

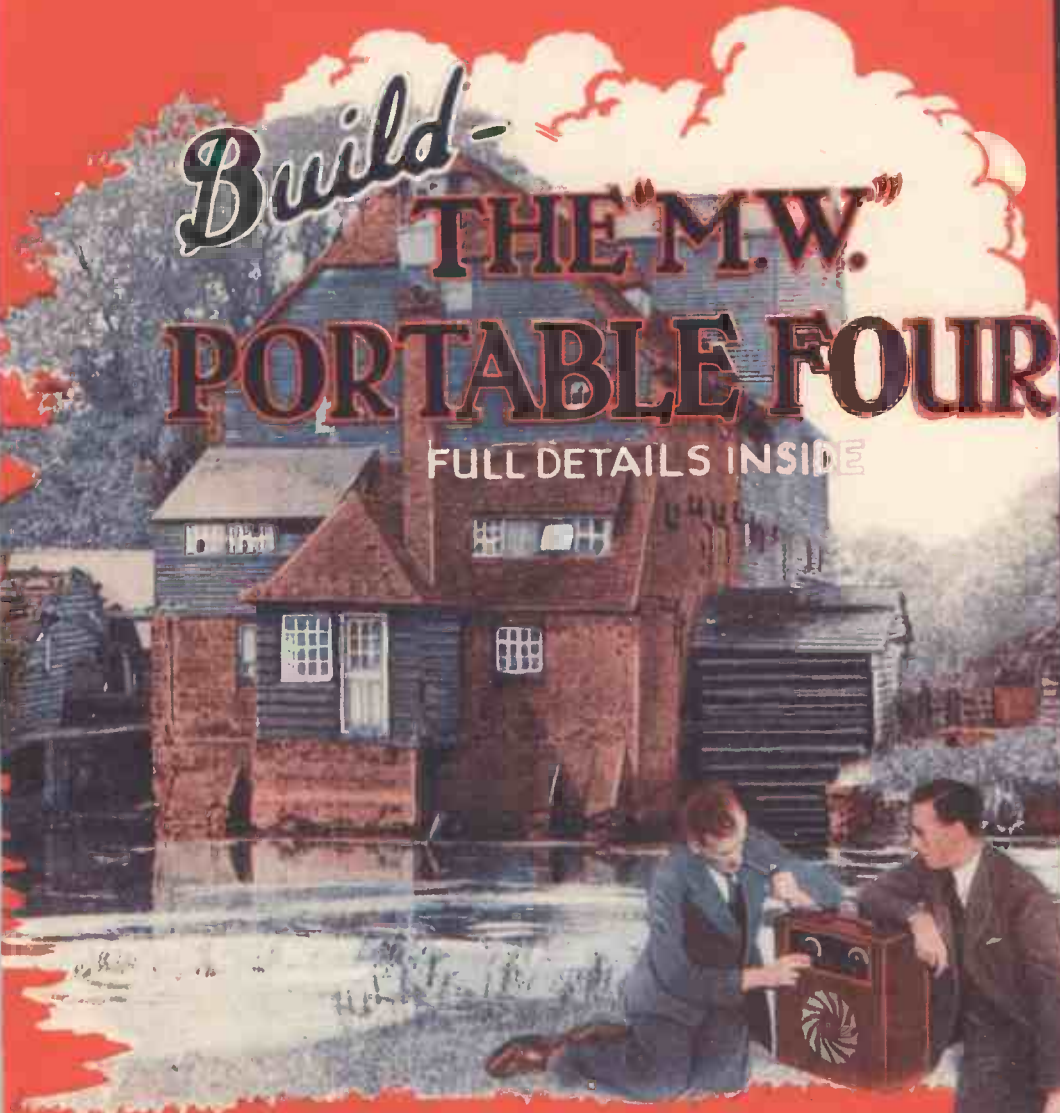
MODERN WIRELESS

1/-

VOL. XV. N° 53

MAY 1931

Build-
THE "M.V.W."
PORTABLE FOUR
FULL DETAILS INSIDE



Also This Month

THE "M.V.W." THREE

An All-A.C. Mains Transportable with Built-In Loud-Speaker.

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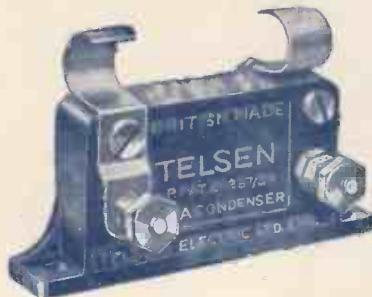
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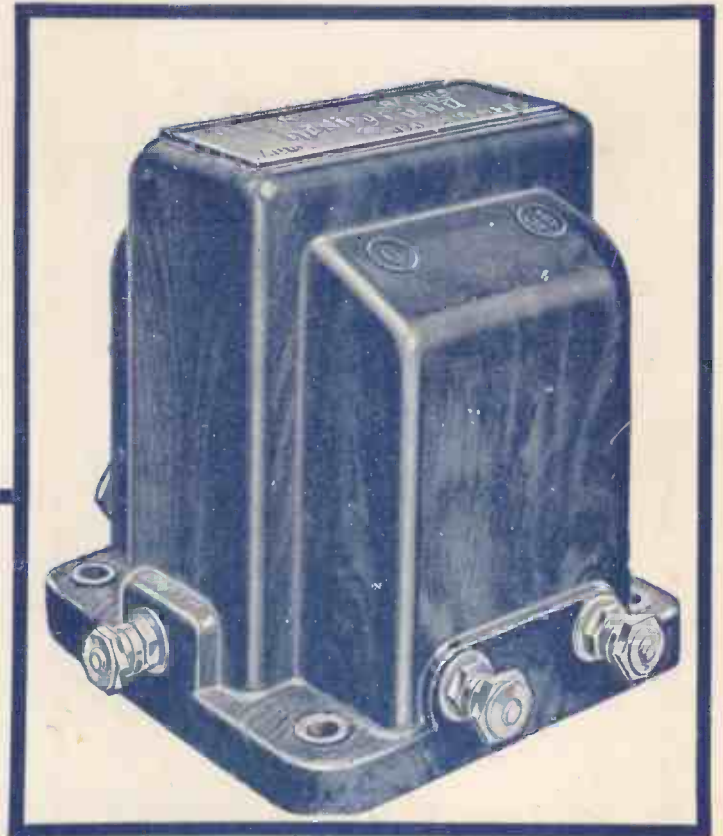
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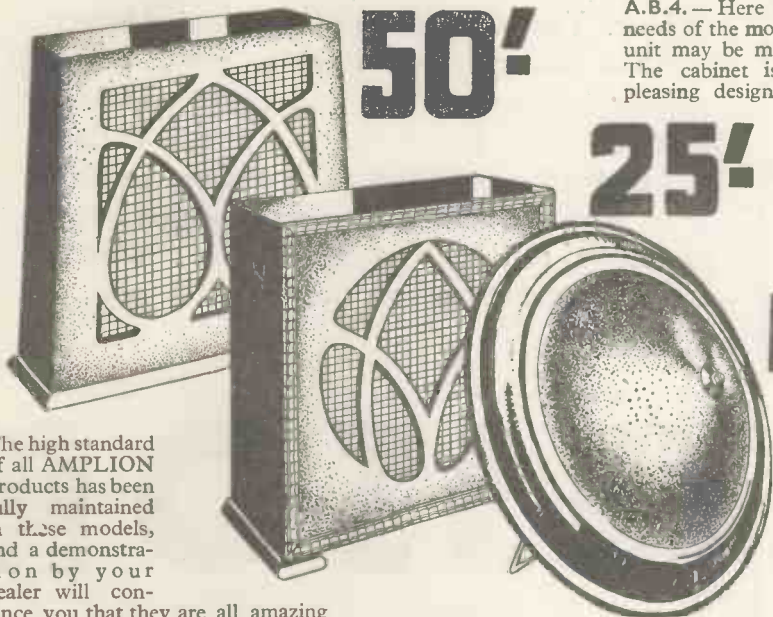
SPECIAL SUPPLEMENT, "THE WORLD'S PROGRAMMES," PAGES 481-496
(See page 481 for contents of this section.)

As some of the arrangements and specialities described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before joining in

Edited by **NORMAN EDWARDS.**

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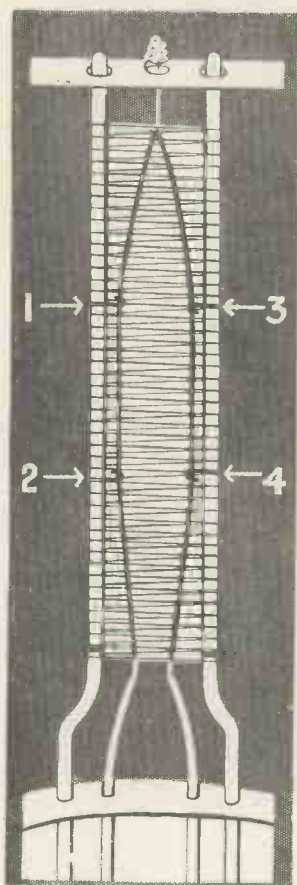
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MODERN WIRELESS



Vol. XV. No. 53

BRITAIN'S LEADING RADIO MAGAZINE

MAY, 1931

Our Special Portable Set Features—A Dual-Purpose Set—Enlarged "World's Programmes" Supplement—The Progress of Radio.

Our Special Portable Set Features

IF we could only rely on the weather in this country there would be no arguing about the fact that this is the right issue of MODERN WIRELESS in which to give our readers plenty of portable set features! But although it may be pouring with rain when you purchase this issue, don't let that deter you from considering the possibility of finer weather to come and, with the finer weather, the joy of the open air and the attractions of picnicking.

And a modern picnic, these days, is pretty incomplete without a good radio set or a gramophone; a radio set for preference, because you can have a lot of fun with it.

Now in this issue you will find details of the "M.W." Portable Four. As you will see from the description of the set in another part of this issue, it incorporates one S.G. valve and 2 L.F. stages. The type is conventional—upright wooden case, etc. The set covers both broadcast wave-bands, and has a very special H.F. coupling scheme. Incidentally, the set can also be used with a gramophone pick-up.

You will find this set has ample selectivity to separate Regional transmissions quite easily. In short, the receiver is robust, quite simple to make, and capable of giving very good quality results.

A Dual-Purpose Set

THE "Convertible" Two is an easy-to-build, inexpensive set. Readers will notice that it is so designed that it can be fitted into an ordinary cabinet and employed as a household receiver. Or, again, it can be slipped into an attaché-case and used with a self-contained frame aerial and batteries for out-of-doors holiday reception.

The "M.V.W." Three is a transportable receiver for mains valve working. It is completely self-contained, and is the ideal household receiver. Provision for electrical gramophone reproduction is made, while for radio the set has been found on test to be capable of bringing in a large number of stations.

We feel that this set will attract wide attention, because

it is not only an up-to-date wave-change receiver, but also a most becoming article of furniture. It is what might be described as a "fit-and-forget" set, and is entirely operated by plugging into the mains.

Enlarged "World's Programmes" Supplement

OTHER features of interest which we should like to bring to your notice are the "Contra-Wave" One. This is not a portable receiver, but a very highly efficient single-valve for distant 'phone reception. It possesses both selectivity and sensitivity to a high degree.

We have enlarged our "World's Programmes" Supplement this month, and the sixteen pages which you will find in this issue are packed with information about foreign stations, technical hints and tips, and other invaluable material of great interest to those who are keen on bringing in foreign stations.

The Progress of Radio

It is interesting to remember (in view of the recently published facts concerning the radio industry) that in 1922 there were only 35,744 wireless licences in force, while it has been recently stated that the number to-day exceeds 3,600,000.

As for the value of our radio trade to-day, it is estimated to be in the neighbourhood of £20,000,000. Official figures have recently been printed to show that there are now, approximately, 3,000,000 homes in this country which have an electrical supply laid on, and the number, it must be remembered, is continually increasing. Consequently the number of mains-operated sets, although only about 1,500,000 to-day, is expected to increase by at least a quarter of a million this year.

Perhaps one of the most remarkable facts which can be obtained from the analysis report of the radio industry is the evidence to show the steady trend towards cheaper receivers.

In 1923, some readers may remember, the average price of a three-valve set was at least £20, but to-day this average is down to £4 10s. or £5. In 1927 a mains set cost £30, but to-day a good one can be bought for £20.





Sir Harry takes his infrequent broadcasts very "seriously" and, as listeners will have gathered by the results, enters into them with gigantic enthusiasm.

I'M a listener masel', ye ken, when I'm at home at Dunoon, and it happens that this is the month in which I'm due to renew my licence. And when I think of the cost of it—losh!

I wonder at myself! I dinna ken why I don't make a special arrangement with the B.B.C. to let me have my licence free in return for my promising not to broadcast for any other radio concern in Europe.

I'm not suggesting that the licence isn't worth the money in a general way. After all, its precious little you get, these hard times, for the same price; and then ye generally get Harry Lauder once a year or so—but I must be modest, and refrain from saying who I think to be the best item of the lot. After all, I don't hear him masel'.

Variety and the Variety Concerts

Seriously, though, I propose to hand out a few brickbats and bouquets about this broadcasting business. We listeners have to sit still and be lectured and have our programmes arranged without any choice of ours all through the year; and I don't see why we shouldn't get in a word in our own defence just now and again. So

Do Listeners Get Their

The great variety artiste "hands out a few brickbats and bouquets about this broadcasting business," and shows in the following special and exclusive article that he is an enthusiastic and well-informed listener.

Good Morning, everybody, and here goes—brickbats first in case they prove so heavy that they save me the cost of bouquets.

I think we might say to begin with that there's a wee bit too much of the serious stuff on the National programme. I'm a serious man masel' (when I get Schedule D, anyway), but I don't want to be improved out of all knowledge.

Supposing I turned up on the stage one night and started giving ye a lecture about the population problems o' China, for instance! Hoots, mon, we ought to prevent that at all costs.

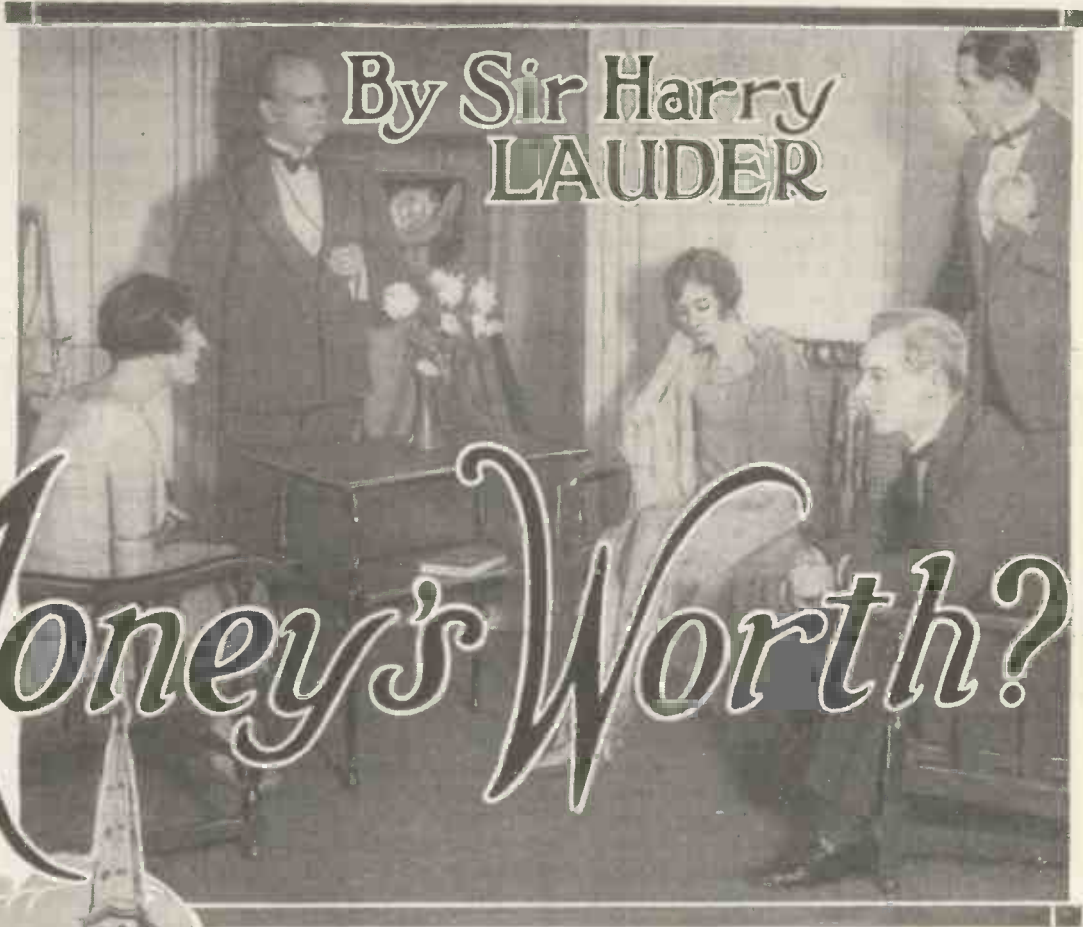
Then (here's a heavy one!) what about a bit more variety in the variety concerts? The artistes themselves are good and clever, and I've nothing but praise for their turns; but we would like some fresh ones now and again.

The High-Power War

Canny Scots get awfu' angry when they get much the same variety concert for about three nights running, and then the same repeated after an interval of a few weeks. A few more artistes, a few novel turns, and a more thorough shuffling in between hearings, would keep us all more contented than we are, at present.

Then there's these new German stations. I don't know quite who to aim my brickbat at this time, but I desperately want to shy it at someone when, as I lie back in my easy chair and listen to some good turn on London Regional, I hear three or four dozen operatic sopranos positively shouting down twice as many violins. It's grand exercise, no doubt, and most beneficial for the lungs—but no' for the lugs, ye ken!

Surely it would be possible for the B.B.C. to come to some working agreement with foreign stations to alter wave-lengths, or increase or decrease power so that this sort of Great War didn't go on? I'm a peaceful man masel', but I could fair do murder and violence when my set starts shrieking at me for no fault of my own.



By Sir Harry
LAUDER

Money's Worth?



Sir Harry pays a warm tribute to broadcast church services. And on the left is a photo of St. Martin's, Trafalgar Square, London, from which many Sunday evening services have originated.

Perhaps makers of radio sets—for whom, in general, I have only most grateful bouquets—could do something to make high-powered sets more selective, and eliminate this nuisance. I'll be glad if they can, for I can't bear to think of my voice getting mistaken for that of Mephistopheles over the ether, even if it is only the horny gentleman from "Faust" instead of from lower still.

More Suitable Times

One more brickbat, and then I'll look and see what I've got in my other hand—maybe it'll be a saxpence, but if so, dinna expect it! I think some of the times of popular items might be made more convenient to the general public.

At present nearly all the radio plays are broadcast either early in the evening or else very late indeed. Those early on suit no one, for they come just round about tea-time; and the ones starting nigh on ten o'clock make decent folk sit up shivering, too interested to stir up the dying fire and too cold to enjoy the piece.

Besides, some of us have to be up early next morning to work, and don't care to stay out of bed till midnight when a more convenient time might just as well be arranged.

"We're Only Tempted to Tune In to the Wicked Continent"

If the principal items of the programme could be given between seven-thirty and ten, I'm certain most listeners would approve. For those people who have dinner, surely it could be put forward half an hour or so, and still allow plenty of time to settle down in the library chairs before the invisible "curtain" is rung up by the pleasant-voiced announcer.

Plays, Records and Sunday Programmes

Now for the nice things I can say. To continue about radio plays, I think the productions chosen, the adaptations for radio use, and the work of the casts is a real triumph of dramatic art. I was once very doubtful indeed as to whether plays would broadcast at all well.

There are some which obviously wouldn't, but those the B.B.C. has had the sense to leave alone. As an actor myself, who has been nearly fifty years before the footlights, I would like to say that my scepticism about radio plays has been swept away in a wave of pleasure and congratulation.

Gramophone records are another thing I like to hear broadcast, though there is sometimes a tendency to give rather too many of them. I think all listeners will agree with me that they would rather hear an artiste than his record; but in the case of many foreign artistes their visits must necessarily be seldom, and, in the meantime, records subduced to their right proportion in the programme are very pleasing.

Church services are another form of broadcast which seem excellent value. Here the present proportion is also

rather on the heavy side, but they always seem interesting.

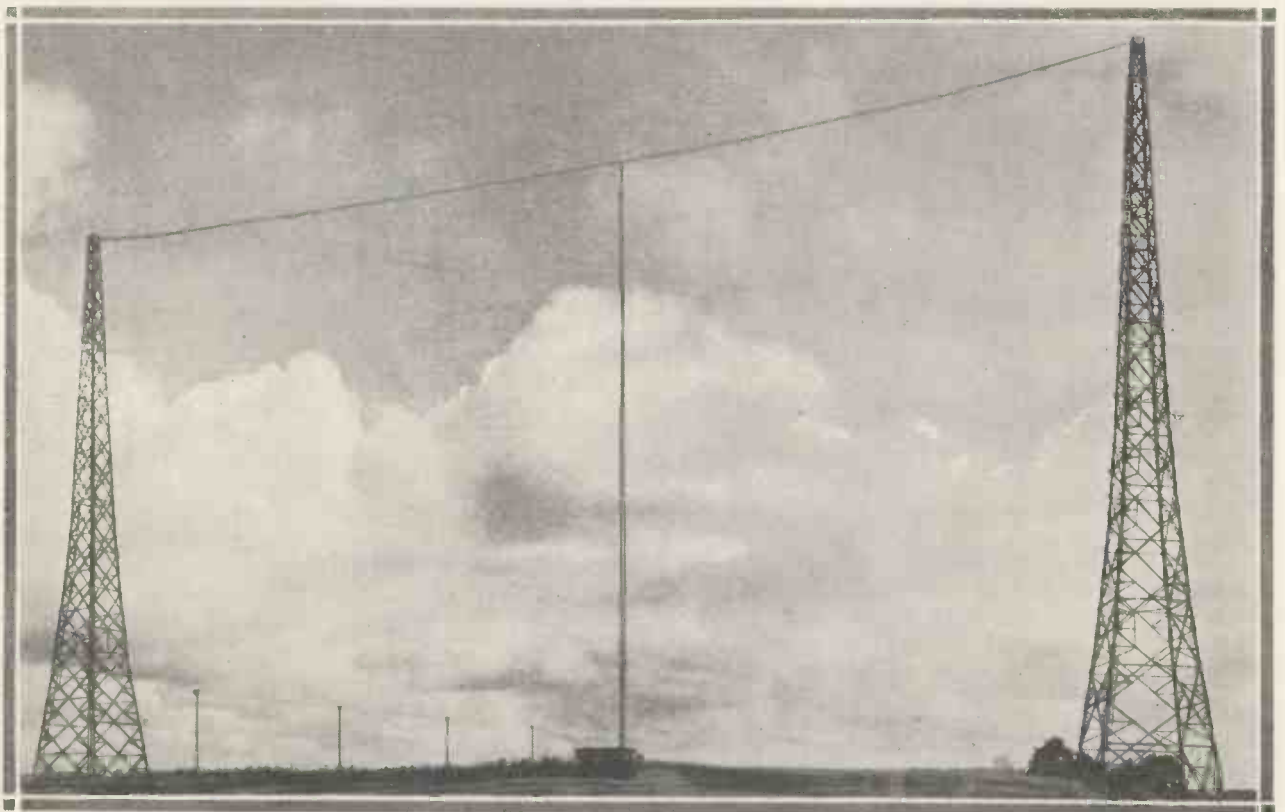
But Sunday broadcasting as a whole is far from the best possible, at least in my opinion. I know that this is a subject on which ideas differ very widely, but, so long as no entertainment is given which tends to make people stay at home instead of attending divine service, I see no reason for making the Sunday programmes the worst of the week. It is the one day in the week which most of us can spend at home, and there is a general feeling that, excepting the hours of ten-thirty to twelve-thirty, and six to eight, we might be given something attractive. Otherwise we're only tempted to tune in to somewhere on the wicked Continent. Which is putting temptation in our way!

Good, But Improvement Possible

And finally, of course, there's those fine talks by that grand comedian, Harry Lauder. I've kept the best till last, ye see; and I daresay that so long as the B.B.C. realises his worth it'll always have thousands of grateful listeners who'll pay their ten shillings regularly, besides those North o' the Tweed, that the Post Office doesn't know about.

More bouquets than brickbats, certainly; but still, as I say, there are things that might be improved. The B.B.C. is a marvellous concern, and on the whole I offer it my serious congratulations; but I'm a guid Scot masel', and when it comes to paying oot ten shillings, and I reckon out the awfu' number of bawbees in the total—well, it makes me just a wee critical, naturally. I'll hae to pit ten shillings on my next broadcasting fee—ou, aye!

"WHICH IS PUTTING TEMPTATION IN OUR WAY"



The aerials of that big German broadcaster, Mü^hacker. He generally transmits lively dance music on Sunday evenings, and you can get this on the simplest of sets after the B.B.C. has closed down.

NEW WAVELENGTHS FOR BROADCASTING?

By R.L. SMITH-ROSE, D.Sc., Ph.D., A.M.I.E.E.

This is the first section of a special contribution on a subject of vital importance to all listeners. The present ether chaos shows no signs of abatement, and the question of using different bands of frequencies for broadcasting has been receiving much attention.



DURING the past few years the history of radio communication has largely comprised development work in the direction of the use of shorter waves. Even before the dawn of broadcasting it was found that the existing bands of wavelengths above about 300 metres were **ROUND ABOUT 5 METRES**

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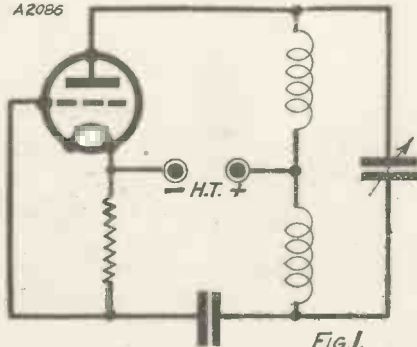


FIG. 1.

A simple Hartley transmitter circuit capable of going well down the wave-length scale.

beginning to be so crowded as to make it difficult to fit in any new wireless service.

The advent of broadcasting gave rise to an insistent demand for the allocation of comparatively large bands of wave-lengths for the exclusive use of this service, and readers are already aware of the various arrangements which have been tried and modified in order to find room for the continually expanding broadcasting services.

Phenomenal Distances

It is indeed fortunate that contemporary research and development several years ago opened up the way to the use of shorter wave-lengths below about 100 metres. Although the transmission of such short waves

was subject to many uncertainties, it was found that in favourable circumstances they could be transmitted to almost phenomenal distances.

Skip-Distance Effect

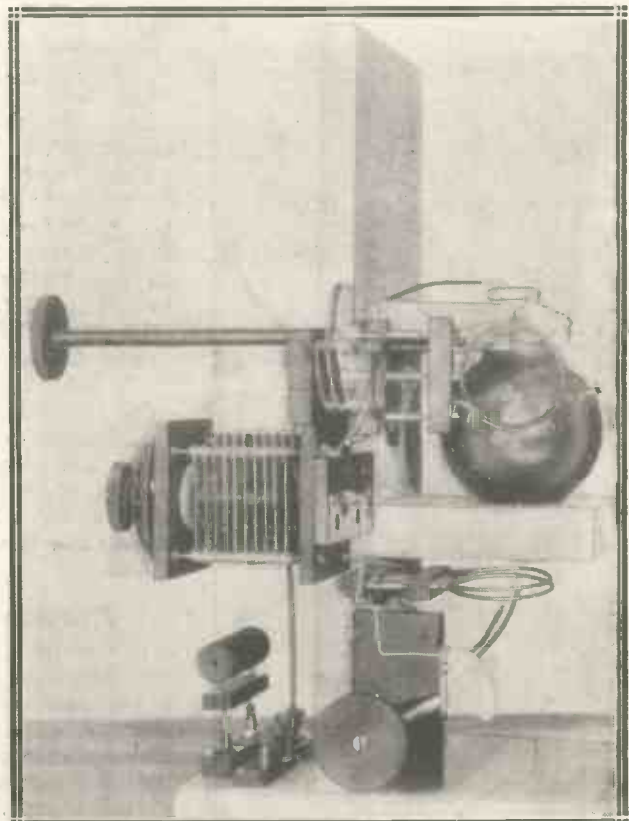
A factor which enters largely into the possible use of very short wave-lengths for broadcasting purposes is that the decay of intensity of the waves when transmitted along the earth's surface is very rapid on the shorter wave-lengths, with the result that, except at very short distances, all the useful radiation is conveyed through the upper atmosphere, and there may be a minimum distance at which this upward radiation is returned to a receiver on the earth.

In view of the crowded state of the longer wave-length bands an advantage of the use of short waves is that a larger number of services can be placed in each "octave" of the available frequencies or wave-lengths.

It is probably well known to readers that an approach to ideal allocation of broadcasting

stations is the basis of giving each station a band of frequencies of 20,000 cycles per second in width, i.e. each station is permitted the use of bands of 10,000 cycles per second on each side of its allotted frequency or wave-length. This is considered not only sufficient, but also necessary for the transmission of accurate reproduction of speech and music.

A RADIO SKELETON



This "bone-y" short-waver is the practical arrangement of Fig. 1—a 100-watt series-fed Hartley circuit. The lower coil forms part of a rejector circuit in series with the grid leak.

Now the band of wave-lengths from 300 to 500 metres covers a frequency range of from one million to 600,000 cycles per second. The width of this band is, thus equivalent to 400,000 cycles per second, providing for twenty stations each occupying a band of 20,000 cycles per second.

If the wave-length band were reduced to 30-50 metres, the frequency range would be from ten million to six million cycles per second, and there would thus be available 200 bands of 20,000 cycles per second each. By lowering the wave-length band to 3-5 metres provision could be obtained for 2,000 stations!

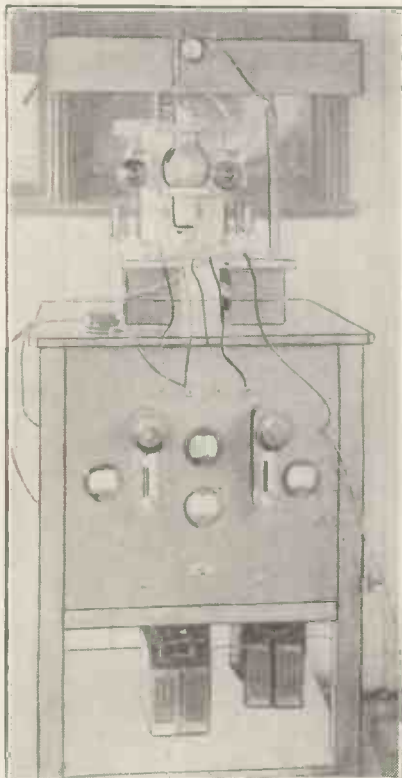
The Beam Stations

In the case of telegraph transmitting stations employing the Morse code, the band width required for each station is somewhat less, and the number of stations which could be accommodated would thus be correspondingly increased.

These considerations demonstrate that it is worth while studying the technique of short-wave working in order to cope with the inevitable progress of modern radio communication.

In this country and elsewhere many beam stations are now utilising wave-lengths of from 10 to 40 metres for the

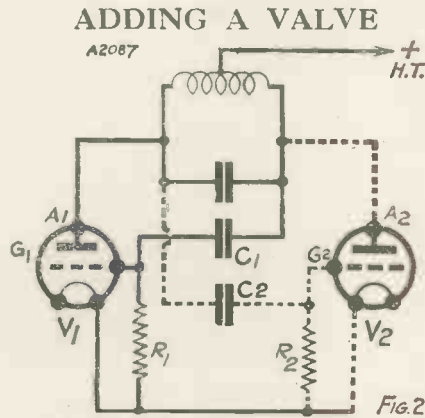
THE COMPLETE OUTFIT



A view of the short-wave transmitter. The oscillator is similar to that illustrated in the photo on the next page.

provision of regular daily services in the transmission of press news and private commercial telegrams.

Although it has been possible for some time past to generate on a laboratory scale oscillations of a frequency corresponding to wave-lengths



A double series-fed Hartley scheme in which the two valves supply the oscillatory circuit alternatively.

below 10 metres, the introduction of such wave-lengths into commercial communication is taking place very slowly.

Ultra-Short Direct Rays

This is partly due to difficulties in the technique of generation with appreciable power and the construction of sufficiently sensitive receivers, and partly to the very limited range which can be obtained in the transmission of such waves directly along the ground.

Communication over anything but the shortest distances must, therefore, take place by means of waves transmitted through the atmosphere; and although this has been stated at times to be impossible, a small amount of evidence to the contrary is now becoming available.

The following portion of this article contains a brief description of some experimental transmitting apparatus which has been constructed for the purpose of studying the propagation of ultra-short waves along the earth's surface and through the upper atmosphere.

Reactance of Wire

It may be said at the outset that very few, if any, new principles have to be learnt and followed in the construction of short-wave apparatus, provided that due allowance is made for the change of frequency in regard to the effect of reactance, mutual couplings, etc.

It has to be realised, for instance, that at a frequency of 100 million

cycles per second the reactance of a straight piece of No. 47 S.W.G. Eureka wire may be greater than its ohmic resistance, and that when a straight wire is arranged in the form of an aerial and is tuned to the working frequency the radiation resistance is usually the predominating factor which limits the current flowing in the aerial.

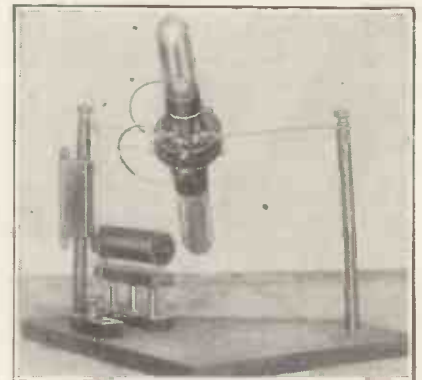
A most useful single-valve circuit for short-wave working is that sometimes known as the series-fed Hartley circuit, illustrated in Fig. 1.

Very Tiny Values

In considering the design and construction of a transmitter based on this circuit it is important to get a clear idea of the values of inductance and capacity which are available for working on the wave-lengths in question.

To crystallise the reader's ideas it may be stated that a single turn of thick copper wire about 12 in. in diameter has an inductance of less than 1 microhenry, and that this

LOWER STILL!



A two-valve oscillator for a wave-length of 1.5 metres, using the circuit of Fig. 4

requires only 36 micro-microfarads of capacity to tune it to a wave-length of 10 metres, or 9 micro-microfarads to tune it to 5 metres.

There is, therefore, not much to spare in the matter of inductance and capacity, and every effort must be made to keep dimensions of the subsidiary portions of the valve circuit as small as possible in order that the bulk of the small inductance and capacity available may be in the main oscillatory circuit.

A single-valve transmitter employing a 100-watt valve in a circuit arrangement, similar to that in Fig. 1, is shown in a photograph. The transmitter is mounted on a panel of American whitewood, which material has a very low dielectric loss when kept dry.

