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May 17, 1930

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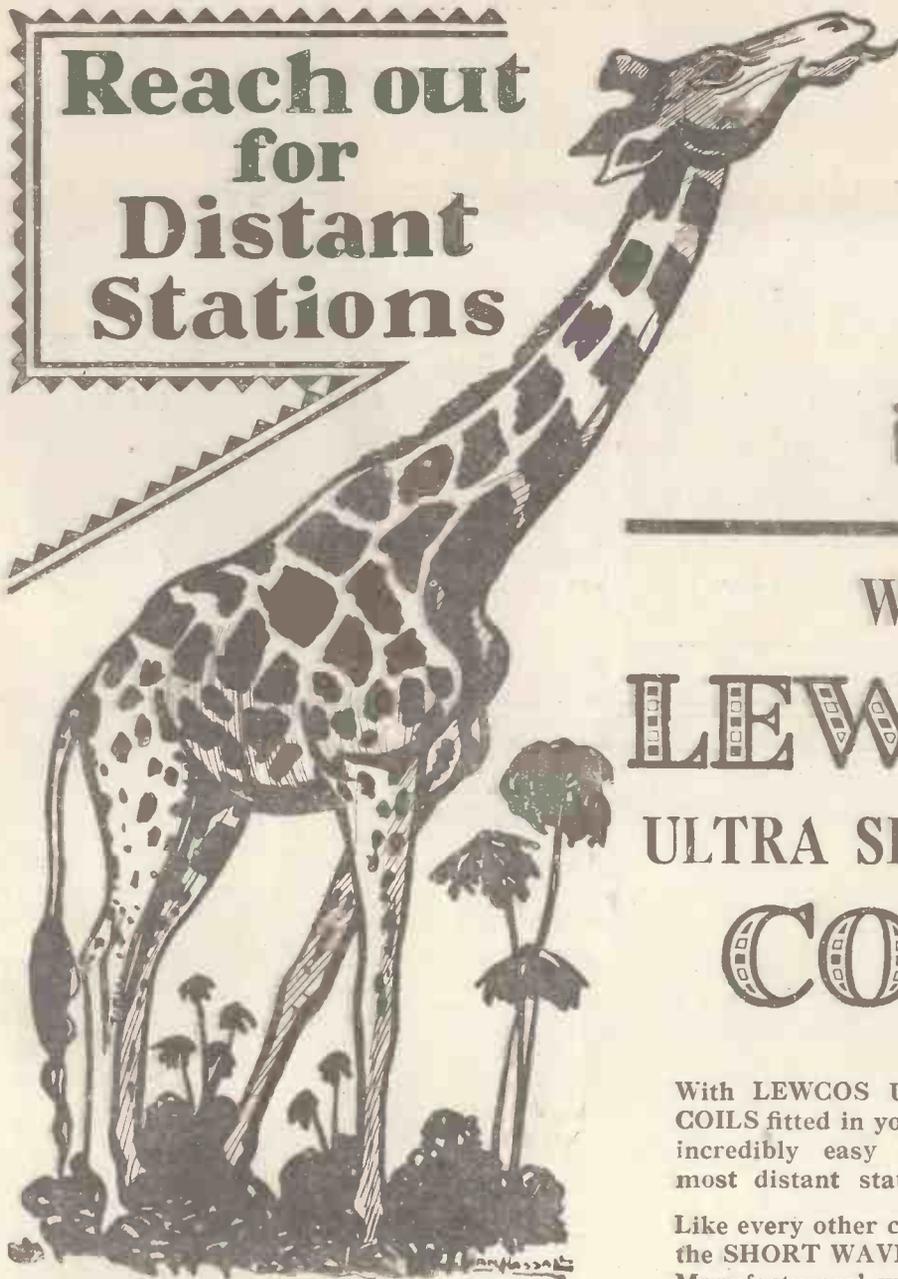
The "A.W." PAPER SPEAKER

FULL
DETAILS
IN THIS
ISSUE

The James H.T. & L.T. CHARGER

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Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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Up They Go!—"What Lancashire Thinks"—Our Letter-bag!— G.M.T. and B.S.T.—Cinema Sounds—Moving Coils Again

Up They Go!—Rumour has it that the power of Eiffel Tower is to be increased, and it seems quite probable. May a kind fate protect us when the long waveband becomes as congested with giants as the medium band! At present it is a haven of rest on evenings when the Regionals and National drown our Continental friends. Do you make use of the long waves?

"What Lancashire Thinks"—One of our contributors, who recently wrote an article on reception conditions in the north has been getting it "in the neck" for representing some people's opinions, and not others. This is but a foretaste of what will happen when Moorside Edge gets going—which it will, perhaps, before Christmas.

The 479.2-metre Moorside will have some range (the longest wave allotted to the B.B.C. on the medium band), and there will be some wipe-out! Anyway, it'll be very nice in the South!

Our Letter-bag!—"Honoured Gentlemen—It is that I hear the small waves because I write you. And tell me please, a plan for machines which is good to the short waves because I hear the Chelmsford (G5SW) and would better hear them on a better machines; quite easily. I wish an assemblage. I wish more parts. And why not the Chelmsford do not send all the day because I hear it awakening, which is nights, which not very easily. Much better the days." So writes an Algerian reader!

The concluding sentence, obviously indicates the need for a 24-hour service from 5SW. That "I wish more parts" is refreshingly frank. We all wish that way at times!

G.M.T. and B.S.T.—As the days go on the time standards in the various European countries are gradually coming into line. Holland, for instance, did not change over, when we did, to Summer Time. She was 40 minutes ahead of us; now she is 20 minutes *en avance*. The times in other countries are similarly uncertain, and it's rather rough on the DX man. A strong letter we've had from a reader suggests that the fixing of radio transmission times ought to be the job of the International whatever-it-is at Geneva, or even the League of Nations!

Cinema Sounds—Admit, please, that the quality of talkie reproduction has improved wonderfully during even the past six months. Well, the next time you are in a cinema, shut your eyes for a minute or so while there is some dialogue going on—preferably including women's voices—and then (unless your set was built in 1922) go home and compare the quality with the radio! It's a pity, but it's the talkie people's

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own fault. Radio engineers should "give themselves a pat on the back," as Tommy Handley so often sings!

Moving Coils Again—"A friend of mine wants a moving-coil, and I am asked to advise him. Personally I hate the things. What do you say?" so writes a Manchester reader. Another reader sends in an interesting comparison between a small moving-coil and a new dynamic speaker; he says he finds the dynamic not so boomy. The plain truth is that while in theory the moving-coil speaker is the best, it is not always the best for use in the home, and in small rooms. As with any other speaker, hear before you buy.

For Beginners.—Just how many radio beginners there are is best judged by the B.B.C. licence figures, which every month show a remarkable increase. No, we aren't near that mythical "saturation" point yet. Beginners need simple but efficient sets, and in next week's AMATEUR WIRELESS will be described the ideal three-valver, for those who want to make a first plunge into set construction. This will be a good "three" for anybody. The name of this new receiver is the "Beginner's Regional Three," and that exactly describes it. It is a family set, and well suited to Regional scheme conditions.

A "super" aerial mast is this model of the Eiffel Tower erected by a young architect of Solihull, Warwickshire

It is 40 ft. high and is made entirely of wood, without guy-wires, and took six months to build





Continental Nights

The Voice of the SIGNORINA

By J. GODCHAUX ABRAHAMS

RADIO Roma, Milano, Torino! Possibly my title should have been couched in the plural for there are many Italian voices on the air. But the one most familiar to listeners must be that of Signorina Maria Louisa Boncompagni, who for some years has acted as chief announcer to the Rome studio. There is no mistaking her call; even if you do not understand the language for every syllable is perfectly accentuated: "*Ente Italiano Audizioni Radiofoniche,*" followed by "*Stazione di Roma.*" In the

Signorina
Maria Louisa
Boncompagni,
the lady
announcer at
Radio Roma



intervals, however, we are spared the full title of the Corporation and we hear the abbreviation: "*Eh-yah* (E.I.A.R.) *Radio Roma.*"

You must not look to Rome for the variety entertainment or small concerts which we find in other Continental capitals or big cities; it is either a large scale symphony orchestra, or better still, the relay of an operatic performance from the Teatro Reale, or from the San Carlo Opera House at Naples. On certain days you may see the performance advertised in the programmes, but do not entirely rely on this published information.

Signor Mussolini has taken considerable interest in the development of broadcasting in Italy, and has decreed that the E.I.A.R. has the right to take relays of performances from any theatre for the benefit of the general public, and may do so at any time; exception only is made on first nights.

The Relays

Gradually the Italian stations are being linked up in order that in the near future a general S.B. may be carried out, when required. As it is, Rome exchanges programmes with Naples, and Milan, Turin and Genoa frequently broadcast the same operatic and dramatic entertainment.

For your guidance these relays are seldom carried out in the early part of the evening. In Italy the performances rarely begin before 9 p.m. B.S.T. Moreover, although now and again one act only may be broadcast, you will frequently find a complete musical work presented through the microphone. In the intervals between the acts you are switched back to the studio for a news bulletin or what may appear to the uninitiated to be a passionate and vehement political discourse and which to one's surprise as a rule is only the Italian conception of a "dry" talk!

Rome possesses no interval signal by which it may be identified; you must rely on "the voice" for recognition.

On Tuesdays and Saturdays at 8 p.m. B.S.T. you will pick up morse signals, but these are part of a lesson broadcast to beginners.

Other Italian Stations

By the way, from Rome you will be given but small doses of dance music, syncopated melodies do not appeal in the same degree to the Italian as to his neighbours, and as such music is always on tap at other Continental stations, the Italian capital considers that it can adopt higher ideals. Jazz and opera do not blend. On one point the Rome station is consistent; it never closes down without giving both the National Anthem and the Fascist Hymn. Neither is the playing of them scamped, they are given in their entirety.

Finally, night after night, as Rome signs off, Signorina Boncompagni with her cordial "*Buona notte a tutti*" wishes the world good-night.

Whilst Naples remains a small station, its transmissions are not generally heard by listeners in the United Kingdom.

Milan, I take it, will be found in almost every log; it is a great asset to the British fan, for its entertainments are many.

Here again we find a lady announcer, Signorina Rizzi, whose voice is heard either on 501 metres or on 291 metres, the wavelength of the Turin transmitter with which there exists a regular exchange of programmes. Milan's interval signal is the letter T in morse, a dash in a high-pitched flute-like note. The lady announcer's voice has not the deep rich tones of her Rome colleague, but her enunciation is perfect: "*Eh-yah Radio Milano (e Torino).*"

Her station is one to which we may also turn on any evening with the assurance that a good concert or operatic performance will be placed at our disposal. It enjoys the freedom of the famous Scala Theatre, dating back to 1777, and which, with perhaps the exception of the San Carlo at Naples, is the largest opera house in Europe.

As in the case of Rome, relays are frequently carried out from this theatre without any previous warning.

The Northern studios, namely, Milan, Turin, and Genoa, co-operate with one another and are linked up by cable. This

Milan also has
a lady
announcer—
Signorina
Rizzi



net is being developed and will shortly rope in Rome and Naples.

No, I had not forgotten Turin; it would be impossible to ignore the bird signal which has puzzled thousands of listeners. However, the bird is not alive; the trills are produced by mechanical means.

Turin as a station is my alternative for Milan, for, although of lesser power, it appears to be a stronger transmission.

This studio frequently is the last of the Italian stations to close down. Opera is its main fare.

The "A.W.P." Paper Speaker

THE SIMPLEST POSSIBLE

The great features of the Loud-speaker described in this article are its low cost and a'solute simplicity. Due to the unique method of construction, the tone is of remarkable quality and will compare favourably with much more elaborate instruments.

OUR post-bag was well filled when the series of AMATEUR WIRELESS linen diaphragm speakers was first introduced in 1928. They have stood the test of time, and a large proportion of our readers made up one or other of the types of linen speakers described, and did not hesitate to write to tell us of their good results.

Now, here is a new idea. Paper is used



This picture shows the simple method of attaching the unit

instead of linen in this new speaker, and there is only one diaphragm. Linen speakers of all sizes were made up in the AMATEUR WIRELESS Laboratory, and it was found that in the very smallest sizes—that is, the diaphragms measuring less than about 1 square foot—the real advantage of having two diaphragms of tightly-stretched linen was not obtained.

For a long time we had been looking out for material which, made up in the same way as the linen speakers, would give "linen speaker" results; and here, in a special type of drawing paper, treated in a very simple, novel manner, is a good solution. No doping with inflammable cellulose or similar dope is necessary, and as there is only one diaphragm, and only simple materials are needed, the cost is trifling.

The only point is, that although it is simple to build, this new speaker must be made with the greatest care, and exactly as described; do not experiment with cheaper

materials, nor carry out the construction in a careless manner, because the best results can be obtained only by copying the original AMATEUR WIRELESS speaker, which represents the result of many weeks' work in trial and error to get good reproduction.

For the benefit of those who like to work from a blueprint, a print has been prepared showing the details of construction of the paper speaker, it can be obtained, price 1/-, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

The first step is to make up the framework, which should be stoutly constructed and should preferably be of seven-ply wood. It measures 13 in. square by 3 in. deep. The paper required for the diaphragm is special drawing paper known as "Whatman's hot-pressed," which is a fairly stoutish paper of very strong texture. You can obtain this through most artists' and colour-man's depots. As the diaphragm is 13 in. square the size of paper, known as Demy (20 in. by 15½ in.), will be quite satisfactory. But it is highly important to get paper of this type, as you will see for yourself when you commence the treating process.

If the paper is of the right quality, it will stretch itself to a proper degree in the manner to be described, but the probability is that if the wrong kind of paper is used, it will go flabby in the stretching process.

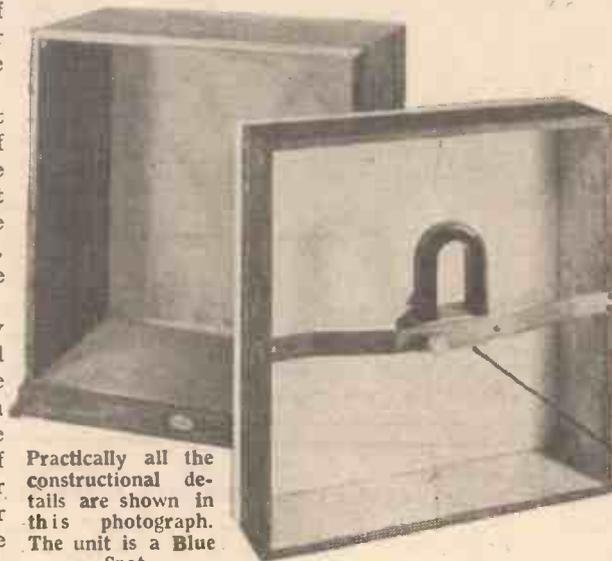
The paper should be neatly cut to fit the frame and should turn over at the edge by about half an inch. When it is cut to size, glue one edge of the paper to the outside of the frame, place the paper across neatly to the other side, so that no folds are caused, but without stretch-

ing it, and then glue down the opposite edge. The other two facing edges can be secured to the frame in a similar manner. The corners of the paper should be neatly cut so that there is no overhanging material.

