tested a set of Tangent coils manufactured by Messrs. Gent & Co., Ltd., of Faraday Works, Leicester, specially for the S.G.P. receiver.

The short-wave coils are wound on a



Tangent S.G.P. Coils

hexagonal moulded former fitted with the maximum of air spacing. In the aerial coil the aerial portion of the grid winding is separated by about ⅛-in. from the remainder of the grid winding. The connections are taken to six pins, which fit into a six-pin base marked in the conventional manner. In the case of the screen-grid anode coil, this comprises a simple untapped anode winding and a reaction winding, both wound on the same type of former separated about ⅛-in. apart.

The long-wave coils are also wound on a hexagonal former, but in this case the winding is bunched together into ten slots. A commendable feature common to all these coils is that the top of the former has been made of larger diameter than the remainder of the former. In consequence one can obtain a firm grip of the coil when lifting it out or inserting it into its socket.

The tests which we carried out on these coils indicate that the tuning range on the short waves extended from about 200 to 600 metres, whilst on the long waves the range extended from 990 to 2,400 metres. Reaction could be readily obtained on both wavelength ranges with a .0003 condenser.

A report from Rome says that all ships flying the Italian flag must be equipped with radio equipment before October 30.

RADIOGRAMS

AS a tribute to that wonderful coster comedian, Albert Chevalier, a programme of reminiscences will be given from the Birmingham studio through 5GB on July 9.

Listeners may remember that some years ago the B.B.C. relayed an auction sale from Christie's. On June 28 from the same rooms another broadcast of a similar character will be made, when Mr Lance Hannen will have under the hammer pictures by Vandyck, Rembrandt, and Zoffany.

Betty in Mayfair, a musical comedy from the pen of John Hastings Turner, author of *Wake Up and Dream*, now filling the bill at the Pavilion Theatre, will be transmitted from 5GB on July 4 and from 2LO and 5XX on the following evening.

During the period June 24 to July 6, Captain H. B. T. Wakelam and Colonel R. H. Brand are giving running commentaries on the more important centre-court matches played at Wimbledon, these are relayed to 2LO and 5XX.

To celebrate Dominion Day, on July 1, the B.B.C. will give listeners a special programme bearing the title *Canada, from East to West in Thirty Minutes.*

The Dumb Wife of Cheapside, a playlet specially written for the microphone by Ashley Dukes, is down for revival by the 2LO studio on July 24.

Although many complaints had been received regarding an apparent decrease in the power of the Langenberg transmissions, the German authorities state that accurate measurements made during a number of broadcasts prove that the power radiated coincides with that observed at the time the station was brought into operation in 1927, and no alteration has been made.

Two new short-wave telegraphy and telephony services are to be established in France with a view to direct communication between Paris and Algiers, and with North and South America. This scheme will necessitate the erection of transmitting and receiving stations, the former at Pontoise, the latter at Marseilles and Sucy la Brie. It is estimated that the cost will reach some forty million French francs.

With twenty-three radio stations, New York City has more than ten other states combined The ten states are Maine, Kentucky, Utah, New Mexico, Vermont, New Hampshire, Delaware, South Carolina, Nevada, and Wyoming. Chicago is the closest rival of New York City, with twenty-one stations.

On a recent occasion through their short-wave station, two-way communication was established between the engineers of KDKA (East Pittsburg) and their radio colleagues at Nauen (Germany). Attempts will be made by the U.S.A. to relay the Berlin programmes through these channels.

It is definitely stated that a site has been found for the high-power broadcasting station to be erected for the Pope in the Vatican gardens; it is hoped to bring the transmitter into operation before next winter.

Notwithstanding the new French broadcasting law which reduces the number of French stations, Paris wireless newspapers report the arrival on the air of two new private transmitters, namely, LY (Douai), working on 262 metres, and Radio Bijou, at Algiers, on 260 metres. Although France, according to the Prague Plan, only disposes of eighteen wavelengths, some twenty-nine transmitters are applying for them.

In view of the success obtained at Ste. Assise (France) with short-wave transmissions, the French P.T.T. authorities have decided to carry out similar experiments in broadcast telephony from the Eiffel Tower.

Whatever its reputation in the world of fiction, in the matter of the result of broadcast appeals Aberdeen has earned the title of one of the most generous towns in Great Britain, and figures prove that any worthy object for which support is asked by wireless from 2BD is well rewarded.

WPTF (Raleigh, N.C.) is the latest station to be added to the National Broadcasting Company's chain.