Single-Loop Coils and Minute Capacities

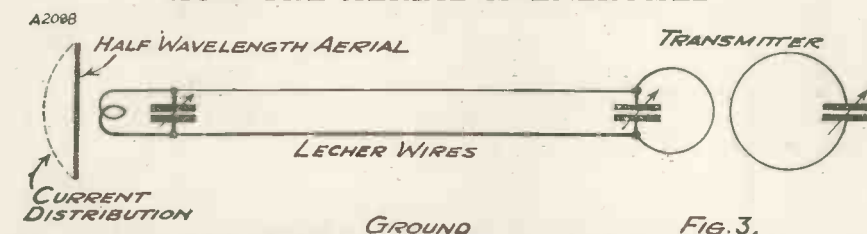
The main inductance is the two-turn loop to be seen in front of the valve. This is formed of No. 14 S.W.G. copper wire wound into a coil $2\frac{1}{2}$ in. in diameter, mounted on an ebonite block with the necessary three-pin connection.

constituent single-valve circuits and testing each in turn. Some readers may prefer to consider the two-valve circuit as one operating on the familiar "push-pull" principle.

A typical short-wave transmitter of this type, using two 250-watt valves,

valve to the grid of the other. The valves are mounted on opposite sides of a common panel of American white-wood, in order to ensure the shortest possible leads from one valve to the other.

HOW THE AERIAL IS ENERGISED



This diagram shows how a half-wave aerial can be coupled inductively to a transmission line of parallel wires from the transmitter.

This coil is mounted directly on the tuning condenser, which contains two moving and three fixed plates, as shown, and has a capacity of about 20 micro-microfarads. It will be noticed that an extended control handle is provided for this condenser in order to minimise hand-capacity effects when tuning.

The larger variable condenser seen to the left of the photograph is used for variable retroaction.

Down to 4 Metres

A single-valve transmitter constructed on the above lines, with care taken to ensure that all dimensions between the valve and the tuned oscillatory circuit are as short as possible, can be operated successfully on wave-lengths down to 4 metres. With limited high-tension voltage increased output may be obtained by using two valves in parallel, but the two valves chosen must have closely similar characteristics.

A more efficient method of connecting two valves to one oscillatory circuit is shown in Fig. 2. In this diagram the solid line represents the series-fed Hartley circuit, as used in the transmitter described above. The broken line shows the manner in which the second valve is connected.

A "Push-Pull" Scheme

It will be seen that this circuit is really a double-series-fed Hartley circuit, the two valves of which supply the oscillatory circuit alternatively.

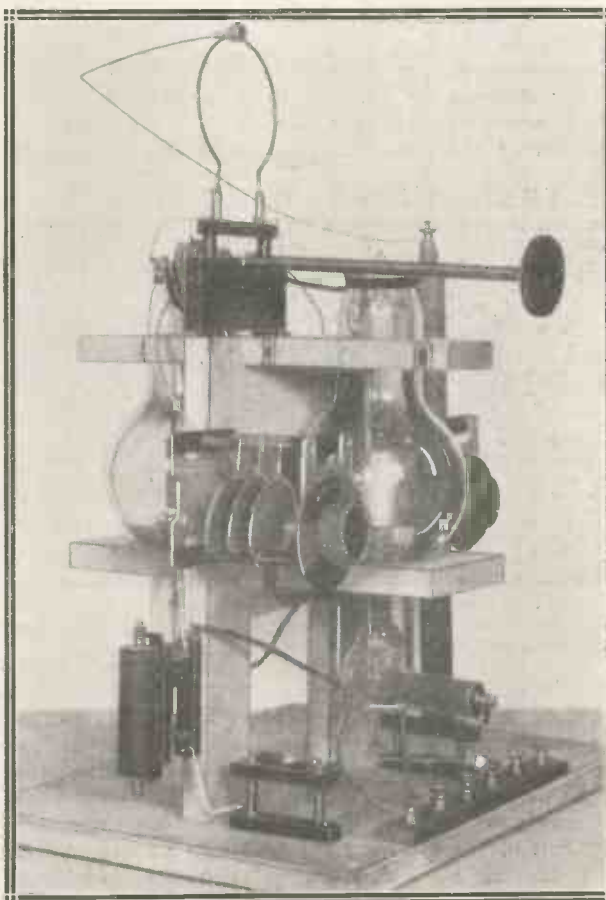
Each valve in such a transmitter may be tested individually under working conditions by converting the oscillator in succession into its two

The Inductances

It is found necessary to use chokes in series with the grid leaks illustrated in order to prevent the leakage of high-frequency power into the filament leads. The interchangeable coils forming the inductance for such a transmitter are constructed of a single turn of either copper rod about $\frac{1}{8}$ in. diameter, or of aluminium tube of a larger size. The dimensions of the coils are so small that the ohmic resistance is not very important, but it is desirable to have a substantial size of conductor in order to secure rigidity and so avoid slight changes in wave-length due to vibration.

The variable condensers employed are conveniently constructed from the standard low-loss transmitting type, and every effort is made to obtain a very low minimum capacity when aiming at the shortest wave-lengths.

"PUSH-PULLING" THE POWER



A single-coil push-pull transmitter employing the circuit shown in Fig. 2 and covering 5 to 20 metres.

Power Supply

The transmitter illustrated is shown again under working conditions. The valve filaments are operated from a 20-volt battery and the anode current is obtained from a D.C. generator.

The transmitter is shown in a photograph set up on a movable table which carries the valve control panel. When using two 250-watt valves at a high-tension supply of 3,000 volts, and a total input power of 300-400 watts, the circulating current in the inductance is several amperes at wave-lengths between 5-10 metres.

Valve Bulb Sometimes Melts During Operation

By moving the table variable coupling is obtained to a Lecher wire system connected to the external transmitting aerial.

The above type of transmitter may be modulated very conveniently by varying the potential of either grid or anode in any of the usual ways, and for this purpose a small 50-watt audio-frequency oscillator unit is employed, its anode current supply being obtained from a separate generator.

Valves intended to deal with power at very high frequencies must have specially designed features not essential for those working at lower frequencies. The first feature desired is low self-capacity and mutual capacity of the electrodes.

Eddy-Current Heat

This means that the leads to the electrodes should be brought out of the glass envelope as far as possible from one another. This separation of the leads, however, is limited by the inherent increase in inductance due to their greater length.

Several years ago Franklin drew attention to the possibility of the glass envelope melting as a result of the heat generated by eddy currents in metallic deposits which occur on the inside of the glass during the

of as great dimensions as is consistent with short leads from the electrodes. The neck of an ordinary transmitting valve is in a concentrated part of the field, and punctures were very common at this point when valves were first used on short wave-lengths.

Reducing the Field

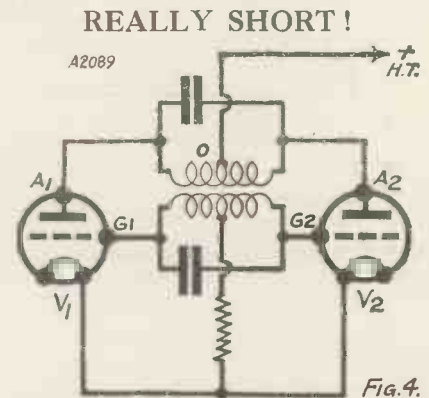
The field may be reduced by continuing the grid mesh beyond the ends of the anode. This construction concentrates the radio-frequency field between the grid and anode, and so reduces that which reaches the glass walls of the valve. It is also advisable to thicken the leads to the electrodes at the places where they enter the glass.

It is convenient in experimental work on very short waves to employ short, straight aerials, the length of which corresponds to either a half or a quarter of the working wave-length. In the former case the aerial should be supported at a suitable distance above the ground, the ends being insulated, since these are the points of high potential variations.

Local Reflection

At high radio-frequencies the antenna either of a transmitting or receiving station should be situated

The easiest method of diminishing this loss is to place the aerial at some distance from any buildings and to lead the energy to or from it by means of a transmission line or Lecher wire system. Most commercial short-wave transmitting and receiving stations are designed in this way.



With this circuit it has been found possible to go down to 1.5 metres.

As an illustration of this a half-wave aerial may be coupled inductively to a transmission line comprising two parallel wires stretched between the transmitter and the aerial in the manner indicated in Fig. 3.

Such a transmission line may be conveniently formed of two stout copper wires stretched parallel at three or four inches apart and at a distance of several feet from all other bodies except from supports. The wires are short-circuited at each end and adjusted by variable condensers connected to them to obtain maximum current at each end of the line.

Measuring Wave-length

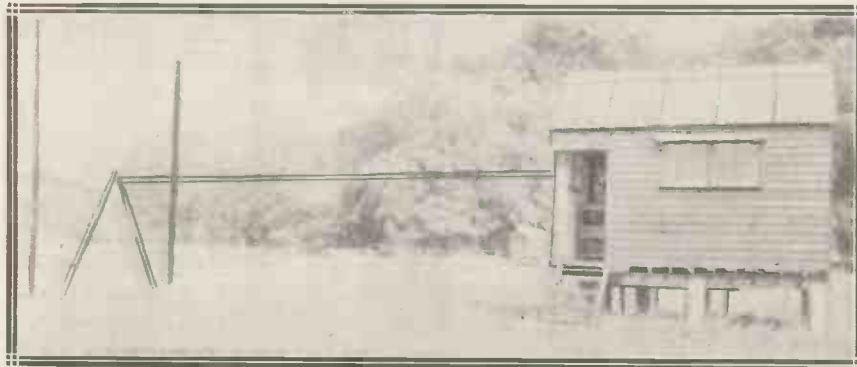
Alternatively, the transmission line may be formed of a twin conductor comprising an inner wire surrounded by a concentric metallic sheath. Such a transmission line, or Lecher wire system, is useful in addition for measuring the wave-length being employed. This can be carried out by running a short-circuiting bridge wire along the line.

It will be found that this short-circuit alters the current in the aerial, except when the bridge is at a potential node on the wires.

The manner in which the transmitter shown in the photo is coupled to its external half-wave aerial is illustrated by a special photograph.

(Continued on page 550.)

WHERE THE TRANSMITTERS WERE TESTED



A general view of the experimental station used in the conducting of the experiments described in this article. Note the feeder wires to the aerial. Part of the transmitter can be seen through the open doorway.

evacuation of the valve. In certain types of transmitting valves it has been customary to use copper foil screens on the outside of the envelope to avoid breakdown from this cause.

Large dielectric losses may also be experienced in those portions of the glass which lie in the high-frequency field between the grid and anode. The envelope should, therefore, be

in as open a space as possible. In a radiating field objects act as reflectors when their linear dimensions are comparable with the wave-lengths of the incident field. Thus on a wave-length of 5 metres (approximately 16 ft.) the buildings associated with a short-wave station may be such that they give rise to very serious scattering of the waves and loss of energy.

MODERN PORTABLES

By G.V. Dowding
Associate I.E.E.



An impartial review of the pros and cons of portable radio receiving sets that will help interested readers in the choice and use of these fascinating instruments.

No doubt most readers regard portable radio receivers as essentially of modern origin. But they are far from being that, although it is only of late years that portables have reached a moderately satisfactory standard of all-round efficiency. But I will have more to say about this later on.

How It Started

Besides a compactness of construction, the outstanding feature differentiating a portable from an ordinary set is, of course, its built-in frame aerial that takes the place of an extended antenna and an earth connection.

The frame aerial is really older than any other type, and can be said to date back to 1888, when the famous Hertz used single-turn loops

both for transmitting and receiving. These certainly illustrated the principles of the frame.

But in 1902, Lee de Forest, the inventor of the three-electrode valve, designed loop aerials identical to those used in most present-day portables. These are, after all, merely large coils of wire which are generally wound rectangularly.

The first frames were not designed for "all-in" sets, but were used for direction-finding, and were mostly about 4 ft square, or even larger than that. In those days it would not have been thought possible that efficient reception could have been carried out with loops less than 18 in. square.

It must be remembered that effective three-electrode valves did not arrive until the war years, so that

useful amplification was not possible. The three-electrode valve made many things possible that were otherwise quite impossible, and not the least of its achievements is that it opened the way for the modern portable.

The Aerial Pick-Up

Frame aerials are very poor collectors of radio energy, as compared to suspended aerials. But, nowadays, thanks to the three-electrode valve and its even more potent descendants, the S.G. and pentode, we do not have to worry much about the initial energy we pick up from the ether.

Such colossal amplification is possible with four or five modern valves

OUTWARD BOUND—AND BOUND TO ENJOY THEMSELVES!



The portable as a companion for camping or picnics has two obvious advantages—it provides all the music you need and keeps you in touch with news and weather probabilities. And if it DOES rain—well, you can always tune in a cheerful little earful!

that it is often advantageous deliberately to cut down the efficiency of aerial "pick-up" in order to reduce interference from unwanted disturbances of the ether, such as are caused by atmospherics, etc.

Also, a frame aerial enables vastly greater selectivity to be obtained than does the suspended type. This is mainly due to the highly marked directional qualities of a frame aerial, and if these are intelligently used it is possible to receive, free from interference, many stations otherwise hopelessly "mushed" up by heterodynes, and so on.

The Question of Direction

It is important to note that a frame-aerial's directional powers are more sharply defined over the area of "minimum strength" than over the maximum strength area. This point has been dealt with in detail in a recent "M.W." article, but a brief repetition on this occasion may be appreciated by many readers.

A frame aerial picks up the maximum of energy from a given station when it is edgewise on to it, and least when it is at right angles to the direction from which the transmission is coming. Thus a frame aerial receives equally well from two opposite directions and equally badly from two other opposite directions.

If you want to locate the approximate direction of a station with a portable set you should work on the

minimum strength position; for, as I have said, this will be the more sharply defined.

And if you are wanting to cut out

I suspect that one of the reasons for the undoubted popularity of the portable set is that it imposes no risk of lightning descending on a house

ONE TOUCH OF NATURE . . .



A happy party on a German lakeside waiting for the steamer to take them home.

an interfering station, turn the portable until the reception of the interfering station is at its weakest, and not until the station you want is at its strongest. See the point? It may be a bit difficult to grasp straight away, but if you think it over for a bit you will, no doubt, get it clearly.

and doing damage. It is a mighty small risk with an outdoor aerial, and if one uses a lightning arrester the danger is practically non-existent; but there you are, some people would not believe that if they read it in the book of judgment!

But people aren't buying tens of thousands of portables just because of that one thing. Let us tabulate the attractions these particular instruments offer. I am, of course, dealing with true portables, and not those "all-in" types of sets generally referred to as "transportables," which cannot be closed up suit-case fashion for carrying into the wide, open spaces. Well, here is my list, though I do not claim that it is exhaustive.

Some Big Advantages

1. Portability. A portable can be used in any room in the house and can be carried about in a car or taken away for the holidays, like a portable gramophone.

2. Neatness. There are no aerial and earth wires necessary, and the batteries and loud speaker are tidily tucked away.

3. Selectivity. Greater freedom from interference is possible, although it should be noted that there are many portables that definitely are inselective, and that a frame aerial cannot deal with two programmes coming from the same direction, such as those of one of our Regionals, any better than any other kind of aerial.

4. Complete freedom from lightning hazard; although here, again, this is almost negligible with any set.

**I SAY!
LISTEN
TO THIS!**



Not only his friends, but a casual passer-by had to join in the jubilation of this proud set-owner when the foreigners came rolling in.

Where the Frame Aerial Scores

5. Service. When a portable goes wrong it can easily be taken or sent back complete to the manufacturer for repairs and adjustment.

6. Maintenance. There is no aerial to blow down or need overhauling.

H.T. and L.T. trickle-charging for portables. Tens of thousands of these are in use. Their owners employ dry H.T. batteries only when, during the summer, the sets are used out-of-doors. At other times

for two main reasons. First, again to save space and weight, small cones with inefficient units are too frequently employed. Compare the sizes of cone and unit of a first-class modern loud speaker (not necessarily of the moving-coil type) with those used in most portables. You will find the comparison enlightening.

In the second place, in order to economise in H.T. the output valve of the average portable is far from being of the super-power type. Sometimes it is nothing more than an ordinary L.F. valve such as the knowledgeable constructor would hardly employ in the output position of a simple two-valver.

CRICKET IN THE COOL



This knowing cricket fan takes his set on the river when it is too hot to attend the county match in comfort. He likes to know the scores wherever he is.

A pretty good list, I think you will admit, though there are disadvantages that to some extent offset it. First of all we have the question of cost. A portable is bound to cost more than an ordinary outfit, for the simple reason that it must provide greater amplification and, generally speaking, that means more valves than its fixed equivalent.

And in their turn more valves mean more L.T. and more H.T. Then, again, a portable calls for more careful design and assembly, and there are not so many margins permissible. You see, as they have to crowd the set, the loud speaker, the batteries and the aerial into one very tight bunch, special screening, etc., is essential in order to achieve stability and avoid interactions of an undesirable character.

Using the Mains

It is on account of this that it is often not possible to use rather badly constructed mains units with portables, although they might be adequate for "fixed" receivers.

Because of the desire to compact the instruments and save as much weight as possible, there is a tendency to "under-battery" portables, with the result that H.T. battery replacements and L.T. charging become annoyingly frequent.

But here I must add that there are now a number of mains units that are completely satisfactory for supplying

the H.T. is drawn from the mains, and the trickle-charging keeps the necessarily small accumulator right up to scratch all the time.

Now we come to the most important aspect of all—quality of reproduction. Most portables fail very badly here

Questions of Quality

And yet you want more volume from a portable in the open than you do from an ordinary set indoors to give the same apparent loudness! It would seem that the "fat" super-power valve, with its three or four hundred volts H.T. and seventy or eighty volts grid bias, and the big moving-coil loud speaker, are just the things the portable needs to bring it into line with ordinary sets in regard to quality. That is, if you want equivalent loudness out-of-doors; which is,

RADIO WATER-NYMPHS



After splashing about a bit they clamber on board again to hear some jazz!

You Will Enjoy Reading This Impartial Review!

after all, the true province of the portable.

But all this is obviously quite impossible. In these circumstances, it seems that for the time being the portable must admit this disadvantage. But when it is used indoors—as apparently it mostly is, for you see very few at picnics—it can operate very pleasingly at the restrained volume that proves adequate for very many listeners.

About the Volume

If you want pure-as-gold concert-hall strength, you won't get it from any portable. And those of you who may be wavering between the purchase of a portable and a set of the ordinary variety should take careful note of this point.

Nevertheless, a good modern portable will give you comfortable volume at a quality equal if not superior to the majority of not-too-expertly-handled three- and four-valve outfits employing cone loud speakers. Indeed, it is wonderful how well manufacturers have, on the whole, used their restricted material in this regard.

"And So To Bed"

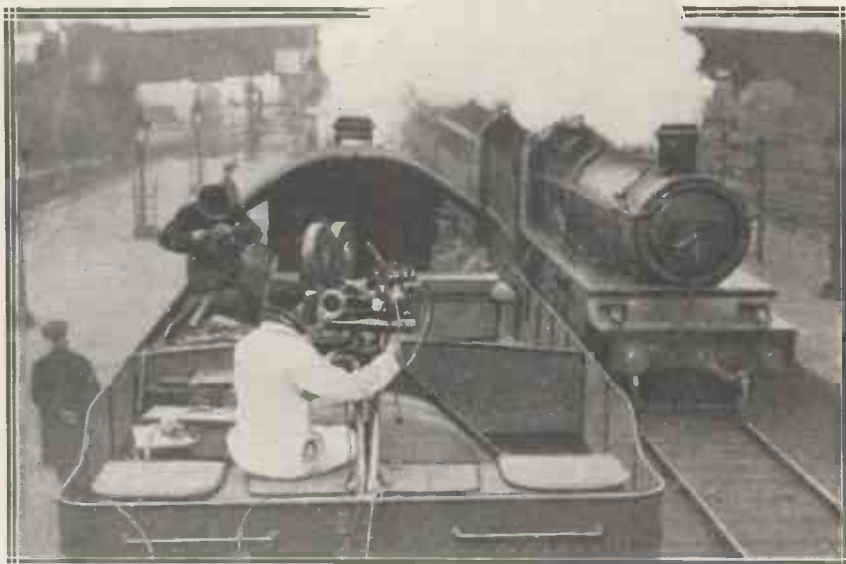
I am now going to turn on a little sunshine! If I don't do this fairly

soon you may think I am writing portables down. However, I trust you will appreciate the necessity of presenting the case fairly.

flexible station-searcher than the ordinary receiver.

You will also discover that it becomes intimate and companionable,

SAFETY FOR HOLIDAY-MAKERS



Taking a film of a new electro-magnetic train control, tried out by the G.W.R.

A portable is a most fascinating instrument to operate, and if it is of good design and construction you will find it a much more interesting and

for you can carry it from room to room and place it just where it provides the most satisfactory sounds. You can take it away with you when you go for your holidays, and you can carry it up to bed with you so that you can listen to the final items while you undress and while you nestle under the sheets waiting for friend Morpheus to approach.

If you or any other member of the house falls sick, the tedious hours can, in part, be whiled away for you by the convenient portable.

For the Lazy Man!

Sitting in the drawing-room or in the kitchen you can arrange yourself and your portable so that the controls can be adjusted for another station merely by lazily lifting your hand, and that without the necessity of leaving your chair or even of sitting up.

And if and when a room or rooms are subjected to temporary or permanent re-arrangement, your portable can be shifted in a few seconds and without interrupting the programme to which it is tuned.

And I think all that, together with the other advantages outlined at the beginning of this article, completely outweighs any disadvantages there may be.

WHAT'S A WATSONGRAPH?



The inventor of this remarkable instrument is explaining to his friend that one of its advantages is the ability to transmit words by wireless at the rate of 1,200 per minute.



A LIGHTWEIGHT TRANSMITTER

By Dr. ALFRED GRADENWITZ.

A young German radio enthusiast has constructed a complete wireless telephony transmitter that weighs much less than a portable typewriter.

THE writer was recently given a demonstration of a portable transmitter weighing much less than a portable typewriter and consisting mainly of a minute condenser microphone, a pocket-lamp battery, H.T. battery and oscillator.

transmitter, no microphone amplification being employed. The use of a short wave-length (7 metres in the case of the apparatus demonstrated to the writer) ensures the transmission of ample strength. Another advantage of this short wave-length is that interference by other transmitters and by electrical apparatus and motors, alternating current lines, etc., is practically eliminated.

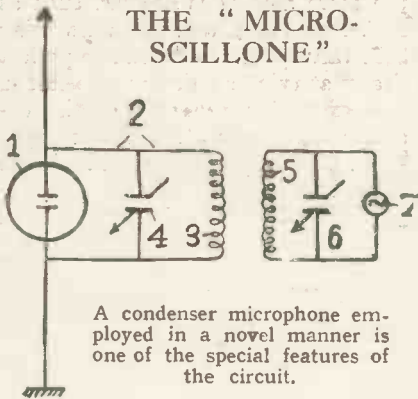
wave-length to be altered. The oscillator valve 7 is connected up to the primary circuit 5 and 6.

Earth Not Necessary

The condenser microphone is in the secondary circuit, to which the aerial is joined. The oscillations produced in the primary circuit are, of course, controlled by the microphone. The type of aerial actually chosen does not seem to matter much: moreover, an earth connection can be used as well, though this, because of the reduced mobility, is not very desirable.

This arrangement, which the inventor calls the "Microscillone," constitutes an undoubted advance over those so far in use, and points new ways for the design of portable transmitters.

THE "MICRO-SCILLONE"



The Circuit Used

In the circuit diagram the condenser microphone is shown at 1. It is connected up to an oscillatory circuit 2 (consisting of the inductance 3, and capacity 4). The capacity 4 is much smaller than the capacity of the condenser microphone itself, and can be adjusted, thus enabling the

ALL IN A SMALL ATTACHE CASE

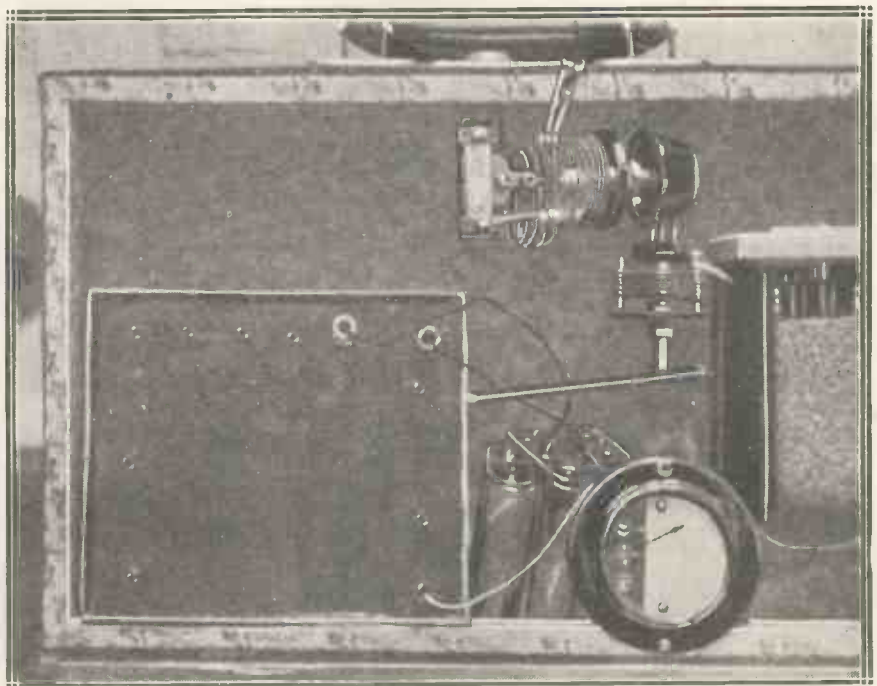
A few turns of wire wound on a piece of cardboard were used as an aerial, and the whole outfit was accommodated in a small-size attaché case.

Every word spoken into the microphone was distinctly heard on a loud-speaker set installed some distance away, in a remote corner of the same building. The range is not limited to this distance, although the maximum has not yet been ascertained. The transmitter is specially intended for use by "travelling" radio reporters and in the production of talkie news items.

On Seven Metres

I was surprised to note how light and handy the portable transmitter was, the inventor of which is Mr. Horst Hewel, of Berlin, an undergraduate of the Charlottenburg Engineering College and an enthusiastic radio and television fan.

The microphone, of the condenser type, acts directly on a short-wave



The transmitter is completely self-contained and is built into a quite ordinary attaché case of small dimensions.

The "M.W." Portable



It is a portable with a particularly attractive presence.

*

Here is a magnificent set for garden and holiday use or for efficient reception in any room in the house. It is entirely self-contained and has a built-in frame aerial and loud speaker. Using an S.G. valve and special simplified screening, it is inexpensive to build and maintain, and it gives really excellent loud-speaker results on both the medium and long wave-bands.

*

the introduction of a little extra screening will often tame the wildest of H.F. stages.

But surprises are not always in the nature of annoying little troubles. Occasionally a set will work miles better than a perusal of the theoretical specification would lead one to expect!

As you can guess, the forecasting of what will happen when a circuit is made up is largely dependent upon the type of circuit. Some pan out just as expected, but others are as different from what is expected as chalk is from cheese.

Real Teasers

In the latter category usually come the more ambitious designs, such as A.C. mains sets, and portables using S.G. valves. The latter can be perfect beasts at tying all theory into knots, and exercising the skill of the designer to the utmost. But once right—oh, boy, they sure go, if the design is good!

Which all leads to the fact that you must choose a good design if you want good results; and, after all, what better design can you have than a MODERN WIRELESS one? So with our usual confidence we present for your benefit the "M.W." Portable Four.

This is just the time of year that thoughts of warm, sunny weather again predominate; and whether the background be tea in the garden, a picnic with the car, or bathing from the beach hut, a good loud-speaker portable will always find a place in the foreground. It makes a first-rate

Do you know, one never becomes hardened to set designing. There is always something to be discovered—something of interest cropping up; in fact, the production of every new design is a real live adventure.

Drawing up the preliminary theoretical circuit is just like planning some expedition. Maybe we are going to follow more or less well-trodden ways—or perhaps we are to trespass into entirely unknown country.

In any case, seldom do things turn out just as planned. There will be difficulties to overcome, unexpected requirements will crop up, and the original plans may be much modified before the final triumph is attained.

Overcoming Difficulties

Put more "radiocally," a trouble such as L.F. instability may prove itself present in the practical form of a circuit which one would have sworn was perfectly de-coupled. Or, again,

Your Guide to the Parts Required for this Fine Set

PANEL

14 in. x 7 in. (Parex, or Keystone, Goltone, Lissen, etc.).

CABINET

(Cameo "Favourite").

VARIABLE CONDENSERS

- 2 .0005-mfd. plain, with slow-motion dials (Formo, or J.B. "Tiny," or other good make of small condenser).
- 1 .001-mfd. plain reaction (Lotus, or Ready Radio, Keystone, Ormond, etc.).
- 1 neut. type (Bulgin, or Keystone, Magnum, etc.).

SWITCHES

- 1 4-spring wave-change (Bulgin, or Wearite).
- 1 double-pole change-over switch (Wearite).
- 1 L.T. switch (Bulgin, or W.B., Goltone, Igranio, Lissen, Benjamin, Ready Radio, Keystone, Wearite, Lotus, Red Diamond, Ormond, etc.).

RESISTANCES

- 1 1,000-ohm "Spaghetti" type (Magnum, or Lewcos, Ready Radio, Bulgin, Sovereign, Keystone, Graham-Farish, etc.).
- 1 2,500-ohm ditto.
- 1 25,000-ohm ditto.
- 1 50,000-ohm ditto.
- 1 5,000-ohm ditto.
- 1 2-meg. leak (Graham-Farish, or Lissen, Telsen, Dubilier, Ediswan, Igranio, Ferranti, Mullard, etc.).
- 1 2-meg. leak (Graham-Farish, etc.).
- 1 5-meg. leak and holder (Lissen, etc.).

VALVE HOLDERS

- 2 ordinary 4-pin (W.B., or Lotus, Telsen, Igranio, Clix, etc.).
- 2 horizontal (W.B., or Parex, Telsen, Bulgin, Lotus, etc.).

FIXED CONDENSERS

- 1 1-mfd. (Filta, or T.C.C., Ferranti, Formo, Dubilier, etc.).
- 3 2-mfd. (Dubilier and Lissen, etc.).
- 2 .001-mfd. (T.C.C., or Lissen, Dubilier, Telsen, Ferranti, Ready Radio, Mullard,

Ediswan, Igranio, Sovereign, Formo, Graham-Farish, etc.).

COILS (see text).

CHOKES

- 2 H.F. (Ready Radio and Keystone, or Varley, Lewcos, Telsen, etc.).
- 1 output filter type (Igranio, or Atlas, R.I., Varley, Bulgin, Ferranti, Wearite, Lissen, Magnum, etc.).

TRANSFORMER

- 1 low-ratio J.F. (R.I., or Ferranti, Telsen, Igranio, Varley, Mullard, Lissen, Lewcos, Lotus, etc.).

MISCELLANEOUS

- 2 sockets (Clix, or Belling & Lee, Igranio, Eelex, etc.).
- 1 standard screen and sheet of copper foil.
- 2 vernier dials (Lotus).
- G.B. and H.T. plugs, etc. (Clix, Eelex, Belling & Lee, etc.).
- Flex, screws, Glazite, etc., G.B. batteries.

Just the Set You Want in the Summer Time

finally we have the H.F.C. and .001-mfd. condenser in the anode circuit of the last valve. The keeping of H.F. out of the speaker and L.F. components is a point that needs watching with portables, or devastating instability will set in.

The set proper is built in a wooden frame, around which are the aerial windings. This frame slides into the outer shell, as far as the fret to which the loud speaker is fixed.

The advantage of this style of portable is that it can be plonked

bottom of the baseboard are utilised, and so there are two wiring diagrams.

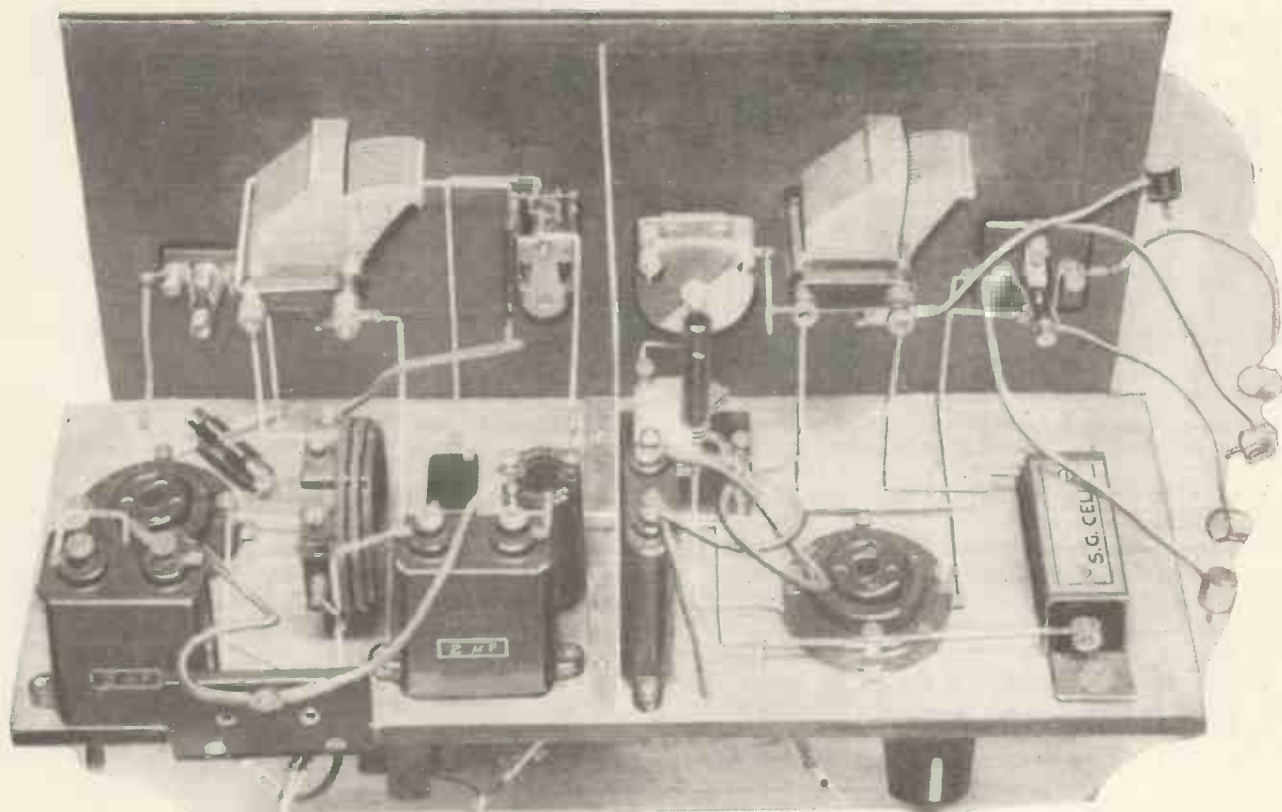
H.F. on Top— L.F. Below

"Upstairs" you will find the S.G. and detector valves, together with their associated components, while below, fixed to the ceiling, are the L.F. valves and components. Before the components upstairs are fixed in place, the linoleum, as we may call it, must be put down; it consists of a piece of copper foil covering the baseboard.

switch and the 1-mfd. fixed condenser arranged alongside the vertical screen.

This component is turned out especially for use with the very convenient Spaghetti type fixed resistances. It has three terminals, two on top in the usual places and one at the side. One of those on top is a blank, being provided solely for making easy connection to the Spaghetti, the other one on top and the one at the side actually constituting the condenser connections.

Ever Seen Spacing in a Portable Like This Before?



Compactness in portables usually means electrical cramping with a subsequent loss in sensitivity and stability, or very elaborate metal screening. But we have circumvented both in the "M.W." Portable Four. Note the G.B. battery for the S.G. valve.

down anywhere and is immediately ready for work; in fact, you can carry it about while reception is actually taking place. Also, it takes up very little space, although even if it required a large area it could justifiably claim it.