Next, lightly draw two diagonal lines to find the exact centre of the diaphragm, and at this point make a small hole. Place an ordinary linen-speaker cone washer through this hole. When the glue has dried, the paper diaphragm should be lightly damped with a wet sponge.

The strain on the diaphragm, which in the linen speaker is obtained by means of the smaller diaphragm, is in the case of the paper speaker, the result of the tension of two short lengths of springy steel wire. The wire used should be ordinary steel wire of about 26 s.w.g.

Two lengths of wire should be cut and soldered to a small flat washer on opposite sides. This washer should then be slipped over the loud-speaker cone chuck and secured as shown on the blueprint.



Practically all the constructional details are shown in this photograph. The unit is a Blue Spot

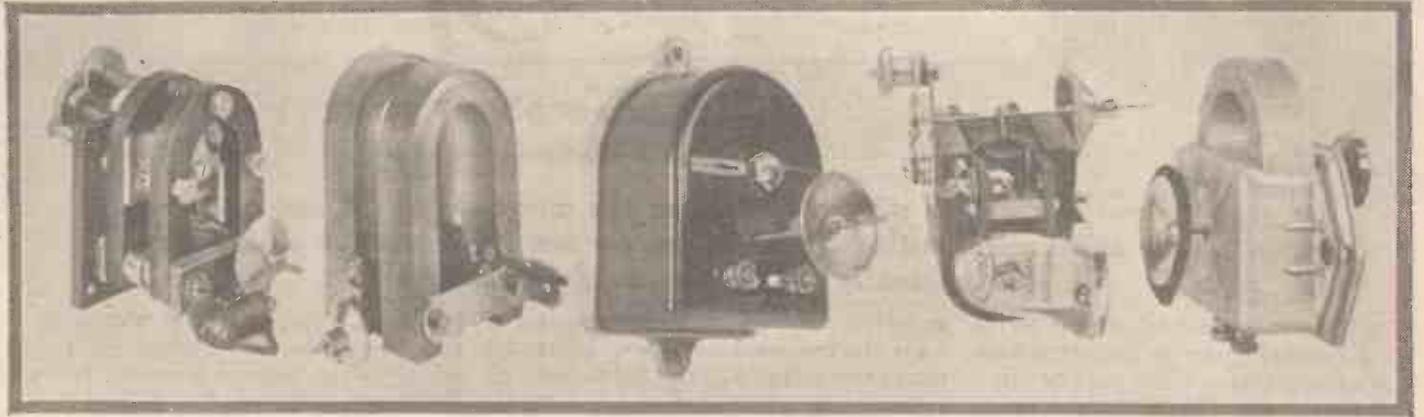
Two small holes are drilled on opposite sides of the frame, in the centre of each side and about half an inch from the rear edge—that is, away from the diaphragm.

Through each of these holes a tiny eye-bolt should be inserted with the eye inside the frame, and with a flat washer placed between the outside of the frame and the straining nuts so that when the nuts are tightened up, there will be no tendency for

and not any dope of any kind. Do not be frightened at the appearance of the diaphragm, which will crinkle up when the paper is moistened and which will appear to go quite flabby! The diaphragm can now be slightly stretched again.

Place the frame on one side for a while, still with the diaphragm facing upwards, and cut and drill the brass strip which, screwed to the back of the frame, supports

All is now ready for working. Attach the loud-speaker unit rigidly to the metal strip, turn the frame upside-down and place the driving rod of the unit through the loud-speaker chuck, thus accurately locating the unit position; then tighten the chuck, thus securing the driving rod, and screw the strip to the back of the framework, taking the greatest care not to change its position.



Alternative units that may be used with the paper speaker. From left to right they are: Wates, Goodman, Lissen, Wamel and Triotron

them to be dragged through the hole. The wire should now be gently pulled (taking great care not to tear the paper), twisted through the eyes and soldered securely. With the utmost care the nuts and the eye-bolts can now be tightened a little, each a fraction of a turn at a time, thus drawing the diaphragm in at the centre by a small amount.

the loud-speaker unit. A wooden batten may be used for this if desired, but it should be very rigidly mounted. The metal strip makes a much neater job.

The Unit Mounting

By the time the strip is drilled the diaphragm will be dry; and provided that the right type of paper has been used it will

The speaker can immediately be put into use.

A PANEL-DRILLING TIP

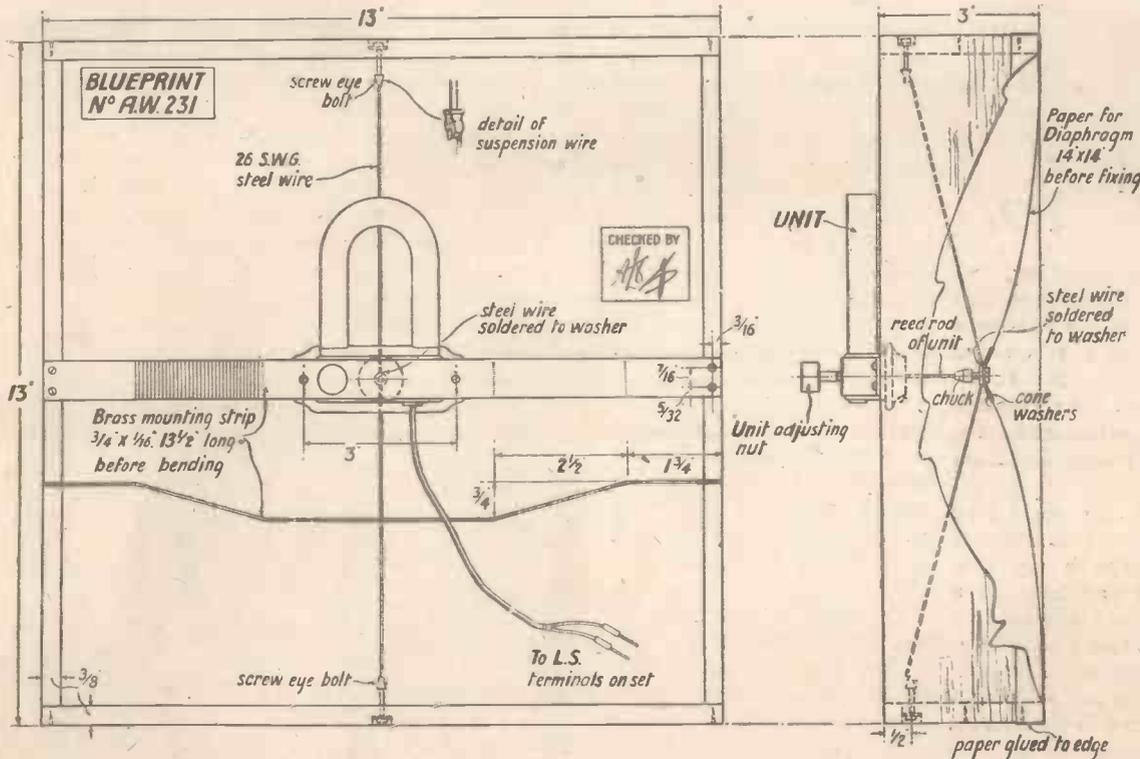
THE usual method of making a large hole, where a panel-cutter is not available, is to drill a number of small holes and to file them out to the required size. A

simpler and quicker plan is first to bore a central hole of sufficient diameter to take a good-sized nail.

This nail and a second are then clamped in a vice at a distance apart equal to the radius of the required hole. The panel is now threaded over the first nail and the surface brought to bear on the point of the second nail, which should project about a 1/4-inch above the jaws of the vice. The hole can then be cut out by rotating the panel under steady pressure against the cutting point.

M. A. L.

Permission for the construction of a broadcasting station in New York which would be used entirely for broadcasting sound in conjunction with a television station synchronised with it, is being sought by Radio Pictures, Inc., New York.



An elevation and plan showing the details of construction. A full-size blueprint is available, price 1s.

Next, lay the frame down flat with the diaphragm facing upwards and again moisten its surface. Use only water for this

have stretched evenly and will be almost at drum tightness so that it emits a "pong" when tapped with the fingers.

An experimental two-way television service between the Bell building at Broadway and the laboratories at West Street, N.Y., has been in operation for some time. It was disclosed to American journalists last



month. Special telephone booths were installed at these two points equipped with television transmitters and receivers. How the system works is explained in this article by Alan S. Hunter

TWO-WAY TELEVISION!

SINCE the demonstration of colour television in New York, last June, the Bell Telephone Laboratories have made further progress; two-way television has now successfully been accomplished.

In the television-telephone booth, the subscriber seats himself before a frame, in which he can see the face of the person with whom he is talking. The subscriber's own face is, at the same time, rapidly scanned by a beam of blue light. The variations of this light beam are made to operate a bank of photo-electric cells in the usual way, giving rise to a variation in the transmitting

current conveyed to the distant booth. Due to the use of a mild beam, the subscriber does not suffer any discomfort, because there is no fierce glare.

On entering the booth, which is illuminated by a dim orange light, having no effect on the photo-electric cells, the subscriber is not confronted with the usual telephone mouthpiece. The telephone transmitters and receivers are concealed. The subscriber talks face to face to the distant person; due to the hidden receiver, the illusion that his words are coming from the mouth of his image is easily sustained. An ordinary telephone cannot be used, because it would hide part of the speaker's face from his distant observer.

The television image appearing in the frame appears with sufficient detail for recognition of facial expression. But because the image is produced in monochrome, the effect is only comparable with an animated photograph.

In a note in the March 29 issue of AMATEUR WIRELESS, "Thermion" drew attention to a difficulty of two-way television that the Bell engineers have now overcome. "Thermion" was assuming the use of a single revolving disc for transmission and reception. He pointed out that, with such an arrangement, it seemed impossible to obtain the effect of one person looking directly at another. In the Bell

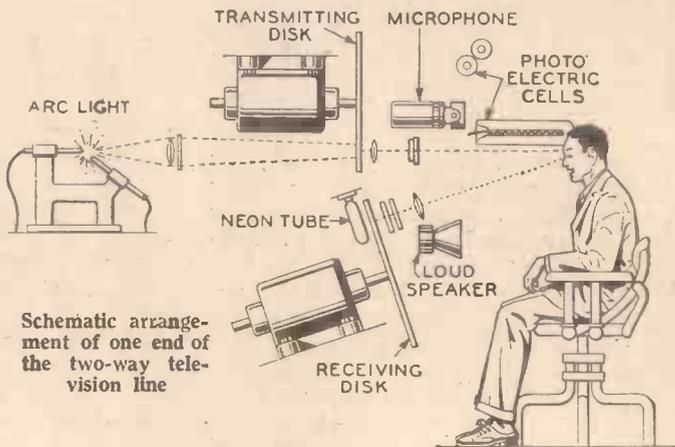
two-way television system, two entirely separate scanning arrangements are used. At each end of the system are two discs, a bank of photo-electric cells and a neon lamp.

One of the discs is 21 in. in diameter and serves to direct the scanning beam from an arc lamp on to the face of the subscriber. The other disc, 30 in. in diameter, is arranged below the transmitting disc and exposes through its holes the neon lamp, which the observer sees through a magnifying lens in a position slightly below that of the scanning beam.

The television image is more detailed than in previous demonstrations, because the number of holes in the scanning disc



In the lower part of the opening one sees an image of the person at the distant end. From a point just above it, the scanning beam is directed to the face of the speaker, and the reflected light is picked up by photo-electric cells visible through the glass plates at sides and top



has been increased from the original fifty to seventy-two. The transmission band of frequencies required for the system has been doubled. A forty-kilocycle frequency band is required for the two-way television demonstrated.

For the success of the system, some means of synchronising the four scanning discs is

66
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2/5

essential. The discs at the receiving and transmitting ends, rotating at a speed of 18 revolutions per second, are synchronised by a valve oscillator situated at one end of the telephone line. The synchronising frequency, which is 1,275 cycles per second, is transmitted over a separate pair of wires. At the receiving end, this frequency controls the field strength of the motor and thereby holds its speed exactly proportional to the frequency. There are several novel features in the synchronising system of considerable interest to the television engineer.

Another improvement is in the photoelectric cells. These are now so much more sensitive that excessive illumination of the object to be transmitted is no longer necessary. While his face is being transmitted, the subscriber in the Bell two-way television system is hardly conscious of the fact that his face is being scanned 18 times a second by a beam of light.

Apart from the improvements in the actual television equipment, the acoustic part of the new Bell system is unusual. Some deviation from the usual telephone apparatus was obviously essential. The elimination of the telephone instruments is

accomplished by the use of a condenser microphone for transmission and a moving-coil loud-speaker concealed near the television for reception. The microphone is connected through suitable valve amplifiers

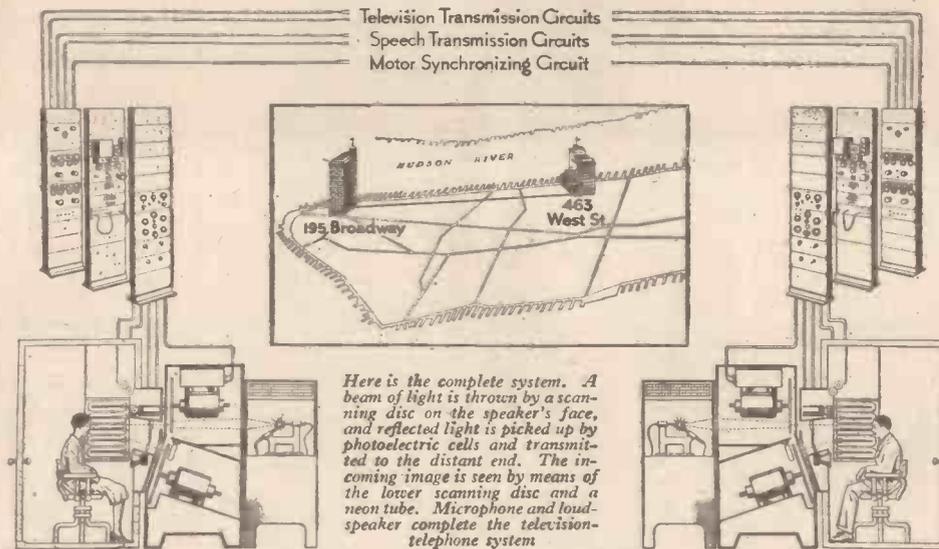
this phenomenon, the microphone and loud-speaker are installed in carefully chosen positions. The inner surfaces of the sound-proof booths are treated to prevent, as much as possible, the reflection of sounds from the loud-speaker into the microphone.