(*More Radiograms on page* 896)

MR. FLEX'S IDEA WAS ALL RIGHT—

—BUT THE MOMENT WASN'T OPPORTUNE

CHIEF EVENTS OF THE WEEK

(LONDON AND DAVENTRY (5XX)

July 3 *A Beggar on Horseback*, a play.
" 4 A Wireless Military Band concert.
" 5 *Betty in Mayfair*, a musical comedy.
" 6 *The Diary of a Nobody*, by the late Weedon Grossmith, read by George Grossmith.

DAVENTRY EXPERIMENTAL (5GB)

July 3 *Moonshine*, a new radio show by Charles Brewer: sketches by Edwin Lewis.
" 4 *Betty in Mayfair*, a musical comedy.
" 5 Vaudeville programme.

CARDIFF

July 4 A concert from the Zoological Gardens, Clifton, Bristol.

MANCHESTER

July 6 Excerpts from French operas.

NEWCASTLE

July 2 A running commentary on Richmond Historical Pageant.
" 5 An orchestral concert from the North-East Coast Exhibition.
" 6 A band concert from the North-East Coast Exhibition.

ABERDEEN

July 6 A Scottish variety programme.

The new Prague Wavelength Plan is to come into operation on June 30 next; the separation of nine kilohertz will now cover all stations. It has been extended downwards to 216 metres, thus providing for a larger number of transmitters in the broadcast waveband.

The volume of transatlantic telephone business continues to increase and has at times overloaded the radio-telephone facilities. A short-wave channel is now in use supplementing the long-wave channel, and more radio channels are planned.

According to statistics furnished by the Union Internationale de Radiophonie at Geneva, Europe now possesses 189 recognised broadcast transmitters—an increase of 60 stations over the previous year. Of these both Sweden and France head the list with thirty-one; Germany following with twenty-six and England in the third place with twenty-one. Information regarding the exact number of stations in Russia was unavailable at the time. It is interesting to note that Greece, Bulgaria, and Portugal are the only three countries in which a broadcasting system has not yet been inaugurated.

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	Glasgow (5SC)	1.0
*399	753	Daventry (5GB)	17.0
*479	626	Manchester (2ZY)	1.0
*1,553	193	Daventry (5XX)	25.0
AUSTRIA			
*218	1,373	Innsbrueck	0.5
*246	1,220	Linz	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	20.0
BELGIUM			
230	1,300	Chatelineau	0.25
249	1,203	Schaerbeek-Brussels	0.5
250	1,200	Ghent	0.5
280	1,070	Liége	0.5
*509	590	Brussels	10.0
CZECHO-SLOVAKIA			
*279	1,076	Bratislava (Feriby)	12.0
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjöbenhavn)	1.0
1,153	260	Kalundborg	7.5
ESTHONIA			
*295	1,013	Reval (Tallinn)	1.3
FINLAND			
*291	1,031	Helsingfors (Helsinki)	0.8
*1,800	167	Lahti	20.0
FRANCE			
170	1,750	St. Quentin	0.25
212	1,415	Fécamp	0.3
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
*273	1,103	Rennes (PTT)	1.0
*286	1,049	Grenoble (PTT)	1.5
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
*309	970	Vitus Paris	2.0
*316	950	Marseilles (PTT)	0.5
*329	914	Montpellier (PTT)	1.5
336	892	Petit Parisien	0.5
*345	869	Strasbourg	0.3
352	850	Algiers (PTT)	2.0
368	815	Radio LL, Paris	1.0
*381	788	Radio Toulouse	9.0
413	725	Radio Maroc (Rabat)	2.0
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 (testing)	2.0
*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	Nuremberg	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	0.9
*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	666	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
*572	527	Freiburg	0.7
*1,635	183.5	Zeesen	20.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
*223	1,346	Luxembourg	2
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
*298	1,004	Huizen (until 5.40 p.m. B.S.T.)	5.0
*1,072	280	Hilversum (ANRO)	5.0
*1,875	160	Huizen (after 5.40 p.m. B.S.T.)	5.0
*1,875	160	Scheveningen-Haven	5.0
HUNGARY			
*550	545	Buda-Pest	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
450	666	Bolzano	0.3
*501	599	Milan (Milano)	7.0
JUGOSLAVIA			
*307	977	Zagreb (Agram)	1.25
*429	698	Belgrade	4.0
*572	527	Ljubljana	5.0
LATVIA			
*525	572	Riga	2.0
LITHUANIA			
*1,935	155	Kovno	15.0
NORWAY			
*242	1,240	Rjukan	1.0
*297	1,010	Notodden	0.7
*364	824	Bergen	1.0
*337	774	Frederiksstad	1.0
456	657	Tromsoe	1.0
456	657	Aalesund	1.0
456	657	Porsgrund	1.0
*493	608	Oslo	1.5
POLAND			
*234	1,283	Wilno	1.5
*313	959	Cracow	1.5
*335	896	Posen	1.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	10.0
PORTUGAL			
*283	1,058	Lisbon (CTIAA)	(Wed and Sat. 10-midnight)
ROUMANIA			
*394	761	Bucharest	4.0
RUSSIA			
*351	855.5	Leningrad	20.0
*427	702.5	Kharkov (NKO)	5.0
*483	621.5	Homel	2.5
*825	364	Moscow (PIT)	25.0
*1,304	230	Kharkov	15.0
*1,481	202.5	Moscow	30.0
SPAIN			
*208	1,121	Barcelono (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
324	926	Almeria (EAJ18)	1.0
*349	860	Barcelona (EAJ1)	10.0
*308	815	Seville (EAJ5)	0.5
400	750	Madrid (Radio España)	1.0
405	740	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
*257	1,166	Hoerby	10.0
265	1,130	Trollhattan	0.4
*322	932	Goeteborg	6.0
333	900	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	1.0
*770	390	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	0.2
TURKEY			
*1,200	250	Stamboul	5.0