Baseboard Arrangement

The panel and baseboard are housed in the top part of the cabinet, the batteries being arranged below and behind the speaker. To obtain double the baseboard area without taking up too much space both the top and

This foil is thus conveniently placed to serve a dual purpose. It assists the vertical screen in screening the H.F. valve's section from that of the detector, and at the same time helps to keep the L.F. stages stable.

The only component used which is special to this set is the medium-wave tapped coil. This is very easily made at home and we will deal with it later.

The other components are more or less all regular stock lines. The only two that you may not have met before being the 4-point paralleling

To simplify collecting all the components together, we give our usual list; the makes mentioned first are those we actually employed, the others being suggested as alternatives. If you use components of makes other than those given, you will have to make sure there is room for them, but you are not likely to find many cases where components you want to use will not fit in.

Winding the Coils

The valve holders we have employed are of the universal five-pin

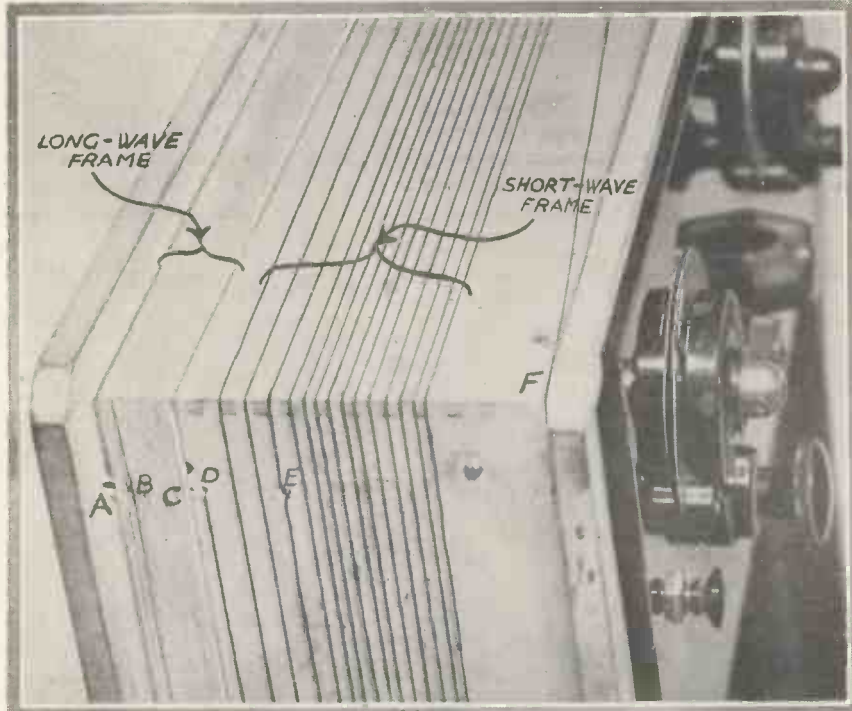
type, but as the set does not run from the mains the fifth one will never be needed, and consequently the four-pin variety of valve holders are just as good. And now to get down to it.

must make slots for the two sections of the windings. You can either cut these with a fret-saw, or file them with the edge of a flat file. They should be the full depth of the ribs, about $\frac{1}{8}$ in. wide and $\frac{1}{16}$ in. apart, and

at 15, 20 and 25 turns, these being joined to taps Nos. 1, 2 and 3 respectively. The beginning goes to the terminal next to tap No. 1, and the end to the remaining terminal.

Both sections are wound in the same direction, as though they were all one winding, and the best way to make each tap is to thread a loop of the wire through a small hole, just baring the wire of insulation where it is clamped under the terminal nut. The coil can be held in place with a little right-angled bracket, or by means of a small piece of wood slipped through it and secured to the base-board by two ordinary wood screws.

HOW YOU WIND THE FRAME



This close-up shows you how the frame aerial is arranged. The letters correspond to those given on the wiring diagram.

The Frame Aerial

Next we come to the frame aerial, and to simplify matters we reproduce a photograph of one corner of it. The connections are made on the inside of the wooden frame by means of plugs on the ends of flex leads attached to the four-point switch and first variable condenser.

These plugs fit into sockets arranged on a small strip of ebonite fixed inside the corner of the wooden framework where the wires from the actual winding are brought through. This piece of ebonite should be raised off the wood.

The long-wave winding is carried out with 32 D.S.C. wire and the medium-wave with 26 D.S.C. wire. The first is close wound and the latter spaced, about $\frac{1}{8}$ in. being allowed between each turn.

Both windings are in the same direction (it does not matter which), and both are tapped. These taps are joined together and taken to one socket.

The medium-wave winding has 15 turns in all, and the long-wave one

First of all we will get all the winding done, and of this we will tackle the special medium-wave coil first. For this you will want a small piece of ribbed former, $2\frac{1}{2}$ in. in diameter to the outside of its ribs, and about 1 in. wide.

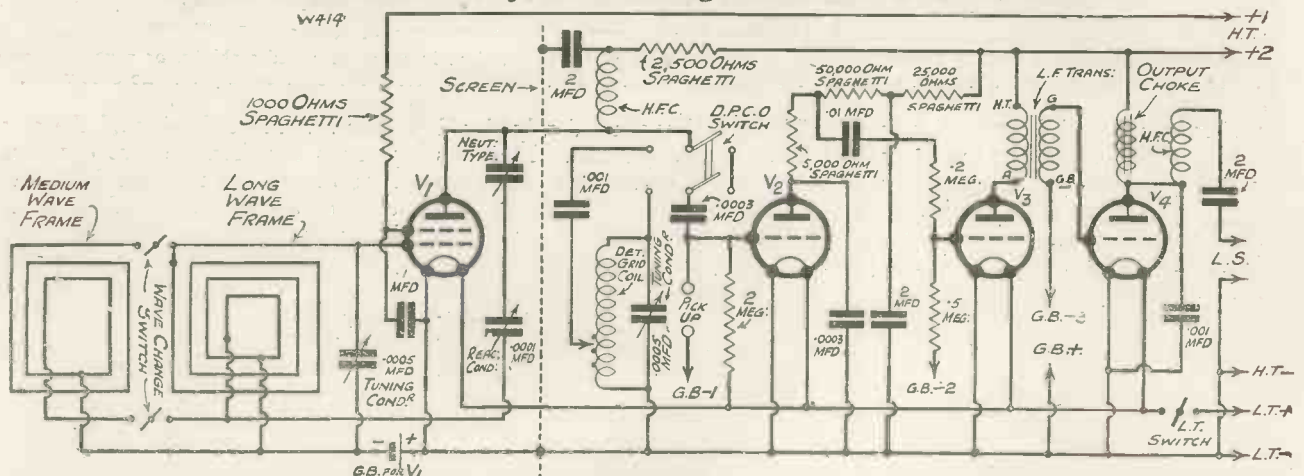
In the ribs (incidentally, it does not matter how many there are) you

five holes will be needed for terminals.

You can get a good idea of the arrangement of this coil from the photographs and diagram in which it is shown.

The winding is carried out with 26 gauge D.S.C. wire, there being 20 turns in each slot. Taps are made

There are Some Very Interesting Features in This Circuit



Note the frame-aerial wave-changing and how the H.F. intervalve coupling is changed from tuned grid to aperiodic for long waves. By this means optimum effectiveness on both bands is achieved.

You Will Have Programmes Wherever You Go!

48 turns. In the case of the former the tap is at 3 turns from the start and in the latter 10 turns.

The rest of the constructional work will not present any difficulties to you, for it consists merely in following the diagrams. First of all, you drill the panel, then fix it to the copper-covered baseboard, after which the components are mounted.

The Loud Speaker

All that remains after this is to wire up, and then to connect up. The latter is not quite so straightforward, but nevertheless is an easy matter with the help of the following details.

Naturally, before you can connect up you must have the batteries, so let us deal with them and the other accessories now. We will start with the loud speaker.

There is ample room for almost any compact assembly, either home-made or purchased. The one we employed was a Mullard assembly, which is particularly suitable because the unit is arranged on the inside of the actual cone, thus keeping the overall depth quite small.

The speaker is bolted to the fret in the outer shell, and should you

find the opening in the fret is larger than the cone diameter it is a good idea to mount it first on a piece of 3-ply wood.

Three batteries are wanted. The first is an unspillable type 2-volt accumulator; the one you can see in the photograph of the back of the set is an Exide PC-2. An ordinary grid-bias battery of the 9-volt variety is also needed, and a 100-volt H.T. battery.

These three batteries will pack neatly in the set behind the speaker, and to prevent them fouling the cone you just screw three fillets to the sides and bottom of the inner frame. You will find that one of the photographs shows these fillets very well.

Valves Required

If you prefer, you could use two ordinary 60-volt batteries instead of a 100-volt one, joining them in series, and naturally the extra twenty volts are useful. Next on the list comes the valves, of the 2-volt variety, of course.

You need one S.G., an H.F. type or special detector, an L.F. type, and a small power. The position of the S.G. is obvious, but don't forget to

connect the anode flex lead to the terminal on top.

V_2 is the H.F. or detector type valve, and V_3 the L.F., and this leaves the power valve for the V_4 holder. Now for the flex connections, of which you may think there seems rather a lot!

Final Connections

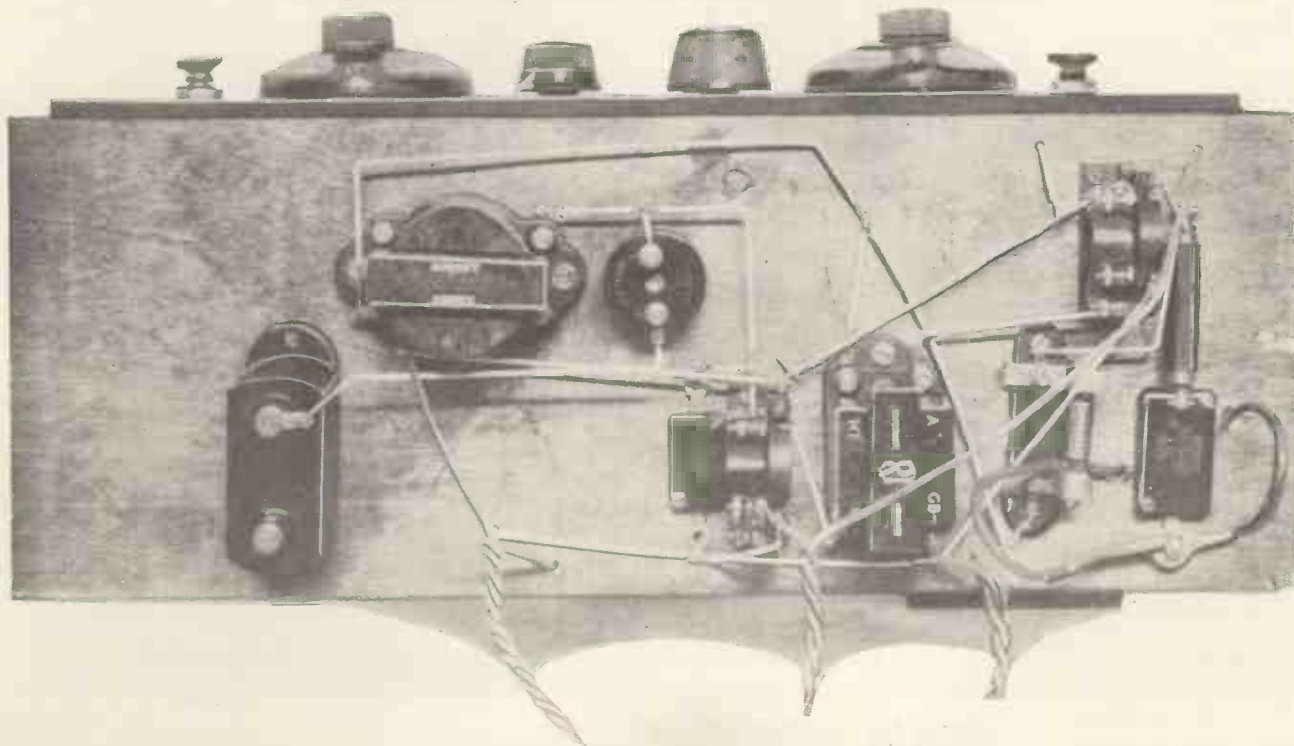
However, they are soon done. Start with the five plugs to the frame-aerial sockets, joining up as indicated in the wiring diagram. The only other flex connection "upstairs" is the one to the tapped coil, and you can put this on No. 3 for the time being.

"Downstairs" most of the connections are obvious. Note how L.T. —, G.B. + and H.T. — are all on one flex. One L.S. lead goes to the free terminal on the 2-mfd. condenser and the other to the valve-holder terminal from which L.T. — runs.

Put G.B. — 1 in 3 volts negative, — 2 in $1\frac{1}{2}$ volts (this is for pick-up work), and put — 3 in the full 9 volts. Put H.T. + 1 in 70 volts and + 2 in the maximum (100 or 120).

All that's now left is to switch on and tune the set. The controls all

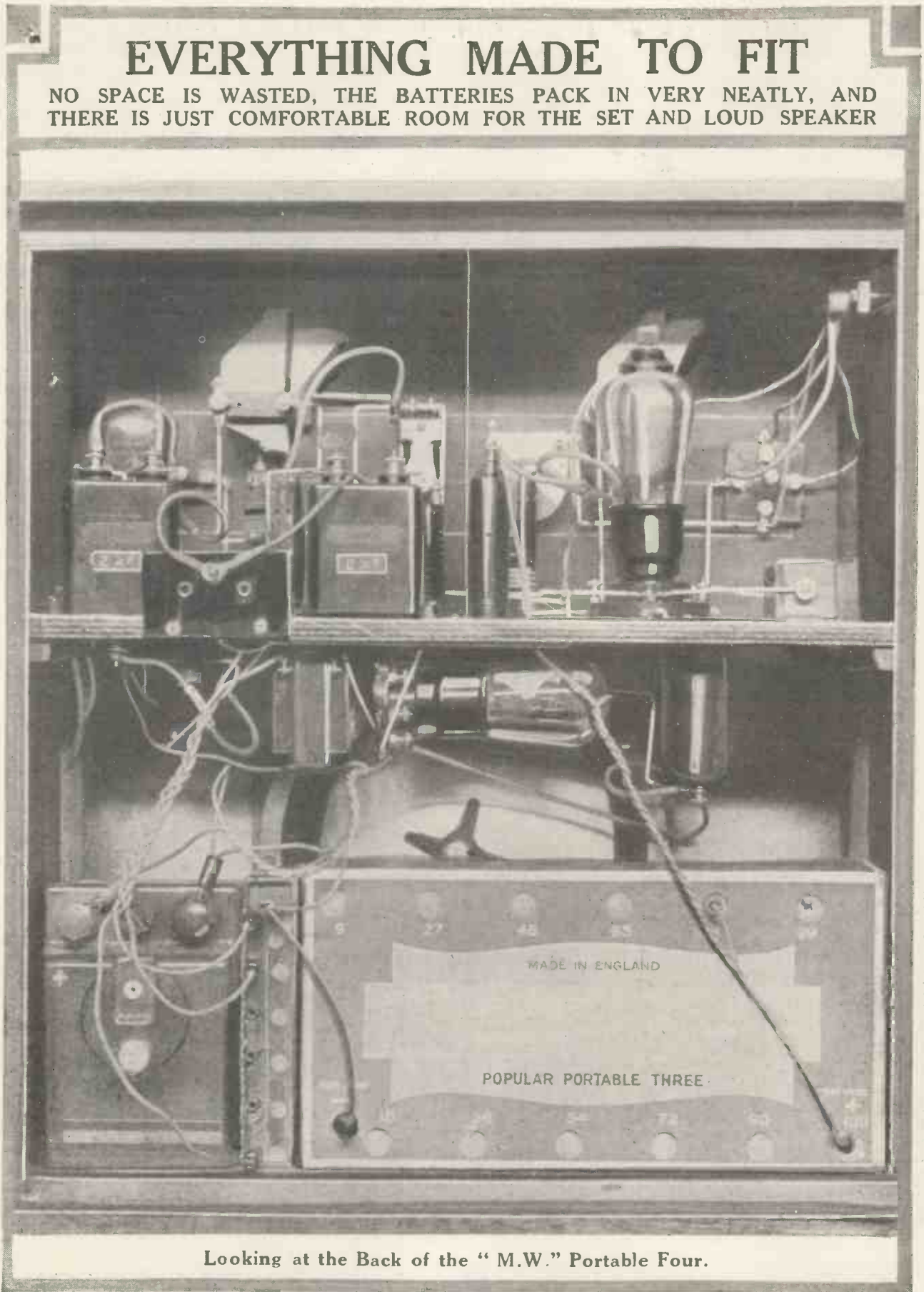
BOTH SIDES OF THIS BASEBOARD ARE USED



A number of the components are securely tucked away underneath the baseboard, and these comprise the L.F. and output stages of the set.

EVERYTHING MADE TO FIT

NO SPACE IS WASTED, THE BATTERIES PACK IN VERY NEATLY, AND THERE IS JUST COMFORTABLE ROOM FOR THE SET AND LOUD SPEAKER



Looking at the Back of the "M.W." Portable Four.

You Can Use a Pick-up with this Portable

work in the usual way, but for best results you want to get them set in the right sequence, so carry out your first test on the following lines.

Commence with long waves. To get on to this band push in the four-spring switch, put the change-over switch knob to the right, set the reaction right round to the left, and pull out the L.T. switch.

All the tuning will now be done on the left-hand condenser dial, and reaction will increase as the reaction condenser is turned to the right. Remember, the set must be pointed at the required station for best results.

Medium-Wave Tuning

As soon as you have got the feel of the set on long waves you can come down to the lower broadcast band. To do this pull out the four-spring switch and change over the "change-over" switch.

Both tuning dials are now used, and you may notice that the reaction condenser seems to work backwards. This is quite O.K., as it is due to a neutralising effect; just use it in the ordinary manner, but turn in the opposite direction.

If you find difficulty in getting the two dials in step, or in finding stations (the receiver is quite selective), put the change-over switch to the long-

wave position, and set the first dial, then put the switch back again and adjust the second dial. Perhaps this will make a new setting of the reaction condenser necessary, and a final adjustment of the first condenser should also be made.

Final Adjustments

That covers the general control. When you are thoroughly conversant with the operation you can proceed

In Our Next Issue Look Out For THE ALL-BATTERY RADIO-GRAM

On Sale May 30th. Price 1/-

to make a few slight adjustments that will give you the last ounce.

First of all, if you want a bit more selectivity, or there seems a desire on the part of the set to oscillate at high-frequency, try one of the other taps on the coil. This naturally only applies to the medium waves.

Next, if you find reaction a bit rough or sudden, try reducing the value of the neutralising condenser a little, which I should have told you

to set at maximum for the kick-off. You can then experiment with slightly different voltages on G.B. — 2 and H.T. + 1. G.B. — 3 should only be lowered in accordance with the data given by the power valve makers.

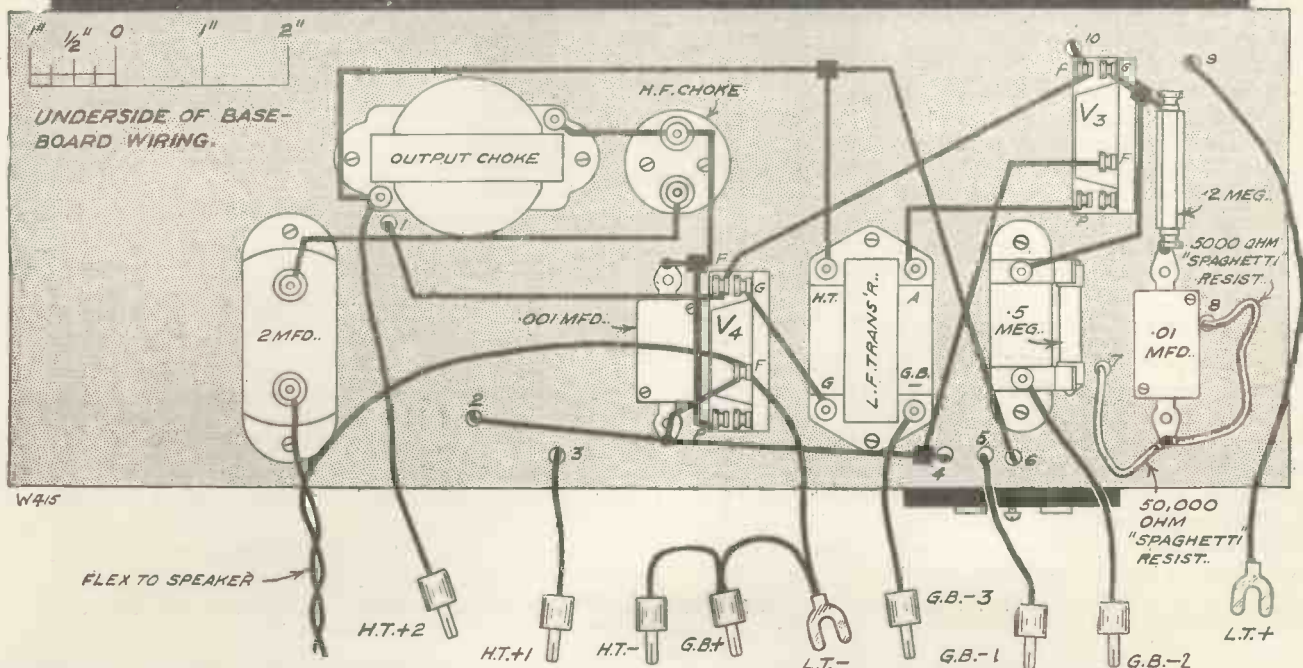
For pick-up work you remove the back of the case, put the change-over switch in its central position, and plug the leads from the pick-up into the two sockets on the small piece of ebonite. Either way round will do, and, incidentally, the nut and bolt between the sockets is nothing to do with pick-up work, merely being a convenient way of connecting up to the two Spaghetts.

Pick-Up Volume Control

A potentiometer type volume control of .5 to 2 megohms must be joined across the pick-up. One end goes to one pick-up connection and one socket on the set, the other going to the volume control slider, the other pick-up connection being taken to the remaining terminal of the volume control.

Operation for pick-up work is just a matter of switching on the L.T. and adjusting the volume to a suitable level. After that you just sit and listen and enjoy yourself just the same as when a station is tuned in on the radio side.

LEADS THAT MAKE "BEE-LINES" FOR THE BATTERIES



By positioning the L.F. and output stages under the baseboard, many of the battery leads are able to follow very short, direct routes to the batteries. This diagram should be used in conjunction with the large wiring diagram that appears on a preceding page.

INTRODUCING THE "EXTENSER"

By THE EDITOR

Some general observations concerning a new component that is destined to play a leading part in the future of radio set design.

No doubt by now the word "Extenser" is familiar to readers of "M.W.," although this is the first opportunity I have had of describing the "Extenser" in "M.W."

To be more accurate, I should have referred to the "Extenser system," which, in conjunction with the "Extenser," a new type condenser, constitutes an entirely new tuning method.

Early "Extenser" Experiments

To our Technical Editor, Mr. G. V. Dowding, goes the credit for the origin and development of the "Extenser" system. For some years past Mr. Dowding has been conducting experiments with the idea of simplifying the technique of broadcast radio reception; in fact, as far back as 1916, when he was an officer in the Royal Flying Corps, he carried out a series of experiments with the idea of achieving a very simple tuning circuit, and it was while making these experiments that it might be said the "Extenser" system was born.

Full plans of Mr. Dowding's invention were communicated to the Board of Invention and Research, but there he was optimistic, for red-tape during the war years was more than cloying, and beyond an acknowledgment from the Board, which Mr. Dowding still possesses, not much was done about it.

Mr. Dowding himself, as a matter of fact, admits that his system in those days had a serious drawback, inasmuch as it permitted tuning on only two wave-bands of a restricted character, whereas in the war years sets had to pick up wave-lengths from 180 metres up to 3,000 or more.

Before Its Time!

But when broadcasting was inaugurated in this country the situation was radically altered; and when Mr. Dowding joined the staff of our associated journal, "Popular Wireless," he again turned his attention to the idea of the "Extenser" system. In fact, as far back as April 3rd, 1926, he presented in "Popular Wireless" an article outlining this system.

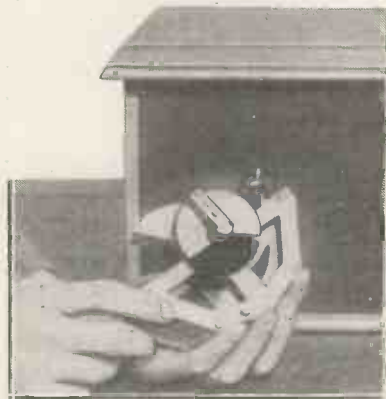
The system was embodied in a crystal set, where a straight-line capacity variable condenser, rotating

through 360 degrees, was used in conjunction with a semi-circular metal "switch plate" fixed to the panel underneath the condenser dial. In Mr. Dowding's own words:

"A metal tongue was attached to the condenser spindle, and when this tongue traversed the metal plate it shorted a portion of the tuning coil out of circuit, and enabled the medium-wave stations to be tuned in. Over the remaining 180 degrees the whole of the coil was in action and the circuit was automatically wave-changed for the reception of 5 X X."

But in those days the listening public was not ready for this particular system. Years have passed since then, however, and it has become quite evident that there is a growing demand for simplicity in radio

IT REPLACES TWO COMPONENTS



In this photo you can see the original "Extenser," the construction of which was described in the "Wireless Constructor." An "Extenser" replaces one variable condenser and one wave-change switch, and simplifies both set construction and operation.

technique. In brief, wave-changing by panel switches, instead of by changing coils, became a necessity, and so again Mr. Dowding resumed his experiments which eventually resulted in the perfection of the "Extenser" tuning system.

In short, the "Extenser" system is one whereby, with the use of a specially designed condenser, a separate wave-change switch may be disposed of, and listeners may tune in from the short to the long waves

through the 360 degrees of the condenser dial. An automatic switching device is incorporated in the condenser in such a way that the transition from the long to the short wave-bands may be accomplished without resorting to a separate wave-change switch.

What Capt. Eckersley Says

It has been said with truth that the introduction of the "Extenser" system marks the opening of a new era in simpler radio, and critics who have had an opportunity of testing an "Extenser," and of investigating its application to modern radio technique, are convinced that it has a universal application, and that before very long no really up-to-date set will be without its "Extenser."

The perfected system was first described in our associated journal, the "Wireless Constructor," for April (on sale March 14th) this year, but if any of our readers would like to trace its historical development they can do so by referring back to "Popular Wireless" dated April 3rd, 1926, and the issue dated November 2nd, 1929.

It is interesting to note, by the way, that already the importance of the "Extenser" has been realised, not only by the trade, but by Captain Eckersley, who in a "Popular Wireless" article says:

"I advise all those who have an interest in the design of radio receiving sets to make use of the new device."

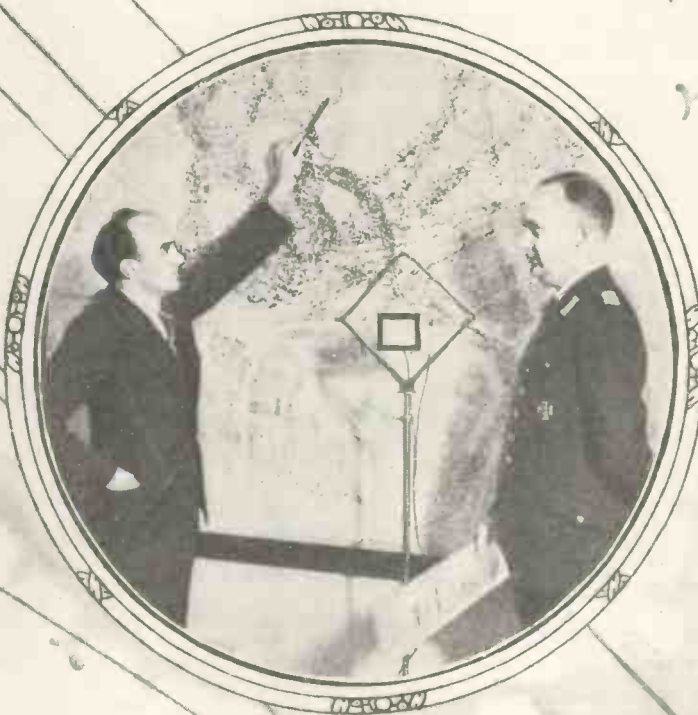
Praise from Contemporary

And not only Captain Eckersley has given his commendation to the "Extenser" system. Praise has already been awarded it by our contemporary, "Amateur Wireless." In that journal, for week ending April 4th, a highly appreciative notice of the system was printed, in which the writer explained clearly the action of the "Extenser" condenser in its application to modern radio technique.

The writer also pointed out that "sooner or later the question of the cost of the new type of condenser will have to be considered. It has been ascertained that although the device would be slightly more expensive than the normal variable condenser, there is certainly nothing in the construction to make the cost prohibitive. Actually, the condenser should not cost more than the combined costs of a normal variable condenser and a panel switch."

As a matter of fact, a very high-grade "Extenser" is now available at the reasonable price of 15s.

THE WORLD'S PROGRAMMES HOW, WHEN AND WHERE TO HEAR THOSE FOREIGNERS



CONTENTS OF THIS SPECIAL SUPPLEMENT

What is Happening on Short Waves
Other People's Programmes
A New Station For Your Log
German Jottings
Station Information
How Many Miles?
How the Stations Stand
Berlin's New Studios
On the Ordinary Waves
Insulation Information

From Breslau to Bandoeng
In the Interval—
The Long-Wave Programmes
Radio Rush in Russia
That Final Coaxing
Deceiving the Microphone
Broadcasting from Bandoeng
We Are Now Closing Down
The Power They Use

The photograph in the circle shows a police officer being interviewed before the Hamburg station's microphone regarding street accidents

WHAT IS HAPPENING ON THE SHORT WAVES

Eindhoven, Holland.—The famous Dutch station at Eindhoven, P C J, has been continuing the transmission tests referred to last month. The aeriels under test are:

- Aerial A.—An ordinary aerial.
- Aerial B.—New aerial for Colonial service, radiating east and west.
- Aerial C.—A directional aerial radiating south-west, for S. America.

P C J's Programmes.—At the time of going to press, P C J's transmission on 31.28 metres are given as Weds.: 5—8 p.m.; Thurs.: 2—6 p.m. and 10 p.m.—2 a.m.; Fri.: 6—8 p.m.; Sats.: 2—6 a.m. (All G.M.T.).

The Pope's Station.—The new short-wave station at the Vatican has commenced a series of talks of scientific interest. It is expected that the leading lights of the Pontifical Academy of Science will cover a wide field in this series.

Voilà Vincennes.—France's projected short-wave station, to keep her in touch with her colonies, is due to open this month, at Vincennes. This will be a feature of the French International Colonial Exhibition.

Nebraska.—The great U.S. listening station at Nebraska, equipped to "pick up everything in the air," has now been staffed by qualified experts, and is about to "police" the transatlantic ether.

Moscow.—This is the situation of the station on 50 metres that has been coming over at enormous strength, but to the accompaniment of a loud hum.

Casablanca, Morocco.—The Rabat programmes are now relayed by Casablanca (on 48 metres) on Mon., 8—10 p.m., and Tues., 12—1 p.m. and 8—10 p.m. G.M.T.

Buenos Aires.—Under the call-sign L S X, Buenos Aires transmits most nights on 28.98 metres from midnight to 2 a.m. G.M.T.

"Winnipeg."—The word "Winnipeg" frequently repeated on 28.98 metres has been causing much speculation among American short-wave enthusiasts. Apparently it comes from Buenos Aires, who has been testing with Canada.

"Radio Roma-Napoli."—The Rome short-wave station has been getting over to America very strongly, and the relays of the

Rome-Naples programmes have created great interest in the Italian lady announcer!

Mexico City.—Tests on 15.58 metres have been going on for some time between Mexico City X D A and the German station D F A.

France.—The French station F 8 B Z has been busy of late with experiments (on 19.5 metres) in connection with Marconi's yacht the "Elettra."

S.S. "Olympic."—The White Star liners "Olympic" and "Majestic" have recently been working on new groups of wave-lengths ranging from 17 to 71 metres.

Tokio (J O A K) has been testing short-wave telephony with Rugby, Warwickshire.

NOTES ON CANADIAN S.W. RECEPTION

Winnipeg's S.W. station, V E 9 C L, has for a considerable time been working on a wave-length of 48.7 m., owing to interference experienced on their original wave. This station, which takes the place of the old C J R X, is getting reports showing good coverage of the whole American continent, but very little foreign reception.

A Helpful Change

Probably the majority of Canadian S.W. listeners will be glad, however, of the change in wave-length, as C J R X used to interfere badly most times with reception from G 5 S W.

The super-heterodyne receiver, already very often used for regular broadcast reception, is now gaining ground very noticeably among short-wave fans. This

the highest frequencies, would seem to indicate this type of receiver as the ideal for short-wave work.

A new short-wave station at Saskatoon, Saskatchewan, has recently been testing on a wave-length of 103 m., re-broadcasting the evening programmes of several of the U.S.A. broadcast stations. The station call is V E 9 A R.

Quite a number of versions of the super-heterodyne, or "super-sonic" S.W. converter, for use in conjunction with a regular broadcast receiver, have been published in the American radio journals during the past few months, and several such converters, commercially built or in kit form, have been placed on the market.

Some Use A.C. Valves

The converter is usually a two-valve affair, consisting of a screen-grid first detector, or "mixer," and an oscillator.

In some cases, using A.C. valves of the cathode type, the converter also contains its own small power unit, using an A.C. filament amplifier valve as half-wave rectifier.

Short-wave station R F M, at Khabarovsk, U.S.S.R., is attaining quite a reputation in Western Canada. For months now he has been in evidence almost any night after midnight, Pacific time; often coming through like a 5-kw. "local," only two or three hundred miles away.

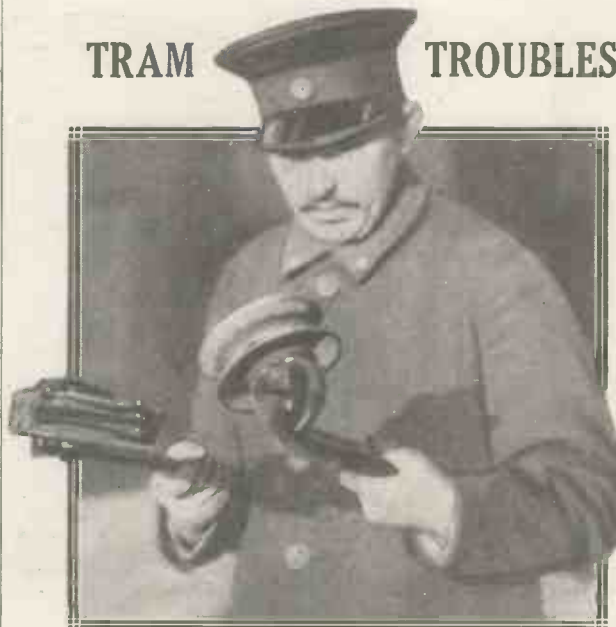
Good "Going"

On nights when S.W. reception on the 100-m. band is particularly good (rather infrequent, alas, these times!) it is interesting, and rather amazing, out in the interior of British Columbia, to hear various "broadcasts" which are certainly not intended to cover any great distance, but which at times come in at great strength over distances of two or three thousand miles.

For instance, it is not unusual to hear, at fine loud-speaker strength, the voices of the police broadcasting stations of several large cities in the central States transmitting orders to their radio-equipped patrol cars! Usually, by the way, one will hear from these stations wearying long lists of descriptions of stolen cars.