From the details given, the reader will be inclined to agree that two-way television is a fairly complicated process. Whether it has any immediate commercial application is debatable. In this connection, a statement by Dr. Jewett, president of Bell Telephone Laboratories is significant.

"While the equipment now available for television is more simple and efficient

than that employed in 1927, the terminal apparatus is still complicated and expensive. This complication arises from the necessity for producing, transmitting and reproducing a large number of distinct images each second. No practical suggestions for eliminating this fundamental requirement have yet been made."

The president added that although no commercial application of television is yet in sight, Bell Laboratories are to continue in their detailed improvements of the existing apparatus.



and a telephone circuit to the loud-speaker at the other end of the line.

To maintain the realism created by the television image the normal telephone quality of reproduction had to be considerably improved. The condenser microphones are of the type extensively utilised by American broadcasting stations.

A difficulty that had to be overcome in the acoustic side must be mentioned. In the ordinary way, the microphone is liable to pick up the sounds emanating from the loud-speaker. In order to prevent

For the Newcomer to Wireless: SKIP AREAS

CAN you tell me why it is that with my short-wave set I hear very little of 5SW, the powerful short-wave transmitter at Chelmsford?

You are surprised, I expect, that whereas you can pick up 2XAF at loud-speaker strength you don't hear 5SW nearly as well, though the former is over three thousand miles from your aerial and the latter only about twenty-five.

Yes, that's just what's puzzling me.

The short waves behave in a very peculiar way, for there is always what is known as a skip area round a transmitting station.

Just what does that mean?

When we receive the local station, which uses a wavelength between 200 and 479 metres, we rely mainly upon what is known as the ground wave.

One moment please, I think I want an explanation here.

Right you are. In the present state of our knowledge of wireless transmissions we believe that wireless waves travel in two quite different ways. One

set of waves follows the contours of the earth fairly closely. These are known as the ground waves. Their range is not very great, especially over land, since there is a considerable resistance to their outward movement. Even with an output of 30 kilowatts the all-the-year-round range of the ground waves in daylight is not much over one hundred miles within the limits of the medium waveband.

Then what's the second sort of wave?

One part of the radiation does not follow the earth's contours, but goes outwards and upwards until it strikes the Heaviside layer, whence it is reflected back towards the earth. These are known as the reflected waves. Their range is enormously greater than that of the ground waves, but the reflected waves do not come back to earth for some distance from the transmitting aerial.

You mean, then, that within a certain range of a broadcasting station the ground waves only can be relied upon?

Exactly. In short-wave reception

most of the work is done by the reflected waves and if you live fairly close to a short-wave transmitting station you may be able to hear very little indeed of its transmissions simply because you are too near to receive the reflected waves.

I begin to see. Then the skip area is that in which the reflected waves are not received?

That's it. This area varies considerably in width according to the wavelength used and the type of transmitting aerial employed. It also varies in daylight and in darkness.

Please give an example.

If you listen to PCJ, the famous Dutch short-wave station, you will find that in most parts of this country signal strength is immensely greater in daylight than after dark. After dark a large part of our country comes into the skip area, though at such times PCJ has no difficulty in making himself heard on the other side of the world. You don't hear 5SW well simply because you live too near to him for the best reception.

On Your Wavelength!

Off the Rails

THE lay press—or some of it, at any rate—still continues to believe that Marchese Marconi actually transmitted a considerable amount of power from one end of the world to the other during his recent feat of switching on the lights at the Sydney Exhibition from his yacht *Eletra*. Marconi himself must have had many a good laugh at some of the nonsense on the subject that has appeared of late. The other Sunday one paper came out with a splash article with the theme that when Marconi had perfected his invention the rivers of Scotland would supply the chief power for running British factories, Africa would have its lamps lit and its wheels turned by the Victoria Falls, and so on, and so on, and so on.

What it Really Was

Actually, Marconi has in this instance made no invention at all. What he did was to transmit, from a set of very compact design, ordinary radio impulses which were picked up in this country and relayed on to Australia by the beam service. There they were made to operate the relay to do the switching on. The same kind of thing is being done in every part of the world—whenever, in fact, a morse dot or dash is printed on a tape by one of the instruments at a commercial receiving station. Wireless is helping the world to do its work in countless ways, but it is a very long way from doing the world's work by enabling power to be sent through the ether from place to place.

Can it be Done?

Will it ever be possible to transmit power by wireless? The first answer to that question is that the thing has already been done over very short distances. Some time ago the General Electric Company of America gave experimental demonstrations of a highly interesting method of transmitting power in this way. Air in its normal state is an excellent insulator, but when it is ionised it becomes a conductor. Ionisation can be produced by means of ultra-violet or X-rays. In the course of the experiment two thin pencils of high-frequency rays were focused from different points. These formed the outward and return conductors and it was found possible to send electric currents along them between the two points. The process, however, has no practical value, since the expense of creating and maintaining the high-frequency pencils is greater than that of installing copper transmission lines, and the distance covered must be very short.

An Improbability!

No means is known of focusing any kind of rays into a pencil with absolutely straight sides. There is always a certain amount of diffusion, which means that the two pencils must eventually meet one another if the distance is great enough or that they must both reach earth. In either case a short-circuit would take place if heavy electrical currents were carried. We may, I think, safely say that until great advances have been made upon our present knowledge of radiation anything like the transmission of power without metal conductors is absolutely out of the question, except at very short ranges. It will be a very long time before the rivers of Scotland, the Victoria Falls, and so on provide power by wireless for factories hundreds of miles away.

A Successful Start

The telephone service between this country and Australia has been successful beyond all expectations from the word "go." As soon as Mr. McDonald and Mr. Scullin had ended their opening conversation, applications for calls came in by the dozen from people at both ends. A great deal of use is being made of the service by business houses who have discovered, by experience of the transatlantic telephone system, how exceedingly useful for commercial purposes it is to be able to talk instead of writing. But it is private calls that are forming a very large proportion of the business done. There are so many British families who have a son or daughter or some near relation in Australia whom they have not seen for years. Letters have been exchanged, but now comes an opportunity for friends and relations to hear one another's voice for the first time after a lapse of years.

At the present time the calls are transmitted by ordinary methods and can be picked up by anyone who knows the wavelength used. Very shortly, though, a special method of jumbling will be used which will make it impossible to receive them without special apparatus. Under this system speech is "scrambled" in a special way before transmission and then "de-scrambled" by apparatus installed for the purpose at the receiving end.

Royalties—Good News

I am glad to see that there are signs of a happy solution of the royalty problem, which has been worrying wireless folk, directly or indirectly, for the last couple of years. A very peculiar state of affairs arose some months ago, when certain of the most important patents owned by the Marconi

Company lapsed. The company, however, still owned not a few that were vital for the construction of up-to-date sets, but they did not own them all. Now there is a prospect of an understanding between the two sets of patent owners which may culminate in the issue of comprehensive licences for a total royalty of five shillings per valve holder to include all patents.

Wireless Answers Queried

I sometimes think that the heading that one sees in non-technical papers, "Wireless Questions Answered," should really be "Wireless Answers Questioned." Lately I have made quite an amusing collection of some of the quaint replies published in answer to the questions of correspondents. Some of them are merely amusing, others are rather alarming. Frequently, for example, I find the advice given to those who suffer from noise caused by some piece of electrical apparatus in the house or building to connect a couple of 2-microfarad condensers across the terminals and earth the mid-point. Nothing is said about using condensers designed to stand up to high voltages. It should be understood that the ordinary paper dielectric 2-microfarad condenser is not intended for voltages much greater than those which occur in the normal battery-operated wireless receiving set. Wherever A.C. mains are concerned, special condensers designed and tested for much higher pressure should be used. The moral, I think, is that if you have a wireless problem and want reliable information, your best way is to send your query to the AMATEUR WIRELESS experts, who do know what they are talking about.

New Power Valves

Some very interesting new power valves are coming along just now. One of these is a 2-volter, which has a really astopishing performance. Previously the 2-volt man, though he has been very well off in the matter of low-consumption, medium-impedance valves, has found the super-power valve a bit of a handful, owing to the fact that one of really low impedance ate the best part of half an ampere. I have just been trying out a new type of which the characteristics are actually a trifle better than those of a first-rate 6-volt super-power valve—and this with a filament consumption of only .2 ampere. It handles a surprisingly large volume and, owing to its very low impedance, brings out the full quality of both speech and music.

Another new valve is a 6-volter, which again gives a remarkable performance. Though it requires only a moderate plate voltage and consumes but .25 ampere of

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On Your Wavelength! (continued)

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filament current, it will operate the largest moving-coil loud-speakers, giving faithful and pleasing reproduction. This valve has an impedance of only 1,400 ohms, an amplification factor of 3.6, and a mutual conductance of 2.6. The two valves mentioned are by different firms and their production reflects the greatest credit upon our makers.

A Gramo-radio Point

I came across a rather interesting example the other day of audible distortion due to grid current. Where a receiver is taking grid current, of course, the peaks of the wave form are damped by the grid current, and consequently the wave form is not pure; but in the majority of cases one is not able to say definitely, "Oh, look at the grid current distortion!"

In the case in point, however, I was playing an organ record which had some very low pedal notes on it, which was one of the show records which I usually employ to demonstrate my sets with. I was showing it off to a friend at the time and I was horrified to find that these low notes of the organ were broken up. Instead of a pure clear pedal note, I was obtaining a noise something like a *basso profundo*, gargling and singing at the same time. There was a noise just as if the set was motor-boating; and, indeed, I looked at first for symptoms of this trouble. The difficulty disappeared, however, as soon as I ceased to play the record, and the amplifier was quite silent without any sign of instability. I therefore came to the conclusion that motor-boating could not be the trouble, yet every time I played this particular record I was troubled with this horrible break-up on the low frequency.

The Reason for the Distortion

After a little bit of head-scratching, I located the trouble to the fact that I had no grid bias on the first valve in the amplifier. I had been making some temporary alterations, and I had quite omitted to include the necessary grid bias. I was using an A.C. valve which took grid current at a small negative voltage, and it was quite clear that, at any rate, one complete half-cycle of each note was being heavily damped. Most A.C. valves, by the way, have this peculiarity: that grid current starts to flow when the grid is a little negative, and not at zero grid voltage, as is usually the case with average battery valves. Therefore, instead of getting a pure wave form on these pedal notes, I was reducing the strength of one-half of the wave to some fraction of its proper value, while the alternative half-cycle was reproduced directly.

How the Effect Was Produced

This effect produced a sort of rectifying action; so that, in addition to the proper pedal frequency, a frequency was set up on half the true value, and as the pedal note itself was some 50 or 60 cycles, I was getting a 25-cycle note in addition, sufficiently strong in intensity to cause the horrible break-up effect which I heard.

This struck me as rather interesting, as I have not come across a case before which demonstrated so emphatically the very heavy damping which is imposed by grid current if it is allowed to be at all serious. The quality was simply hopeless, whereas the inclusion of a 1½-volt grid-bias battery immediately put the matter right. Incidentally, this is an interesting point for those readers who do not use grid bias with a pick-up. The case is only serious, of course, where one is using an A.C. valve, but even with a battery valve it is clear that some grid current must flow, and therefore the true reproduction cannot be obtained unless one has a small battery of 1½ volts to 3 volts on the first valve of the amplifier.

Speeding Up Television Signals

There are many ways by which communication between distant places can be established, and to this list we can now add television. Whether telephonic, telegraphic, or picture working, it is fairly obvious that any means which will enable the rate by which individual signals can be successfully interchanged is sure to be a distinct advantage. We have many examples in the telegraphic world. The Baudot system, to quote one instance, gives four messages along the same wire and this can be duplexed.

Now, is it possible to apply a kindred scheme to television transmissions and achieve working results? I should answer in the affirmative after gathering details of a plan suggested by the Baird Company, which it has protected. The invention really consists of a method for transmitting a plurality of individual signals consisting in recording them either simultaneously or in concurrent groups, on, for example, successively adjacent parts of a record element. Subsequently all the individual records can be read in succession, preferably at a higher speed, by a device which is operatively connected to the transmitter.

Group Exploration

One way of applying it to the television system is to explore simultaneously various sections of the scene to be televised and recording the groups of signals corresponding to each section of the picture on a record element so as to form a continuous record of the whole of the picture. The

record can then be traversed by a pick-up device which "reads" the impressed signals and transmits them to receiving stations. There are several ways of accomplishing this and one of the most interesting is that which makes use of a magnetic recorder. A series of discs of steel is mounted on a shaft and rotated. The number of discs is equal to the number of sections into which the picture is split and one disc is appropriated to each section.

The signals derived from the photo-electric cells for each section are applied respectively to magnetising coils so as to make a corresponding record on each of the discs during its rotation. Each of the discs has associated with it a search coil and wiping-out coil so mounted that they can be rotated in the opposite direction to the disc at a higher speed. The latter coil is energised by alternating current so that after a record has been read it is erased and the record element left ready to receive a new magnetic impression.

Recording, Searching and Wiping

In operating the device and presuming for the sake of illustration that there are to be three picture sections and hence three discs, when the record on the first disc has been completed, the search coil reads it and the associated coil erases it. If the coil is rotated at three times the speed of the disc it completes the reading during one-third of the revolution of the disc. It is immediately disconnected and a similar operation performed on the second disc and finally the third disc. These changes in recording, searching and erasing, go on in a complete cycle and it is seen, therefore, that the magnetising coils are in operation practically continuously, while each search coil is reading and transmitting a record for one revolution in three.

A Possible Development

The scheme, of course, is capable of being worked in several different ways, but it struck me that the idea ought to be capable of solving the problem of a dual speech and vision transmission with only one wavelength instead of two as at present. Record both speech and picture on the elements but split up the occupation of the wavelength into the proportion of say nine to one or even greater, with speech speeded up for transmission purposes to occupy the smaller period of time. Then re-filter at the receiving end and readjust the times. It seems to me that the scheme might lend itself to this problem and if so only one wavelength and also only one receiving set would be required by the individual tuning-in the television transmissions.