Note.—As, on going to press, definite information is still lacking from some countries regarding the distribution of wavelengths allocated to them under the *Plan de Prague*, the list could not be completely revised for this issue.

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

MORE RADIOGRAMS

THE American Broadcasting Company has added five stations to its present western network of seven. The added units are WRHM (Minneapolis), WIBO (Chicago), KTNT (Muscatine, Ia.), KFAB (Lincoln, Neb.), and WIL (St. Louis).

KFI (Los Angeles) reports that its studios are always filled with boxes of oranges, avocados, and other luscious fruits sent to artistes by their admirers.

So popular have wireless installations become on Scottish fishing boats that several hundred drifters are now, at the start of the East Coast herring season, fitted with receiving sets. One of the advantages of this, of course, is the receiving of the fishing bulletins, which are to be broadcast regularly this summer from the Aberdeen station twice a day on Tuesdays, Wednesdays, Thursdays, and Fridays.

The latest venture of Glasgow's broadcasting concert party, "The Radioptimists," breaks new ground. They are to depict, in somewhat hilarious fashion, the long process of selection, trial, and elimination which precedes the final putting together of a musical comedy.

All well-known broadcasters in the North of Scotland, an interesting combination of mixed voices has just been formed in Aberdeen under the leadership of Mr. W. A. Craig, L.R.A.M. Known as "The Craison Vocal Octet," the new organisation is already booked for its first combined appearance before the microphone.

Fresh cause for protest has been given West of Scotland listeners by news that the Glasgow Station Wireless Band is being dismissed. It is understood that the B.B.C. policy of centralisation involves dispensing with the services of the twenty-eight musicians, and that from September onwards only an octet will be provided for 5SC.

The Wireless Protective Association, representing the American independent radio industry, has just lodged an official protest against the amalgamation of the International Telephone and Telegraph Company and the Radio Corporation of America. The Association state that the amalgamation of the two giant corporations represent a $5,000,000 trust and that such a union would be a violation of the anti-trust laws.

The Zurich broadcasting station has adopted a special signal transmitted between programme items, namely, two bells which are struck at intervals of nine seconds. In this manner the station may be identified by foreign listeners.

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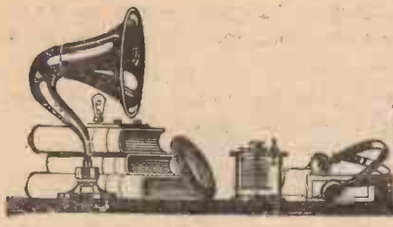
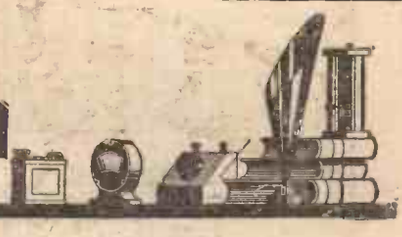
General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Queries** should be addressed to the Editor, and the conditions printed 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.



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

Outdoor and Frame Aerials.

Q.—*Using a screen-grid valve set with an outdoor aerial, will it be possible to separate stations working on the same wavelengths such as, for instance, Liverpool and Swansea, Edinburgh, Stoke, or Bournemouth? If not, will the directional properties of a frame aerial be of any use in this matter?—G. H. (Walsall).*

A.—It is very doubtful whether an outdoor aerial would be of any use in the separating of such station signals. A frame aerial will certainly be an asset, as only by using a frame aerial will there be any possibility of receiving such stations' transmissions clear of each other. Pointing the frame aerial in the direction of the station it is desired to receive will enable the operator to tune in the station, provided it is within the normal range of the receiver —L. A. C.

A TECHNICAL NOTE

Flux and Faulty Connections.