New short-wave stations are continually cropping up in Canada, and we have recently received news of another one at Vancouver. This station's call-sign is V E 9 C S, and we understand he works during certain periods on Thursdays and Sundays. So far, however, we have no information regarding the power this station is to employ.

TRAM TROUBLES



Berlin uses tramways more than London, and listeners complain that these ruin reception. So the roller (right) is being replaced experimentally by a copper shoe (left), in an attempt to stop the trouble.

Rio de Janeiro has been putting out a Brazilian programme on 31.75 metres, from 10.30 p.m. to 12.30 a.m. G.M.T.

Vienna has not been heard much recently on 49.4 metres.

trend is undoubtedly very largely due to the development of the new type of A.C. screen-grid valve, which is used in practically all of the new supers.

The very large over-all gain obtainable in a super-het., even on

Metres

- 70.1 Khabarovsk
- 62.5 Long Island (W 2 X V)
- 61 Radio L L (France)
- 58 Prague, Tues. and Fri.
- 50 Barcelona Radio Club, E A J 25
- 50 Bucharest (Rumania)
- 50 Moscow (Russia)
- 50 Nairobi (Kenya), 7 L O
- 49-83 Chicago (Ill.), W 9 X F
- 49-67 New York (W 2 X A L)
- 49-5 Cincinnati (W 8 X A L)
- 49-5 Philadelphia (Pa.), W 3 X A U
- 49.4 Vienna
- 49-34 Chicago (Ill.), W 9 X A A
- 49-22 Toronto (Canada), V E 9 G W
- 49-18 Bound Brook (N.J.), W 3 X A L
- 49-02 Richmond Hill (N.Y.), W 2 X E
- 49 Saigon (French-Indo-China)
- 48-86 Pittsburg East (W 8 X K)

SELECTED SHORT-WAVERS

The World's principal short-wave stations and the wave-lengths they use.

Metres

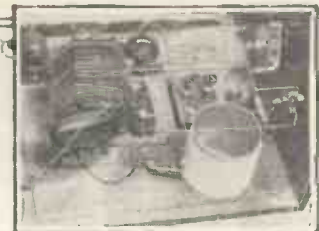
- 48.8 Manila (Philippine Islands), K Z R M
- 48-62 Tegucigalpa (Honduras), H R B
- 48-35 Bogota (Colombia), H K C
- 48 Casablanca (N. Africa), C N 8 M C
- 46.6 Moscow (Russia)
- 45 Constantine (Algeria)
- 44.6 Georgetown (British Guiana), V R Y
- 43 Madrid (E A R I X O)
- 42.9 Lisbon (C T I A A)

Metres

- 41.7 Singapore (V S I A B)
- 39.7 Bogota (Colombia), H K F
- 37.76 Bangkok (Siam), H S P
- 36.92 Bandoeng (Java), P L W
- 34.68 Long Island (W 2 X V)
- 32.5 Paris (F L J)
- 32.26 Rabat (Radio Maroc)
- 31.56 Melbourne (Australia), V K 3 M E
- 31.51 Lyngby (Denmark), O X Y
- 31.48 Schenectady (N.Y.), W 2 X A F
- 31.38 Zeesen (Germany)

Metres

- 31-28 Eindhoven (Holland), P C J
- 31-28 Philadelphia (Pa.), W 3 X A U
- 30-75 Agen (Tues. and Fri.)
- 30-5 Poznan (Poland)
- 29 Saigon (French Indo-China)
- 28-98 Buenos Aires (L S X)
- 28-2 Bandoeng (Java), P L R
- 25-53 Chelmsford (G 5 S W)
- 25.4 Rome (Italy), 3 R O
- 25-27 Calcutta (India), V U C
- 25-25 Pittsburg East (W 8 X K)
- 24-5 Manila (K 2 X R)
- 23-8 Rabat (Radio Maroc)
- 21-5 Bucharest
- 20-5 Chapultepec (Mexico)
- 19-72 Pittsburg East (W 8 X K)
- 19-56 Schenectady (W 2 X A D)
- 16-9 Bangkok (H S J)
- 16-8 Bandoeng (Java), P L F
- 16-52 Bandoeng (Java), P M C
- 16-3 Kootwyk (Holland), P C K
- 16 San Lazaro (Mexico)
- 15-93 Bandoeng (P L E)



OTHER PEOPLE'S PROGRAMMES

Some items to interest every searcher of the ether.

"POSTE PARISIEN" (328.2 metres) is to increase its power to 60 kw.

RADIO PARIS plans to use 80 kw. shortly, and Toulouse is now installing more powerful transmitting apparatus.

SYDNEY (N.S.W.) recently played a chess match with Otago (New Zealand) by short-wave radio.

MOSCOW is to have its power increased to 500 kw., as a part of the Soviet Five-Year Plan.

RUSSIA is to build eleven new stations each of 100 kw., to supplement the new giant at Moscow, which will be the most powerful station in Europe.

NAIROBI, whose recent short-wave experiments with this country attracted great interest, transmits its local programme on 400 metres. (This, of course, can be received only in Kenya Colony itself.)

BODO, the new Norwegian low-powered relay, is supposed to be the coldest station in Europe. It is situated well within the Arctic Circle.

KONIGSBERG, which relinquished its wave-length to Heilsberg and was expected to be seldom heard after the change-over, has been coming through in great style on 217 metres.

ROME is undertaking some special opera broadcasts, and it has therefore been found necessary to alter the time of the Rome programme of H.M.V. records. This is now scheduled to go out on 441 metres at 7.15-8.15 p.m. on May 3rd.

WILNO is due to take up its full increase of power by the time these words are in print. It will probably operate on Cracow's wave-length, 312.8 metres. Power, 21 kw.

TORUN-ON-VISTULA is the site of a new Polish relay station. It will use the old Wilno transmitter, and the wave-length 233.8 metres.

be on the air in about seven months, according to the latest reports

GENEVA will hand over its present wave-length (760 metres) to Monte Cenero when this new station is completed.

LENINGRAD, on 1,000 metres, is often a strong programme,

RADIO BEZIERS, which was recently heterodyning the Belfast programme, lowered its wave-length to about 220 metres some weeks ago.

BRUSSELS usually concludes an orchestral programme with "La Brabançonne," the Belgian National Anthem.

ZAGREB uses several different languages when making announcements, including French, German, and Serbo-Croatian.

LUXEMBURG has given to a French firm a concession to build and operate a 100-kw. broadcasting station.

MOORSIDE EDGE, the B.B.C. North Regional station, near Huddersfield, is in such an exposed position that provision has been made so that in winter a heating-current can be passed through its aerials, to melt ice lodged there.

RADIO PARIS was recently ordered to pay the heirs of Victor Hugo the sum of 25 francs, for infringement of copyright. (Victor Hugo has been dead about forty-five years.)

BAVARIA is contemplating the erection of a new high-power station.

KONIGSWUSTERHAUSEN should now be coming over well. It increased its power by another 5 kw. at the end of April.

LANGENBERG is carrying on as usual on 473 metres, whilst a new 75-kw. transmitter is being installed. This is due to take duty in the autumn.

THE LATEST GERMAN MICROPHONE



This improved "Bandchen" mike has an aluminium band suspended in a magnetic field, which alters as sound waves reach the band. It is said to be a real winner

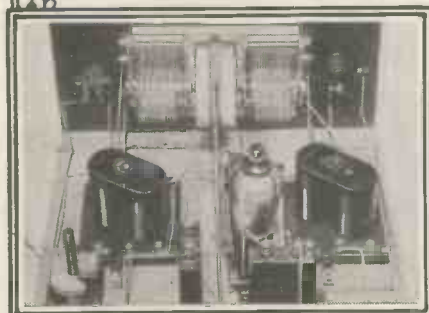
OSLO has rather surprised its admirers by very marked wave-length wobbles of late.

TURIN seems determined to stick to 295.9 metres, instead of its allotted wave-length (273.2 m.).

MONTE CENERE, the Italian-speaking Swiss station, should

but is badly interfered with by the British radio-beacon stations.

BARCELONA (E A J 15) has been the cause of much heterodyning recently, complaints being made from Toulouse, Gleiwitz, Moravska-Ostrava, and Leipzig.

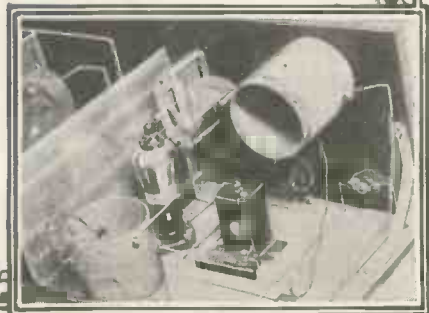


NEXT MONTH

The June issue of "M.W." will be a very attractive issue, and will be ON SALE MAY 30th.

For goodness sake, don't forget to

ORDER NOW



A New Station ICELAND

Have you heard him—Radio Reykjavik, the Iclander? This new-comer to the long wave-lengths is about the same distance from England as "Radio Roma," and is now working nightly on a wave-length of 1,200 metres. Even if you have not succeeded in tuning him in you will be interested in this latest triumph of British engineering skill.

FOR several weeks there was a kind of mystery about the test transmissions from the new Iceland station. Several listeners in this country reported reception of this station on various wave-lengths from 250 up to 1,500 metres, whereas the engineers who were putting the finishing touches to the plant firmly maintained that no actual aerial tests had been made, and that it was impossible that anyone could have picked up broadcasts.

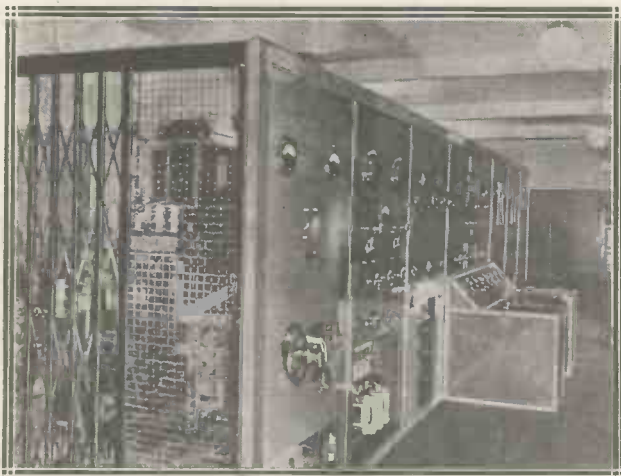
Those Mysterious Tests

Test transmissions were made on a "dummy" aerial (non-radiating), but obviously the range of these would not extend beyond a mile or so. On the other hand, several keen foreign-station listeners were positive in the belief that they had heard the first tests from Iceland.

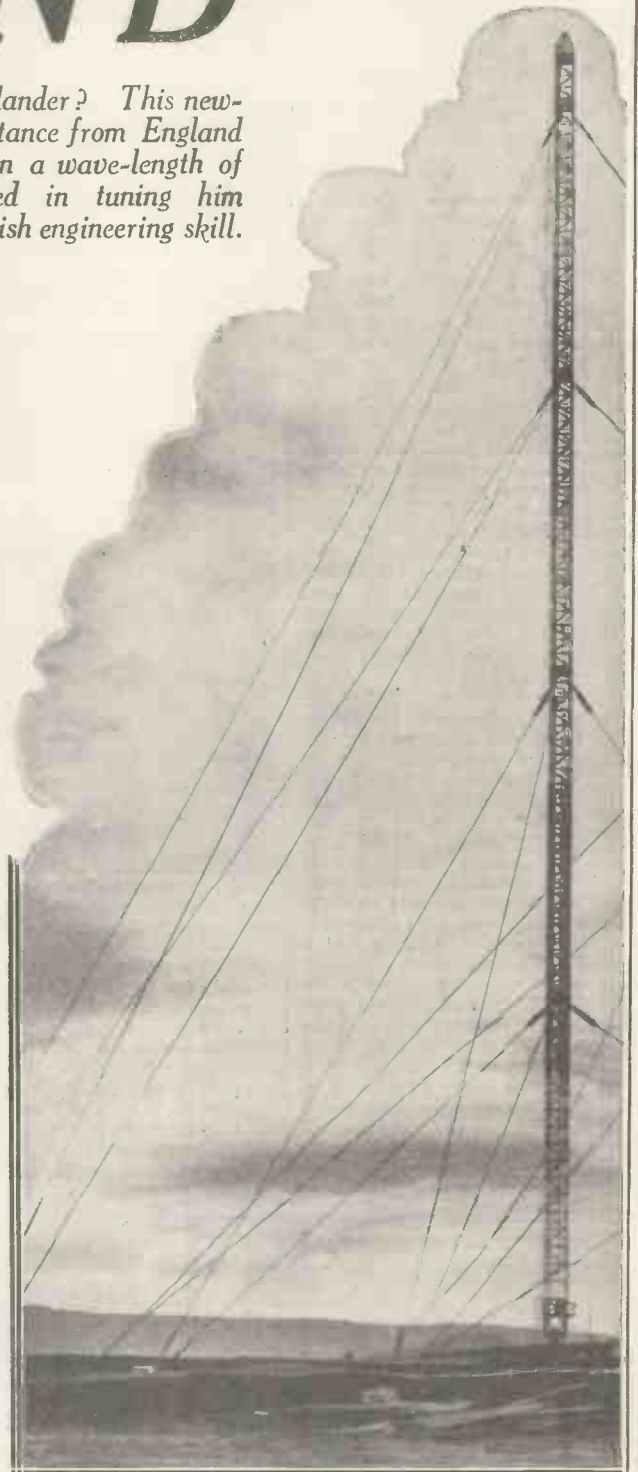
Anyway, the station really is working now, and fairly regular transmissions may be heard on 1,200 metres. An amazing thing, at first thought, is the strength with which the station is picked up.

Iceland seems so far away. Actually, when you come to measure the distances on a map you will see that the town of Reykjavik—the chief place in Iceland, and near the station site—is about the same distance from, say, London as is Rome. Radio Roma is just under the 1,000 miles away, and Reykjavik is just over the

CONCENTRATED KILOWATTS!



Here is the huge transmitter which provides an aerial power (unmodulated) of 16 kw.



Towering high against the Arctic skies, the giant masts seem to challenge the elements. They are situated on a plateau—

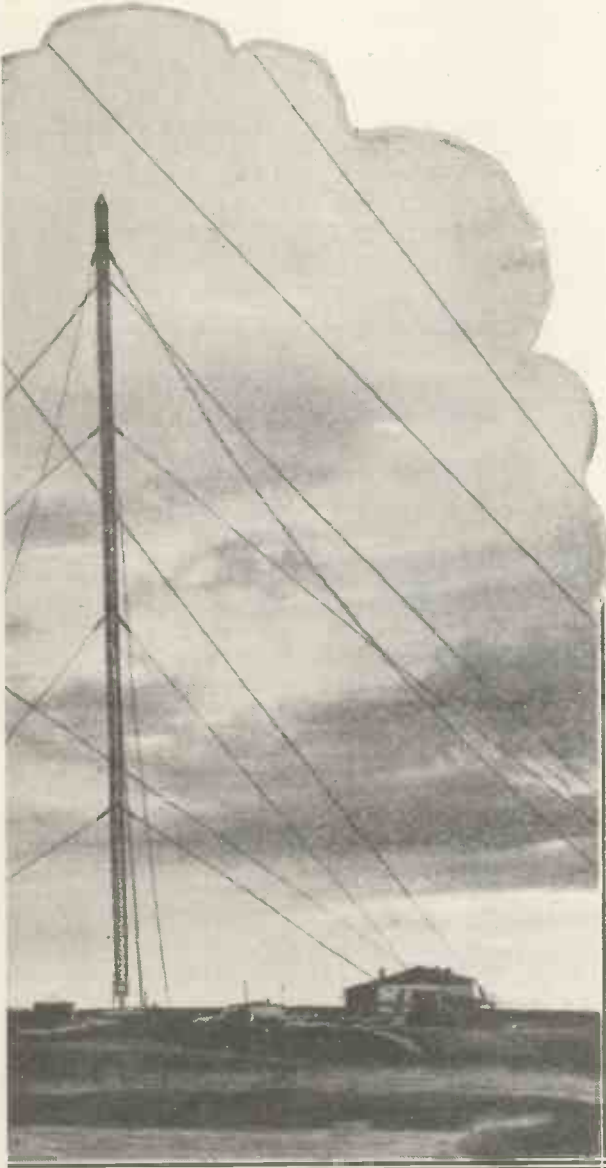
For Your Log—

1,000; but the island is not entirely "off the map," and touching the North Pole, as many people believe it to be.

The aerial masts have been put up in a very favourable position, on a stretch of open ground about eight miles from Reykjavik. Narrow steel pillar masts, 500 ft. high, support the aerials, which has its length and lead-in so arranged that it is not very directional, and what little directional effect there may be is probably in favour of reception in this country.

Well Up In the World

The station itself stands 500 ft. above sea-level, on the top of a plateau; so you see that, geographically, it is no small wonder the station is well heard.



—about 500 ft. above sea level and 8 miles from Reykjavik, the capital of Iceland. Each mast is 500 ft. in height.

The long, low buildings housing the transmitter and generating plant are a fair distance from the centre of the aerial, and an H.F. transformer arrangement with twin leads-in runs from the electrical centre of the aerial to the output stage of the transmitter.

The station building is quite small, but is very neatly arranged. It has special cavity walls, as have many buildings in Reykjavik!

In one corner of the main room is the transmitter itself—a large metal cabinet, some 20 ft. by 12 ft. at a rough estimate—the rear portion of which is caged off with netting and a safety door. The H.T. supply to the anodes of the big valves is switched off by a relay if for any reason this safety door is opened while the power is on and the set is working.

The control desk butts up against the outside of the metal cabinet. Much of this transmitting gear comes from the same "stable" as the B.B.C. plant for Brookmans Park and Slaitwaite, and the Reykjavik control desk appears just the same size and shape as that at Brookmans Park.

Valve-Controlled Transmitter

Main H.T. and grid-circuit meters are on a panel along the top of the desk, and there are four anode-circuit controls, two on each side. Most of the small controls, such as valve rheostats, modulation controls, together with fuses, are on the outside of the metal panel protecting the transmitter.

With the power switched off one can take a look at the huge valves, coils, and condensers, behind the panel. The set is valve controlled, and all the valves in the final stages are water-cooled. A motor-driven pump keeps the water flowing round the hollow anodes, and in each separate H.T. piping circuit there are flow meters which show the pressure and rate of flow of the cooling water.

The rubber piping is coiled so that there is a water column of nearly a hundred feet from the anodes to the

THE MASSED MACHINES



The large generators are housed in a separate room, well away from the actual transmitting gear.

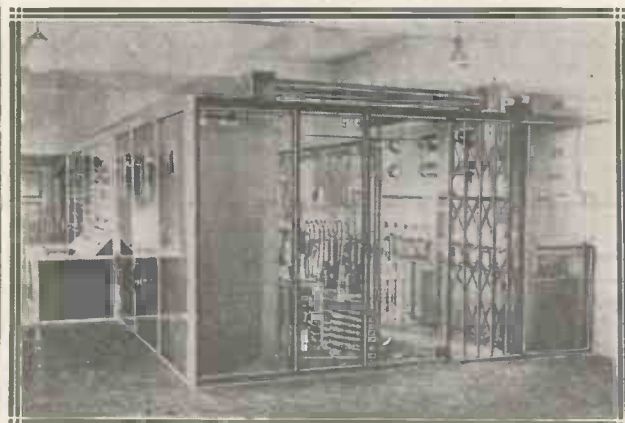
The Double Rôle of Reykjavik

cooling point. The piping is coiled up on curious conical-shaped formers made of porcelain; these are in circuit at the anode ends, where the voltage drop is greatest.

Several of the coupling condensers and H.F. chokes are fixed on porcelain brackets to the back of the metal panelling, and are connected direct by flexible copper strips, some only a foot or so in length, to the valves. The tuning coils have remote controls, and are regulated from outside the cabinet.

This is important, because although the broadcast wave-length of the station is 1,200 metres, this can be varied for working with ships, and the station can transmit

SCREENED FOR SAFETY



When the gates giving access to the gear are opened the power is automatically cut off.

Morse as well as telephony. During the mornings, as a rule, Reykjavik is devoted to commercial work, keeping Iceland in touch with the rest of the world, passing on weather reports from the North, and so on; and in the evenings it is used for broadcasting.

When the station gets into its full stride every important announcement will also be given in English; so British listeners will find a special interest in the station.

GERMAN JOTTINGS

Some notes about radio on the other side of the North Sea.

Postmark Persuasion

HAVE you looked at the postmark on a letter from Germany? Nowadays you will not see "Buy German Goods." Letters with the German postmark now bear the words "Become a Wireless Listener."

This is one of the many ways in which the Germans are trying to popularise broadcast listening. There are many other devices in Germany for stimulating the wireless industry.

Simplified Battery Sets

Mains-operated sets have undoubtedly helped the wireless trade in this country. The same thing has happened in Germany.

The Germans realise that many listeners have no mains.

They are therefore trying to give the battery-operated set the advantages of the mains set. The new German battery-operated sets are almost as compact and as simple as mains sets.

These sets first made their appearance at the Leipzig Fair this spring. They are what we should call transportable. They have built-in batteries and loud speakers.

Something approaching the simplicity of the mains set is gained by the construction of the batteries. They are now made with sunk metal contacts. These batteries are slid into the set in the same way that a battery is replaced in a pocket flash-lamp.

The set contains spring contacts which engage in those of the batteries. The set and batteries are so arranged that only the correct connections can possibly be made.

By the application of more grid bias high-tension consumption has been reduced, so that a four-valve set takes only 6 milliamps.

A Screened Frame-Aerial

In these days of screened grids and screened coils the Germans have turned their attention to a new branch of screening. The screened frame-aerial.

AN INSIDE VIEW



This view was taken inside the transmitter itself, and, of course, the power was off! Note the huge coil on the extreme left of the picture.

This can only be used when several stages of high-frequency are employed. It is an ordinary frame aerial with the windings screened. A small portion at the top is left open.

The usual screening material is employed. The use of the screen has many advantages. It is said that local interference, such as the noise caused by trams, is easily cut out when one of these aerials is used.

A Paper for the Ether Searcher

"The Hour in Europe" is the English equivalent of the German name of a weekly paper giving foreign programmes. This paper is arranged like a time-table.

The time is given on the twenty-four-hour plan. By looking up the day of the week and the hour of the day it is possible to see at a glance what all the European stations are doing at this hour.

RADIO PARIS is, like some of the rest of us, hard-up! Some afternoon transmissions were recently suspended

SOTTENS, the new Swiss station recently opened on 403 metres; announces itself as "Ici poste nationale Suisse," or "Ici radio Suisse Romande."

COPENHAGEN has just erected a new "Broadcasting House," but so great is the increase in Danish broadcast interest that it is already too small.

TURIN gives its listeners one of the most doleful broadcasts in the world in the form of Talks for Invalids. The advice given is of a semi-medical character!

BRESLAU uses a fast-ticking metronome in the intervals between items. It does 240 beats to the minute.

HILVERSUM, which recently had been announcing on the long waves, has now taken its allotted wave-length of 298.8 metres.

CHICAGO recently broadcast the first American television play. It was entitled "The Maker of Dreams."

WARSAW may often be heard sending the Morse characters . - - -. This represents the letter W, the station's initial.

Station Information

All the News and Views from Here and There.



ALGIERS, on 363.4 metres, has been giving Tuesday night talks in English at 10 p.m. G.M.T.

VIENNA is to have a new super-station, as the present plant (Rosenhugel) is being "shouted down" by powerful neighbours. The idea is

RADIO PARIS has been doing a lot of sports commentaries recently. It sometimes tunes in 5XX, and translates a commentary from there into French.

RADIO CAEN, which was fined the sum of 2s. 8d. for unauthorised working and closed

THAT OVERSEAS FRIEND OF YOURS

Why not send him "Modern Wireless" every month? Make the mail-day a red-letter day for him by keeping him in touch with home radio. All you have to do is to send his name and address with 17/- to the Subscription Dept., Fleetway House, Farringdon Street, E.C.4, and "M.W." will be sent every month for a year.

for a station with a power up to 120 kilowatts, to be erected about 30 miles from the city.

KONIGSBERG (217 metres), unlike most of the German stations, has been wobbling off its wave-length rather badly of late.

PRAGUE recently gave its listeners a much-appreciated programme by Jack Hylton's band.

down, has not at the time of writing been allowed on the air again.

SIR HUBERT WILKINS is to broadcast from his submarine during its voyage of polar exploration. He leaves America this month, and final details are not yet fixed.

GENOA has been very restless from a wave-length point of view, and recently appeared

above Milan on 525 metres. (A long wave is favoured, owing to its mountainous situation.)

VIENNA now gives physical jerks at 8.30 a.m. G.M.T. on Sundays.

DENMARK, also, has been favouring gymnastics recently, giving a regular ten minutes from 6.30 a.m. During the summer there is to be a Sunday morning drill, also at 8 a.m.

KALUNDBORG and **COPENHAGEN** now broadcast the early morning service from Copenhagen Cathedral at 7.30 a.m.

CRACOW will probably change its wave-length permanently to 244.1 metres when Wilno's alterations have been completed

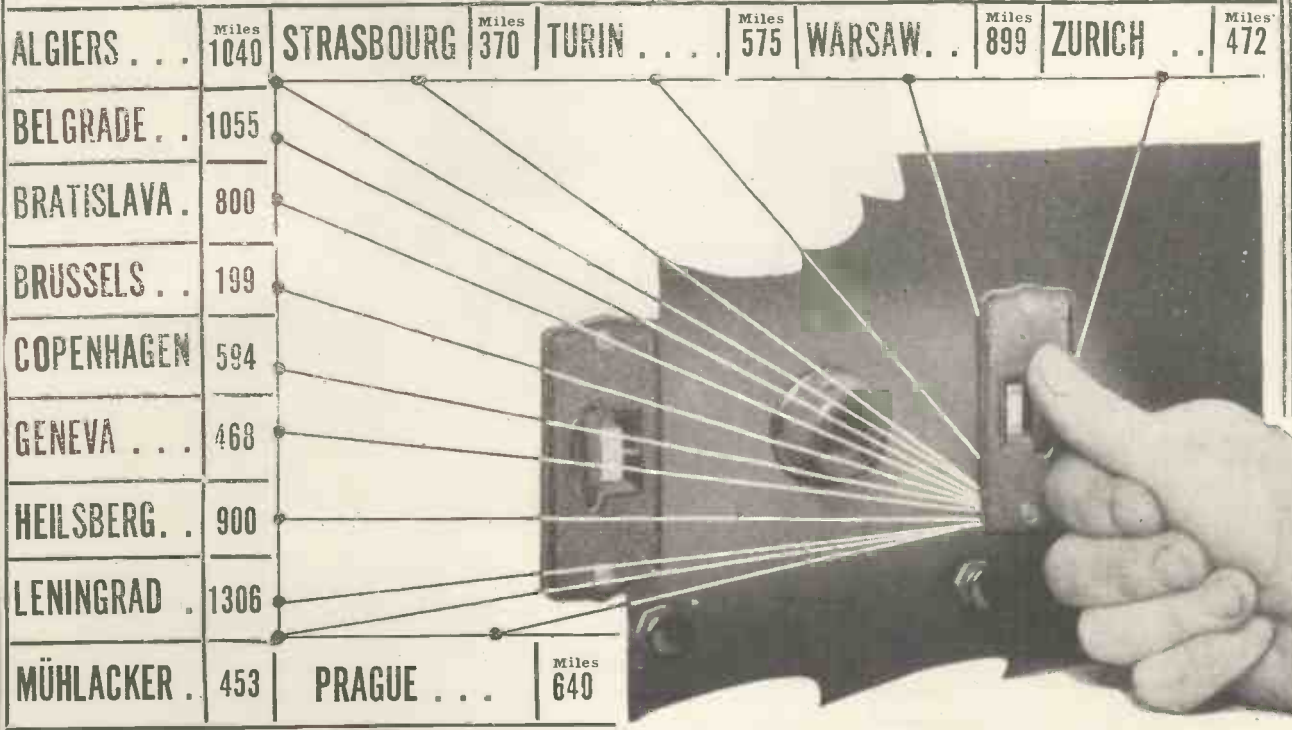
SOTTENS, the Swiss 403-metre station, employs a man announcer of the programme which comes from Geneva, or a woman if it is relayed from Lausanne.

GENEVA recently increased its power considerably, but is still a difficult station for most owing to its unusual wave-length (760 metres).

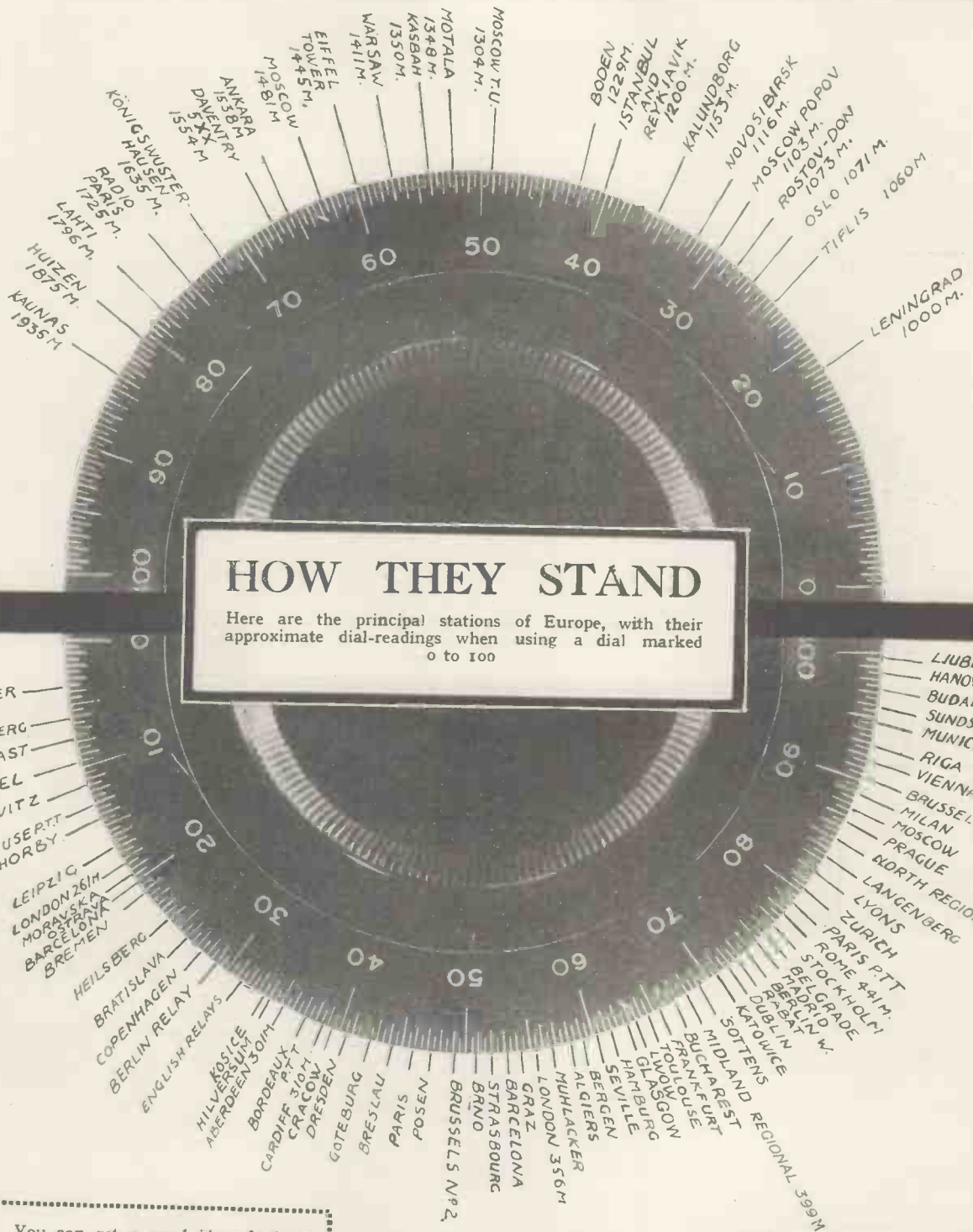
LWOW, which has been coming over at great strength on 380.7 metres, recently increased its power to 21 kw.

HOW MANY MILES ?

The distances from London of some favourite broadcasters.



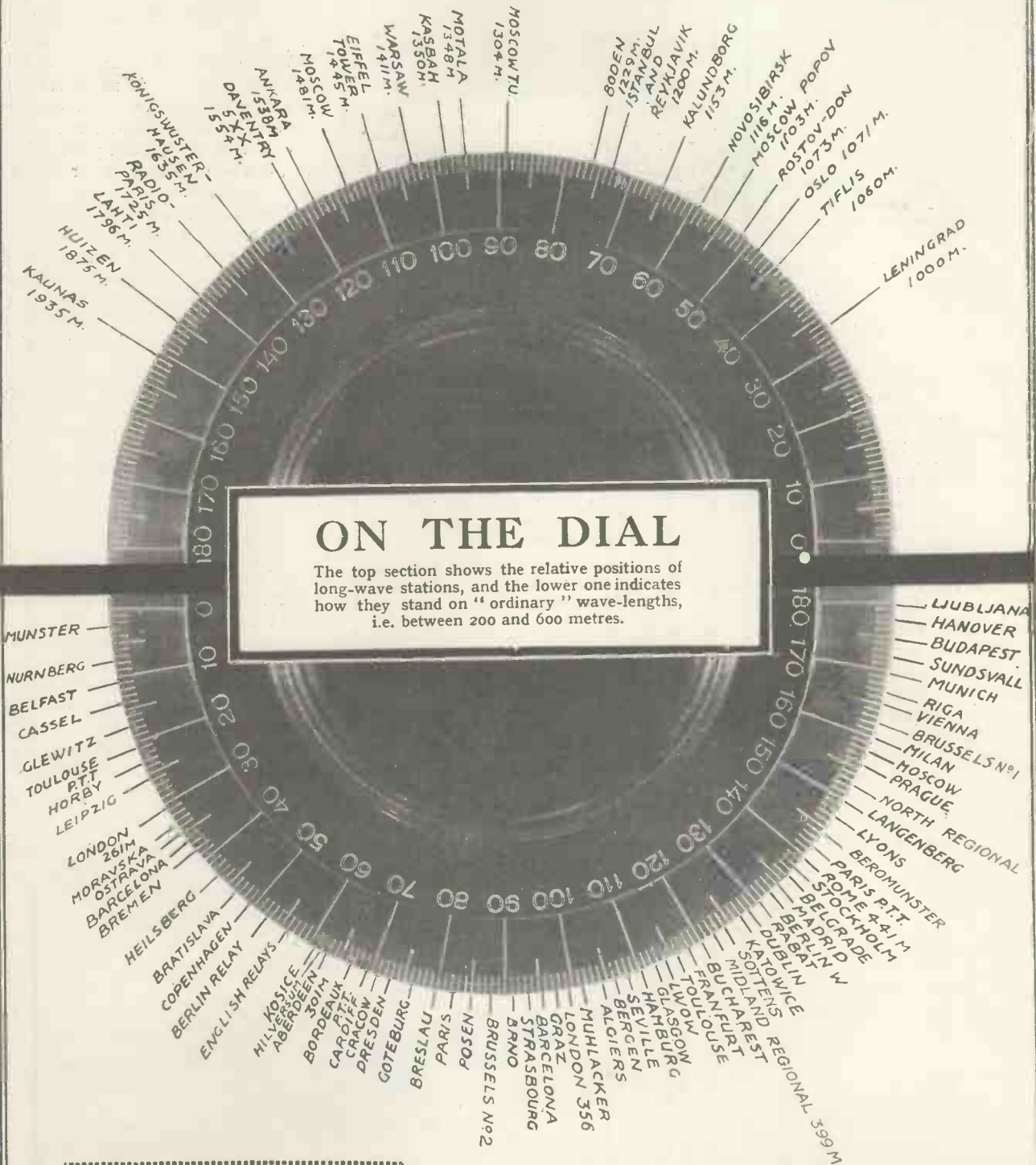
TUNING ON A "100" DIAL



You can get a good idea of where to look for any station shown by noting its dial position relative to any other known stations.