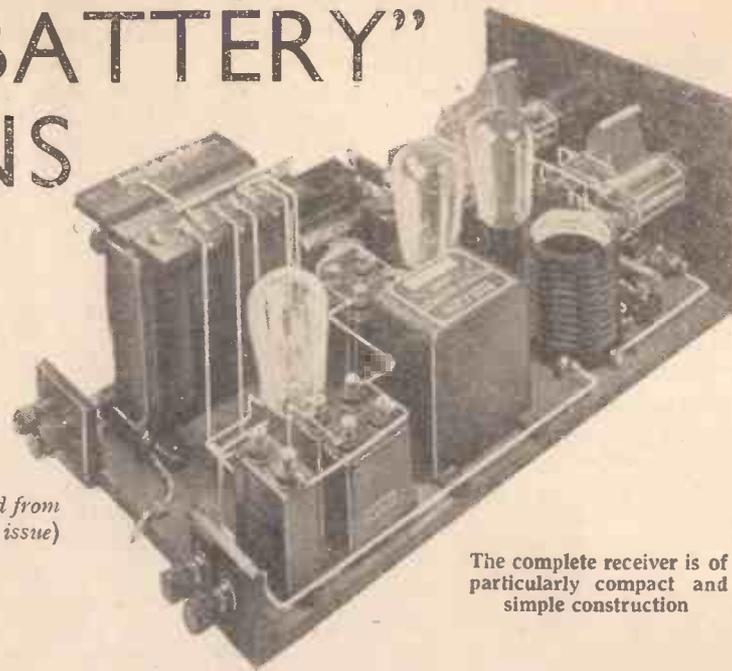
THERMION

Next Week: THE "BEGINNER'S REGIONAL THREE" — A FAMILY SET

BUILDING THE "NO-BATTERY" MAINS

2

(Continued from
last week's issue)



The complete receiver is of particularly compact and simple construction

IT is really quite simple to build the "No-Battery" Mains 2, for, although it embodies more components than are to be found in the average battery-operated two-valver, the actual mounting and wiring of the parts is quite straightforward

The circuit is easy to follow, and is basically that of a simple two-valver with transformer coupling; and, of course, with the addition of the mains unit. The aerial tuning arrangement is quite efficient, and the fact that a separate aerial winding is incorporated results in such a satisfactory selectivity that a wavetrap should be unnecessary except at very close quarters to a powerful station. The detector and low-frequency arrangements are normal and it is largely owing to the fact that mains valves are employed that this receiver gives such amazing results.

The connections of the mains portion are quite straightforward, and readers who are interested in design should cer-

tainly study this portion of the theoretical circuit diagram. Provided the wiring plan is accurately followed, the least technical constructor should have no trouble with wiring up the whole set

A small reproduction of the wiring plan was given last week. This is available as a full-size blueprint, which can be obtained price 1s., post free, from the Blueprint Department of AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C. 4. Those who have any doubt about their constructional abilities should, more particularly in a set of this description, write up for the blueprint rather than trust to their own accuracy in copying design.

There is not a great deal of space to spare on the baseboard and it is most important to follow the layout.

The first constructional job is to drill the panel and attach it to the baseboard, and at this stage only the wave-change switch and the on-off mains switch should be

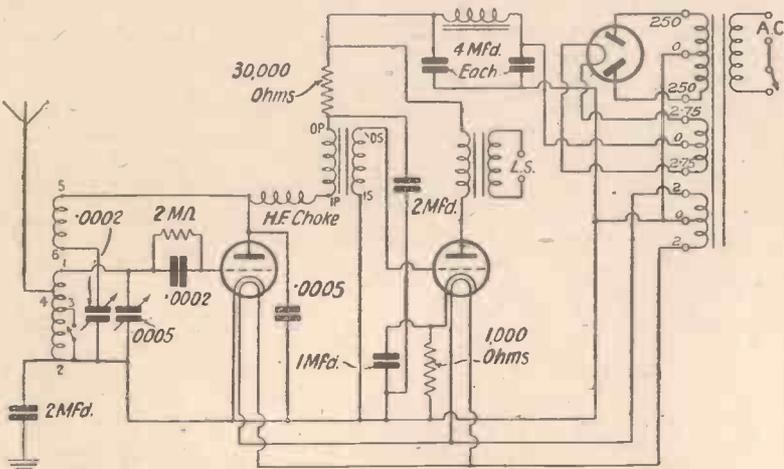
mounted. The two tuning condensers should be added at a later stage when part of the wiring is done. The terminal strips at the back can be bought ready drilled, but of course they can be cut from short strips of ebonite if desired, the terminals mounted and

the two strips attached at right angles to the rear edge of the board. It is most important to mount all the parts exactly as shown.

The blueprint can be used as a guide in

COMPONENTS FOR THE "MAINS 2"

- Ebonite panel, 9 in. by 6 in. (Trolitax, Lissen, Becol).
- .0005-mfd. variable condenser (Ready Radio, Lissen, Dubilier, J.B., Igranic, Lotus, Burton, Formo, Polar).
- .0003-mfd. variable condenser (Ready Radio, Lissen, Dubilier, Igranic, J.B., Burton, Lotus, Formo, Polar).
- Three valve holders (Junit, Benjamin, Lotus, W.B., Formo, Burton, Igranic, Trix, Brownie, Wearite).
- .0002-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Atlas, Watmel, Graham-Farish, Igranic).
- Dual-range coil (Tunewell, Watmel, Formo).
- High-frequency choke (Peto-Scott, Lissen, Lewcos, Tunewell, Sovereign, Watmel, Igranic, Bulgin, Wearite, Ready Radio).
- .0005-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Atlas, Watmel, Graham-Farish, Igranic).
- Low-frequency transformer (Lissen, Lewcos, Telsen, Ferranti, Igranic, Brownie, Burton, Lotus, Varley, Bulgin).
- Six 2-mfd. fixed condensers (Dubilier, T.C.C., Lissen, Hydra).
- 1-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Hydra).
- Output transformer (Ferranti, OPH1, Lissen, Igranic, Varley).
- Smoother choke, 20 henries (Bulgin, Lotus, Lissen, Ferranti, Varley).
- Mains transformer (Wearite, type 2; Varley).
- On-off switch (Lotus, Benjamin, Keystone, Bulgin).
- Single-pole mains switch (Bulgin, type S54; Claude Lyons).
- Two terminal blocks (Junit, Lissen, Keystone).
- Four terminals marked: Aerial, Earth, L.S.+, L.S.— (Belling-Lee, Eelex, Clix, Burton, Keystone).
- 1,000-ohm strip resistance (Clarostat, Climax), or 15 yards No. 44 enamelled Eureka wire (Lewcos, Keystone).
- Baseboard, 16 in. by 9 in. (Camco, Pickett).
- 2 yards of twin flex (Lewcos, Keystone).
- Mains adaptor or plug (G.E.C.).
- 2-megohm grid leak (Lissen, Dubilier, Igranic, Watmel).
- 50,000-ohm wire-wound resistance (Igranic, Ferranti, Lissen, Dubilier, Ready Radio).



Here is the circuit of the set. Note the selective aerial arrangements and the absence of all batteries

this job. It should be laid flat on the baseboard and the mounting screw holes lightly pricked through. This will show just where the parts are to be mounted. It is
(Continued at foot of next page)

PAY WHILE YOU LISTEN

EXQUISITE, murmured George, switching off the B.B.C. programme and wiping his eyes. We had been listening to a talk on "Fallacies about Flamingoes," or something of that sort, and George was deeply moved.

"Ah laddie," he went on, when he had recovered his composure, "if only one could express one's gratitude to the B.B.C. in a tangible form! Nothing ostentatious of course; a bunch of forget-me-nots would do, or perhaps a small contribution—"

"No," I interrupted, "not a contribution. Take out a wireless licence instead. That's a big enough subscription for one year. What more can they expect?"

George shook his head sadly.

"I'd like to give more," he said, "but what can one do?"

Suddenly his eyes brightened.

"An idea!" he exclaimed. "Why not abolish wireless licences and inaugurate a free-will offering scheme instead?"

"You mean," I cried, "that the B.B.C. should be supported by voluntary contributions?"

That was what he did mean. The idea seemed immense and we sat down at once and worked it all out with pencil and paper. Briefly, the scheme boils down to this. The contributor switches on to Brookmans

Park for, say, five minutes, and listens to the Saturday String Scrapers. Then he asks himself seriously whether he is experiencing enjoyment. If the answer be in the affirmative he slips a copper or two into a neat little cash box clamped to the side of the wireless set.

"The key," said George, "would be in the possession of a B.B.C. Collector who would call once a quarter."

"Probably twice a week," I ventured.

"After extracting the contents—"

"Separating the coins from the bits of fluff and used bus tickets—"

"After extracting the contents," George repeated, "the official would wisely return 2d. or 3d. in the £ by way of rebate to encourage one to contribute more next time and so earn a bigger rebate."

Nothing seemed fairer than that.

"The scheme would not end there," added George. "The B.B.C. could employ it to discover which items in the programmes were giving most pleasure."

"Too much pleasure, you mean?"

George began to draw parallel lines on a piece of paper.

"With each cash box," he continued, "a form of paying-in slip would be issued on which the listener could indicate the amount of his contribution in respect of

each particular item. By studying these slips the B.B.C. would obtain an infallible guide as to listeners' requirements."

"I begin to understand," I said. "By the way, why are you spoiling that piece of paper?"

"I am preparing a specimen slip," he said. "Let us fill in the blanks together."

This is what we produced:—

B.B.C. FORM No. 1536A, CONTRIBUTIONS,
Listeners, for the Use of,

Name: E. A. R. Ache.

May 2.	Foxtrot, "Does She not Possess Exquisite Charm?"	2¼d.
" 3.	Debate on "Flowerpots v. Umbrellas"	½d.
" 4.	Weather Forecast	1s. od.
" 5.	(Didn't listen; Sunday School Treat)	—
" 6.	"The Week in Parliament"	¼d.
" 7.	Lord Whattle's Point of Viewbutton

"And so on," said George.

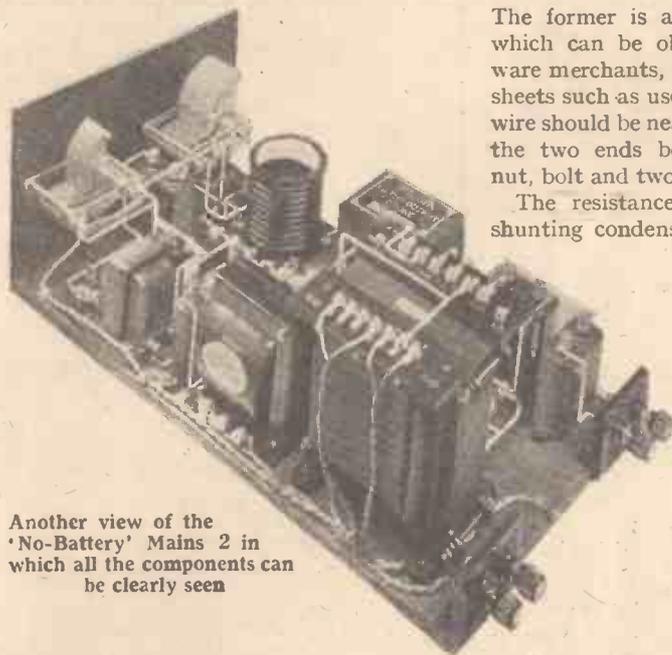
"Wait," I said. "Here's a useful counterfoil."

To the B.B.C.

Dr. to E. A. R. Ache.

May 8.	To listening to — for five minutes	£5 5s. od.
		G. C.

"BUILDING THE 'NO-BATTERY' MAINS 2" (Continued from preceding page)



Another view of the 'No-Battery' Mains 2 in which all the components can be clearly seen

The former is a small strip of asbestos, which can be obtained from most hardware merchants, and is a cutting from large sheets such as used in building work. The wire should be neatly wound on to the strip, the two ends being secured by a small nut, bolt and two washers at each end.

The resistance is supported above its shunting condenser by the rigidity of the two short leads which connect it. If the resistance is bought, then it would be advisable to provide clips to hold it rather than make soldered connections direct to the resistance itself.

The wiring is done with rigid insulated wire, with the exception of the flexes connecting the power transformer to the mains plug, and the two flex leads which run from the secondary of the output transformer to the loud-speaker terminals at the back of the baseboard. There is also a flex lead from the detector and L.F. valve holder to one winding of the power transformer.

Follow the blueprint very closely as regards wiring as it is not difficult to make a connection to a wrong terminal when wiring

up the power transformer. The tuning coil has a strip of paper pasted on its inside which shows how the connection should be made, and these correspond of course with the instructions given on the blueprint.

When the components on the baseboard near the panel have been wired up, the two tuning condensers can be mounted and connected.

Indirectly-heated valves should be used in the detector and power stages and valves of the MHL₄ and ML₄, respectively, are recommended. The rectifier should be of the U₅ type.

In the Wearite type 2 transformer specified there are tapplings for 200, 220, and 240 volts, and the nearest tapplings should be chosen to suit the mains supply. It does not matter, of course, which way round the mains plug is inserted.

Tuning is carried out in the usual manner, the wave-change switch being pulled out for the medium waveband and pushed in for the long. If the detector does not work very well, a change of grid leak value may clear matters, and the value of the grid leak is always a more important matter in a mains set than in a battery set.

Preliminary tests should be made on the local stations, and when it is found that the reaction control is quite smooth then one can commence to search for foreigners.

not advisable to mount all the components at once, but some of them should be added by degrees as the wiring proceeds.

With regard to the resistance used for obtaining grid bias, this component can be bought ready made or can be made up from simple materials. The wire used is No. 44 enamelled Eureka resistance wire, and a length of fifteen yards is required.

SYDNEY MOSELEY'S WEEKLY PROGRAMME CRITICISM

The
Sunday
Addresses
A Good
Choir



Gramophone
Trans-
missions
The Hotel
Bands?

MY readers will remember that I paid a tribute to Canon Elliott's homely addresses. Several listeners, as well as my own friends, reading these notes, back up the opinion I have formed. Canon Elliott is one of the popular, if not the most popular, preachers.

I cannot resist the temptation nowadays of jumping from one station to another. To me it is like playing with a new toy. Sometimes, alas, it is necessary! For instance, although for a moment I have said what I want to say about Church services, I did not feel inspired at all by the address of the Bishop of Pella from St. Ann's Church, Upper Kennington Lane, Vauxhall. Those present at the service seemed to enjoy the choral part, but I doubt whether this was a service suitable for national broadcast.

I suppose one ought to maintain a charitable attitude in dealing with "The Week's Good Cause," but here again I doubt whether the subject expounded by Neville Chamberlain was suitable for the domestic hearth on Sunday night. The problem of the unmarried mother and the child is of the utmost importance and deserves universal support. But I submit that it is not a suitable subject for a Sunday night in the bosom of one's family.

Congratulations to Barclay's Bank Male Voice Choir, whose relay from the Pavilion, Bournemouth, was excellent in every way. The organ, too, played by Philip Dore, sounded extraordinarily good, and then the soloist, May Huxley, is one of the best in the long list of B.B.C. vocalists.