Quite recently an amateur complained that a receiver built according to a published design would not give one half of the results claimed for it. The trouble appeared to be very weak signals from stations which were normally received at good loud-speaker strength, and occasional cracklings. The accessories were tested in another receiver and proved to be quite satisfactory. Also, a number of the components had been taken out and tested in another receiver already giving good results. All of the components used in the set had been employed at various times in other receivers, except for certain components which were new, and these had been tested.

The amateur in question was positive that the design of the receiver was faulty, and nothing would convince him otherwise. Eventually, a personal test of the receiver was undertaken, and the trouble was traced to the valve holders. True, these had been in use in another receiver and the wires connected to the holders were originally soldered. In the new set, the wires had been clamped under the terminal nuts to facilitate their further use. In the original soldering process, the flux had been allowed to run underneath and between the terminal screw and the metal spring, with the result that poor contact existed between these points. This was not detrimental with the actual soldered connection, but was the cause of the entire trouble when using the terminal nut for connection purposes.

After taking each valve holder to pieces, cleaning away the flux and polishing the surfaces of the terminal heads and the metal springs, the receiver gave very satisfactory results. This little difficulty, we believe, is similar to that experienced by many home constructors. Before putting previously-used parts into a new receiver, readers are advised to make sure that all contact surfaces are clean.

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.

"MARCONI ROYALTIES CONFIRMED"

(Continued from page 884)

community to enjoy the advantages of the broadcast service.

If there was a manufacturer who was prepared, if granted a license on reduced terms, to satisfy a large body of listeners with a two-valve set at 50s., it was obviously in the public interest that he should be put in a position to do so.

The Loewe Multi-stage Valve

In the second case, the Marconi Company appealed against a decision of the Comptroller of Patents granting a compulsory license to the Loewe Radio Company enabling them to manufacture multi-stage valves (that is, valves containing two or more complete amplifying units enclosed in the same glass bulb). The royalties payable by the Loewe Company were fixed by the Comptroller at 7s. 6d. for each double-stage valve and 10s. for each triple-stage valve. The Marconi Company claimed to be paid 25s. for the double and 37s. 6d. for the triple valve respectively.

In the course of evidence it was stated by counsel for the Marconi Co. that the Loewe Radio Company was incorporated in April 1927, and had an issued capital of £50. It was the creation of a German company which, no doubt, had a substantial capital at its command and was carrying on an important business in the manufacture of these goods in Germany. There was absolutely no case for granting a compulsory license. The issue of a compulsory license would not, he said, create a new trade and industry in this country. All it did was to give another person the opportunity of entering an existing trade in which there were over 2,000 manufacturing under various patents.

For the Loewe Company it was contended that the manufacture of the multi-stage valve in this country was the establishment of a new trade or industry in the fullest sense of the patent law of Great Britain. The Loewe valve was an entirely different article from the ordinary wireless valve. Its manufacture was not only a new art, but a highly skilled job for which a special factory had been built and equipped in this country. There was a further important consideration. Mr. Loewe had promised to transfer to this country the export trade in these articles to the British Colonies, a trade which amounted to several thousand sets per month.

It was, counsel argued, in the public interest that an enormous number of people who would be able to afford to buy the cheap Loewe set, but who could not afford existing sets, should have the opportunity of enjoying cheap wireless reception through the use of these multi-stage valves.

Judgment: The Marconi Appeals Allowed

Mr. Justice Luxmoore's judgment was announced on Tuesday of last week. Both of the appeals were allowed—in the Brownie case the judgment recording that "there was nothing in the evidence or in the circumstances to establish that it was in the public interest that a license should be granted to the applicant. In His Lordship's opinion it was impossible in the face of the evidence to say that the amount of the royalty was unreasonable. The standard form of license known as A.2 was not an unreasonable license, and consequently the question "Has the Patentee refused to grant a license on reasonable terms" must be answered in the negative. The trade generally could not be prejudiced by the refusal of the license and it was impossible to say that the Brownie Company's trade was prejudiced by its refusal.

In the Loewe case, His Lordship held there was not, in fact, a definite refusal to grant a license and the time had not arrived for the Loewe Company to be in a position to apply for a compulsory license on the ground that the license offered was unreasonable, because its terms were never discussed. He did think, however, that 12s. 6d. for each separate valve holder would, in all the circumstances of the case, be unreasonable, and that it was unreasonable also to treat each multiple valve as comprising a number of separate valves, that was, to treat the triple Loewe valve as the equivalent of the three separate valves, and so impose a royalty of 37s. 6d. on each triple valve. The Comptroller had fixed the royalty at 10s. for each triple valve and 7s. 6d. each double one and His Lordship did not think that a royalty at this rate was unfair. The Marconi Company's appeal was allowed on the ground that there was, in fact, no refusal to grant a license.

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