As an example, if you want to look for Leipzig, remember its dial reading will be slightly lower than London National, 261 metres, above Horby, Toulouse, etc.

TUNING ON A "180" DIAL



These dial readings will not be exactly right for your set, as every tuning dial gives readings a little different from every other receiver's.

Each station is shown in its correct order on the dial. For instance on long waves (top) Leningrad will always be towards the 180° (or 100°) maximum mark, with the others between as shown

Berlin's New Studios



An authoritative and interesting review of the methods employed by the German broadcasting engineers in designing their huge new broadcasting building.

By Dr. ALFRED GRADENWITZ

THE conditions to be complied with by a hall destined to serve as studio have but lately been ascertained. In fact, the first studios were got up in a more or less haphazard way, and experience as well as actual research work had to show how the best results could be obtained in each case.

Acoustic Requirements

When planning a new studio nothing needs now to be left to chance, and the studios of Berlin's new House of Broadcasting could be designed on strictly scientific lines with a full assurance of success. The facts that had to be taken into account were aptly summarised in a recent lecture by Mr. W. Schaeffer, chief engineer to the German Broadcasting Corporation.

It is no easy matter to define just what should be understood by good acoustics. However, the following are the main positive characteristics of a satisfactory audibility: Sound effects should be pleasant and lively, with a convenient range covered, a good intelligibility of words and a suitable acoustic intensity as compared with the actual power of the source of sounds.

Things to Avoid

The following negative features should be avoided: Any distinct echo, excessive resounding causing successive sounds to be merged, any pronounced resonance, dullness of the lower and flicker of the higher frequencies.

An echo, of course, is due to sound reflection, the returning impulse fol-

lowing so late upon the original sound as to be perceived separately. When the interval is shorter there is no separate echo, but merely an extension

"HIER BERLIN"
The following are the stations serving the Berlin area:—

Königswusterhausen, 1,635 m. (Zeesen)	
Berlin (Witzleben)	418 "
Berlin Relay	283 "

Instead of "Hello" the Germans use the word "Achtung," which means "Attention."

of the original sound. This is what is meant by *resounding*.

The intelligibility of speech is apt

to be greatly impaired by prolonged resounding, whereas the reproduction of music may not suffer from it. The closer a speaker is to the microphone the less will the disturbing influence of resounding be felt.

Adjustable Resounding

Apart from the Grand Studio, 148½ ft. long, 82½ ft. wide, and 36½ ft. high, and a number of minor studios, the House of Broadcasting comprises two studios each 76 ft. long, 23 ft. high and, in the central part, 36½ ft. wide, one of which serves for Berlin's daily broadcasts.

In order even in a relatively empty hall to ensure a good audibility the whole of the walls has been lined with wood, but for a certain portion made up of *hinging* sections, the inside surfaces of which consist of a damping material (celotex), which enables the resounding time to be adapted within certain limits to the actual piece of music and the number of persons present.

Sound-Proof Windows

The other studio of equal shape and size is, from an acoustic point of view, controlled in another way, viz., by means of draperies, thus enabling the methods to be compared.

The three large studios have been erected on special foundations insulated from one another and from the remaining parts of the building.

Adjoining the studios there are what are termed Management or Control Rooms, whence all that is going on in the studios can be watched through large sound-proof glass windows.

BIGGER AND BETTER THAN B.B.C.'s!



Germany has legislated for radio on a regal scale, and the vast new Berlin Radio Building shown above makes the B.B.C.'s effort at Portland Place look very small stuff indeed.



They call them ordinary waves if they fall between the 200-600-metre mark. But there have been some *extraordinary* doings between those limits of late.

Usually long-distance reception falls off very sharply during April. This year it continued to be good—really good—and there are still plenty of easily received foreigners for the one-valve man.

Apart from little ups-and-downs such as everyone makes allowances for, there have been many *reliable* programmes. Toulouse, for instance (385 metres), has never failed to arrive with a thump on my aerial.

As for Heilsberg and Mühlacker—least said, soonest mended. They come in early, and they go on strongly till closing time! Stickers, both!

Still Alive

Königsberg, who went down on to 217 metres when Heilsberg took over, has shown that there is plenty of life in his old transmitter yet. And another surprisingly strong German has been Breslau, on 325 metres.

On the Ordinary Waves

Some details of the doings on the wave-lengths between 200 and 600 metres.

As a matter of fact, all the stations just below the London Regional seem determined to make themselves heard now. Just below Barcelona and Strasbourg, the Brno (or Brunn) programme, on 342 metres, has fairly excelled itself for punch and persistence.

Good Stations

A little lower, Poste Parisien and Goteborg have been "going strong," on either side of Breslau; and still lower down, Bordeaux Lafayette, on 304 metres, has been as deafening as his neighbour Hilversum. Even Copenhagen—usually not a powerful foreign programme

—has been better than during February and March, and Bratislava (which is sandwiched in between Copenhagen and Heilsberg) has made 279 metres a wave-length worth watching.

Bucharest, on 394 metres, has been freely tipped as an outstanding programme, but on the half-dozen or so occasions on which I have tried for this station it has not been worth listening to. Both Sottens (403 metres) and Katowice (408 metres), which are just above Bucharest, have, however, been excellent.



B.B.C. Changes

The re-shuffle of the B.B.C. wave-lengths involved by the coming of the North Regional into its own has to some extent interfered with many listeners on the look-out for foreigners.

Working All Right

The change-over between North Regional itself, 5GB, Manchester and Glasgow seems to be working out well, but most of us will rejoice when everybody has settled down to the new conditions.

North Regional itself, by the way, has made a splendid getaway from those high masts of his, and strikingly good reception has been reported from

long distances. No doubt very many foreign listeners have been moved to write jubilantly to the B.B.C. about him, but that august body inclines to the polite reply rather than to telling the world what a fine station is now gracing Moorside Edge.

A Good Job

The stations deviating from their allocated wave-length seem to be getting rather smaller, a fact at which to rejoice. Also, as a rule, the amount of deviation is not very large.

INSULATION INFORMATION

Some Practical Hints To Bear In Mind.

Two "egg-insulators" placed in series in the aerial will generally give efficient and sufficient insulation.

Coated or insulated wire, such as enamelled or rubber-covered, is perfectly satisfactory for use as an aerial.

Even if the aerial is of insulated wire it should be supported by insulators, as this is the best way of spacing it from other conductors.

When fixing an egg-insulator in position pass the wires through the channels made for it. It will then be found that the aerial loop intersects the supporting loop, and if the insulator breaks the aerial cannot fall.

All insulators need cleaning periodically. In smoky atmospheres this may be necessary every three months, or less, but in other situations once a year is sufficient.

BRESLAU is one of the German programmes to be gingered up under the reorganisation scheme. Its new station is to be erected on a site fourteen miles from the present one.

FRANKFURT will shortly increase its power to 25 kw., and a new relay station to take this or the Cologne programme is to be erected at Treves.

LEIPZIG is another centre at which the Germans are planning to erect a new high-power station.

SOTTENS, the new 403-metre station that has been radiating the Lausanne programmes, was generally understood to be a "25-kw." station; but this was the

FROM BRESLAU TO BANDOENG

Some Interesting Items from Abroad.

unmodulated rating, and its actual power is said to be nearer 60 kw.

BEROMUNSTER, the second new high-power Swiss station, is, like Sottens, a British-made transmitter.

NAPLES plays the "Pipes of Pan" melody, in several keys, as an opening signal.

HEILSBERG has already been picked up, on 276.5 metres, in Canada, Liberia, and Egypt.

BRUNN (or BRNO, CZECHOSLOVAKIA) is to use a power of 36 kw., on 342 metres instead of the present 3 kw.

HILVERSUM has been working and announcing on 1,875 metres. Every three months it "changes" over with Huizen, who has been on 298 metres.

REINA DEL PACIFICO, the liner, has been equipped to receive on all wave-lengths between 15 and 20,000 metres.

EIFFEL TOWER has the highest broadcasting aerial in use in Europe (the Tower itself), and the 600-ft. masts of Warsaw carry the next highest.

POSTE PARISIEN (PARIS) usually commences its evening programme at 9 p.m.

MILAN is the site of one of Italy's new check stations for measuring the wave-lengths of its own and foreign stations.

SESTO COLENDE is the new Italian "Tatsfield." It is to work in conjunction with Milan as a frequency-checking station.

BANDOENG (JAVA) recently held a long telephonic conversation with Oslo, without interference or other difficulty.

IN THE INTERVAL—

How they fill in programme-pauses at some of the chief foreign stations.



The apparatus illustrated in the circle is that used for Berlin's interval signal.



You might not think it, but the instrument shown above which is being held in front of the microphone is Turin's famous "night-ingle."

The sound emanates from a small bellows contained in a wooden box, and operated by means of clockwork. Very unromantic!

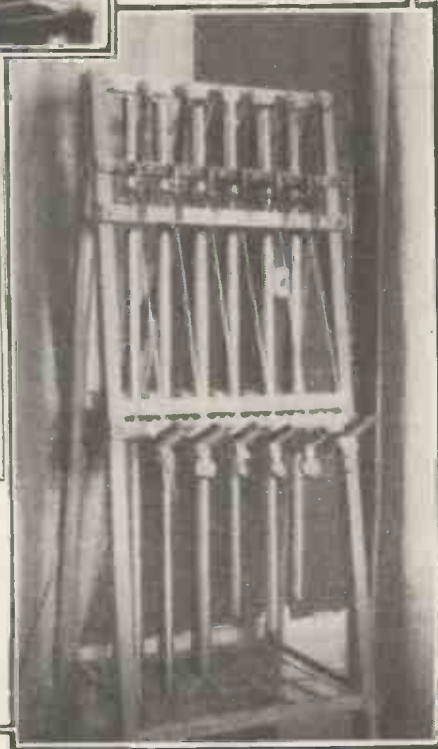


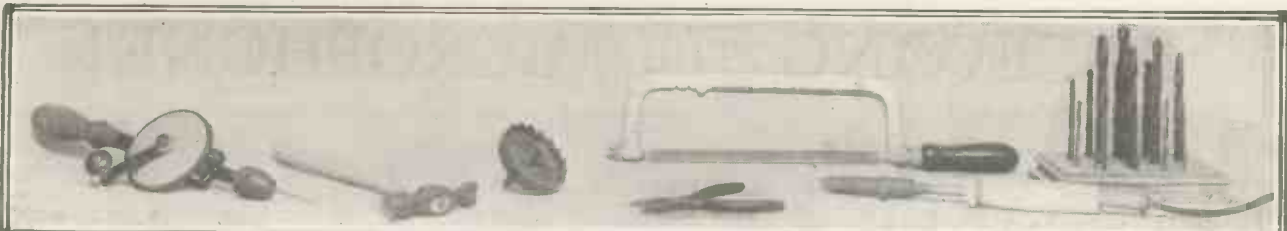
Above is the metronome which is used as an interval signal at the Munich station, in its box with a microphone. This can be heard on 533 metres. To the left is the apparatus which Budapest uses on 550 metres. In action it sounds like a musical box.



Most of the apparatus illustrated on this page is not very tuneful-looking, but that cannot be said of the delicate coils housed in these three little boxes. They look as though they are quite capable of setting up a tinkly little tune or two! Perhaps you have heard them from Bratislava (Czecho-Slovakia) on 279 metres?

The rather elaborate-looking system of gongs shown to the right is installed at the Milan station. Milan works on a wave-length of 501 metres and uses a power of 8.5 w.





THE LONG-WAVE PROGRAMMES

The past month was full of programme interest to the long-distance man, if only because he could hardly believe his ears! Last year the distant stations seemed to get very, very distant during April, but this spring has certainly favoured us with excellent reception conditions.

Up among the long-wavers there was one little-noted official change that was distinctly interesting, and that was the promotion of Kaunas to "top of the wave-length class."

Actually Kaunas did nothing towards gaining its new distinction of being Europe's longest wave-length station; all that happened was that Ankara (the former holder) officially dropped its wave from 1,961 to 1,538 metres, thus coming just below 5 X X. Ankara is a Turkish station, and in most parts of the country is wiped right out by the Daventry National.

Talking of Kaunas reminds me that, like many other Europeans, this station has more than one name. It is often called Kovno.

It has never been a popular station in this country, and it is very heartily disliked by Capt. Eckersley! (Not for any fault of its own, but because these very long waves give such splendidly consistent service compared with shorter waves. And Capt. Eckersley rightly points out that such a splendid wave-length is more or less wasted in a sparsely populated country like Lithuania.)

An important long-wave change which came into force on April 1st was the Hilversum-Huizen re-shuffle. As the old hands all know, these two Dutch broadcasters exchange wave-lengths every three months. Very puzzling to the uninitiated!

Officially, 1,875 metres belongs to Huizen, but during the Jan.-March period the Hilversum announcements were heard on that wave-length. But now, and until June, Huizen really is Huizen, and at the time of writing his pro-

grammes are coming over very well.

It seems that Italy is becoming very interested in long-wave broadcasting. There are strong rumours that she will press for a wave-length around the 1,500-metre mark at the next Radio Congress.

All the regular long-wavers have been behaving well, and both Oslo and Kalundborg have provided wonderful strength and consistency. Warsaw, too, has been simply wonderful.

Warsaw, by the way, has been doing a lot of sleigh-bell ringing of late. Have you heard this delightful jingle on 1,411 metres?

It is a charming interval-signal, quite distinctive, and suggestive of the wide, open plains and droszhkys. But the sound was at one time exclusive to Cracow's programme. Possibly Warsaw has been relaying from there more than formerly, which would account for this tinkly surprise.

About five years have elapsed since the starting up of 5 X X, which is not now one of the most up-to-date long-wavers. Still, we understand the Chief Engineer of the B.B.C. has stated that it is

to be considerably "polished up" in the near future.

The threatened Russian invasion of the ether certainly seems to be likely, judging by the way Moscow, Novosibirsk and Leningrad have been arriving in this country. Leningrad, on 1,000 metres, has been in great form.

The trouble with this particular wave-length is that it is occupied by a group of wireless-beacon stations, who call and call interminably in Morse. First, perhaps, G D M will roar in, and before it has finished G O M takes up the tale. Then G S M has a go, and G G G chips in—and so they go on! Good for navigation, no doubt, but simply terrible for listeners!

We can predict with certainty that there will be quite a lot more long-wave listening now that Extensers are being widely marketed, the old bothers of manipulating switches and keeping two tuning charts having been rendered unnecessary by this great invention.

Perhaps you would not have thought it, but there are at least 23 European broadcast stations between 1,000 and 2,000 metres.

RADIO RUSH IN RUSSIA

Some Details of a Startling Scheme!



Ten million pounds are to be spent on the development of Russia's radio in the near future, if a report from American official sources can be believed. This is said to be a part of the famous Five-Year Plan.

Apparently popular interest in radio is being fostered by the Soviet authorities through radio clubs, one of which, known as "The Friends of Radio," claims a membership of about 300,000. Technical papers, etc., are available to all who are interested, and it is said that the number of listeners has increased sevenfold in the last two years.

Among the proposals are plans for forty-five new stations, all but seven of which should be

erected before the end of this year.

This is said to be but a first instalment, the scheme being based on a future total of twenty-two really super high-powered stations, and one hundred and thirty-three others of powers ranging from one to one hundred kilowatts.

It is certain that the Russian stations have been coming over well of late, and possibly some increases of power are now taking place. But if the scheme outlined above is carried out in its entirety, we shall certainly know all about Russian radio, and the ether of Europe will have something stupendous to put up with!

THAT FINAL COAXING

To be successful with short-wave reception you need not be a conjurer, nor spend hours and hours in practise. But you must be able to coax your set a little.

First and foremost, reaction. It must be smooth and silky, gliding in and out of oscillation without a plop or a howl. If it misbehaves, coax it.

Try different values of H.T. on the detector. If it has a grid potentiometer, try varying the setting of this.

Usually any trace of "plop" that survives when correct H.T. is applied can be removed by pushing the potentiometer's slider a little towards negative. (That side of the potentiometer that is connected to the L.T. negative wiring.)

If you have a spare detector or H.F. or L.F. valve, try this, as changing the valve often restores a short-wave set to good behaviour. And don't forget that a different valve may need new H.T. and potentiometer adjustments.

When reaction failure is confined to just one or two areas on the tuning-dial, other positions being O.K., these "dead-spots" can be moved. Usually a neutralising or other small condenser in series in the aerial lead will shift them.

Another cause of poor reaction results is too tight aerial coupling. Use a small aerial coil (two turns usually) where a separate coil is employed; or if your aerial "taps in" on the grid coil, keep it towards the earth end, when coupling is looser.

If you fancy a wave-meter for the short-wave stations one of the absorption type is easily constructed. But there is no real need for a wave-meter if dial readings, etc., of well-known stations are recorded, and the various favourite wave-bands soon become familiar hunting-ground.

Don't forget that what would be a poor aerial for ordinary wave-lengths may be excellent for short-wave reception. And that indoor aerials, in the loft or along a hall or passage, are often very successful.



DECEIVING THE MICROPHONE!



All over the world radio engineers are engaged in making and finding faked sounds that when broadcast sound like storms, breaking waves, galloping horses and so forth.

The above is a scene in a New York studio, the gentleman on the left being about to turn on a terrific thunderstorm!



After many patient attempts to make a cat miaow in the right place the Berlin engineers (above) had to give it up and use a faked pussy for the job.

In the circle are two men of Mühlacker who do the noise effects from that station on 360 metres.



Here is the whole bag of tricks used at one of the American stations. The operator is just about to "put the wind up," and near him will be seen the "aeroplane," and the "let go the anchor" gadget. Note, too, the slamming door at the back, and the host of noise-makers on and around the table.

BROADCASTING FROM BANDOENG

Some sidelights on a famous short-wave station in the Dutch East Indies.



Bandoeng is in Java, on the other side of Singapore, but its station building looks just as trim and tidy as a house in Holland. Those wonderful colonisers, the Dutch, soon saw the vital possibilities of radio as a link with home, and Bandoeng is recognised as one of the finest short-wave stations in the world.



The people of Java are very fond of music, both of the Eastern type and also of our own Western melodies, and they take great pride in the Bandoeng station orchestra, which is shown above. Have you ever tuned-in their tuneful twanging?



This picture shows a native orchestra at Bandoeng, while the comfortable room depicted to the right is the main studio.

PROGRAMME PARTICULARS

Metres	Call-sign used	Remarks
15'93	PLE	Tues., 1.40-3.40 p.m.
16'52	PMC	[G.M.T.]
16'8	PLF	Power 30 kw.
28'2	PLR	—
36'92	PLW	—





"WE ARE NOW CLOSING DOWN—"

Some more about Europe's Good-night Greetings.

The photograph on the left shows one of the most popular announcers in the world. She is Signorina Maria Luisa Boncompagni, the lady who rolls out the "Radio Roma" announcements. Her "Good-night, Everybody" is given in Italian as "Buona Notte a Tutti."

Three thousand miles farther west, Oakland and the other Pacific stations are then in the middle of their evening transmissions! And not till 8 a.m. or later do their engineers switch off, after hearing the "Good-night" greetings go out over California.

Meanwhile, of course, the Japanese, still farther west, are getting ready to tell Tokio the same good old story.

And so we go on!

In last month's "M.W.," under the title "Goodnight, everybody, good-night!" we gave a selection of phrases used by favourite European stations when "signing off" for the night. In response to many requests, here are some more "Good-nights."

But the most curious thing of all about these "Good-nights" of the other is the fact that they never stop! For after the latest European has gone to bed the American stations can be heard taking up the world's radio entertainments; and owing to the difference of time it is 5 a.m. or later before the New York announcers bid their audiences at midnight "Good-night."

The Czechoslovakian equivalent of "Good-night" are the words "Doubrou Noc," and this salutation may be heard from Prague, Brno, Kosice, Bratislava and Moravska-Ostrava when the evening programmes finish.

Copenhagen—which incidentally is to be found about four degrees above Heilsberg, and has been coming over well during April—closes down with three strokes on a gong.

Half-way, or thereabouts, between the Heilsberg and Copenhagen readings will be Bratislava. The announcer here—it may be a man or a woman—closes with a sentence in an incomprehensible language, Czech or Slovakian, commencing

with "Hal-lo, Bratislava." After about a dozen other words comes the final "Doubrou Noc" (Good-night) referred to above.

The air played by Oslo when closing down (usually at 11 p.m.) is taken from the Norwegian National Anthem. It is preceded by a short phrase concluding with the words "God Nat."

The words "Vashi Antenna," with which the Moscow station closes down (usually at 10 p.m. G.M.T.), are a reminder to Russian listeners to earth their aerials. Incidentally, the clock which chimes at the end of this programme is that of the famous Kremlin at Moscow.

Yugo-Slavia also says "noc" for "night," but the full "Good-night" is given as "Lahko-noc," and may be heard on 574.7 metres (Ljubljana), 430.4 metres (Belgrade), and on 307 metres from Zagreb.

When you get to recognise a few of the "Good-nights," they become surprisingly helpful in identifying stations, but unfortunately they

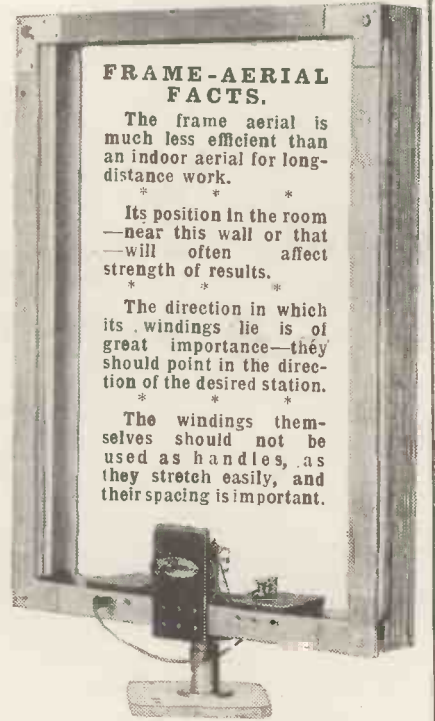
FRAME-AERIAL FACTS.

The frame aerial is much less efficient than an indoor aerial for long-distance work.

Its position in the room—near this wall or that—will often affect strength of results.

The direction in which its windings lie is of great importance—they should point in the direction of the desired station.

The windings themselves should not be used as handles, as they stretch easily, and their spacing is important.

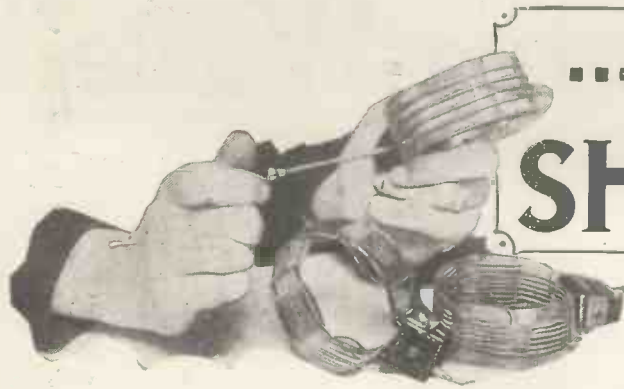


occur only once during the evening's broadcasting.

The British transmission on a Sunday is probably the only one which is not completed with the words "Good-night," for there is always the epilogue to follow, an item that is very much appreciated by many listeners.

Recently the new Sottens station has been testing on 403 metres, but that wave-length was officially allotted to Berne. This latter station had a habit of closing down with the words—in the Bernese dialect—"Schlafet راحت wohl." Whatever the literal translation of this phrase may be, it certainly sounds as though the announcer wants his hearers to "Sleep right well."

THE POWER THEY USE					
Berlin 1.7 Kw. <small>Witzleben</small>					Moravska Ostrava 11 Kw.
Budapest . . 23 Kw.	Heilsberg . . 75 Kw.	Hilversum . 8.5 Kw.	Ljubljana . . 2.8 Kw.		Paris 15 Kw. <small>Biffel Tower</small>
Cologne . . . 1.7 Kw.					Paris 17 Kw. <small>Radio Paris</small>
Cracow 1.5 Kw.					Rome 75 Kw.
Daventry . . 35 Kw. <small>5 X X</small>					Toulouse . . 8 Kw. <small>Radio</small>
Dresden . . . 3 Kw.					Turin 8.5 Kw.
Genoa 1.5 Kw.					Vienna . . . 20 Kw.
Gleiwitz . . . 5.6 Kw.					Wilno 5 Kw.



... ON THE ... SHORT WAVES

By W.L.S.

"Anyone can make a detector, but can they make it detect? That is another matter." Thus writes our short-wave expert in this article which stresses the need for a good set design and deals with the question of small points which can mean so much.

As a regular writer of notes on short-wave subjects, it is natural that I receive plenty of criticism and expression of personal opinion from readers. One letter that recently reached me, however, gave me much food for thought.

O.K.—On Paper

The writer said, among other things, "Why keep introducing new short-wavers? The fundamental principles of all receivers must be the same—they must incorporate a detector valve and one or two stages of amplification—that is all one requires of a short-waver."

Now, on paper this sounds well enough. But, in practice, what a lot this estimable reader has left out! "A detector and one or two stages of amplification." That is easy enough. Anyone can make a detector, for instance. But can they make it detect? That is another matter.

Likewise, anyone can make an amplifier, but can they make it amplify? Pardon me if I appear to be humorous, but that is not my intention.

Surely, if everyone knew how to make a detector and an amplifier, and that were all that were necessary to make a good receiver, MODERN WIRELESS and other technical papers might as well go straight out of business.

An Impossibility

Examine any of the excellent sets brought out from time to time in MODERN WIRELESS, and you will find that the fundamental principles are the same. No one on the staff would deny it.

But as a matter of far more importance than the fundamental circuit of a receiver is the general arrangement of details. Under this heading comes the layout of the components, the values of the components, the

various little schemes perfected from time to time to give easier and better operation, and so on *ad infinitum*.

More particularly does this apply to short-wave receivers. Two people may make a "detector," as our reader so glibly says, but what will the results be like in the two cases? No one has yet made a 100 per cent efficient detector, and no one ever will; nothing on this earth, probably, will ever be 100 per cent efficient.

Thus the whole problem of receiver design turns into one of *efficiency*. And it is the small detail work that makes all the difference in this respect between one receiver and the next.

The Weakest Spot

I could enumerate hundreds of little tips that experienced short-wave designers incorporate in their

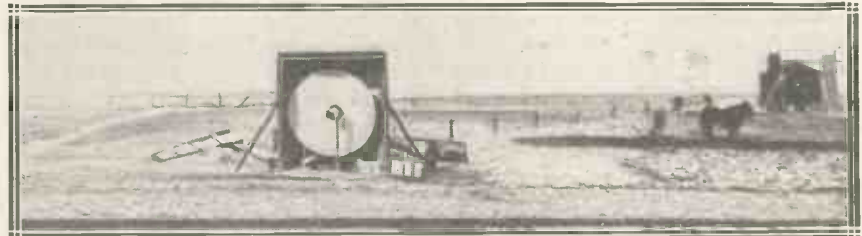
Unfortunately, the greater part of this weakness lies in the valve itself, and thus one's style is cramped at the outset.

Valve Noises

I refer to the annoying phenomenon of "valve noises." That gentle hiss that one hears just on the oscillation point may appear so trivial, yet it means so much. For as one piles on successive stages of amplification so that little hiss becomes greater and greater, and it is only when one gives a thought to the minute signals that may be weaker still and are never heard, because they are drowned, that one realises its importance!

I have already taken up much space (spread over seven years or so) in driving home the point that if one could detect a weak signal

CROSS CHANNEL ON AN 18-CENTIMETRE WAVE



Successful telephony tests were recently carried out on very short wave-lengths between Dover and Calais. The beam principle was utilised, and the reflectors, one of which is clearly to be seen in this photograph, were only 10 ft. high. It is claimed that owing to the extreme sharpness of tuning, many channels could be fitted into one small band, only a little power being required by the transmitter.

sets so automatically that they probably have forgotten their existence. It is possible that the short-wave novice has never dreamed that such small matters could make any difference to his set at all. But let him put his copy of MODERN WIRELESS aside, forget all that he has learnt from it, and try to build up his own short-waver from first principles, and then where would he be?

Personally, I am inclined to think that the detector is still the weakest spot in short-wave receiver design.

without any background noises one would have solved all the problems of radio! There would be no limit to the amplitude to which that signal could be brought up by means of amplification, which presents, by the way, fewer problems than detection.

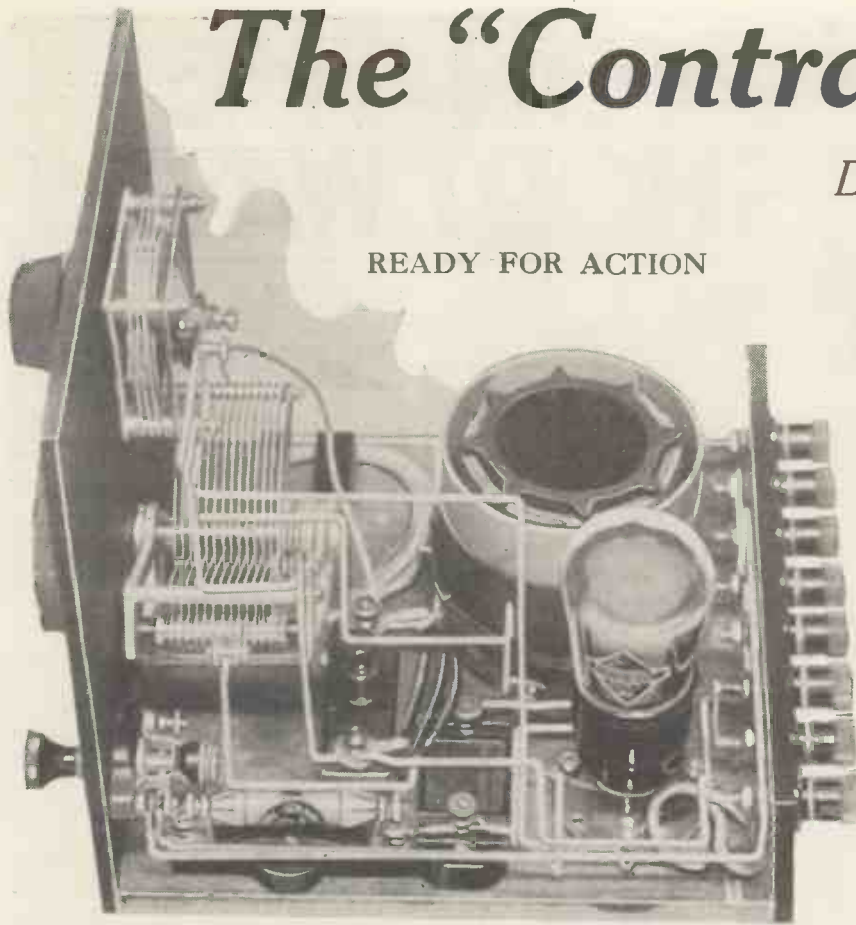
Thus we can do no more than concentrate on the efficient detection of our signals, and forget that for a while we are at the mercy of the research departments of the valve manufacturers.

For not all that noise is due to the valve itself!

The "Contra-Wave"

READY FOR ACTION

*Designed and Described
by the "M.W."
Research Department*



This is the output end. Note the Spaghetti resistance between the 'phone terminal and anode of the valve.

THERE are no doubt those who may imagine that a one-valver is an insensitive instrument and one that is suitable only for the reception of local stations. But probably such people think in terms either of crystal sets or of loud speakers.

Of crystal sets because they, too, necessitate telephone receivers; but a crystal detector can only rectify, whereas a valve can amplify as well; and amplify to very good effect when reaction is employed, as is invariably the case with modern valve sets of any kind.

Programmes in Plenty

In the case of a loud speaker, it must be admitted that a one-valver is seldom able to give satisfactory loud-speaker results even from a close-at-hand and powerful local station. But it should be remembered that there is a very great difference between the power necessary to operate loud speakers and that needed by 'phones.

An output sufficient for comfortable telephone receiver operation may not evoke even a whisper from a loud speaker. Now you all know how many

stations can be tuned in directly on the loud speaker on a good three-valve set. Given moderate local conditions forty or fifty programmes are sometimes available, although it must be admitted that, due to mush and heterodyne, it is seldom that they are all really worth listening to.

Anyway, you should be able to get with a one-valve set using telephone

receivers what you can with a three-valver and a loud speaker; and, moreover, you will find the reception cleaner, for the lesser amplification carries with it the distinct advantage that a quieter background nearly always results.

Those of you who have never roamed around the stations with 'phones have missed a fascinating and enjoyable experience. 'Phones are more intimate than the ubiquitous speaker, and they seem to bring you closer to both the spirit and life of broadcasting.

Selective, Too!

It is no exaggeration to say that the difference is startling, but the first essential is a really good one-valver; and this, at least, we are able to present to you in the design described in this and subsequent pages.

It is, indeed, a magnificent little design. Obviously it would be useless for distance if it were not selective, in view of modern conditions, but it attains a very high degree of selectivity for a set not employing H.F. stages. If you refer to the theoretical diagram you will see that it employs an "M.W." dual-range coil; and this, as those of you who have

WHAT YOU NEED TO BUILD IT

PANEL
7 in. x 7 in. (Goltone, or Peto-Scott, Lissen, Parex, etc.).

CABINET
Panel space 7 in. x 7 in., baseboard 7 in. deep (Pickett, or Camco, etc.).

VARIABLE CONDENSERS
1 .0005-mfd. (Burton, or Lotus, Lissen, Dubilier, J.B., Cyldon, Ormond, Igranic, Ready Radio, Formo, etc.).
1 .0001-, .00013-, or .00015- mfd. differential reaction (J.B., or Igranic, Ready Radio, Ormond, Lotus, Dubilier, Lissen, Cyldon, etc.).

ADJUSTABLE CONDENSERS
1 compression-type, max. .002 mfd. (Formo, or Polar, R.I., Lewcos, Lissen, etc.).
1 compression-type, max. .001 mfd. (Polar, etc.).

SWITCHES
1 3-point on-off wave-change (Wearite, or Ready Radio, W.B., Ormond, Magnum, Junit, Keystone, Bulgin, Red Diamond, etc.).
1 L.T. on-off (Lissen, or Igranic, Bulgin, W.B., Ready Radio, Benjamin, Lotus, etc.).

RESISTANCES
1 25,000-ohm "Spaghetti" type (Magnum, Ready Radio, or Lewcos, Bulgin, Sovereign, Graham-Farish, etc.).
1 10,000-ohm ditto.
1 2-meg. grid leak and holder (Graham-Farish, or Dubilier, Ferranti, Telsen, Ediswan, Lissen, Igranic, Mullard, etc.).

VALVE HOLDERS
1 4-pin (Clix, or Lotus, Telsen, Benjamin, W.B., Igranic, Lissen, Bulgin, etc.).

FIXED CONDENSER
1 .0003-mfd. (Dubilier, or Telsen, Lissen, Ready Radio, T.C.C., Ediswan, Igranic, Ferranti, Formo, Mullard, Graham-Farish, Sovereign, etc.).