I liked particularly the choir singing in accompaniment with the pianoforte and organ.

In switching-in on the programmes being played by the City of Birmingham Police Band I could not make out for the moment what was being played, although I am pretty good on the uptake on things of this sort. Imagine my surprise when I found that the band was playing *Carmen*. It sounded more like a funeral march.

For those who like good light music the Wireless String Orchestra, with Betty Bannerman as contralto, provided a good hour and a half's entertainment.

I asked readers recently to let me know what they thought of the television programmes, but I should like to make it clear that for the present the first intention is to put over a good picture. That is the criterion; but, of course, the aural side is of great importance, and here is where readers can be of assistance to those who are compiling the programmes.

Foreign stations take great advantage—sometimes, I think, too much advantage—of gramophone records. It is because it is the cheapest and laziest way of filling up the broadcast hours. I must admit, however, that the request programme arranged by Christopher Stone was quite worth while. The reproduction was so good that you might have imagined the singers themselves to be before the microphone. Whether the numbers of the records should be read out before and after each item, however, is another matter. To me it sounds rather commercial.

SPARKS

A writer says the time is near when people will go promenading with portable sets attached to their ears. Out on "paradio!"

The question still rages: "Do we want more wireless jazz?" Some people want the band—others want the jazz banned.

A health culturist proposes to broadcast a lecture on the benefits of fasting. This would be empty talk.

A correspondent says: "I spent hours drilling holes in a panel." A "boring" job.

Writing to a paper, a correspondent says, "When I hear some of the wireless items, I have difficulty in keeping cool." He can't be a wireless "fan!"

A reader has narrowly escaped serious trouble with the traffic authorities. He went down a one-way road with a two-way switch.

At a lecture on "Electrical Resistance" everyone present felt quite at Ohm.

"Biochemistry" hardly sounds an exciting theme; but again a dry-as-dust subject proves to be what the newspapers term "of human interest." I recommend readers to follow the series.

What has happened to those first-class hotel bands which used to regale us with light music during the lunch-hour on Saturdays? I am all in favour of changes. But there is such a thing as leaving well alone, and it would be interesting to know why changes have been made in a department which has proved so satisfactory. Unless the reason is a commercial one, I can imagine no valid reason why the present orchestra should have ousted those from the Carlton and elsewhere.

The announcing of "Diversions" still gives cause for ribald laughter. I wonder whether they call in the street criers to do this part of the business.

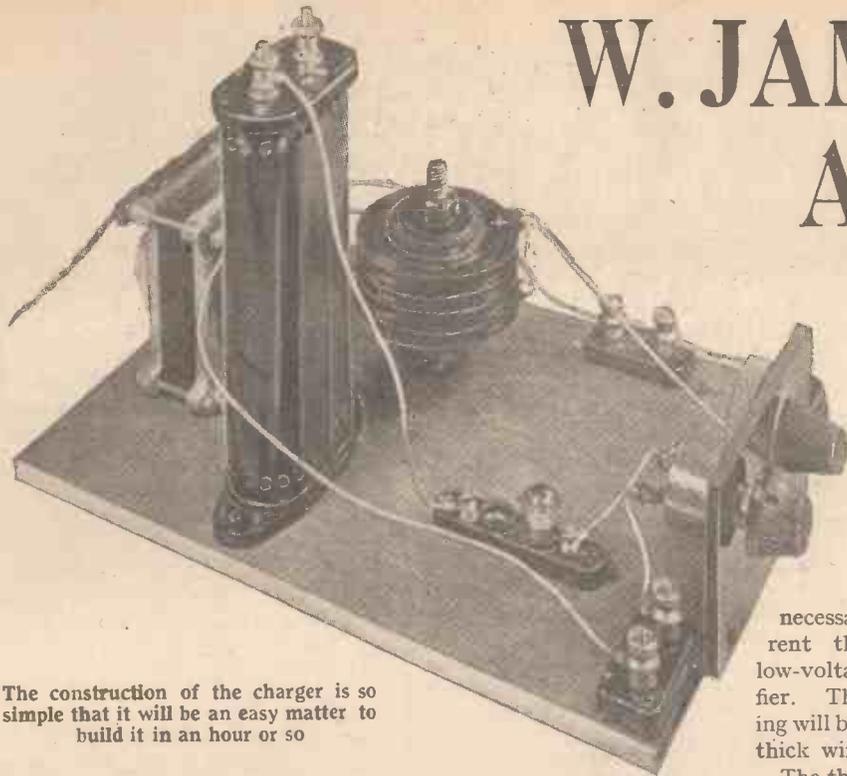
Incidentally, I was interested to hear my friend Beachcomber, although he has written far better stuff than that he put over. How long ago was it I took my colleague by the arm, dragged him up to Savoy Hill, and tried to fix him up as a broadcaster? Then he was contemptuously indifferent to the wonders of wireless, but he appears to have undergone a startling conversion. All the better that he has had the courage to realise that those of us who believed in broadcasting were correct.

I notice Jack Padbury and the Cosmo Club Six were billed to appear, photograph and all, in a recent vaudeville, but that they were by no means overwhelmed in work. What is the object of engaging expensive bands to sit by, listening to other people's turns?



An impression of William Lack of the 'Roosters'

W. JAMES DESCRIBES AN L.T. AND H.T.



The construction of the charger is so simple that it will be an easy matter to build it in an hour or so

THERE are a number of amateurs who wish to charge both high and low-tension accumulators from A.C. mains.

The parts needed are a transformer with suitable windings, a high-tension rectifier, a low-tension rectifier, fuses, terminals and, perhaps, a switch. As both batteries will probably not be charged at the same time, a fairly small transformer will suit, but this

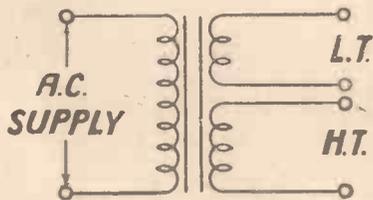


Fig. 1. Details of transformer windings

naturally depends upon the size of the cells, and their charging rates.

Both batteries could, of course, be charged at the same time if the transformer will carry the currents without overheating. The transformer will have three windings.

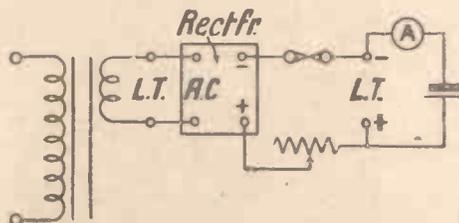


Fig. 2. The low-tension side of the charger

One is the primary and is wound to suit the voltage and frequency of the supply.

The second winding is for the low-tension circuit, and will be arranged to pass the

necessary current through a low-voltage rectifier. This winding will be of fairly thick wire.

The third winding is for the high-tension accumulators and will, therefore, provide the relatively high voltage needed for charging. These three windings are shown in Fig. 1.

I prefer to use Westinghouse metal rectifiers for work of this nature. Many models are available. For charging a low-tension battery of from 2 to 6 volts at, say, half an ampere, style R4.2.1 is suitable. This rectifier is of the full-wave type, and has two terminals marked A.C. and two more marked D.C. + and D.C. -.

For the purpose of illustrating this article, I have used a style R4.2.1, but without its case, as it had been used in other experiments. But a note should be made that a new one has a metal case, with terminals marked as described.

Input to L.T. Rectifier

This rectifier should be supplied with 8 to 9 volts A.C. The full output of half an ampere through a 6-volt battery will then be obtained. If a 2-volt cell is connected the current will probably approach 1 ampere and the rectifier may overheat and be damaged. A resistance ought, therefore, to be connected in the output circuit, as indicated in Fig. 2.

This diagram shows the complete low-tension circuit. Note the fuse, the meter, and the connections to the battery. The two positives are joined, and so are the negatives. A meter ought to be connected when first trying the apparatus, but is not necessary when once the current has been adjusted. The resistance may be of about 6 ohms and capable of carrying half an ampere continuously.

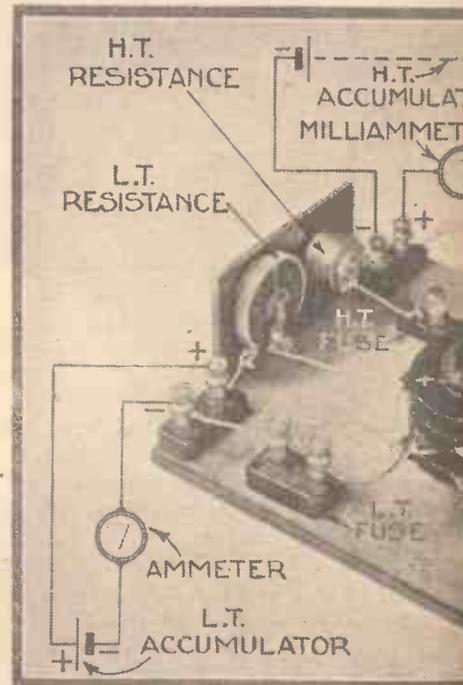
The apparatus described below will furnish suitable for battery-charging purposes of the circuits will show that in cases will be an easy matter to modify the con

For charging the high-tension accumulators a different style of rectifier must be used, depending upon the voltage and charging current. If the battery is of not more than 120 volts and a charging current of 30 milliamperes is suitable, style H.T.3 (Westinghouse) rectifier may be used.

Voltage Doubling

For batteries of up to 180 volts, style H.T.4 should be used and the current restricted to 50 milliamperes. Rectifier style H.T.3 must be supplied with A.C. not exceeding 135 volts. It is of the half-wave type and is connected as in Fig. 3, with an adjustable resistance and fuse. The resistance may have a maximum value of 2,000 ohms, and a compression type is suitable. Alternatively a lamp could be used here, as the exact charging rate is not important.

When more output is needed rectifier style H.T.4 is used; the transformer may



This schematic photograph explains the function of the batteries

HOW TO MAKE H.T. CHARGER

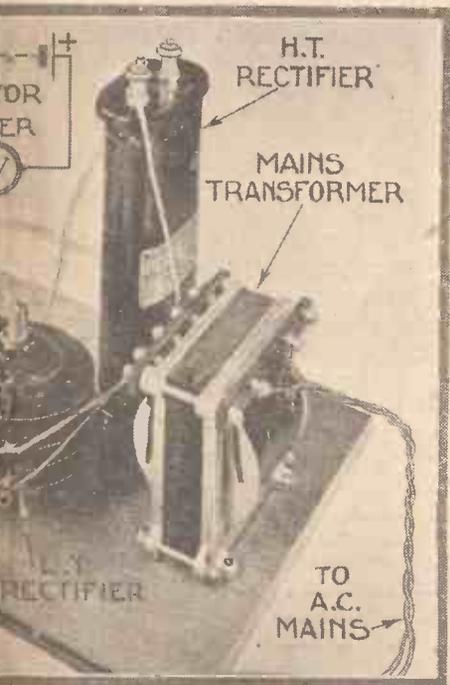
furnish either low- or high-tension current when A.C. Mains are available. A study here only one voltage is required, it will construction of the unit for this purpose

supply 230 volts. The unit is used for half-wave rectification, as shown in Fig. 4. In mains units a voltage-doubling circuit is often used with this rectifier, full-wave rectification being obtained, and this circuit, including two 4-microfarad condensers, could be used for battery charging. An output of up to 180 volts at 30 milliamperes can be obtained with an input of 135 volts A.C., but a greater current can be taken at lower D.C. voltages, such as 50 milliamperes at 120 volts.

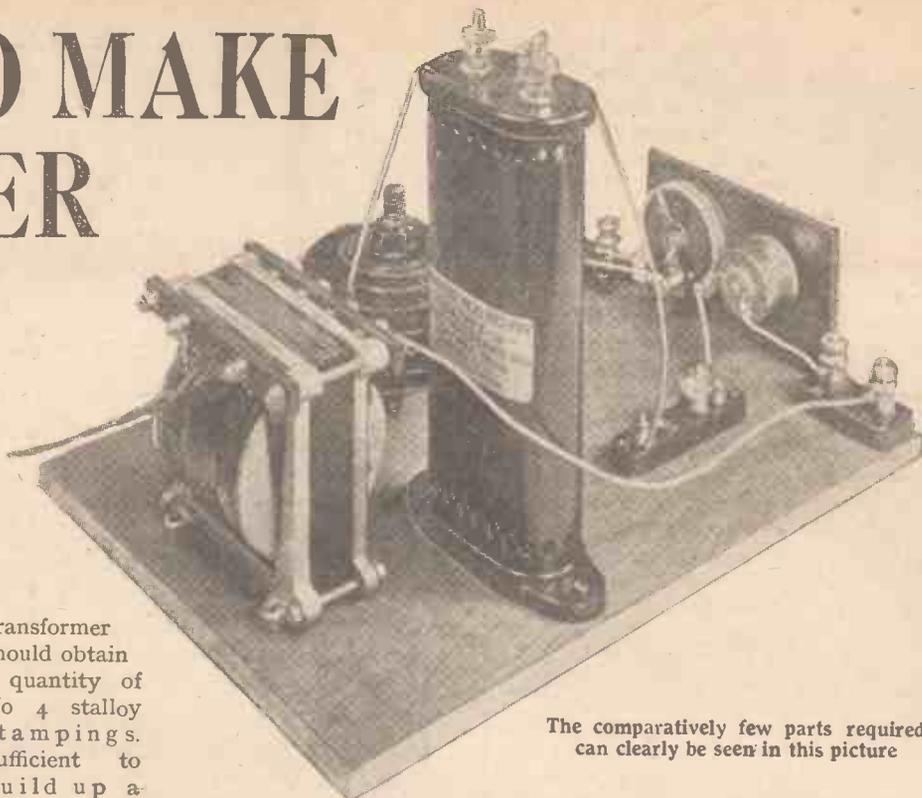
There should be no difficulty in connecting the rectifier chosen for the work. The illustrations and Fig. 5 show a half-ampere low-tension rectifier and a type H.T.4, giving 180 volts at 30 milliamperes down to, say, 120 volts at 50 milliamperes.

The Transformer

For the low-tension unit an A.C. voltage of 9 is needed, and 230 volts for the H.T. Those who wish to construct a suitable



ions of the different components and indicates are connected up



The comparatively few parts required can clearly be seen in this picture

transformer should obtain a quantity of No 4 stallo stampings. Sufficient to build up a core 1 in. thick should be obtained, and will cost about 4s. For a 50-cycle supply, of 200 volts, 1,400 turns will be enough for the primary, with 1,540 turns for a 220-volts supply and 1,680 for 240 volts. Number 30 gauge enamelled wire will be suitable and it should be wound on a bobbin which can be made from cardboard.

The sides of the bobbin should be cut to fit the core and also the central part; a width of 1 in. is enough.

A second bobbin, 1 1/4 in. wide, should be prepared for the two separate secondary coils. One of these windings should comprise 65 turns of No. 24 enamel- or cotton-covered wire. This is the 9-volt winding and it may be put on first.

Over it wrap a few layers of tape and then wind on 1,600 turns of No. 32 enamelled wire. This winding will give about 235 volts. Those who are used to constructing transformers will be able, from this brief description, to build one suitable for the units illustrated. The windings must, of course, be well insulated from one another and from the core, and will be satisfactory if wound as suggested. Hand winding is not difficult if time is taken and the wire kept fairly tight.

It is necessary to clamp the core laminations or they will buzz. These clamps may be provided with feet for fixing, as described before in these pages.

First Adjustments

When first setting up the apparatus put an ammeter in the charging circuit and regulate the current to prevent the recti-

fiers from becoming too hot. The resistance used in the low-tension circuit must be capable of carrying half an ampere continuously or it will overheat. For a 6-volt battery no resistance will be required, but for 2- and 4-volt cells, the resistance

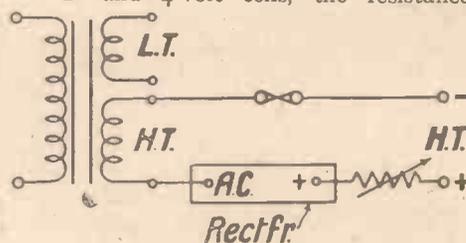


Fig. 3. The high-tension side using a style H.T.3 rectifier

should be adjusted to pass the desired current

Trickle charging of high-tension accumulators is satisfactory. The amount of the current which passes will depend upon the number of cells and the resistance in circuit.

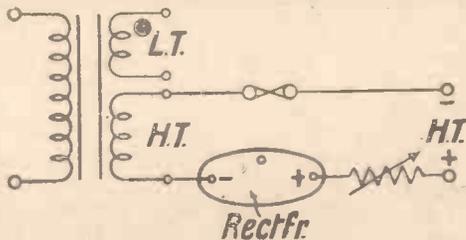


Fig. 4. The same circuit as Fig. 3 incorporating a style H.T.4 rectifier

A milliammeter ought, therefore, to be connected in the circuit when first using the apparatus and the resistance regulated to pass a suitable current.

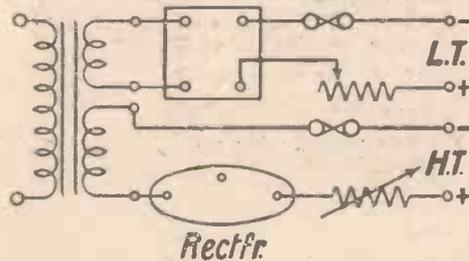
"HOW TO MAKE AN L.T. and H.T. CHARGER"

(Continued from preceding page)

If a wire-wound type is preferred, its value may be estimated by assuming that it has to drop the voltage from 180 to that of the battery when the current passing is 30 milliamperes. Thus, for a 120-volt battery, a resistance of about 2,000 ohms will suit.

It is not necessary to disconnect all the wires from the receiver when charging the high tension, and one could charge whilst using the set. Both batteries can be charged together, but not with the set connected, as hum might be heard and it is possible that the voltage applied to the filaments of the valves would be too great.

The low-tension output might be sufficient for certain types of moving-coil loudspeakers, but an electrolytic condenser might be necessary for smoothing.

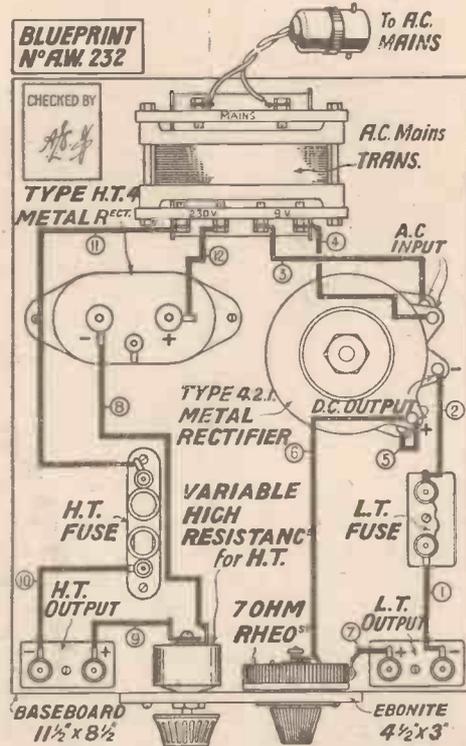


The complete circuit of the charging unit

Metal rectifiers used for charging purposes, if not overloaded, will last for years without trouble. A good transformer will also give no trouble. The fuses will protect these parts in the event of a short-circuit occurring across the output and should, therefore, have suitable current-carrying capacities. A Bulgin fuse-lamp passing 100 milliamperes will be satisfactory in the high-tension circuit, but a bulb passing

1 ampere and of low resistance should be used in the L.T. circuit or the voltage drop across it will be excessive. Alternatively, a piece of fine copper wire may be used.

It is advisable to handle the unit with a certain amount of care, as the voltages are fairly high, particularly on the transformer. This should, therefore, be covered, or else the whole unit be placed in a safe place.



Comparison of this wiring diagram with the photographs will make the construction quite clear. A full-size blueprint is available, price 1/-

SIDE-SHOWS OF THE ETHER

Jottings from My Log, by JAY COOTE

CONCERTS, dramatic performances, vocal or instrumental recitals are all good in their way; in specified doses they go to make up the day's wireless menu. We may compare them to the swings and roundabouts of Europe's Radio Fair for they are the stand-by and *piece de resistance* of every wireless entertainment and as such make a wide appeal. It is, however, the unexpected side-shows which arouse general interest; those extempore or eleventh-hour stunts of which no warning is given in the published programmes. And these may be picked up fairly frequently by the listener who uses his receiver intelligently. It will always repay you to make a round of your logged stations once nightly if only to ascertain whether they are working to schedule. In many instances you will find that they are not and it is on these occasions that you will secure a peep at worth-while side-shows which otherwise you might have missed.

Of one of these I find an entry in my log under April 15. It is true that in view of the coming Centenary celebrations Radio Alger (Algiers) is on the look out for broadcasts which may whet the appetite of eavesdroppers on this side of the Mediterranean, but I did not expect to hear the quaint and picturesque ceremony of an Arab wedding. It was an illustrated lecture arranged as a series of radio-views, namely, short talks leading to scenes descriptive of Oriental marriage customs. Step by step I was taken through the various stages of courtship from the time a formal request was made for the young girl's hand to the moment the bride was presented to her parents-in-law.

Incidentally, I heard these monotonous chants which are usually associated with Oriental events but contrary to the custom of Radio Alger, a clever translation in French was given of these peculiar wailing songs so packed with flowery figures of speech. A clever running commentary with accompanying music on native instruments was broadcast of the procession in which the bride was escorted to her new home, a ballet of dancing girls was also featured as well as the formal ceremony in which the happy couple were presented to one another.

If we are to have a relay from Cologne, Berlin, Brussels, Vienna or Paris, why give us samples of their most modern musical compositions? Would it not prove more interesting to the mass of listeners to be given an insight into the other man's daily life, occupations and favourite amusements?

The Radio Club de Cannes (France) broadcasts a vocal and instrumental concert every Wednesday evening at 9 p.m. B.S.T. on 175 metres.

PORTABLE AERIALS—Some Useful Tips

ONE of the limitations in the design of a portable set is the necessity for the incorporation of a frame aerial. This must be reasonably large in order to obtain a satisfactory amount of pick-up, and it must also be somewhat carefully constructed if one is to cover both wavebands with satisfactory efficiency.

In these circumstances it is perhaps surprising that more use is not made of the ordinary vertical wire as an aerial. This is more particularly the case where one is taking a portable set out into the country for an afternoon's enjoyment. A good deal of the difficulty can be overcome if one is content to carry about a small length of perhaps 20 ft. of flexible wire. This may be provided with a suitable weight at one end, and in operation it is simply slung over a convenient tree or other object having a reasonable height.

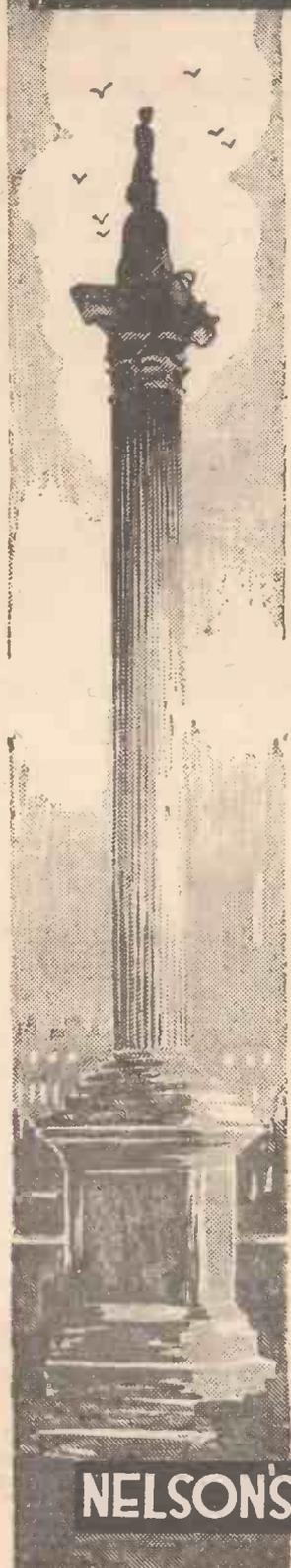
This provides a short vertical aerial having an effective height of 10 to 15 ft.,

which is distinctly more sensitive than the average frame aerial. The signal strength receivable is three or four times as great as the average frame, despite the fact that no definite earth connection is used. The capacity effect between the set and the ground is sufficient to provide an effective earth, particularly if the set is made with a metal case or some similar arrangement having a large capacity effect.

With a device of this character a simple tuning circuit is usually all that is necessary even at some distance from the local station, so that a three-valve set having a detector and two L.F. stages is capable of giving excellent results.

The device has the additional advantage of being non-directional so that it is not necessary to find the best position for the frame in order to obtain the best reception. Results are obtainable with greater ease and better quality than with the average portable receiver.

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MY WIRELESS

Weekly Tips,
Constructional and Theoretical—

A Strange Position

I SEE, from the papers, that the radio manufacturers in America have promptly refused to use the new pentodes offered them by the valve makers, at least in the coming season's sets.

Apparently, alternating-current valves were issued there before they were in a truly commercial form. In other words, the public paid for bad valves.

The screen-grid receivers too, seem to have been put into production before the engineers had thoroughly grasped the principles involved. Users, therefore, failed to obtain satisfactory service.

These experiences have no doubt had the effect of making the set people cautious, and they are shy of the new pentodes. There are two of them, one is a sort of screen-grid pentode—for high-frequency amplification, of course, whilst the other is for the power stage of a set.

On the whole and based on the published characteristics, American valves are not so good as ours. I should say, too, that our valves are more uniform and last longer.

These New Valves

The new screen-grid valves having a very low anode-grid capacity are not much better than older patterns in many circuits, because of various stray couplings.

With complete shielding of the coils, condensers and wiring, the full benefit of the new valves is to be obtained. But in many instances the stray couplings are of such magnitude that they swamp the stray capacity of the screen-grid valve. The result is that no improvement is noticed when one of the latest valves is fitted. In fact, owing to the better characteristics, the tendency to oscillate may be even more pronounced than with older types.

Fortunately it is often possible to improve the screening without much trouble. Thus where a simple upright screen is used, a top piece may be added with advantage in some sets. This top screen may help reduce the capacity of one condenser to another or between coils and so improves matters.

Corroded Coils!

One is not troubled much in these days with corrosion causing a break in a coil, but I have heard of a few cases where an end which has passed through a former has



DEN

By
W. JAMES

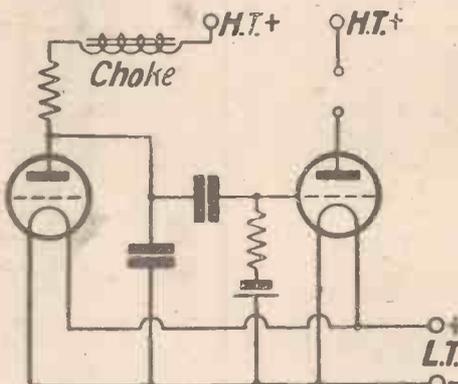
For the
Wireless Amateur

been eaten away. Apparently the formers were not properly dried out, with the result that where the ends of the coils were passed through holes a green spot appeared.

A fine wire is soon destroyed at these places and all that one can do is to rewind. The trouble is avoided by sealing the hole with wax. A little wax should, therefore, be run into the hole when the winding is finished.

A Tone-Changer

Those who use a resistance-coupled low-frequency amplifier and feel that the higher notes are not being brought out at the correct strength may very easily put matters right by adding a choke as indicated in the figure



A simple method of "shifting" the tone range, described in the accompanying paragraph

The higher notes are lost for one reason, namely, that the impedance of the anode circuit at the higher frequencies is less than at the lower frequencies. This may be the result of a high anode resistance and the valve capacities, or perhaps a fairly large by-pass condenser is fitted for the purpose of helping rectification.

By connecting a choke, as shown below, the impedance of the anode circuit may be increased, but for the best results it may be essential to reduce the value of the anode resistance. An effective tone control is to be obtained by fitting an adjustable anode resistance. When it is set at a low value, the high notes will be emphasised; as the resistance is increased the lower

notes are strengthened in proportion.

Some compression-type resistances would be too noisy for a circuit of this type, but one or two that I have appear satisfactory. A choke of 20 henries would be suitable, and as it passes only a small current quite a compact component will be satisfactory for this work.

The Small H.T. Fallacy

Gradually, users are realising that small H.T. batteries are not suitable for three-valve sets. Not only do they quickly fall in voltage, but their resistance increases. Therefore the quality of the reproduction falls off and the range of the set is affected.

Screen-grid valves do not work very well when the high tension is below 100 volts. Rectification is likely to occur, particularly when grid bias is used and as the impedance of a screen-grid valve increases as the voltage is reduced, the magnification is lowered.

Connecting a "Pot"

A point that sometimes worries users of mains sets having a screen-grid volume control, is to which end of the potentiometer the slider should be turned when reducing volume.

It is found that the volume can be cut down by turning the control above or below the central point. But when the control is turned one way, the current through the valve is increased, whilst when it is moved in the reverse direction the current is decreased.

Obviously the control ought to be turned towards the point where the current is the minimum. The voltage of the shield of the valve should, therefore, be reduced when it is desired to lower the volume. This type of volume control is fairly satisfactory in practice, but one should always remember to turn the control over the right part or the current passed by the valve may be greatly increased.