COIL
1 "M.W." dual-range (Goltone, or R.I., Ready Radio, Formo, Wearite, Keystone, Magnum, Tunewell, Parex).

MISCELLANEOUS
1 vernier dial if required.
8 terminals (Igranic, or Clix, Eelex, Belling and Lee, etc.).
1 terminal strip, 7 in. x 2 in.
Screws, Glazite, flex, 2 oz. of No. 30 D.S.C. wire, etc.

One-Valver

A simple, selective and sensitive receiver with which you will be able to pick up programmes from all over Europe. It incorporates both the Contradyne and the "M.W." Interwave system of long-wave coupling.

knowledge of the component will admit, is a good start for any set.

In addition, there is a series condenser in the aerial circuit which provides an efficient selectivity adjustment.

The "M.W." Interwave system comes into action on the long waves, to which you can switch over by means of a simple panel switch.

Long-Wave Efficiency

The Interwave coupling, in which the .002-mfd. compression-type condenser and 25,000-ohm resistance figure, functions only on the long waves, and its main purpose, besides providing an effective coupling between the aerial circuit and the grid circuit, is to eliminate that breaking through of medium-wave stations while you are endeavouring to tune in long-wavers, which is a very common complaint in sets of ordinary design.

The "M.W." "Contra-Wave" One also embodies the Contradyne scheme; and this, too, is concerned only with the long waves. A simple hank-wound coil is switched into circuit, and this loads the aerial and



Many a fascinating evening can be spent with this little set touring the Continent, pulling in programmes from Motala to Madrid, from Britain to Belgrade. It is a wonderful little space shatterer.

greatly increases the efficiency of reception of stations such as 5 X X, Motala, Radio-Paris, etc., etc., as well as joining with the Interwave in suppressing any medium-wave tendency to break through.

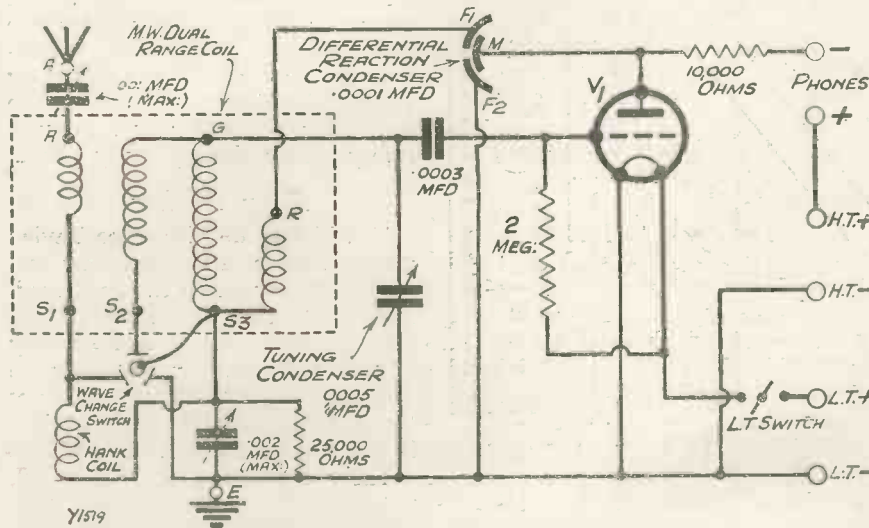
Smooth, yet virile reaction is essential for successful long-distance listening. In this set this is made certain by using differential reaction control in combination with an anode resistance that replaces the more expensive H.F. choke.

Those of you who build this set will find that over both wave-bands reaction is delightful to handle and is free from ploppiness or any other

fault tending to prevent it from pulling its full weight. Further, it will be found that it remains remarkably constant over the whole tuning range, and does not, in its turn, upset the tuning.

The "Contra-Wave" is easy to build and, for what it does, inexpensive. You will not find it temperamental; that is to say, if you adhere rigidly to specification you will get 100 per cent results, yet complete failure should not follow some slight accidental diversion. We have purposely developed the circuit on robust lines as is evident by the combination of Contradyne and Interwave.

IT INCORPORATES IMMENSE IMPROVEMENTS



The "M.W." dual-range coil, Contradyne and Interwave long-wave coupling, and differential reaction, are some of the fine features in this vigorous little set.

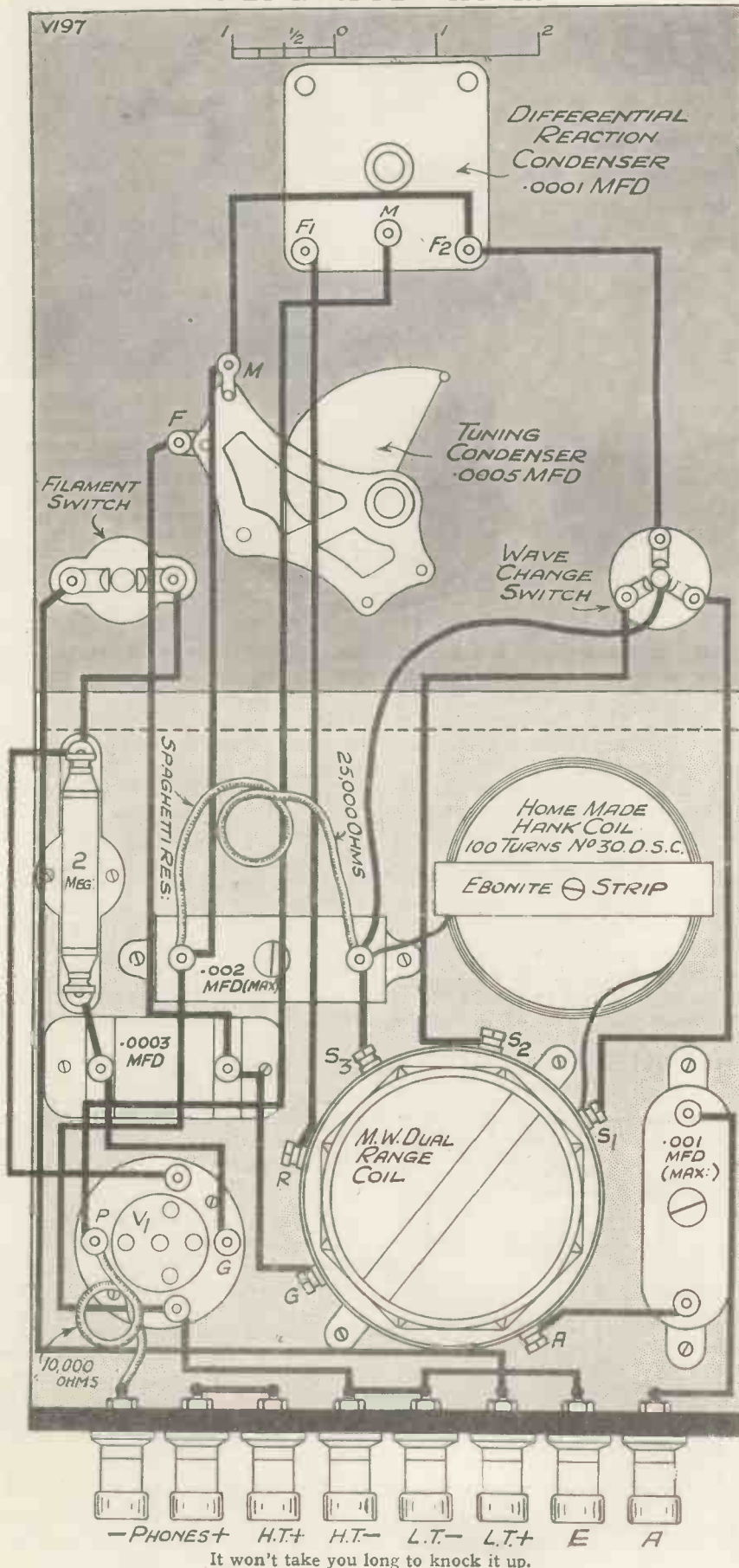
Buying the Parts

Now just a few words about the components. Don't be afraid to get a differential reaction condenser of the higher capacity, as .00015 mfd. is often better than .0001.

Do not use a smaller compression type variable than a .002 mfd. maximum for the Interwave, or the selectivity will suffer.

And here is a very important point. Four contacts figure in the wave-change switching, and you must have a switch having three separate springs and a plunger that is not connected in any way to any one of them. The wave-change operation depends upon the joining together of four points when the switch is in the one position and when it is in the other position, all these four points must be separated from each other.

BUILT IN A FEW HOURS



You will note that a three-point on-off wave-change switch is specified, but you yourself make the fourth point by soldering a lead to the metal plunger. For goodness sake do not get one of those double-pole types of switch, for it will be quite useless in this set.

Watch Your Coil

The only other component of a really vital nature is the "M.W." dual-range coil. You run a very grave risk of meeting trouble if you purchase a coil of unapproved make. As you will see, there are nine that are approved, but, additionally, there are many other makes, some of which sell at attractively low prices. Not all of these are inefficient, no doubt a few are excellent, but we can assure you that many cases have come to our notice where constructors have failed to get results simply because a badly-made dual-range coil was used.

Contradyne Construction

The home-made Contradyne coil is an entirely different proposition. Moderate variations from our original model do no cause serious trouble. It comprises 100 turns of No. 30 D.S.C. wire (2 oz. will probably leave you quite a bit over for your junk box). Wind the 100 turns in a close bunch around something having a diameter of 2½ in.

After having wound the wire in an ordinary hank, the coil can be secured by tying thread around it at three or four points. It is held to the baseboard by means of an ebonite strip with a screw in the centre. Failing ebonite, a small piece of hard wood will answer the purpose quite satisfactorily.

As an examination of the photographs and wiring diagram will show you, there is not much space to spare on the baseboard. The components are compact and efficiently positioned, so lay out the parts before you screw any one down, to make sure you have them properly placed.

Easy Wiring

You should do this after having mounted the panel components and screwed the panel to the baseboard. Make sure that the filament and wave-change switches are accurately centred. By the way, it may be necessary for you to cut away a little of the fillets from the side of the cabinet in order to clear these switches.

The wiring is quite straightforward, but there are one or two points that call for special care. For instance, there are three terminals on the

It won't take you long to knock it up.

A Revelation in One-Valve Receivers

differential condenser, and it is important that these should be connected in their correct order.

Some differentials have their terminals arranged slightly differently from the particular make used in our model, but invariably the terminal joined to the moving vanes occupies the central position between the other two.

Differentials That Aren't!

And that reminds us: there are some ordinary reaction condensers that have three terminals. Two of the terminals are joined to the one set of plates as a rule. Obviously, you cannot use such a condenser instead of a differential, but quite frequently constructors have tried to do so, with the inevitable result that their sets failed to work properly.

That a condenser has three terminals is no proof it is of the differential variety.

There are six terminals on the dual-range coil, and, needless to say, it is essential that these should be connected correctly. Therefore, it is just as well to start joining up these points in some methodical fashion, ticking off each lead as it is completed.

Wave-Change Switch

The plunger of the wave-change switch is connected to the S_3 terminal on the coil by means of a piece of flexible wire, and it is well worth while using wire of the stranded variety, such as a single length taken from ordinary twisted flex. Ordinary single-stranded wire is not likely to prove serviceable.

Make a good soldered joint right on the end of the wave-change switch plunger.

You have a wide choice of valves open to you, and among the 2-volters are some excellent detectors. This little set is far from being critical in regard to its valve, but you will probably get the best results with one of 10-15,000 ohms impedance.

The H.T.B.

Sixty volts H.T. will prove ample, and one of those small 10-, 15-, or 20-ampere accumulators will provide you with low-tension for at least a month per charge. If you do not happen to possess telephone receivers, you will find that quite good ones are available at 7s. 6d., and even cheaper than that at local radio stores; but

make sure that they are of the high-resistance variety—i.e. 2,000 ohms or so each earpiece.

Now and then low-resistance 'phones are offered, although admittedly not frequently; anyway, these are quite unsuitable.

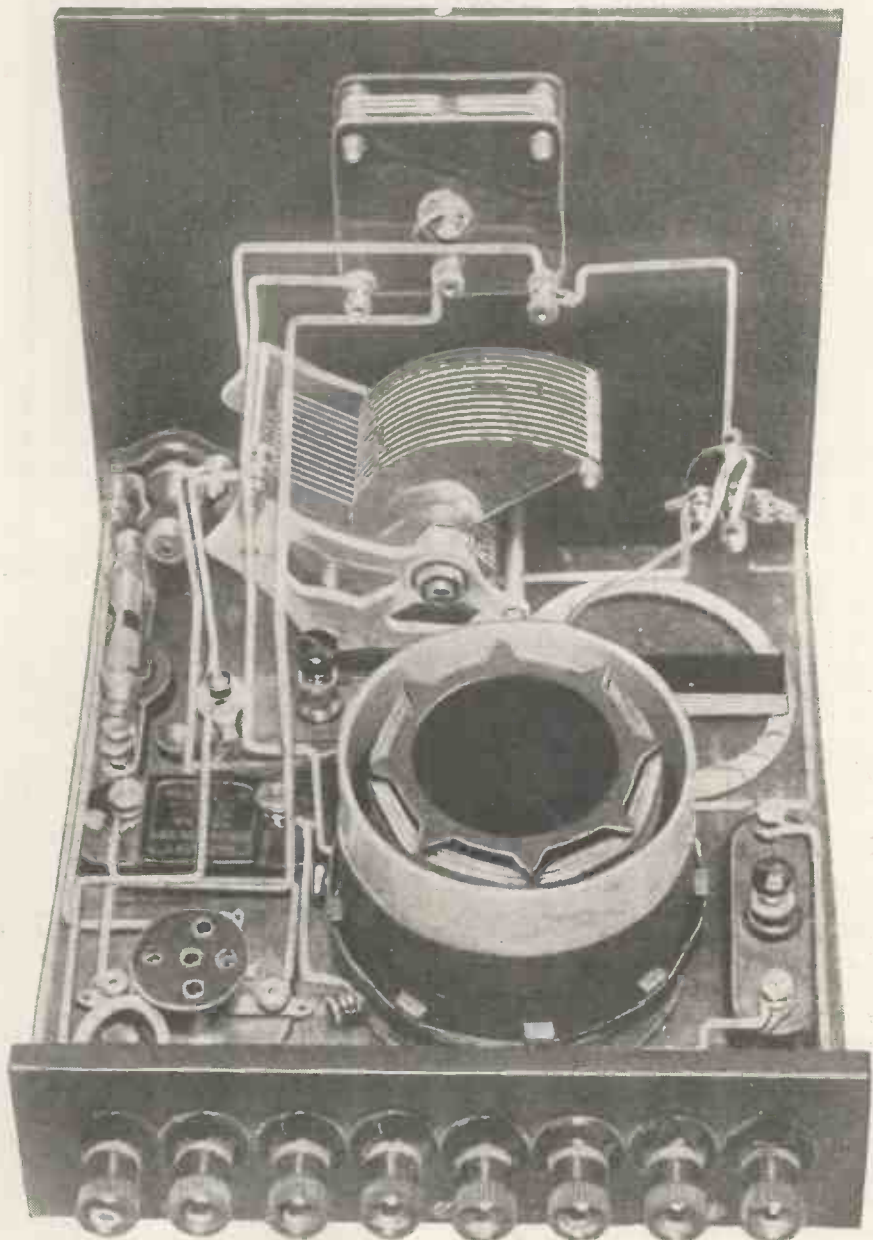
The .001-mfd. compression-type condenser gives you a selectivity adjustment on the medium waves, while the .002-mfd. compression condenser is in operation only when you are on long waves.

With the wave-change switch pulled out you are set for the reception of the Brookmans National, London Regional, Manchester, Newcastle, Daventry 5 G B, and other such stations.

Selecting Selectivity

Have the .001-mfd. condenser screwed right in for its maximum capacity if sufficient selectivity is obtained with such an adjustment, but ease it out if it is necessary on account of jamming.

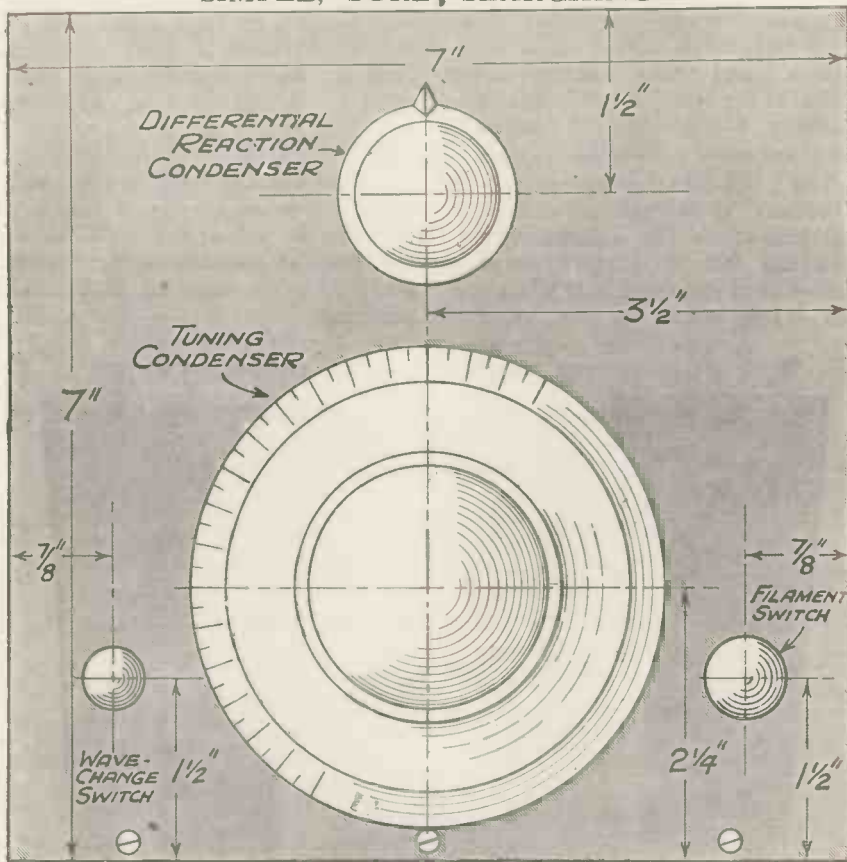
PACKED WITH PROGRAMME POSSIBILITIES



Though it's packed in tight, it is not difficult to construct, and you will find it the most efficient "one" you have ever handled. Its pulling power is marvellous and it will surprise you with its punch.

It's Easy to Find Those Foreigners

SIMPLE, SURE, SEARCHING



Y/520

PANEL LAYOUT

The nicely placed controls enable remarkable results to be obtained easily.

Once you have found the right position for your local conditions you should not need to refer again to this control. The same applies to the long-wave selectivity adjustment by means of the .002-mfd. compression condenser. Once you have adjusted this for your own particular circumstances, it, too, can "stay put."

Adjusting the .002

But it should be noted that maximum capacity with the .002 compression condenser which figures in the Interwave system provides the maximum selectivity for the long waves, and this is, of course, opposite to the .001 compression condenser which at maximum gives the least selectivity on the medium wave-band.

As you decrease the capacity of the .002 compression condenser so you decrease the long-wave selectivity, but do not forget that this condenser is right out of action on the medium waves.

Again, the .001-mfd. condenser differs in that it is in operation on

both wave-bands, although you should adjust this only for medium-wave selectivity. The other controls are quite normal, and they are so simple that they do not require detailed treatment.

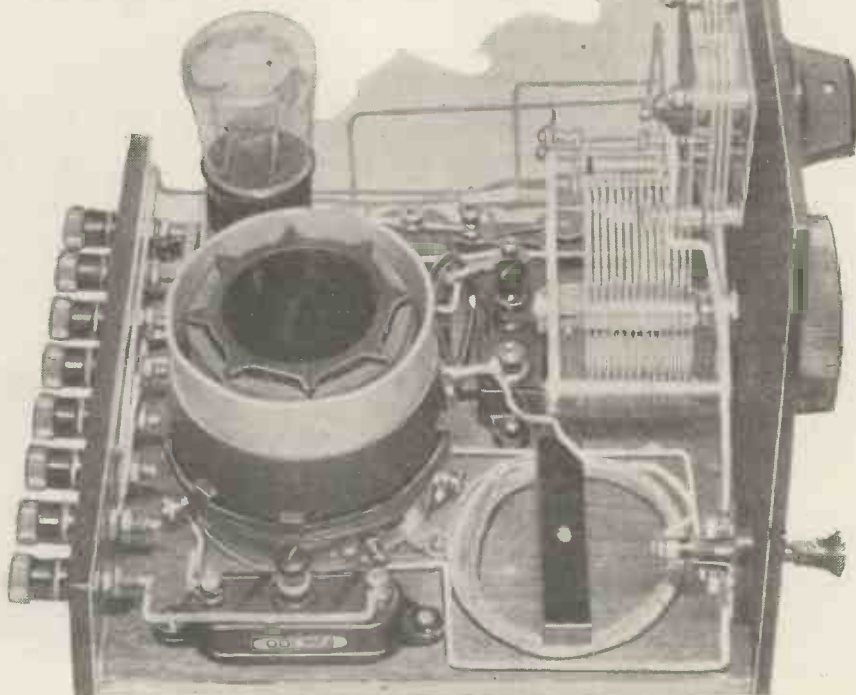
You search for stations with the tuning condenser, applying by means of the differential condenser sufficient reaction to bring the set to its maximum sensitivity, making sure that you keep just below the oscillation point.

A Final Hint

Handle these controls carefully and you will locate stations by the dozen. Move the tuning condenser dial slowly, and do not sweep it around expecting the programmes to leap in by themselves, as it were.

With a selective set such as this little one-valver, a quick movement over 15 degrees of the dial may jump through at least three stations that will remain quite unheard.

THE REASON FOR THE RESULTS



Here we see the why and wherefore of the fine results—the dual range coil and special long-wave coupling scheme.

MY BROADCASTING DIARY



Our own Broadcasting Correspondent records the progress of the British Broadcasting Corporation, and frankly comments on the policies in force at B.B.C. headquarters.

Interference Problems

SAVOY HILL is busy preparing for the great wave-length re-shuffle that will take place at Madrid next year. This will be a much more important affair than a conference of broadcasters.

Nearly all the civilised governments of the world will be represented, with broadcasters in attendance as expert advisers and assessors. The congestion of the ether in Europe is already a matter of considerable concern; by the time the conference assembles at Madrid it will be a matter of grave anxiety.

All the chief broadcasting systems are imitating the B.B.C. in the development of high-power transmitters, and experience so far points to the impossibility of satisfactory working of high-power transmitters on a separation of 9 kilocycles, which is what international agreement requires at present.

By next year I think it more than likely that listeners, both in this country and on the Continent, will be glad to accept fewer wave-lengths as an alternative to a continuance of chronic interference. But, of course, this sacrifice will entail a revision of regional broadcasting.

The B.B.C. and Canada

The B.B.C. has been wise to keep clear of the controversy in Canada about the future of broadcasting there. It would have been asking too much, however, to have expected the B.B.C. to swallow in silence certain remarks by the Director of Publicity of the Canadian Pacific Railway in a Canadian magazine.

It seems that the Railway Company fell back on the absence of direct reference to them to justify their innocence and ignorance. The B.B.C. appears to have accepted the disclaimer of the C.P.R., but were not altogether happy at the refusal of the railway to make any public statement.

With regard to the offending article, the B.B.C. statement revealed more

resentment than any other statement of the kind that has been issued from Savoy Hill. There were only eleven words in the rejoinder, and they were as follow: "The article is a unique combination of inaccuracy and of malevolence." The incident is by no means closed.

The Future of Belfast

There never was much chance of Ulster securing a twin-wave service from Belfast. For a time, however, it was felt that perhaps the Belfast station would be swallowed in the Regional Scheme, and Northern Ireland once more appended to the Scottish Region of the B.B.C.

But Mr. Beadle, the experienced and urbane director at Belfast, had so impressed the authorities of Ulster with the potentiality of broadcasting that now there seems no question of annexation to the Scottish Region. I anticipate the erection near Belfast of a new single-wave

REMEMBER THAT MURDER CHARADE?



Mr. Frank Wells (left), who is the son of H. G. Wells, with Mr. Harold Warrender. Most of you will no doubt remember them in connection with the "Anchor Mystery" which was recently broadcast.

Latest News Items for the Listener

high-power transmitter that will work on one of the best of the medium waves.

True, Ulster will not get its own alternative service and will have to rely for an alternative on the long-wave Daventry station. On the other hand, I have no doubt Mr. Beadle will turn out a first-rate programme on his single wave.

Black Lists of Artistes

A friend of mine who appears regularly in the B.B.C. programmes tells me that there is growing discontent in theatrical and musical circles about the new B.B.C. rule permanently black-listing certain artistes whose work has not been outstanding or whose conduct has been particularly "trying."

PREPARING TO "STEP ON IT"!



Workmen cementing the gallery floor of the giant studio in the B.B.C.'s Portland Place headquarters.

I have been unable to discover from the B.B.C. whether or not such a black list is officially recognised. Something of the kind may be necessary, but, if so, it should be open to constant revision, not only to be just to artistes, but also to provide the best available material for listeners.

The Organ Question

The problem of what sort of organ should be installed in Broadcasting House has now arisen.

There is the "popular" view that the B.B.C. should acquire a big cinema organ, capable of huge volume of sound and specially adapted to light sentimental music. Others are working feverishly for a "chamber" organ of the kind already tried, and, finally, there are those who want a "musician's" organ, a really first-class instrument adapted to the full edification of the music lover. Which organ will win?

B.B.C. Finance

After all, the B.B.C. did not allow the incident of the opera subsidy to go by without exploiting it to ventilate the larger issue of the Treasury depredations on licence revenue. I have been wondering for the past two years why the B.B.C. did not push for more money.

Apparently they were merely awaiting a favourable opportunity. The situation would be much better for the broadcasting service if the present Treasury proportion (about half a million sterling) were halved.

The State would still derive substantial reward for safeguarding the monopoly, and broadcasting would acquire much needed additional funds. Nor would there be any serious opposition in Parliament, because, after all, licence revenue is not a form of "public funds."

Sir George Henschel

That veteran conductor and composer, Sir George Henschel, who recently reproduced in a B.B.C. studio the same concert he conducted in Boston half a century earlier, will take another concert, including a Brahms Symphony, later in the year.

"Krassin Saves Italia"

This play, which was postponed at the last minute during the attacks on the B.B.C. for "Bolshevist" tendencies, has not yet reappeared in the programmes. No information is vouchsafed at Savoy Hill, but my impression is that the postponement really meant cancellation.

If this is so, it is a great pity. The play has real dramatic value, and is a fair chronicle of an historic occasion. Incidentally, not to put it on is a tacit admission that it should not have been accepted or prepared. The B.B.C. would be well advised to revert to its traditional policy of sticking to its guns on matters like this.

British Dance Music

Many wild charges are being made against the B.B.C. for broadcasting only American dance music. So far as Jack Payne and his orchestra are concerned (and they supply the bulk of dance music) the fact is that on the average one tune in three is British, and that in many programmes the percentage is fifty-fifty.

Apparently the view accepted in professional circles is that on a basis of impartial selection, on merit only, British tunes hardly secure more than one place in ten. If this estimate is correct, then the B.B.C. is well on the right side.



AT YOUR SERVICE



by
**OUR TRADE
COMMISSIONER**



Home-Made Static

ON looking through the latest catalogue of Dubilier Condenser Co. (1925), Ltd., I notice that in addition to all their usual lines—condensers, resistances, wave-traps, etc.—there is an interesting little anti-interference unit specially designed for the suppression of interference with radio receivers due to motors, electric fans, etc.

In the text describing the little unit I note that Dubilier's say they specialise in overcoming interference of this type, and have standardised a wide variety of anti-interference units and filters overcoming such troubles, so readers who are worried by interference noises which can be traced to disturbances arising from nearby electric motors, refrigerators, electric fans, violet ray and other similar apparatus, should write for particulars to the Dubilier Co. at Acton for particulars of filters to meet any "get-at-able" case.

I say "get-at-able" because obviously you cannot employ any filter to stop noises due to electric trains, trams, etc. These noises have to be stopped at the source, and it is only in cases of particular motors or pieces of apparatus causing the trouble that these filters will be of use. There are many cases, however, of small local engineers causing trouble where the owner of the plant which is creating the disturbance would be only too willing to apply one of these little units if you will tell him what to do.

Cutting Out Interference

As if to emphasise the importance of getting rid of electrical interference at the source, I have also just had a communication from Messrs. Philips, in which various experiments are described, tests being carried out with an idea of finding exactly what

Here is some varied news of the trade that should interest all readers, whether or not they are connected with the radio industry. Manufacturers, dealers, home constructors and general readers are invited to send items of interest to be included under this heading.

this man-made static—as it is often called—really is.

We all know what the symptoms are—buzzings and cracklings in the loud speaker, and very often we are tempted to attribute it to a fault in our own receivers. Actually such interference may have its origin far from the set, in a bad electrical

contact, loose contact spark, bad switches, the selector disc of an automatic telephone, electric bells, trams, etc.—all must be regarded as interfering transmitters liable to cause ether surges which can spoil radio reception over a radius of several hundred yards.

Waves That Wander

Owing to recent discoveries such interference is supposed to be caused by what are known as transient waves, and it has been discovered that these waves, which are often the cause of burnt-out transformers and cables, have the same characteristics as

NEXT SEASON'S RADIO SECRETS



The Radio Trade Exhibition opens in London this month, though the public will not be let into the secrets shown there until September 18th, when the annual National Radio Exhibition commences. Above is a scene at one of our exhibitions, when Mr. V. Z. Ferranti, Managing Director of the famous electrical firm, presented one of the Ferranti sets given away as prizes in connection with a popular competition.

Interfering Waves Wandering Along Water-Pipes

waves which are generated when a tight rope is struck sharply.

In this case the wave passes along the rope at a certain speed from the point of impact, and in many cases it is reflected when it reaches the end of the rope. The created wave passes backwards and forwards along the rope until it is exhausted. This is something like what happens when a transient wave comes into contact with any conducting surface.

It has been definitely proved that the electrical circuit causing interference not always reaches the radio

such cleaning up is in many cases extremely difficult to build, but the recent researches seem to emphasise the need for further investigation in this matter, and the question of fitting electric motors with such apparatus if the motors are capable of causing trouble to radio set owners in the vicinity.

The Latest Pye

From the stark crudeness of the radio set of a few years ago we have passed through various designs, especially in the case of portables, far more befitting the furnishing scheme of the average home.

A good instance is supplied in the new Pye Twintriple Portable, which can be obtained in all-electric or battery form, and which has set quite a new standard, not only in appearance but also in results.

Beautifully finished walnut comprises the case which holds the main chassis and the loud speaker, while the design, though unusual, is extremely attractive. So also is the Pye electric radio Console model and the all-electric radio-gramophone. This latter is a magnificent instrument which is also most impressive as a piece of beautifully designed and finished furniture.

The chassis method of construction, of course, is carried out throughout the Pye receivers, and there is no doubt that this method is rapidly making for more efficient and, at the same, time cheaper commercial radio receivers.

An Old Friend

Here is an interesting letter sent along by the Igranic Electric Co., Ltd. It was received by them from one of their satisfied customers living at Reigate. I will quote it in full: "Dear Sir,—In a recent article on modern radio components in MODERN

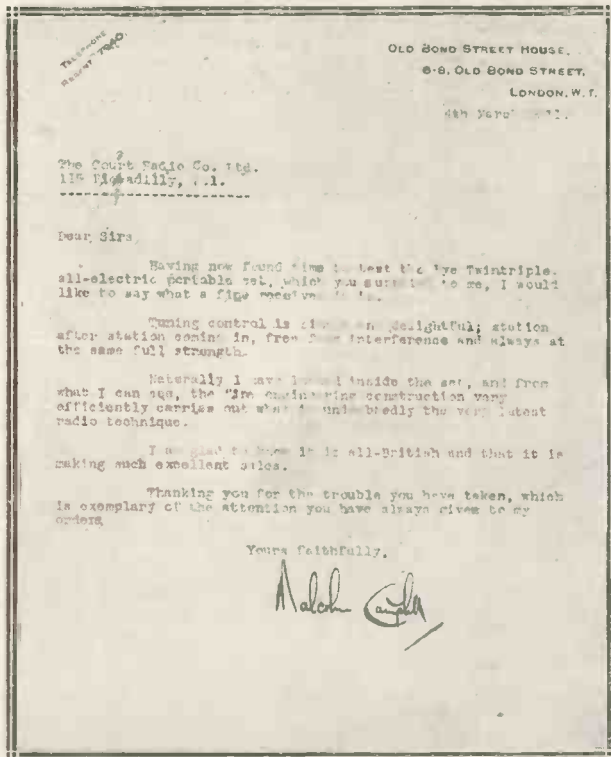
WIRELESS, the writer, in the course of his very interesting article, referred to transformers and stated that this component of four or five years ago was a crude affair, and went on to give what was no doubt a very excellent reason for his statement. At the time of reading this article I was giving my set one of the periodical alterations, and I suddenly realised that my first-stage transformer was an Igranic which I purchased some six years ago, and I have used it consistently every since. As a very keen wireless man it has been put through very rigid tests, has been periodically revised and set up in other sets. Yours faithfully.—"

We are not surprised; the Igranic, of course, has always been excellent both mechanically and electrically, and this letter from a satisfied customer of theirs must be only one of thousands they receive during the course of a year.

Records from Slot Machine

The erection of the first automatic machine for supplying gramophone records was recently completed at a London picture theatre. The machine, which is the patent of a British firm, Filmophone Flexible Records, Ltd., carries 200 flexible coloured records. By means of a separate slot, boxes of gramophone needles can also be obtained.

THE SPEED KING'S CHOICE



This is a photograph of the letter sent by Capt. Sir Malcolm Campbell, holder of the world's land speed record, in reference to his Pye Twintriple Portable. The letter speaks for itself.

set by purely a wireless wave. It can travel—especially in town—along the network of electrical, gas and water mains. Sometimes interference is transmitted along the overhead telephone wires.

According to the latest discoveries it is the sharpest wave front that makes itself felt most, and radio interference is caused by the sudden change in the magnetic and electric fields of a receiving set. If this wave front can be smoothed by means of electrical apparatus the interference is sure to disappear. Apparatus for

NEXT MONTH

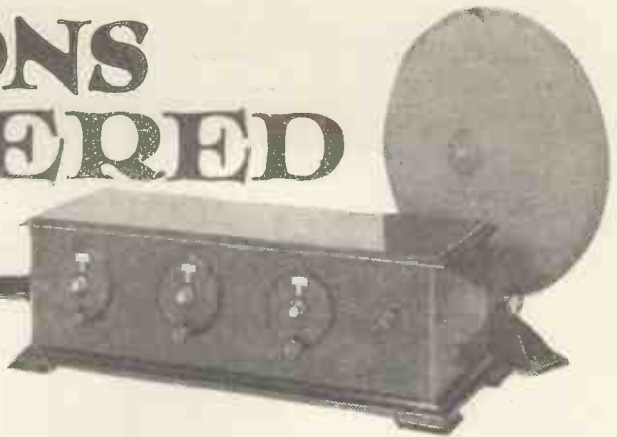
**AN INEXPENSIVE
MAINS UNIT WITH
METAL RECTIFIER
AND A TWO-VALVE
H.F. MAGNIFIER**

"MODERN WIRELESS"

On Sale May 30th. :: Price 1/-.

It is proposed to erect thousands of these machines outside theatres, cinemas, and gramophone dealers all over the country. I understand that those in front of the cinemas and theatres will give records of the two popular numbers being played at that moment, and the machine outside the dealers will be stocked with records of a few numbers which happen to be the most popular at that time. At the time of writing one of these machines can be seen in operation outside the Shepherd's Bush Pavilion.