It is expected that the new 16-kilowatt station now in course of erection at Reykjavik (Iceland) will be ready for work in June next, when broadcasts are to be carried out of Iceland's celebration of her thousandth anniversary. Announcements and explanation of the ceremonies in connection with the festival will be made in Icelandic, English, German, and a Scandinavian language.

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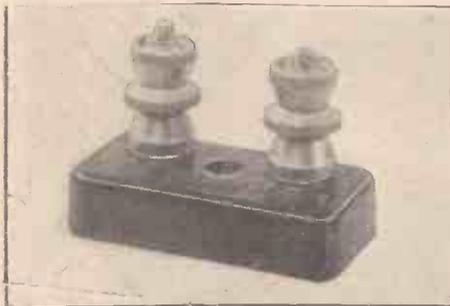
"A.W." TESTS OF APPARATUS

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

Lissen Terminal Block

ONE often finds difficulty in making an external connection to one particular part of the set, owing to the fact that the leads may have to be attached to some loosely fixed component, such as a coil. With the aid of a terminal and suitable base, however, it is possible to take the connection from the coil to this terminal, and then attach the external lead. There are, in fact, numerous occasions when a couple of terminals on a small base can be extremely useful.

This fact has been realised by Lissen,



A handy component—the Lissen terminal block

Ltd., who have submitted for test a small terminal strip consisting of two double terminals mounted on a moulded base with a single hole for fixing into a baseboard. Two leads can, therefore, be joined independently to each terminal and one removed without upsetting the other.

This useful little article can be recommended.

G.E.C. Moving-coil Speaker

IT used to be considered that the chief merit of a moving-coil speaker was its ability to reproduce bass; and, indeed, we have heard models which reproduced little else! Now, however, the craze for the "boomy" speaker is beginning to die out, and a reaction has set in, with the result that designers are putting their efforts into obtaining greater brilliance in reproduction.

The chief properties of a moving-coil speaker should be the ability to reproduce frequencies equally well at both ends of the audible scale, an absence of fundamental resonance, and, perhaps of still greater importance, an amplification proportional to the electrical input; by this is meant a wide graduation between *pianissimo* and *forte* passages.

These fundamental points of speaker design seem to have been fully realised by the General Electric Co., Ltd., who, after much research, has produced a Gecophone

moving-coil speaker giving an excellent performance. A cursory inspection of this speaker reveals the soundness of the mechanical construction. The framework is solid, but not bulky; all vital parts, such as transformers and leads, are completely enclosed; a fool-proof centring device is fitted, and all those little refinements associated with the best types of speaker.

To go into further details, a 7-in. impregnated paper cone forms the diaphragm and is attached to the aluminium framework by flexible calf skin. A heavy felt ring is provided for interposing between the speaker and the baffle.

The speech coil is wound on a 1 3/8-in. former which together with the suspension device is machined out of a single piece of duralumin. The object of such an arrangement is to limit as far as possible the number of separate parts in the moving system, for the purpose of preventing rattle.

The ends of the speech winding are taken to the secondary of a transformer of which the primary winding has a centre tap. It is consequently possible to use either half or the whole of the primary according to the impedance of the valve or valves in the output circuit. Furthermore, with a centre tap the speaker can be connected in a push-pull amplifier without using an additional output transformer.

The actual model submitted for test was designed to operate off alternating current mains from 200 to 260 volts, three taps being provided. Rectification of the A.C. for the field is performed by a U5 rectifier valve in conjunction with a suitable transformer. All transformers and associated parts, excepting the valve, are enclosed in a metal casing. D.C. models are also available and we understand that they are exceptionally silent in operation.

We connected our model to our standard quality amplifier having an A.C. output of approximately four watts obtained from two push-pull valves. This amplifier, by nature of its uniform characteristic is excellent for showing up faults in speakers.

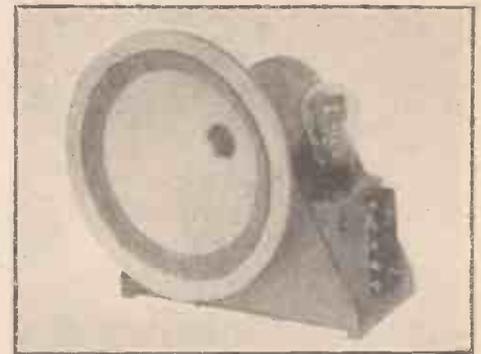
We expected good results from the Gecophone speaker and were not disappointed. There is a notable absence of resonance, particularly in the lower frequencies, yet the pedal notes of an organ are reproduced with clarity and freedom from dither. The brilliance on the higher audible frequencies is more than usual and we think that with the majority of sets, this will be an advantage, as it makes speech particularly clear.

As regards volume we were able to make

the floor and the walls of the laboratory reverberate without detecting any sign of chatter

Naturally a speaker of this type requires a full-size baffle, it is, therefore, interesting to note that the General Electric Co. makes an attractive baffle in the shape of a small easel, which does not appear out of place in a lounge or drawing-room.

It is obvious that considerable time and experiment has been expended on this



The new G.E.C. moving-coil speaker

speaker, and we should like to compliment the makers on the success of their efforts.

A Handy Valve Adaptor

A FEW months ago, only a very limited number of sets used A.C. valves, but recently their popularity has increased considerably and many readers are probably contemplating a change over to the new type.

If one substitutes five-pin valve-holders for the old four-pin type, the change will occupy a little time and may require extra soldering: it is possible, however, to obtain an adaptor fitting into the old four-pin holder, and by a simple modification, including wiring to the 4-volt "heater" winding, the conversion will be complete.

We have just tested such a device known as the Six-Sixty valve adaptor marketed by The Six-Sixty Radio Co., Ltd. Essentially it consists of a five-socket holder with four pins for plugging into a normal holder, the two sockets for the heater are taken out to terminals on either side, and the central cathode socket is connected to both of the filament pins.

With this arrangement one can be certain of earthing the cathode in a satisfactory manner, and indeed if the simple instructions supplied are followed, there should be no difficulty whatsoever in carrying out the conversion successfully.

These adaptors sell at 1s. 6d. each, and are in every way serviceable articles.

Let "A.W." Solve Your Problems



THE B.B.C. will make its usual yearly attempt to broadcast the song of the nightingale during the week May 26 to 31; the transmission will be given to National listeners. Engineers stationed at Pangbourne will stand-by nightly between 10.30 p.m. and midnight and will switch on the microphone when the birds are deemed to be singing well enough for relay to Savoy Hill.

The annual season of promenade concerts at Queen's Hall will occupy eight weeks, namely, from August 9 to October 4; a number of these will be broadcast through the National and Regional transmitters.

On May 22 the B.B.C. will relay from the Palladium the complete Command Performance of the Variety Artistes' Benevolent Fund and a commentator will describe from the wings of the stage turns which do not lend themselves to transmission by wireless.

In the *Diversions* hour on May 15, visitors will be taken to a speedway meeting at Wembley Stadium and later to the Willesden Junction signal box from which the nerve centre of a great railway will be described.

The Nankin (China) Government recently placed a contract with a German firm for the delivery of a 60-kilowatt broadcasting station. It will be of the type supplied to Oslo (Norway), and will therefore prove by far the most powerful transmitter in the Far East.

Plans for the reorganisation of the broadcasting system in Hungary call for the erection of a new 120-kilowatt high-power station in the neighbourhood of Budapest as well as a number of small relays to cover the country. As the authorities aim at an alternative programme the present transmitter in the capital is to be retained.

The Rumanian authorities have decided to erect a 5-kilowatt transmitter at Jassy, in the province of Bessarabia. Although a local studio will be installed it is expected that the station will devote the greater part of its time to the relay of the Bucarest programmes.

Contrary to legal decisions in force in the United Kingdom, the Reich Supreme Court at Berlin has declared that broadcasting stations in Germany cannot claim an exclusive copyright in the news transmitted by their studios. In view of this fact the Reichsfunk has modified the wording of

listeners' licences by incorporating a clause whereby it is made clear that the reproduction or publication of news gathered from the broadcasts will be a breach of the conditions on which the licences are granted.

The *Sir James Clark Ross*, a new whaler tanker of 19,500 tons, recently built by the Furness Shipbuilding Company for a Norwegian firm, is the most up-to-date vessel of its kind. Whale hunting will be carried out by small motor launches carried by the tanker, which will also be equipped with an aeroplane for scouting purposes and a wireless installation to enable the captain to keep in daily touch with his owners at Sandefjord, Norway.

A broadcasting station is to be erected at Kingston, Jamaica. The cost is estimated at £20,000.

Frederic William Wile, the Washington correspondent who broadcast the London Disarmament Conference proceedings to the American public, said he was sometimes flabbergasted at the nonchalant orders from New York. One message of instruction Mr. Wile received read: "For next Sunday, please arrange to put on the Archbishop of Canterbury, H.G. Wells, or Lloyd George."

Evelyn Laye, who recently appeared in New York in Noel Coward's *Bitter Sweet*, was the guest artiste of the General Motors family party over a nation-wide hook-up by the National Broadcasting Company.

A sum of £750,000 is to be spent on the broadcasting service and its reorganisation in Australia. The scheme includes the erection of at least a dozen subsidiary stations in different parts of the Commonwealth, and, when completed in about three years, is expected to provide a good service for about 95 per cent. of the population.

The Grecian islands are to be linked with Athens and the mainland by wireless telephone and telegraph services, for which equipment has been ordered. Three duplex telephony and high-speed telegraphy stations are to be erected, one near Athens, one on Crete, and the third on Chios. A radio telegraph ship-to-shore installation is also in course of construction.

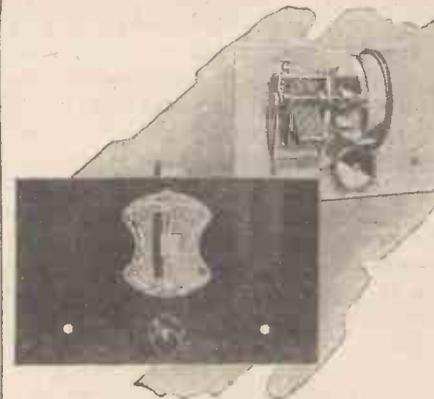
Wireless stations in the Pacific under the control of the New Zealand Government are being modernised. Raratonga is having a new transmitter to replace one of older type. This station will then link up Wellington (N.Z.) and Apia, thus forming an important link in the wireless network of the Pacific.

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FAULT-FINDING WITH A VOLTMETER

THE really experienced tester is able to say, in some isolated instances, what the probable fault in a receiver is by switching on and noting the peculiar noise which the set makes. For example, where one has a fault in the low-frequency side of a set, one sometimes encounters a sort of strangled reproduction, as if somebody was trying to speak or sing, while some other obliging person was endeavouring to throttle them. This is usually a symptom of a broken grid circuit, although, as I shall show later on, this is not always the case.

Similarly, there are one or two other defects which give a clue to the possible cause of trouble, when one is used to handling sets of various types in fairly large quantities. Generally speaking, however, the operator who endeavours to base the whole of his fault testing upon such crude methods will encounter difficulties sooner or later. The only proper method of testing is the systematic elimination of the various parts of the circuit, so that those which are performing their functions satisfactorily may be eliminated from those which are not.

Many Methods of Testing

Any detailed exposition of the methods of testing faults is obviously impossible in a single article. There are, however, a number of tests which can be carried out with the aid of a simple voltmeter. I propose in the present article to show how useful the voltmeter can be to the operator who is endeavouring to trace a fault, either in a receiver which has just been constructed and which refuses to function with its proper efficiency, or in the case of a receiver which has some definite fault and refuses to work at all.

First of all let us consider the voltmeter itself. This must be of a fairly high grade. The testing voltmeters often used for checking the voltage of a battery are not really satisfactory for this class of work because they take too much current. As we shall see later, the testing consists of measuring the voltage in progressive parts of the set and making sure that these are of the order which one would expect if the circuit is working normally. If, however, the voltmeter takes an excessive current misleading results may be obtained, and for this reason it is desirable to use a voltmeter of a fairly high standard.

The Factor of Merit

Where are we to draw the line? Generally speaking, an instrument which has a factor of merit of 200 ohms per volt is satisfactory.

Many voltmeters have an even higher factor of merit than this, ranging from 300 to 500 ohms per volt, or in the case of special meters 1,000 ohms per volt. This latter class of instrument is particularly useful when dealing with mains apparatus.

If one is in any doubt regarding an instrument in one's possession, it is an easy matter to find out from the makers what its factor of merit is, or alternatively to find out what its total resistance is. This is often marked on the instrument, and if

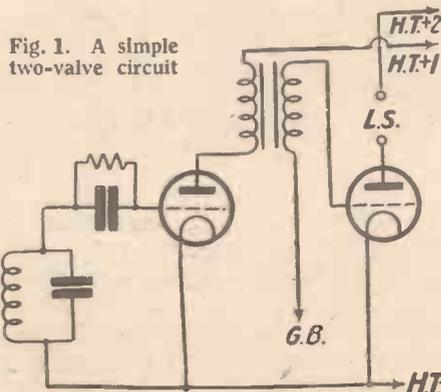


Fig. 1. A simple two-valve circuit

the full-scale reading in volts is divided by the total resistance we obtain at once the factor of merit in ohms per volt. Having settled this point, we can pass on to the use of the voltmeter for set testing.

A Fundamental Rule

Now any circuit which is functioning in a satisfactory manner must be such that there is a gradual fall in voltage from the point of highest potential to the zero point. The high-potential point is the positive tapping on the H.T. battery, while the zero potential point is the negative tap, and each of the circuits connected across the battery must conform to the rules thus given. Let us consider, for example, a simple two-valve circuit shown by Fig. 1.

Here we have a detector followed by a transformer-coupled low-frequency stage. First of all let us consider the output stage. Measure the voltage on the H.T.2 tapping. See that this is of the right order (i.e., that the battery is not seriously run down). Next measure the voltage on the anode side of the loud-speaker. This should be slightly less than the full amount, owing to the resistance drop caused by the passage of the anode current through the loud-speaker winding. The resistance of the average loud-speaker is about 2,000 ohms, and this will drop two volts for every milliampere of anode current. Since the last valve in the

Many people regard fault-finding as a difficult proposition. Whether this is so or not depends very largely upon the way in which one tackles the problem. In the article below J. H. Reyner explains how most of the faults that occur can be tracked down with the aid of a voltmeter.

circuit will take anything from 5 to 10 milliamperes we should expect a drop of 10 to 20 volts on this component.

Detail Tests

There are several possibilities here. First of all we may find no voltage on the anode side of the loud-speaker, which indicates a complete break in the loud-speaker winding. We may find little or no voltage drop, the voltage on the anode side being practically the same as that on the H.T. battery. This indicates that the last valve is passing no appreciable anode current and, therefore, either the valve is defective or is heavily over-biased. On the other hand, we may find the voltage drop considerably more than we should expect, which usually means that there is a partial or complete short circuit across the valve.

In the second case there is a further possibility, namely that although the valve is correct there is a break between the loud-speaker and the anode pin of the valve so that no anode current is flowing, and this point should be investigated. On the assumption, however, that the last stage is satisfactory we can now look at the detector stage. Here we start with the H.T.1 tapping, and then measure the voltage on the anode side of the transformer primary winding. The voltage here should be slightly less than that on the battery, due to the drop on the transformer primary, and the same symptoms can occur as in the previous instance. We may find no voltage at all, indicating a break in the circuit, no voltage drop (the same voltage as on the battery), indicating no anode current from the valve, or we may find an excessive voltage drop, indicating a short circuit.

A broken grid circuit, either in the detector stage or in the L.F. transformer secondary, will have the effect of putting no grid bias on the particular valve, in which case the grid will probably build up to a large negative value, and reduce the anode current considerably below its normal amount. This gives the same symptoms as in the second of the two alternative cases considered, i.e., no voltage drop on the transformer or loud-speaker.

Fig. 2 illustrates a three-valve resistance-coupled circuit. In testing this arrangement the last two stages would be tackled in the manner already discussed. In the case of the first stage we have to remember that the presence of the high resistance in the anode circuit will cause a considerable voltage drop. The voltage on the valve, therefore, will be distinctly less than that



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on the high-tension battery, and this must not be considered a fault. It should be remembered that if the anode resistance is equal to that of the valve, the voltage will be divided almost equally, so that the voltage on the anode of the valve itself is about half that on the high-tension tapping. If the resistance is, say, twice that of the valve, a more usual state of affairs, the proportion is then two to one, so that if we have 120 volts H.T. we shall drop 80 on the anode resistance, leaving 40 on the valve itself.

If the state of affairs is not found to be of this order, then one must suspect a fault in the circuit, and think out what form of trouble will be likely to arise from the particular symptoms. One may, for example, find that the voltage on the anode of the valve is nearly as great as that on the H.T. battery. This indicates that the valve is not passing any appreciable anode current and is probably either defective or incorrectly biased. One may find that the voltage on the valve is practically nil, in which case either some error has been made in the calculations, causing much too large a voltage drop on the anode resistance, or there is a short circuit. Generally speaking, the voltage on a valve, even a detector valve, should be of the order of 40 or 50 volts, as otherwise overloading is likely to occur.

This very brief discussion of the subject gives some idea of the value of voltage tests in finding definite faults in a receiver. The same remarks, of course, apply to high-frequency circuits but the voltage drop on the coils, such as are used here, is usually negligible and the voltage on the anode of the valve should be practically the same as that at the H.T. point of the circuit. Such matters as faults in tuning cannot be determined by this method, but a voltmeter is, nevertheless, a very convenient accessory when testing any set.

The Grid Circuit

I referred earlier in the article to the fact that although a broken grid circuit gave a choked or strangled quality, the same effect can be produced in other ways, as witness the following example which was located by means of a voltmeter. The circuit was as in Fig. 2 (page 682), and the coupling condenser in the first stage had broken down and was showing a resistance of only a few hundred ohms, instead of infinity. The quality was very badly choked and the strength was very weak indeed. The trouble was located by the fact that the voltage on the first valve was shown to be practically nothing. The valve was removed and replaced by another, known to be good, and the trouble still remained. A little further investigation showed that the voltage on the valve holder was still nothing even when the valve was removed. This indicated the presence of a short circuit of some sort from anode to filament, because,

(Continued at foot of next page)

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25.53	11,751	Chelmsford (5SW)	15.0	205	1,016	Limoges (PTT)	0.5	NORTH AFRICA			
*200	1,500	Leeds	0.13	304	986	Bordeaux (PTT)	1.0	361.5	823	Algiers (PTT)	16.0
*242	1,238	Belfast	1.0	308	973	Radio Vitus	1.0	416	820	Radio Maroc (Rabat)	10.0
*261	1,148	London Nat.	30.0	329	974	Marseilles (PTT)	0.5	1,250	240	Tunis Kasbah	0.5
*288.5	1,040	Newcastle	1.0	360	874	Poste Parisien	0.5	NORWAY			
288.5	1,040	Swansea	0.13	389	872	Grenoble (PTT)	0.5	364	824	Bergen	1.0
288.5	1,040	Stoke-on-Trent	0.13	*381	783	Radio LL (Paris)	0.5	363	813	Frederiksstad	0.7
288.5	1,040	Sheffield	0.13	447	671	Radio Toulouse	8.0	445	674	Rjukan	0.13
288.5	1,040	Plymouth	0.13	466	644	Paris (Etat)	3.0	453	662	Alesund	0.3
288.5	1,040	Liverpool	0.13	*1,446	207	Eiffel Tower	12.0	453	662	Tromsø	0.1
288.5	1,040	Hull	0.13	*1,725	174	Radio Paris	10.0	453	662	Porsgrund	0.7
288.5	1,040	Edinburgh	0.35	GERMANY				*493	668	Oslo	60.0
288.5	1,040	Dundee	0.13	*218	1,373	Flensburg	0.5	POLAND			
288.5	1,040	Bournemouth	1.0	*227	1,319	Cologne	4.0	214	1,400	Warsaw (2)	2.0
288.5	1,040	Bradford	0.13	*227	1,319	Münster	3.0	234	1,283	Lodz	1.5
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*310	968	Cardiff	1.0	*232.2	1,292	Kiel	0.35	*335	896	Posnan	1.2
*358	842	London Reg.	30.0	*239	1,256	Nürnberg	2.0	385	779	Wilno	0.5
*377	797	Manchester	1.0	*245	1,223	Cassel	0.25	385	779	Lvov	2.0
*399	753	Glasgow	1.0	*253	1,184	Gleiwitz	2.0	*403	734	Katowice	10.0
*479	626	Midland Reg.	25.0	*259	1,157	Leipzig	2.5	1,411	812.5	Warsaw	8.0
1,654	293	Daventry (5XX)	25.0	*270	1,112	Kaiserslautern	0.25	ROUMANIA			
AUSTRIA				*276	1,085	Königsberg	2.5	*304	761	Bucarest	12.0
*246	1,220	Linz	0.5	*283	1,058	Magdeburg	0.5	RUSSIA			
*283	1,058	Innsbruck	0.5	*283	1,058	Berlin (E.)	0.5	720	416.6	Moscow (PTT)	20.0
*352	851	Graz	7.0	*283	1,058	Stettin	0.5	824	364	Sverdlovsk	25.0
*453	666	Klagenfurt	0.5	*315.8	951	Bremen	0.35	938	320	Moscow-Stichkovo (C.C.S.P.)	103
*617	581	Vienna	15.0	*320	937.6	Dresden	0.25	1,000	300	Leningrad	20.0
BELGIUM				*325	923	Breslau	1.5	1,060	283	Tiflis	10.0
206	1,460	Antwerp	0.2	*300	873	Stuttgart	1.5	1,103	272	Moscow Popoff	40.0
220	1,364	Chatelaineu	0.25	*372	806	Hamburg	1.5	*1,304	230	Bharkov	25.0
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*279	1,076	Bratislava	12.5	*509	527	Freiburg	0.35	368	815	Seville (EAJ5)	1.5
*293	1,023	Kosice	2.0	*1,035	283.5	Zeesen	37.0	424	707	Madrid (EAJ7)	2.0
*342	878	Brunn (Brno)	2.4	1,049	282	Norddeich	10.0	402	649	San Sebastian	0.5
*437	617	Prague (Praha)	5.0	HOLLAND				SWEDEN			
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*1,796	167	Lahli	50.0	ICELAND				1,200	250	Boden	0.6
FRANCE				*1,200	250	Reykjavik	16.0 (shortly testing)	*1,343	222.5	Motala	30.0
29.70	10,180	Radio Experimental (Paris)	1.4	IRISH FREE STATE				SWITZERLAND			
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214	1,401	Fécamp (Radio Normandie)	0.5	25.4	11,810	Rome (SRO)	9.0	680	484.6	Lausanne	0.6
237	1,265	Bordeaux (Radio Sud-Ouest)	1.0	*332	905	Naples (Napoli)	1.5	780	595	Geneva	0.25
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256	1,171	Toulouse (PTT)	1.5	453	662	Bolzano (IBZ)	0.3	*1,200	250	Istanbul	5.0
263	1,122	Lille (PTT)	0.7	*501	599	Milan (Milano)	7.0	1,958	153.5	Ankara	7.0
*272	1,102	Strasbourg	0.7	LATVIA				YUGOSLAVIA			
287	1,045	Rennes (PTT)	0.5	*525	572	Riga	7.0	306.7	978	Zagreb (Agram)	0.7
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"FAULT-FINDING WITH A VOLTMETER"
 (Continued from preceding page)

of course, if the valve is removed the voltage on the anode socket of the valve holder should be practically the same as that on the H.T. battery itself, allowing for a very small voltage drop on the resistance caused by the current drawn by the meter itself. A little investigation showed that the fault must lie in one of the two condensers C or C1, and by disconnecting both of them in turn; the fault was finally tracked down to the coupling condenser C1.

Fig. 2. A 3-valve circuit in which a fault developed

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MORE RADIOGRAMS

FRENCH critics point out that in the matter of broadcasting France occupies a humiliating position in the world, occupying eighteenth place on the list.

Experiments with radio broadcast instructions in German schools have not been entirely successful, judging by the response to a questionnaire. Most of the municipalities replied that schools had found it difficult to fit the broadcast programmes into the school day, and the result at the loud-speaker left much to be desired. The replies, nevertheless, indicated a general belief in the future of radio instruction as a means of supplementing class-room routine.

Turning the Tables is the title of a "more or less musical mélange" by Graham Squiers and Charles Brewer. It will be broadcast from Midland Regional on May 24.

The new 36-kilowatt Brunn transmitter, which is being built by a British firm in the United Kingdom, is now ready for its initial tests. Czechoslovakia will also possess in 1931 a 60-kilowatt station which is being erected at Boehmisch-Brod to replace the present Prague transmitter.

Although authority for the construction of the new 60-kilowatt transmitter for the Radio Toulouse broadcasts has not yet been obtained, a site is already being cleared at some eighteen miles from the city.

P.T.T. Rennes is to be transferred to Villeneuve, in the same district, and the opportunity will be seized to overhaul the plant of this station and bring it up to date.

It has been definitely decided to endow Milan with a new high-power transmitter and to transfer the present 7-kilowatt plant to Opicina, in the immediate neighbourhood of Trieste. This station, when formally opened in the beginning of 1931, will broadcast on 247.7 metres (1,211 kilocycles).

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LETTERS TO THE EDITOR



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

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

The Programmes Again

SIR,—I was much interested in reading Thermion's recent criticism of the "Regional Scheme." I am glad to know that there is someone who, having the opportunity, is so far independent as to fail to swallow every pill these pundits at Savoy Hill prepare for the public's maladies.

And yet one often wonders what portion of the listening public you and your fellow critics (especially Mr. Moseley) have in mind when approving of or disapproving of many things put up on the ether.

Can you get away from Fleet Street and imagine yourself planted down, for good, in a crowded Lancashire town amongst cotton operatives and then, examining the stuff (and the time it is put up) the B.B.C. gives them, say it is suitable to their requirements? Look at it this way. A Lancashire operative is early to work; he gets home about six in the evening and, generally, is in bed by ten. Now look at the stuff he gets between that time. His particular portion of broadcast receiving is filled in with educational stunts, news items, fat stock prices, French and Spanish lessons, poetry reading, suffragist talks, foundation series, a bit of chamber music, etc., without any chance of escape.

This brings me to the real object of this letter, the "Regional Scheme." Why should Manchester station put out what is known as the National programme when the same is being broadcast from 5XX?

Anywhere in the Manchester area, except, perhaps, under its aerial, 5XX comes through better, and thus we have a duplicated programme and are doomed to put up with it. Surely the working classes are entitled to more consideration than they get, seeing that they provide 80 per cent. of the money for broadcasting?

A. G. (Bolton).

A Curious Fault

SIR,—Three weeks ago I completed W. James' "Brookmans 3," and when I connected up ready for a test I was utterly disappointed with the results. I bought a new power valve, replacing a pentode I had been using; I even tried the set on another eliminator, but still no results. During the past week I made one last effort. I started with the set and finished up with the earth, having made a thorough test of everything, and this is what I discovered. I am using an Aeronomic earth switch and on removing

the cover—this I had not done before, as the lever was working as I thought O.K.—I found a chrysalis in some very mysterious way had formed from the aerial to earth terminal, so making a short. On removing the cause of the trouble I at once returned to the set and switched on to the lunch-time programme. London came through on the L.S. at tremendous power, and on switching over to the long waves 5XX came in with nearly as much volume. Radio Paris could also be heard all over the house.

I can only do one thing now and that is to heartily agree with the designer that the "Brookmans 3" will do all he said it would and, with careful manipulation, a bit more. It is, indeed, a wonderful set, very selective, and the reproduction is of first-class quality. Separating the National and Regional is "child's play," and there is not the slightest interference when receiving foreigners.

O. (Palmer's Green).

Is Mr. Moseley High-brow?

SIR,—I was amused at the complaint of your correspondent, S. O. B., that Mr. Moseley is too "high-brow," because I myself intended to complain that he is too "low-brow."

My objection was that he devotes too much attention to dance bands and vaudeville, although I admit that his notes on these subjects are interesting and diverting.

As S. O. B. considers Mr. Moseley too "high-brow" and I consider him too "low-brow," perhaps the explanation may be that he manages to maintain the happy balance of a good critic. K. (London, E.C.)

It is rumoured in Paris that the power of the Eiffel Tower transmitter is to be increased to 24 kilowatts in the aerial.

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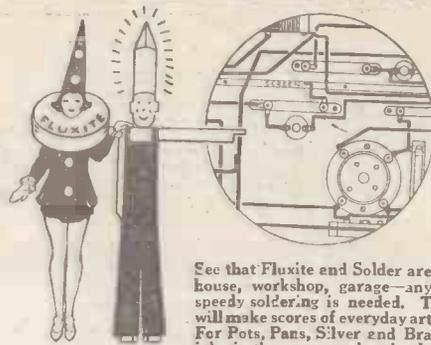
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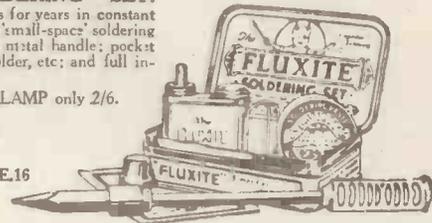
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