QUESTIONS ANSWERED



Taking Voltage Readings

C. P. L. (Catford).—"I have just purchased a double-reading voltmeter so that I can test my L.T. and H.T. batteries. Is there any special way of carrying out these tests?"

The correct method is to take the readings *on load*. If batteries are tested on open circuit, i.e. when the valves are not switched on, the voltage readings are misleading. For instance, your L.T. battery may read 2 volts when actually it needs recharging.

Directly the batteries are called upon to supply their normal currents their terminal voltages drop to their proper values and a voltage measurement gives a true impression as to the state of the cells.

Take your readings after the set has been switched on for a little while.

As soon as your L.T. accumulator drops below 2 volts have it charged.

In the case of grid-bias batteries you can measure these at any time because no current is taken from them.

Power or Super-Power?

M. C. (Lee).—"I am desirous of using a super-power valve in my five-valve portable in place of the existing small power type, but I am rather doubtful about making the change on account of the increased anode current consumption. Do you advise it?"

Well, M. C., it depends upon the space available in your set. Assuming the receiver to be of the true portable type, it is highly probable that the only type of battery which can be employed is one with a comparatively small current output. If you insert a super-power valve in the last valve holder you will increase the current demand beyond the economical discharge rate of the battery and cause it to run down quickly.

Unless you are prepared to renew your H.T. at frequent intervals it

is inadvisable to employ a valve of lower impedance than the one you have at present.

Modifying a Mains Receiver

N. K. (Chiswick).—"I am interested in the 'Mains-Power' Three (December MODERN WIRELESS), but would like to add a second H.F. stage in order to get greater range and selectivity. Moreover, I wish to use a dry rectifier in place of the valve rectifier specified. Will you please state whether you think the additional H.F. stage could take the form of a separate unit?"

TECHNICAL QUERIES DEPARTMENT

Are you in trouble with your set?

The MODERN WIRELESS Technical Queries Department is in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical. Full details, including the revised scale of charges, can be obtained direct from the Technical Queries Department, MODERN WIRELESS, Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of MODERN WIRELESS should have these details by him. An application form is included which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay. Having this form you will know exactly what information we require to have before us in order to solve your problem.

London readers, please note: Inquiries should not be made in person at Fleetway House or Tallis House.

This is a good example of the type of query we are constantly receiving, and we would take this opportunity of stating quite definitely that "M.W." "all-mains" receivers *must* not be modified in any way if the maximum results are to be obtained. Mains designs, whether A.C. or D.C., have to be carefully worked out, and the final layouts are decided upon after weeks of experimenting by the "M.W." research staff. The only

way to ensure satisfactory results is to follow out our instructions in every detail. The addition of another H.F. stage to the "Mains-Power" Three is not advised and would produce instability and other troubles. The type of rectifier employed should also be the one specified in the article.

Reaction Troubles

H. M. (Lincoln).—"I have wound an "M.W." dual-range coil, carefully following the instructions given in the November issue. I cannot get satisfactory reaction effects, and would be grateful for any hints you can give me."

Unfortunately, you do not tell us which "M.W." set you are using, hence we are rather badly handicapped in advising you. However, here are some general hints which should enable you to locate the fault.

In the first place, when no reaction, or extremely erratic reaction, is obtained, a reversed reaction winding should be suspected if the coil has been wound in all other respects to our published specification.

In sets which employ a stage of resistance-capacity L.F. amplification following a detector valve, the value of the anode resistance should be checked up, because too high a value of resistance will produce poor, or even complete absence of, reaction effects.

In addition, a freely oscillating valve of the H.F. or special detector type should be used in the detector valve holder.

Another possibility is a faulty long-wave coupling compression-type condenser. These coupling condensers should have a maximum value of .001 or .002. It is pointed out that the use of a condenser of too low a capacity rating, or one that is in any way defective, will very seriously affect the working of the set on the long waves.

The differential condenser must be of good make, and have a capacity of .0001-.0002. In many cases faults have been traced to this source, and it has been found that the maximum capacity of the differential reaction condenser has been below .0001, and in consequence it has not been possible to obtain sufficient reaction.

In more than one case in which readers have complained of not being able to obtain reaction on the long waves we have traced the fault to a defective detector grid condenser, and in these instances it is interesting to note that the set has behaved normally on the medium wave-band.

Reaction troubles may also be caused by the use of a poor quality H.F. choke, in sets where an H.F. choke is used for reaction purposes.

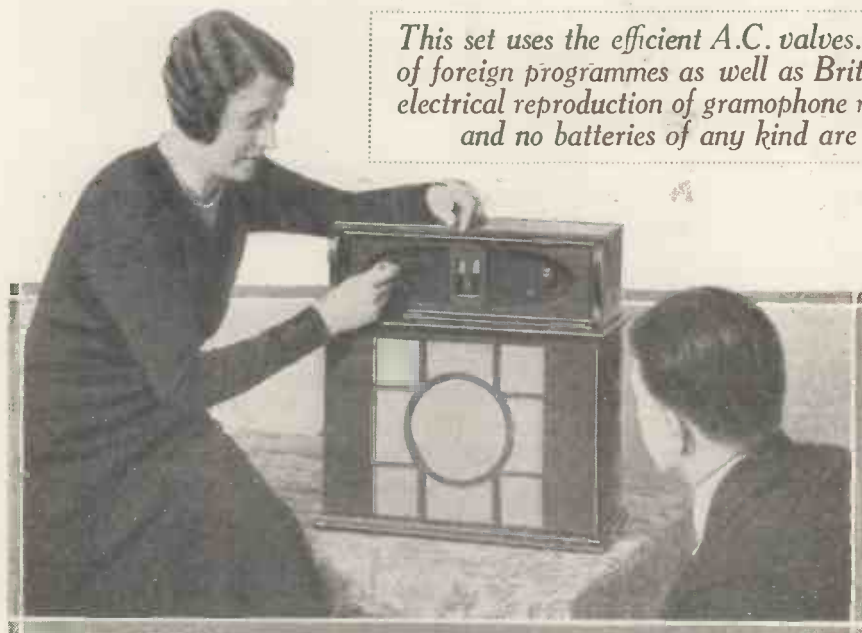
In all cases the value of H.T. which is applied to the valves should be carefully checked up, and the H.T. batteries, if of the dry cell or accumulator type, should be tested on load after the set has been working for a period.

All receivers of our design must be built exactly to our published specification if they are to give the results claimed. We are continually tracing causes of faults to bad wiring, failure to follow our instructions, and modifications to our published layouts, etc.

The "Modern Wireless"

Research Department Presents—

The



This set uses the efficient A.C. valves. It will give an amazing variety of foreign programmes as well as British, and it also has provision for electrical reproduction of gramophone records. Quality is irreproachable, and no batteries of any kind are employed—a real super set!

For all its long range the set is a very easy one to handle.

To the listener who lives in a small house or flat the ordinary radio set is probably very nearly as much of a nuisance as it is a blessing. To have a set with its batteries and wires trailing about, and its loud speaker perhaps placed some way away from the set, is not always convenient, and yet in many cases it is a necessity owing to the particular design of a room.

Ideal Type of Set

Such a set and speaker arrangement is often difficult to keep clean, and the

speaker and set are liable to be knocked about and sometimes seriously damaged.

"Oh," you may say, "it is quite easy to put the set and the loud speaker and batteries or mains unit in a cabinet, or to place it somewhere where doors can be shut to protect it when it is not in use." That may be so in some cases, but is it not much more convenient in many more instances to have the set completely self-contained with the exception of aerial and earth and some power leads which enable it to be connected

up to the electric light supply?

Obviously for the man who wants his radio set to be as inconspicuous as possible this type of receiver is ideal, and undoubtedly the best form of self-contained set, both from the point of view of performance and compactness, is the all-electric A.C. variety. And this is the type of set which we are describing in these pages.

Surprising Magnification

As you will see from the photographs, the whole outfit is housed in quite a moderately-sized cabinet, with the panel and controls at the top and the loud speaker underneath. No external connections of any sort other than those for the mains supply, aerial and earth and pick-up leads (if desired) are required. The use of A.C. valves enables surprising magnification to be got out of the set, and though only three valves are employed (not counting the rectifier, of course) loud-speaker reception is possible with a decent aerial and earth from something like a score or more stations.

Naturally we have included in the design the "M.W." dual-range coil, and Interwave coupling for the long waves, while a .0005-mfd. variable

THE PARTS NEEDED TO MAKE THIS FINE RECEIVER

PANEL

- 14 x 7 in. (Keystone, or Goltone, Lissen, Parex, etc.).

CABINET

- Camco "Nustile."

VARIABLE CONDENSERS

- 2 .0005-mfd., with drum control (Cydon, or J.B., Polar, etc.).
- 1 .0001-mfd., or over, differential reaction (Lotus).
- 1 .0005-mfd. Brookmans type (Ready Radio).

ADJUSTABLE CONDENSER

- 1 .002-mfd. max. (Formo, or Polar, Lewcos, Sovereign, etc.).

SWITCHES

- 2 3-point push-pull wave-change (Ready Rad'co).

RESISTANCES

- 2 25,000-ohm "Spaghetti" (Magnum, Lewcos, Sovereign, Bulgin, Ready Radio, Keystone, Graham-Farish, etc.).
- 1 1,000-ohm potentiometer (Ready Radio, etc.).

- 2 1,000-ohm "Spaghetti" (Lewcos, etc.).

- 1 2-meg. leak and holder (Lissen, or Graham-Farish, Dubilier, Telsen, Ediswan, Igranac, Ferranti, Mullard, etc.).
- 1 .25-meg. ditto (Dubilier, etc.).
- 2 600-ohm and holders (Ready Radio, or Wearite, Magnum, Keystone, Parex, etc.).
- 1 20,000-ohm potential divider (Wearite, or Climax, etc.).

VALVE HOLDERS

- 2 horizontal-type 5-pin (W.B. and Parex, or Bulgin, Lotus, etc.).
- 1 5-pin ordinary (W.B., or Lotus, Telsen, Clix, Igranac, etc.).
- 1 4-pin ordinary (W.B., etc.).

FIXED CONDENSERS

- 1 .01-mfd. (T.C.C., or Dubilier, Formo, Filita, Ferranti, Lissen, Hydra, Mullard, etc.).
- 1 .001-mfd. (Dubilier, or Telsen, Ready Radio, Ferranti, Mullard, Ediswan, Igranac, Sovereign, Graham-Farish, Formo, etc.).
- 1 .002-mfd. (Sovereign, etc.).
- 1 .0003-mfd. (T.C.C., etc.).
- 5 2-mfd. (T.C.C. and Lissen, etc.).
- 2 .5-mfd. (T.C.C., etc.).
- 3 4-mfd. (T.C.C., etc.).

CHOKES

- 2 H.F. (Telsen and Ready Radio, or Varley, Lewcos, Keystone, R.I., Lissen, Dubilier, Lotus, Igranac, Wearite, Magnum, Parex, Watmel, etc.).
- 1 output choke (Igranac, or R.I., Ferranti, Bulgin, Wearite, Lissen, Magnum, etc.).
- 2 smoothing chokes (R.I., or Igranac, Varley, Wearite, etc.).

TRANSFORMERS

- 1 L.F. (Igranac, or Ferranti, Lewcos, Lotus, Varley, R.I., Mullard, Telsen, etc.).
- 1 mains (Wearite, or R.I., etc.).

COILS

- 2 "M.W." dual-range (Formo, or Goltone, R.I., Keystone, Ready Radio, Wearite, Magnum, Tunewell, Parex, etc.).

MISCELLANEOUS

- 1 standard screen (see text).
- 1 pick-up jack, "single circuit closed" (Lotus, or Igranac, Ormond, etc.).
- 1 terminal block (Belling & Lee, etc.).
- 2 safety plugs and sockets (Belling & Lee, or Igranac, Eolex, Clix, etc.).
- Flex, Glazite, screws, copper foil, etc.

"M.V.W." Three

For Mains-Valve Working

condenser of the solid dielectric type, which is placed on the left of the panel, enables selectivity control within very fine limits to be carried out on the short waves. By the arrangement of a small piece of copper foil joined to the fixed vanes, and protruding over them at one corner of the condenser, one is enabled to short-circuit this condenser quite automatically by turning it to the minimum position when one wants to listen on the long waves.

If you study the theoretical circuit you will see that an A.C. screened-grid valve, detector and output valves are employed, with half-wave rectification, giving an output which is perfectly smooth, and with adequate anode voltage and current for all three valves employed.

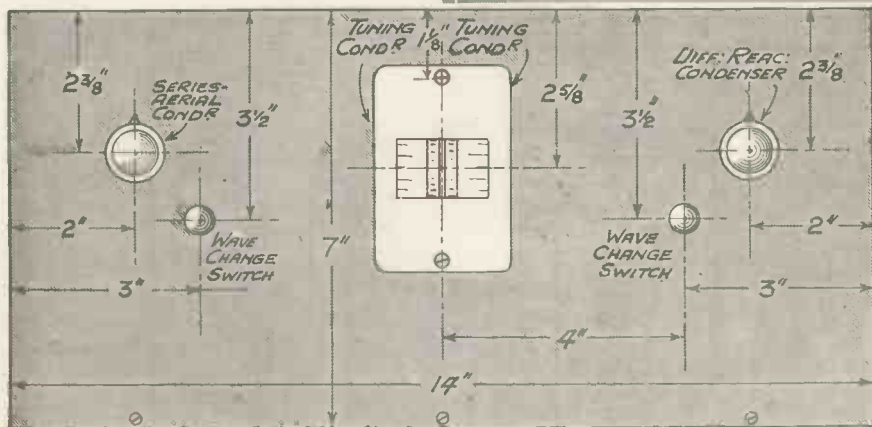
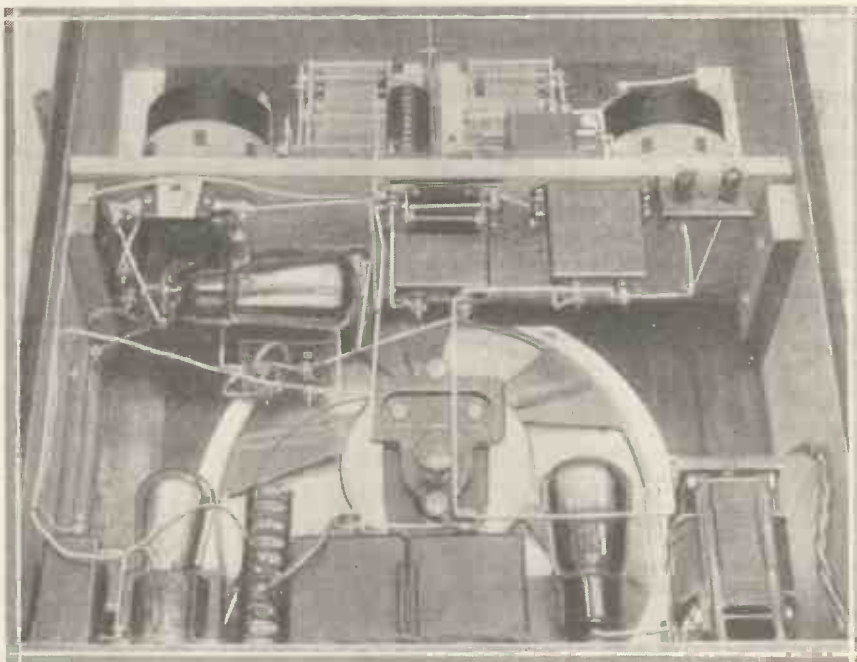
No G.B. Batteries

Automatic bias, of course, is employed, and a pick-up jack enables electrical gramophone reproduction to be carried out if desired. The actual construction of the receiver is not difficult, provided one goes fairly systematically about it, but owing to the scant space at our disposal the components have to be packed in

vignette at the top of the cabinet, giving altogether a very pleasing appearance. The panel drilling should be carried out exactly as shown in the drilling diagram, otherwise you may

on both sides; that is to say, a number of the components comprising the H.F. stage of the set are mounted on the top of the baseboard, while the detector and part of the de-coupling com-

PACKED WITH PROGRAMMES



Although it all "packs away" very nicely, the set is not at all difficult to make. The method of mounting the shelf is shown above, while to the left is a diagram of the drilling dimensions.

ponents are mounted underneath the baseboard. The remainder of the L.F. portion and the mains unit are mounted below in the bottom of the cabinet on a further baseboard. This arrangement will be made clear from the photographs of the back of the set.

The top baseboard and panel rest on a couple of fillets screwed into the side of the cabinet 7 in. from the top. It is best to wire up the upper baseboard first before doing the bottom of the set. The mounting of the components on the panel and on the top of the baseboard is quite easy, though there are one or two little points which should be brought forward.

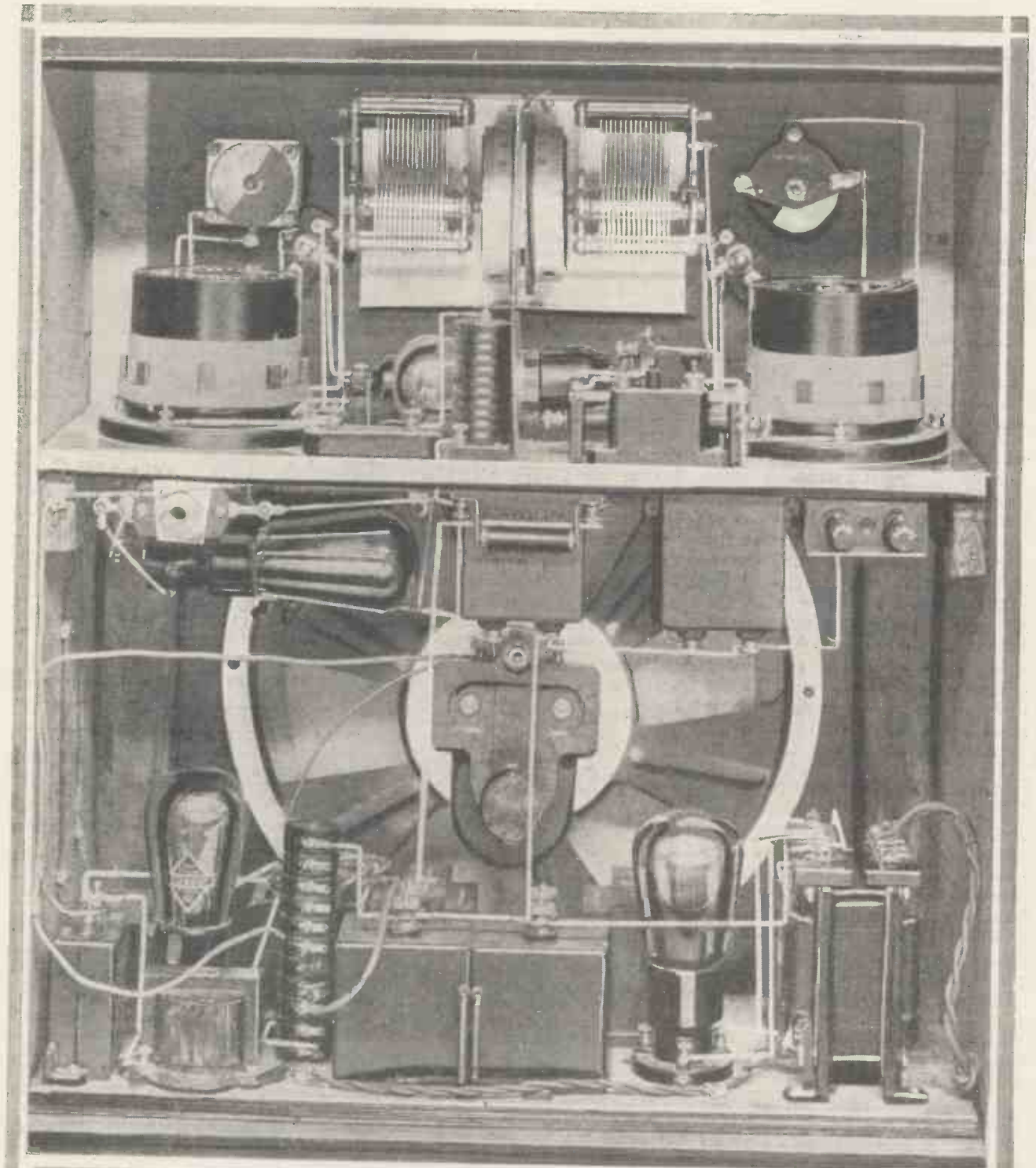
The first concerns the screen. This is an ordinary standard screen which

carefully and with due regard not only to the avoidance of interaction between various components and leads, but also to the accessibility of the wiring.

The panel is of the usual rectangular type, being 14 in. by 7 in., and this is placed behind an oval

find that some of the controls will foul the vignette when the panel is placed into position.

The usual controls are mounted on the panel, as shown in the photographs, and this and the components on top of the baseboard should be mounted first. This baseboard is used



HOW THE FINISHED SET LOOKS FROM BEHIND THE CABINET

This photograph, in conjunction with smaller ones and the diagrams, makes the general layout of the parts perfectly clear. Note the "M.W." dual-range coils flanking the drum-driven tuning condenser, and the way in which the flex is stapled securely to the baseboard

It's a Silky Set to Operate

Now a word about the heater wiring; be sure to leave enough twisted flex to enable you to wire up from V_2 to V_3 , which is going to be mounted on the lower part of the set.

It is essential, of course, to use twin flex for A.C. heater connections, in order to restrict the stray field which would be set up by the alternating current. If you use ordinary parallel wiring, then trouble will almost certainly ensue.

The Bottom Baseboard

Having wired up the top baseboard, above and below, you can now transfer your attention to the bottom part of the set, on which the power portion and the L.F. valve and its circuits are situated.

This part of the set can be wired up complete except for two or three connections that have to be made to the "top storey" as it were. These connections are specially labelled on the wiring diagram, and will be quite easy to follow. For instance, you will note there is one connection marked X, taken to one of the 4-mfd. condensers on the bottom of the set, and joined to the 5-mfd. condenser on the centre portion of the underneath of the upper baseboard.

Then, again, there are two points marked Y, one on the upper and one on the lower baseboard; these have to be joined together, but this can be done pretty well last of all, when the final stages of the assembling of the set are being carried out. The bottom baseboard is very easy to wire up, and the disposition of the components can be easily seen in the illustrations.

Loud-Speaker Connections

The condensers in the smoothing circuits should preferably be of the 200-volt type, as they will have to stand a working voltage of something like 150 or a little more, and it is well to be on the safe side. The loud speaker, of course, is connected between the terminal of the 2-mfd. condenser joined to the cathode of V_3 , and one of the terminals of the 2-mfd. condenser the opposite side of which is joined to the anode of the last valve and one side of the output choke. It will be followed more easily perhaps from the theoretical diagram.

The loud speaker is not placed between anode and earth, as is the case in ordinary battery sets, where

the filaments of the valves go to earth, but is taken between anode and cathode to a point on the cathode circuit where it is on the cathode side of the biasing resistance. If the loud speaker, of course, were taken to the other side of this resistance, then some of the L.F. fluctuations through the speaker would pass through the resistance and cause fluctuations in the grid bias applied to the last valve; obviously a very undesirable state of affairs.

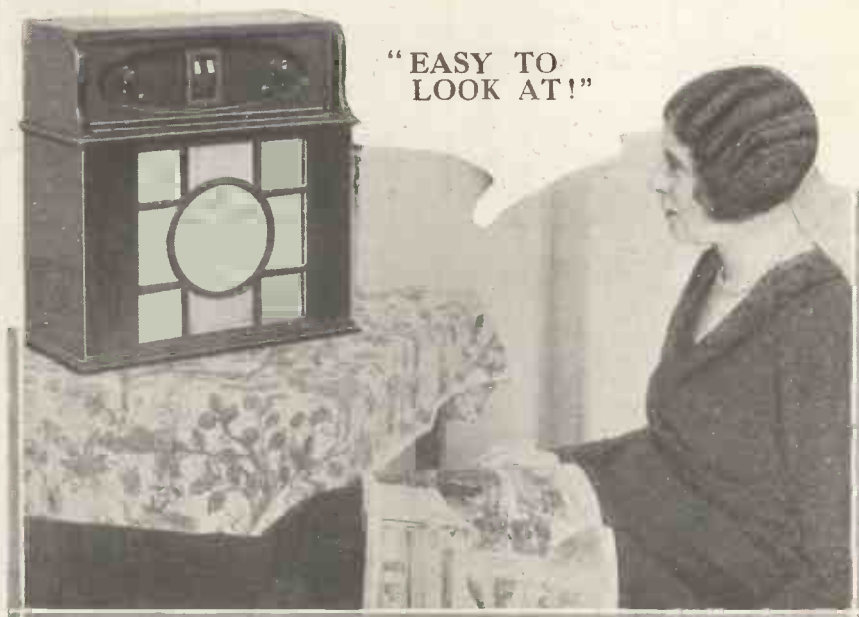
Owing to the fact that half-wave rectification is employed in the mains section of the set, quite simple smoothing can be carried out, while the 20,000-ohm potentiometer enables

speaker leads wired up to the two points we have previously mentioned.

Inter-Section Connections

The next step is to connect up the few points joining the upper and lower sections of the set, and to fix the heater leads between the L.F. valve on the bottom baseboard and the valves "upstairs." These leads, which consist of twin flex, can be wired round the edge of the cabinet and kept down by insulated staples; and, in fact, all flexible leads between the top and the bottom portions of the receiver should be kept out of harm's way in this manner.

The flex leads from the input of the



"EASY TO
LOOK AT!"

When an American wants to pay handsome tribute to appearance he says it's "Easy to look at!" We think that our readers will be in entire agreement here!

various voltage tappings to be made for different stages of the receiver.

The maximum H.T. voltage you will see goes to the output tap on the last valve, and also to the anode circuit of the S.G. valve. The detector and the screening grid of the S.G. valve are tapped off on the potential divider by means of crocodile clips on the flex leads coming from that particular part of the circuit of the valve concerned.

Having wired up the bottom part of the set, connect the speaker in position. This is very easily done by screwing the chassis unit, which in the original set was an Ormond, to the back of the baffle in the front of the cabinet. The bottom baseboard can then be placed into position and the

mains transformer to the electric light plug adaptor should also be stapled down, so that no strain is placed on the connections to the transformer when the flex outside the set is being handled.

Voltage Adjustments

Do not forget that the top of the potential divider is the negative side, and the bottom is the positive side, so that later on when you are increasing or decreasing your voltage on the screening grid of the S.G. valve or the detector you move the crocodile clip upwards to reduce the voltage and downwards to increase it.

As a start we would suggest that the crocodile clip containing the H.T. voltage on the detector be placed

A Set That Sets a Standard

half-way up, and that on the screened grid a couple of taps lower down, that is, a couple of taps giving more voltage.

Having fixed the loud speaker and connected the various stages of the set together in accordance with the wiring diagrams, be very careful to check over the wiring before you place the set in commission. After this you can insert the valves in their

amps. As regards the other valves, the following are considered suitable. The S.G. can be either one of these: Mazda A.C./S.G., Mullard S.4V.B., Cossor 41S.G., Marconi and Osram M.S.4, or the Six-Sixty 4Y.S.G.A.C., or the Eta D.W.2.

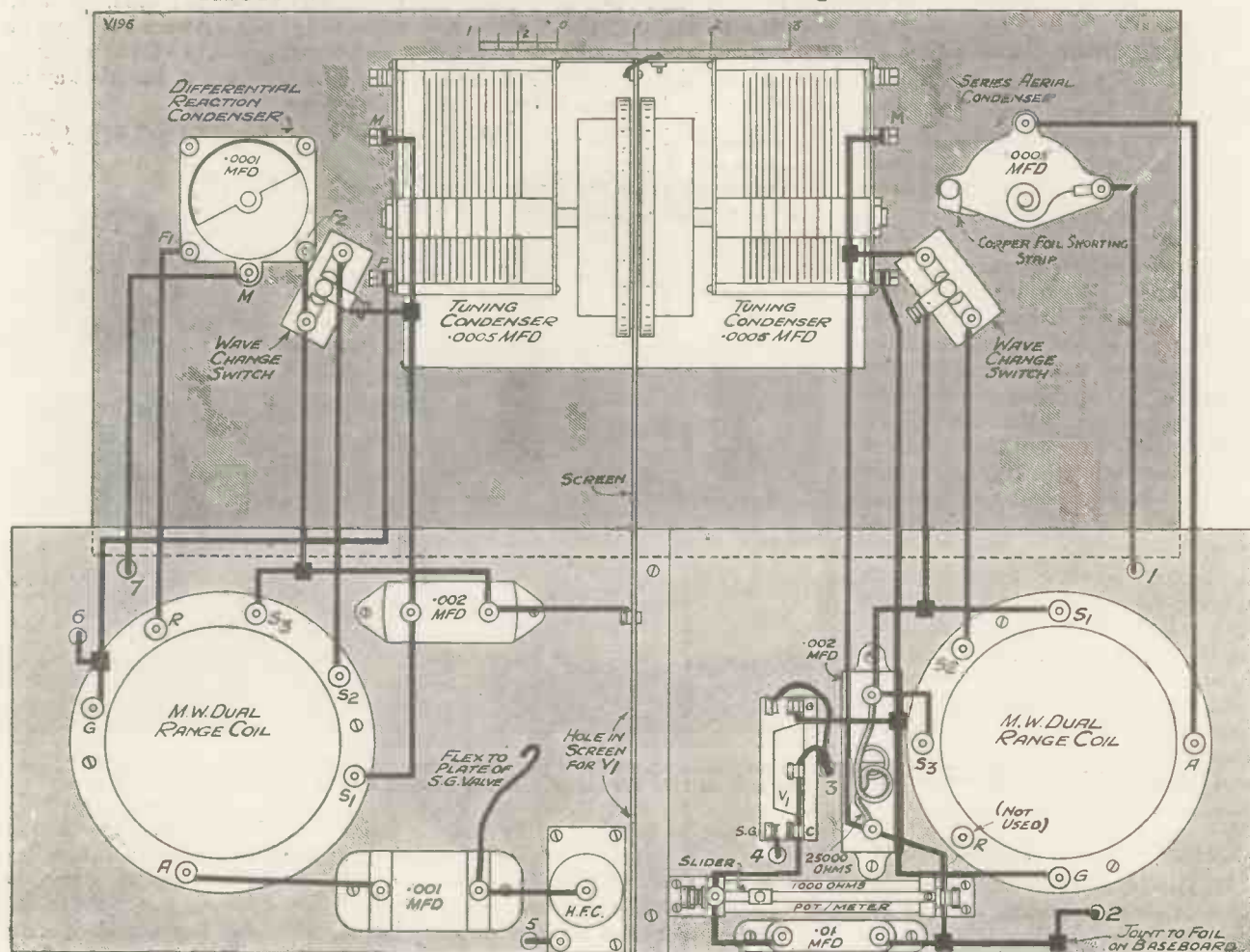
Bias for S.G. Valve

The detector valve should be either the A.C./H.L. Mazda, Marconi and

means of a 1,000-ohm potentiometer, used as an ordinary variable resistance, and placed on the upper baseboard close to the screened-grid valve holder.

In most cases this will give best results when the slider is half-way along the resistance, but you should try the set on a distant station and see where you get the best results, and then try it on the local station

HIGH EFFICIENCY ON THE HIGH-FREQUENCY SIDE



Everybody knows how efficiency is increased by adequate spacing and straightforward screening, and this part of the "M.V.W." Three is an excellent instance of skilled layout and spacing. Note how the holes are numbered to ensure easy wiring.

various positions and close the back of the set before switching on.

A Safety Tip

This is advisable, because on no account should you meddle with the inside of the receiver while the mains are on, otherwise you may get quite a nasty shock. The rectifier valve is the U30/250, a Mazda valve having a 4-volt filament taking 1 amp., and producing a D.C. output of 30 milli-

Osram M.H.4 or M.H.L.4, or the Mullard 354V., Cossor 41M.H.L., or an Eta valve of similar characteristics.

The L.S. valve should be of high-mag. type, such as the A.C./P., or the Mullard 104V. The M.L.4 is quite suitable, as is also the Cossor 41M.P. As automatic biasing is employed here, there is no need to worry about the biasing of any valve other than that of the screened-grid valve. This, you will notice, is biased by

to see whether you get equally good results.

Easily Adjusted

If the set does not seem to give best results on both distant and local stations, then it will be necessary to make a compromise, but you will not find this resistance adjustment very critical, and in five or ten minutes you will have it properly working.

Do not forget, of course, to disconnect

A "THREE-STORIED" SET

the mains every time you vary adjustments in the circuits.

Varying Selectivity

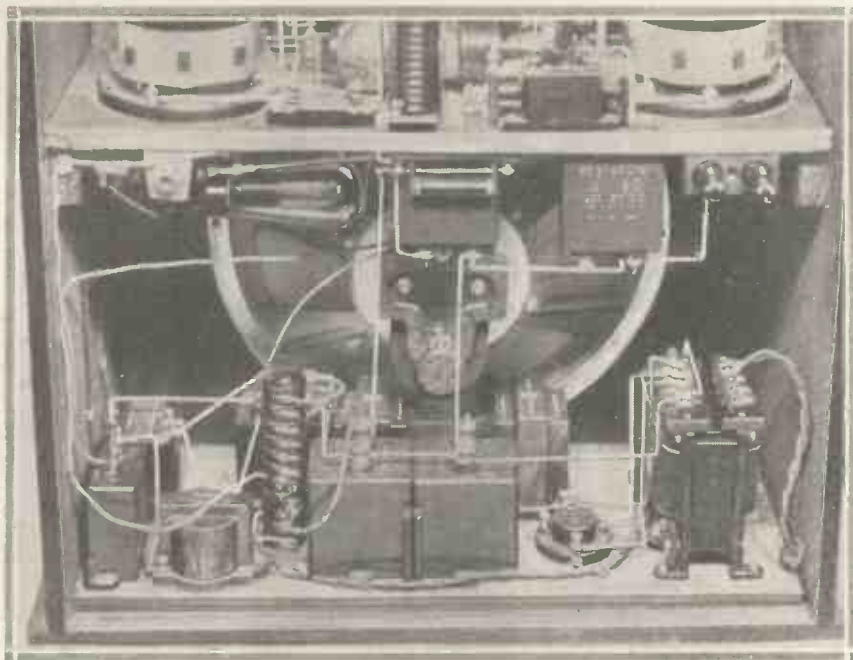
And now some details about the actual operation of the set. Before switching on, of course, you have to connect up the aerial and earth, and it is best to place the selectivity condenser on the panel about half-way in. Inside the set, near the dual-range coil in the first stage, you will find a compression-type variable condenser with a Spaghetti resistance across it. Place this condenser also about half "in" by screwing the knob hard to the right until it is right in, and then bringing it back a few turns.

This condenser is a special selectivity condenser for the long waves, and will make no difference at all to reception on the medium waves. It will, however, effect selectivity and, incidentally, signal strength on the long waves, but we will come to that a little later.

The selectivity variations on the medium waves are carried out on the series condenser on the panel, which we have already mentioned, and this is placed right over to minimum when you go over to long waves; and in that position the moving vanes make contact with the piece of copper foil connected to the fixed vanes, and the condenser is automatically shorted out.

The Tuning Controls

With the tappings on the potential divider as already mentioned, switch the set on and tune in the local station by rotating the two drum controls, which, of course, control the variable condensers on the panel.



The shelf at the top acts as a kind of double baseboard, carrying a layout on the upper and lower sides, as detailed in the diagrams.

These, of course, must be kept in step, in order that the set may be properly tuned in.

Do not forget that it will, perhaps, take a minute for the indirectly-heated valves to warm up, and you must not expect signals the very moment it is switched on. Then, having tested it on the local station, turn your attention to distant transmissions by using the reaction, and adjust the detector voltage so that the reaction control is perfectly smooth.

Here you will have to adjust inside the set and alter the position of the crocodile clip, which we suggested should be placed on a

tapping in the middle of the potential divider. Do not forget to disconnect the mains before you open the cabinet back, and to close it up again before you join up the mains to make a fresh trial.

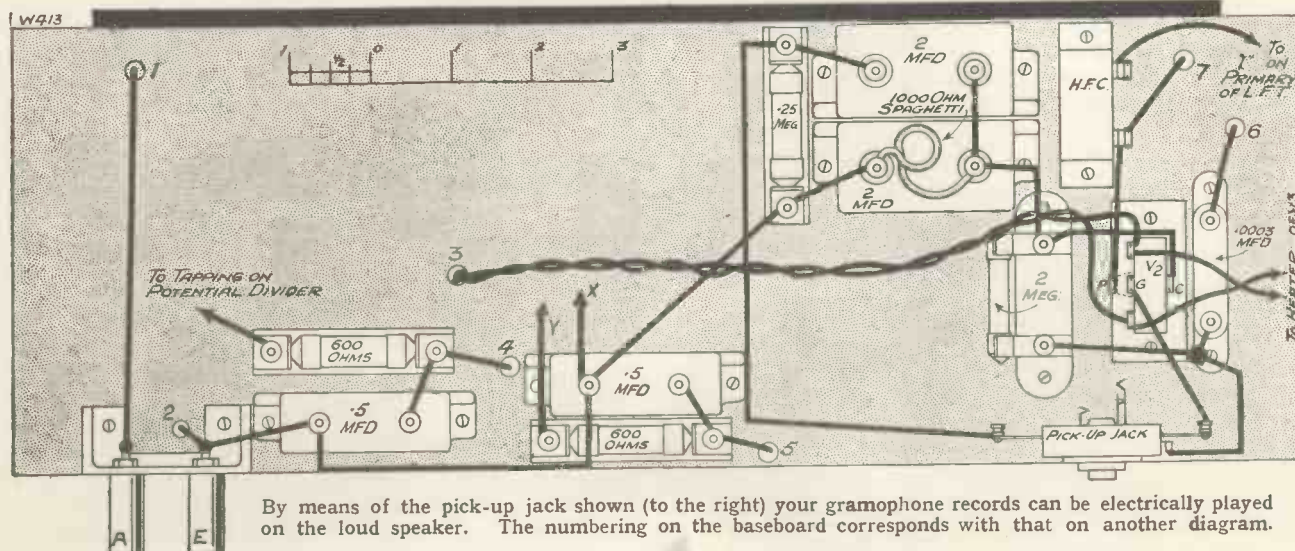
On the Long Waves

The final adjustment for long-distance working should be made by varying the tapping controlling the voltage on the screening grid of the S.G. valve.

Now, assuming that these tests have been carried out on the medium wave-band (that is, with the wave-

Continued on page 552.

YOU CAN USE IT AS A RADIO-GRAM!



By means of the pick-up jack shown (to the right) your gramophone records can be electrically played on the loud speaker. The numbering on the baseboard corresponds with that on another diagram.

By the
Technical
Editor

On the



marked on the case. Thus you can see at a glance whether or not there is "make-weight" to compensate against an early decline in voltage. Of course, in these Ediswans there is no such thing. "60 Volts, 40 Cells"; and that is exactly as it should be.

Magnascreens

For the straightforward screening of H.F. stages the constructor cannot do better than use the Magnascreens which are manufactured by Burne-Jones, Ltd. These are simple partitioning screens and, being made of heavy gauge aluminium, are unusually rigid.

Along the bottom is a series of slots which greatly facilitates the fixing of terminals. There are also perfora-

Spa Safety Aerial Fuse

THIS is made by S. G. Harmer & Co., Ltd., of Bolton, and though primarily a fuse, it also includes an automatic shorting arrangement. It is a well-made device, but we entertain doubts as to its weather-resisting qualities. We are, therefore, subjecting it to prolonged tests, and the results of these will be published in due course.

The unit is about the same size as a small H.T. battery and it is built into a neat metal case having a green crystalline finish. A stout connecting lead of adequate length is provided.

We very carefully tested this A.C.244 both on a screened-grid three and on a portable four-valver. The results given were completely satisfactory. The unit did not introduce any tendency to motor-boating and it was silent in operation.

For all the popular 2-, 3- and 4-valve sets, this latest Atlas product is as good as anything we have encountered.

New Atlas H.T. Unit

The latest Clarke's Atlas H.T. unit, the A.C.244, is a wonderfully attractive proposition. Conforming in every way with the Institute of Electrical Engineers' recommendations, and fully guaranteed for twelve months, this H.T. unit costs only 59s. 6d.

It has three tapings, giving 60 to 80 volts for a screened-grid valve, 90 to 100 volts for a detector, and 120 to 150 volts for a power valve.

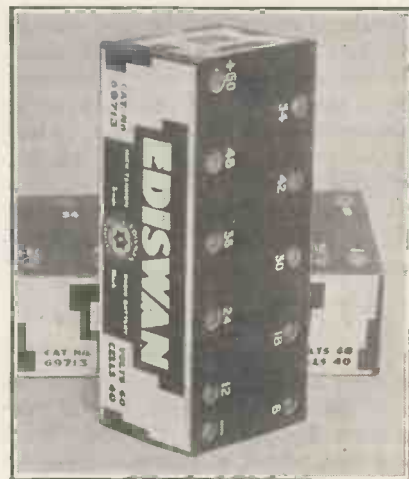
With a total current output of 20 milliamps., 120 volts pressure is registered. At 15 milliamps. the voltage rises to 150.

Ediswan H.T. Batteries

In the selection of H.T. batteries amateurs have little to guide them except the reputation of the makers. There is no short-cut for testing the merits of such an accessory. Indeed, the only real test that can be applied is a scientific discharge test. And that means you must exhaust the article before you can prove its efficiency!

However, Ediswan H.T. batteries have the advantage of an impeccable reputation behind them. Two 60-volters we recently had the opportunity of testing gave practical evidence of the reliability of such a guide.

A very notable feature of these batteries is that besides the voltage the number of cells in each is plainly



Two 60-volt Ediswan H.T. batteries.

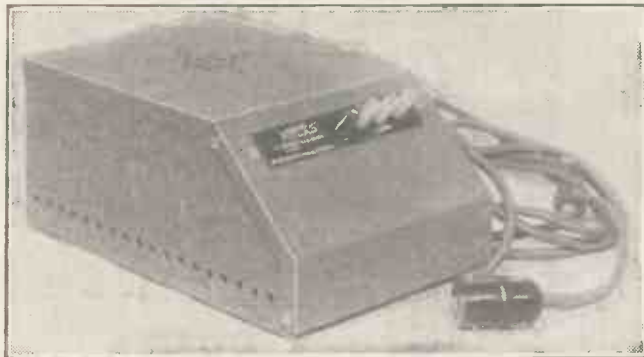
tions higher up for accommodating "through" leads.

These Magnascreens, as with all Magnum aluminium components, are given a sand-blast finish by means of special plant which Burne-Jones have just had installed.

Magnascreens are available in the following three sizes: 10 in. by 6 in., 9 in. by 6 in., 7 in. by 6 in., at 2s., 1s. 9d., and 1s. 6d. respectively.

An R.I. L.F. Transformer

The R.I. Improved G.P. Transformer represents Radio Instruments at their best, and that is saying a lot. Although it only costs 10s. 6d., it has a primary inductance of over 35 henries, and it can handle, without saturation, 5 milliamps., which is more than you meet in most ordinary L.F. stages, let alone detectors. It



A very good mains unit—The Atlas A.C.244.

Test Bench

This month we deal with Atlas, Ediswan, R.I., Magnum, Clix, W.B., and Heyberd products.

has the useful ratio of 1 to 3½, and it is fitted into a handsome bakelite case.

Tapped Mains Resistance

The Loud Speaker Co., Ltd., recently submitted one of their Enemains tapped resistances for D.C. mains. It is wound on slate and is tapped for 200-250 volts. It is designed for use in conjunction with two, three or four valves run from D.C. mains.

It is a useful component and D.C. mains enthusiasts will no doubt be pleased to hear about it. On test we



With this Improved G.P. Transformer, Messrs. Radio Instruments are catering for those who want reliability and inexpensiveness, combined with good characteristics.

found it answered its purpose admirably and ran without undue heating.

New W.B. Loud Speaker

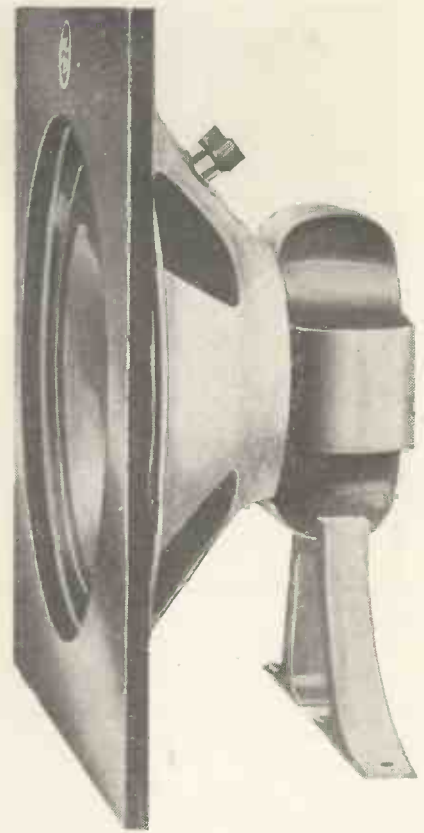
The moving-coil loud speaker which for so long could be enjoyed only by those having very deep pockets is now coming within the range of the ordinary listener. For instance, the new W.B. permanent-magnet moving-coil loud speaker, model P.M.2, costs only £4 10s.

It has a low-resistance winding, so that a step-down transformer is necessary, and this the makers can supply for 15s. extra.

The W.B. P.M.2 is very similar to the P.M.1 model introduced earlier in the season, but it employs a magnet of smaller dimensions. Nevertheless, by using a special cobalt steel in the magnet construction, and a small gap, an exceptional sensitivity has been achieved.

You can, in fact, work the P.M.2 with any ordinary set, for its sensitivity is of the order of that possessed by the most sensitive of ordinary electro-magnetic types of speaker, and its response is first-class.

The bass is clean and free from resonance and the high notes are full of attack. Altogether it is an accessory that the most discriminating listener should find distinctly pleasant hearing.



The P.M.2 W.B. Permanent Magnet Moving Coil Speaker.

Heyberd Block Condenser

Those mains unit specialists, F. C. Heyberd & Co., recently sent us a sample of a very useful component. It is a block condenser and comprises in one quite compact construction three 4-mfd. and three 1-mfd. mains condensers each tested at 800 volts D.C.

There is one common terminal, so the article saves quite a bit in wiring, while it costs less and is smaller than six separate equivalent condensers. It is, in fact, a sound home-constructed component, both in regard to economy and convenience in use.

It is contained in a stout but neat metal case, and the terminals are substantial and accessibly placed. Technically, too, the Heyberd Block Condenser is first-class and well up to the high standard set by other Heyberd products.

Clix Non-Short Accumulator Connector

You can now plug into any L.T. battery with as great a facility as you can into an H.T. type, if you use Clix Non-short Accumulator Connectors. These also con-

tribute the further advantage that it is impossible for the L.T. leads to cause short-circuits if they are left dangling.

There is with each connector a solid pin tag which can be fitted to any standard thread of accumulator terminal. This tag is lead-coated to prevent corrosion. The second portion of the connector comprises a socket and this completely insulated item is fixed to the L.T. lead.

The retail price of this latest Clix device is 3d., and the insulators are supplied in either red or black with appropriate positive and negative markings.



This component replaces no less than six separate mains condensers.



BROADCAST

MANY hours of extremely good musical entertainment may be obtained from Broadcast Records, especially the Tens and the Super Dance Records, which seem to be better in quality on the whole than the Broadcast Twelves, though these latter are rapidly improving. Those Four Chaps, the radio favourites, have made what is, we believe, their first record, on 684, in which they give us their adventures in one of the big London stores during a shopping expedition. This is an excellent record and well worth twice the price.

Mellow and Rich give us Sunny Days, on 685, coupled with I'm Alone Because I Love You, a rather sugary waltz tune; while Joe Lee, with instrumental accompaniment, sings The Volunteer Organist and The Miner's Dream of Home, two old-fashioned favourites, on 687.

The lighter records include Teddy Brown, with military band, playing National Emblem; while Lew Sylva, on 690, gives us What Good Am I Without You, with Memories of You and You're Driving Me Crazy (691). Hal Swain and his Band, playing Melodious Strains, a recent quick-step success, and Blue Again, on 700.

The Broadcast Twelves provide what we might call semi-highbrow music, and such items as the Polonaise in A Major, by Chopin, and The Bees' Wedding and Hunting Song, by Mendelssohn (a couple of piano recordings on 5221), and also My Dreams and Ah, Moon of my Delight, sung by Guy Marshall, tenor, on 5224, are worth hearing.

The Broadcast Twelve Super Dance Records have developed a remarkable depth of tone, and in our opinion are easily the best in the three types Vocalion turn out.

One of the most popular turns on the radio are Bob and Alf Pearson, the comedy duettists who have broadcast several times during the last month or so. We hear them again on the Broadcast Super Twelve 3028, in You're Driving Me Crazy and Tears. This is a record well worth getting. Marius B. Winter and his Dance Band again record for Vocalion, giving Cheerful Little Earful, All Thro' the Night, on 3034, and The Peanut Vendor, and Choo Choo, on 3019.

"The Peanut Vendor," as you probably know, is a rather peculiar item, and it is one of those numbers which one either likes very much or thoroughly detests. We understand it has become the rage in America, and most of the gramophone companies have recorded it.

Other items on the Broadcast Super Twelves are Jack Phillips' Melodians, playing On a Little Balcony in Spain and When Your Hair has Turned to Silver, on 3038; Say Oni Cherie, on 3020, and Love is Like a Song; also Three Little Words and I'm Alone Because I Love You, on 3021. And, finally, we have a very "dirty" American number, Broadway Stomp and Stomping, played by a hot band entitled Jimmy Wornell's Hot Bluebottles, on 3033. These latter are good examples of modern hot playing.

BRUNSWICK

Noted for their deep bass recordings, the Warner Brunswick records are always welcomed, especially by dance band fans. This month we have received a selection of light records, including a very fine Argentine Tango recording that was made in Buenos Aires. Played by the Tipica Julio de Caro Orchestra, we get the real atmosphere of the Argentine dance in Jueves and Mi Queja (1089).

Another good recording is by Red Nichols and his Five Pennies, playing The Peanut Vendor in typical American hot style. On the reverse side is Sweet Rosita, another "Rumba" foxtro (1076). As a test for the bass reproduction of your radio-gram outfit this record is almost as good as the older "Washboard Blues," produced years ago by the Brunswick people.

Bob Haring and his Orchestra give a spirited rendering of Betty Co-ed and Baby's Birthday Party (1077); and the rather haunting melodies, Trees and Stardust, are provided by Isham Jones Orchestra on 1083. This is excellently done and is, apart from a dance number, worthy of inclusion among any library of light music recordings. We particularly like the latter item (1083).

Wedding Bells Are Ringing for Sally and Just Forget form a couple of tuneful, sugary numbers

sung by Freddie Rose (tenor) with piano accompaniment. These are both artistically presented, and are well worth hearing (1085).

Finally, we tried His Old, Cornet and Smoky Mountain Hill, a couple of "comedy" duets by Frank Luther and Carson Robison, on 1080. These do not appeal to us, but it is quite possible that this type of light humour may be welcomed by many, so we will refrain from comment. Brunswick records, however, on the whole, are a force to be considered, and all gramophiles should make a point of hearing them.

COLUMBIA

One of the most interesting records released during the last month by the Columbia Gramophone Company (which has recently amalgamated with H.M.V.) is a recording by Malcolm McEachern, who broadcasts under the name of Jetsam of the famous Flotsam and Jetsam pair, of Honour and Arms, from Samson (Handel), and Judas Maccabæus, Arm, Arm Ye Brave. (DX224.)

These are two solos from well-known oratorios which are eminently suitable to Jetsam's fine bass voice, but it is a pity that he mouths some of his words so much sometimes, for it makes it rather difficult to understand, and in our opinion musical contortions never add to the effectiveness of any

A brief selection from some of the records released during the month. They have been chosen because of their special value to the pick-up user.

item. It is, however, a good record, and one well worth getting.

One of the most charming records that Columbia have turned out for some time contains a couple of duets by Dora Labbette and Hubert Eisdell, who give us The Little Irish Girl and two other Irish Songs, To My First Love and You'd Better Ask Me, recorded on DB431. These are really excellent recordings, and should be in every gramophone lover's library.

J. H. Squire and his Celeste Octette provide us with An Irish Love Song and An Old Church Legend, on DB422; while we get Layton, of Layton and Johnstone, singing a couple of solos on DB419. Mighty Lak' a Rose and Lil' Girl are sung with that artistry of which he is a master. Layton and Johnstone together provide I Bring a Love Song and You Will Remember Vienna, both from "Viennese Nights," on DB427; while in our opinion a not very successful organ recording is the one by Reginald Foort, on the Regal Cinema Organ, of The Silver Toned Chimes of the Angelus and When Your Hair has Turned to Silver, on DB433.

Jack Payne, of course, is still going hot and strong on Columbia recordings, and he gives us this month that old favourite Say It With Music, with which he always introduces himself when he is broadcasting, and with which he fades away after the programme is over. (B240.)

In addition to this we have Between the Devil and the Deep Blue Sea and Sing Holly Go Whistle Hey, Hey, a couple of numbers which everybody should hear (CB232). These are accompanied by When Your Hair Has Turned to Silver and You're the One I Care For, on CB241; You're Driving Me Crazy and When You Were My Sweetheart and I Was the Kid Next Door, on CB222; and, finally, When Kentucky Bids the World Good Morning and The Peanut Vendor, on DB233. Another dance band well worth hearing is that of Ben Selvin and his Orchestra, and in the Columbia numbers this month they give us The Song of the Fool, this being a very fine number, on CB226.

DECCA

One of the most tuneful records turned out by the Decca Record Co. is K573, on which the Hastings Municipal Orchestra provide Gounod's Ave Maria and Meditation (Thais), by Massenet. Another good disc is the Grieg Selection, by Tom Jones and his Orchestra (K571); while among the still lighter items we choose Choo-Choo, by the Million-Airs, on F2241. The other side of this disc holds Love Among the Millionaires.

Finally, That Lindy Hop and Bathing in the Sunshine, by Roy Fox (Whispering Cornettist) and his Band (F2250), is quite an interesting record.

H.M.V.

Undoubtedly the most outstanding record among those made by the Gramophone Company is that of Madame Galli-Curci singing, on DA1164, Bolero (Les Filles de Cadiz) and Chanson Indoue. This is a fine record, though we do not think, in some places, it is quite as well-balanced between voice and accompaniment as it might be.

A second outstanding H.M.V. record is the Royal Opera House Orchestra recording a couple of Slavonic Dances (Nos. 1 and 3), on C2149. The Royal Opera House Orchestra is one of the finest in the country, and the records it makes are invariably worth getting by all lovers of semi-classical music.

A further especially interesting disc is that containing L'Ultim Canzone (The Last Song) and Lolita, sung by Armand Tokatyan (Tenor). This is No. DB1471, and we prefer it to the Galli-Curci from the recording point of view.

Beatrice Harrison, the famous "Nightingale" cellist, has made another record, this time of a couple of Delius' compositions. The items chosen are Elegie and Caprice, and, of course, they are executed in superb style. Miss Harrison is backed by an extremely well-balanced orchestral accompaniment (B3721).

And now for a record which is probably intended to appeal to north countrymen—more than to those of the south—by one of the first radio comedians in this country, John Henry. In our opinion it is not a good record, in that it is almost devoid of humour (and it is supposed to be a humorous item), and the account of The Pied Piper (the title of the record), by "Blossom," and John Henry's comments, are really boring (B3696).

Lovers of sea-shanties will rejoice in those sung by John Goss, and assisted by the Cathedral Male Voice Quartet. The items include Storm Along and Roll the Wood-Pile Down. They are shanties not often heard, and form a rather refreshing break from the usual class of sea song (B3782).

Among the lighter records that by Noel Coward will create quite a lot of interest. We do not consider Half-Caste Woman a particularly artistic item; either it is not well sung, or else it does not suit Noel Coward, in spite of it being his own composition. On the other side of the disc (B3794) he is evidently more at home and it forms a really attractive number.

Raio da Costa is still busy, and this month she has recorded a couple of medleys from well-known folkie theme songs, and is accompanied by a very neat little orchestra. The items are Whoopee and Monte Carlo (B3777).

Finally, we must put forward two of Jack Hylton's latest discs, B5987 and B5986. The former contains Betty Co-ed and Ninety-nine out of a Hundred, and the latter I'm Alone Because I Love You with Songs I heard at Mother's Knee. Both discs are excellent recordings.

LIDO RECORDS

The Goodson Record Co. have brought out a collection of black, flexible discs, under the title of "Lido" records. These are quite good from a recording point of view, and have the advantage that they look like ordinary records. Here are some of the items included in the programme. Underneath the Spanish Stars and We all Go Oo, Ha, Ha, Together, played by the Savoy Plaza Band (B3); Can't We Be Friends? and Sing You Sinners, by the Cosmopolitan Dance Band (B8), and Who Cares, with Dance of the Wooden Shoes, by the Radio Revellers (B10). These records make ideal portable programmes.

PHONOCORD FLEXIBLE

Attractive to look at, these records are also attractive to listen to, for they are remarkably good in quality.

Here is a typical selection of tunes: With Flying Colours and March Militaire (Schubert) (P1107); The Gipsy Princess, Potpourri, by Eddie Wallis' Symphony Dance Orchestra (P117); Wedding of the Winds and The Dwarfs' Parade, by the Vienna Cameo Orchestra, on P111. Finally, we should mention the Oceanic Dance Band's recording of Mary and Somebody Else Will Take My Place (P121).

ZONOPHONE

The Zonophone list is a very interesting and versatile one. Records by all the Zonophone favourites are there, and many more besides, and

(Continued on page 549.)



THIS is the time of the year when many home constructors seriously consider the building of portable receivers. And one of the many important things that have to be considered is the question of anode consumption and the supply of H.T. This power problem is a very pressing one, for a "greedy" portable will take all the kick out of the set, and it will become either an expensive luxury or else so heavy that it no longer warrants the name of "portable."

Very Uneconomical

Expensive it will be, because if you want to keep down the weight you will have to use small H.T. batteries, and for greedy valves this is a very uneconomical procedure; and weighty, because to run the valves economically you will have to use bulky "super"-capacity batteries.

The problem looks a difficult one to solve, doesn't it? But it can be done with a little care, not only in the design of the set but in the choice of valves to use in it.

For instance, you will find in this issue of MODERN WIRELESS a full description of a four-valve portable employing one screened-grid stage, detector and two L.F. If we were using this set with H.T. from the mains, or from super-capacity batteries, we should probably go in for a largish super-power valve in the output stage.

Cutting Down Current

As the set is intended to be portable we must needs cut down the total current consumption to a reasonable figure—say, 10 milliamps. That leaves us about 6 milliamps. for the last valve. And here we find that probably one of the most suitable valves is the L.P.2, which will bias down to 6 beautifully.

If you want a bit more power, and do not worry about a little more anode current, the P.2 will suit you, for this, too, can be biased down to pass only 7.5 milliamps. These two valves, and others of somewhat similar character-

This is the season of portable sets, and so this article on valves for portable receivers should prove of particular interest.
By K. D. ROGERS

istics, can well be called "summer" valves, or "portable" valves. Though not to be "sneezed at" in ordinary sets, the portable is their forte; hence the term that I have given them.

The pentode is hardly a "summer" valve. There is nothing light and airy about its anode-power requirements, and in most cases it is best left alone where portables are concerned. S.G. valves, too, are greedy if you let them, and so careful biasing is advisable wherever this type of valve is employed. By all means use the usual

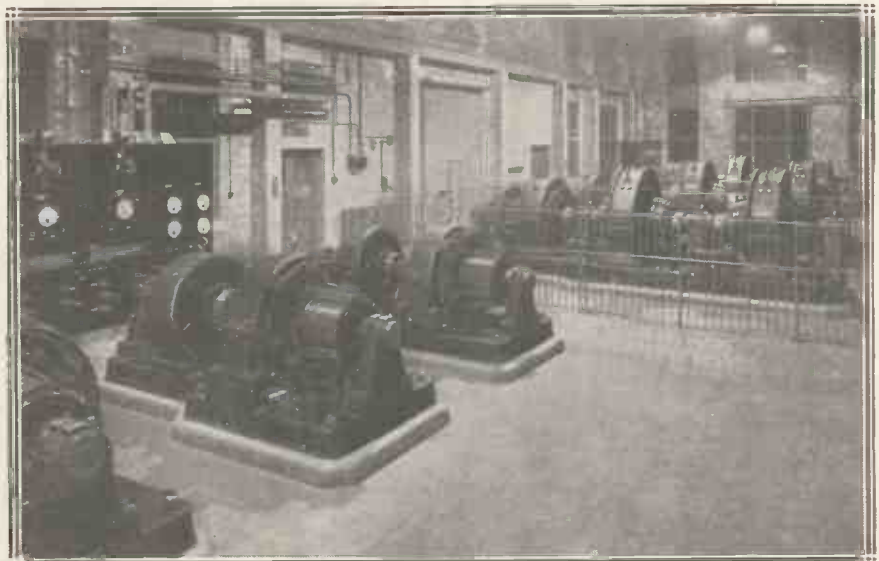
Careful adjustment of H.T. on S.G. and detector valves will do a lot towards getting the best sensitivity from a portable, and you will often be surprised at the amount of variation in volume that 6 volts either way on the screening grid of an S.G. valve can make.

Enter Eta

And while talking about valves for portable sets, I must draw your attention to the new Eta valves. They have been on the market for some weeks now and are a little lower in price than the standard British valves. Two ranges are available—the 2-volters and the directly- and indirectly-heated A.C. valves.

With the exception of the S.G.'s, the type of nomenclature I suggested

BROOKMANS' BROTHER BROADCASTER



Part of the machine room at the new North Regional twin station. In the foreground are three filament current generators, while inside the danger rails in the background are the 312,000-volt high-tension machines.

·9 or 1.5 volts in each S.G. stage, but, if you can arrange it, there is often no serious loss of sensitivity if 3 volts are employed, and not infrequently quite a valuable saving of H.T. current is the result.

some years ago has been employed, namely, that figures should be given to the valves in such a way that they would tell you at a glance the amplification factor and the impedance—the two most important characteristics.

A New Series of Two-Volters

Thus we have Eta valves designated as follows: the B.Y.2023, an H.F. valve having an amplification factor of 20 and an impedance of 23,000. Then, again, the B.W.303 has an amplification factor of 3 and an impedance of 3,000. (This figure is taken to the nearest thousand, for the actual figure is 2,700.)

But you can see how convenient the scheme is. If you want a valve with an amplification factor of about 20 and impedance of 10,000 you can easily find it, and you will choose the B.Y.2010.

The Latest Mazda

Why the S.G. valves are differently listed I do not know, nor by what reasoning the 2-volt S.G. is designated B.Y.6. Perhaps it is to obviate the slightest chance of confusion with the three-electrode valves.

These Eta valves are sold by the Electrical Trading Association, Ltd., of Aldwych House, and the price list starts with the ordinary valves at 7s., as against the average British valve's 8s. 6d. They are good little valves and should make quite a niche for themselves on the market.

And now from portable to portly.

The filament takes 2 amps. at 4 volts (8 watts), and is meant to be heated by A.C. But most surprising of all is the mutual conductance, which is 6.

Not for Portables!

A startling figure for any valve, isn't it? Yet here we have a super-power valve, not indirectly heated either, with the astounding figures of 1,500 ohms for impedance, and an amplification factor of 9.

Naturally, a valve of this type cannot have a large grid base, and the grid swing is restricted to 64 volts (grid bias being about 32 volts at 400 volts anode pressure), while the anode current is about 80 milliamps. Hardly a "summertime" valve perhaps, but one that will be a boon to moving-coil enthusiasts.

And while on the subject of A.C. valves, how very much more reliable they are now than they were a year ago! My experiences with the indirectly-heated type of valve have been very varied in the past, but lately the high standard of excellence set by all reputable makers has been reached in all the valves I have had on test.

frequent. The impedance usually works out about right, and the magnification factor is nearly always correct. The main trouble usually occurs in the heater system, insulation between the heater element and the cathode being the point at which

SOME "BOTTLE"!

*

This valve with the huge anode is the Mazda P.P.5/400, a directly-heated A.C. output valve. It takes 2 amps. at 4 volts on the filament and 400 anode volts. The amplification factor is 9, and impedance 1,500 ohms



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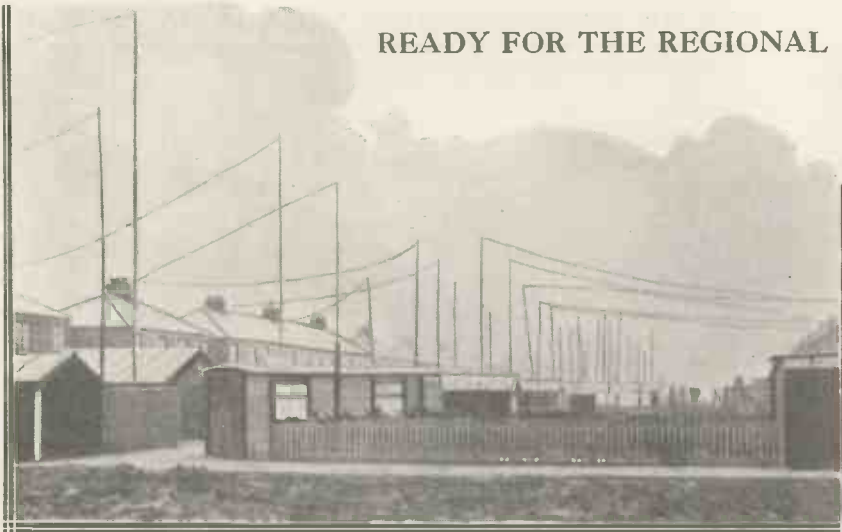
such trouble is most likely to take place, and during the testing of many hundreds of A.C. valves I have had some very funny things happen.

Those Few Failures.

I do not mean by this to insinuate that the A.C. valve is a doubtful quantity. It is not. There are failures which get on to the market, or, rather, which develop after the valve has got on to the market, in spite of the very careful testing systems which are employed by our manufacturers. I know of one firm in which not infrequently 10 per cent of the valves are discarded because they are not quite up to scratch.

That is the only way in which to build up a name for complete reliability, and all the valve concerns are very keen that their unimpeachable names, as far as reliability in battery valves, shall be continued when it comes to indirectly-heated types. But the A.C. valve is a much more difficult proposition to manufacture, and firms have had less experience in these valves than the others, so that consequently we cannot expect complete "perfection" in every single specimen that is turned out.

READY FOR THE REGIONAL



Some of the aerials erected in one line of houses in the Hull district. When this was taken they were all eagerly awaiting the advent of the new North Regional station.

Have you seen the new Mazda "Bottle"? It is the P.P.5/400, a massive valve for loud-speaker work where up to 5 watts undistorted output is required. It takes up to 400 volts on its anode (which, by the way, as you can see, is of very generous proportions, so as to dissipate the heat properly).

There have been no repetitions of some of the queer happenings that used to occur—none of the weird results that have not infrequently attended my use of the valves some little time back. But I hope to tell you more about these next month.

The failures of A.C. valves under proper conditions, however, are not



The "CONVERTIBLE" TWO

WHILE considering early this year plans for this season's small portables, it became evident that to progress in the design of this very interesting type of receiver a radical change in our ideas would be necessary.

However well designed an attaché case portable may be, it is not really an economical proposition, because its usefulness is naturally restricted during the winter months. Although extremely valuable for outdoor work, most types of small portable sets are hardly suitable for use as permanent receivers.

Following up this line of argument, the design of a more economical type of portable was commenced, the outcome of which was the "Convertible" Two. This is based on what I believe to be a new idea in construction, as I cannot recall having come across it before.

Very Economical

As the photographs here reveal, the essential idea is a two-valve chassis which can be used either as a permanent cabinet receiver in winter, or as a lightweight, self-contained portable in summer. Whenever you want to experience the pleasure of outdoor radio, just remove the chassis from its cabinet, place it in its carrying case with a couple of batteries—and there you are!

In both receivers, portable and permanent, you have a complete set, of up-to-date design, while the change from one to the other is quickly made. The economy side will appeal to you, I feel sure; seeing that you get the benefit of two different receivers for just a little more than the cost of a normal two-valver.

Actually the overall cost works

Two receivers in one. That's what the "Convertible" Two is. In a few minutes you can change it from a "pukka" loud-speaker cabinet set, to an all-in and efficient attaché case portable. This interesting receiver is designed and fully described
By J. ENGLISH.

out at about fifty shillings, excluding, of course, valves and batteries.

Turning now to actual constructional features, you will have noticed that the chassis, the panel and baseboard assembly is rather longer and narrower than is usual for a cabinet receiver, but this suits the portable

IT WORKS ANYWHERE



You do not have to open the set to tune in, for the few controls project through the case. You can actually carry it about while listening to a programme.

layout better. Here the chassis nicely fills just over half of the case, while the baseboard acts as a partition between receiver and batteries.

The control knobs project through holes cut in the "bottom" of the case, and are thus easily accessible externally. As the chassis is fixed in position by just two screws, it takes but a few moments to change over to permanent receiver or vice versa.

Exceptionally Smooth Reaction

Perhaps it will simplify matters if I deal first with the chassis as a normal two-valver, leaving the additional work for completing the portable side until later. As regards the circuit, shown in Fig. 1, this is typical of the high-efficiency two-valvers introduced by "M.W." Essential features are tuning circuits based on the "M.W." dual-range coil, inter-wave aerial coupling on the long waves, differential capacity control of reaction, and detector de-coupling.

Using the latest productions of the valve designer, it is surprising what excellent results can be obtained to-day from only two valves. In the present receiver, for instance, you can get a high degree of sensitivity with exceptionally smooth reaction if you use one of the new special detector valves, such as the Marconi H.2, a wonderfully efficient little valve. Follow this up with an H.L.210, and you have an ideal combination for the portable receiver, which then seems uncannily sensitive.

An Interesting Feature

For the "Convertible" Two you really want on hand three valves for the best results—the two high-mag. types already mentioned, and a medium power valve for the output



This is how the set looks when completely packed up in its travelling case. It is capable of working several pairs of telephones, and with a little ingenuity one pair can be packed inside the portable.

need not go into fully here. It is sufficient to notice that the frame winding is in series with the aerial winding of the coil unit via the .001-mfd. compression-type condenser. The latter in turn can be used as an additional tuning control for increasing volume and selectivity as will be explained more fully later on

Results Obtained

Although good results were expected of the receiver in both its guises, its actual performance on test was distinctly gratifying, especially as a frame-aerial portable. The two London transmissions were received on the little frame aerial very loudly on headphones, with the Midland Regional at ample volume at 75 miles. In addition, an occasional foreigner was easily picked up after dark. On an open aerial, normal loud-speaker reception of the usual powerful transmissions was obtained.

Turning now to the actual construction of the chassis itself, the

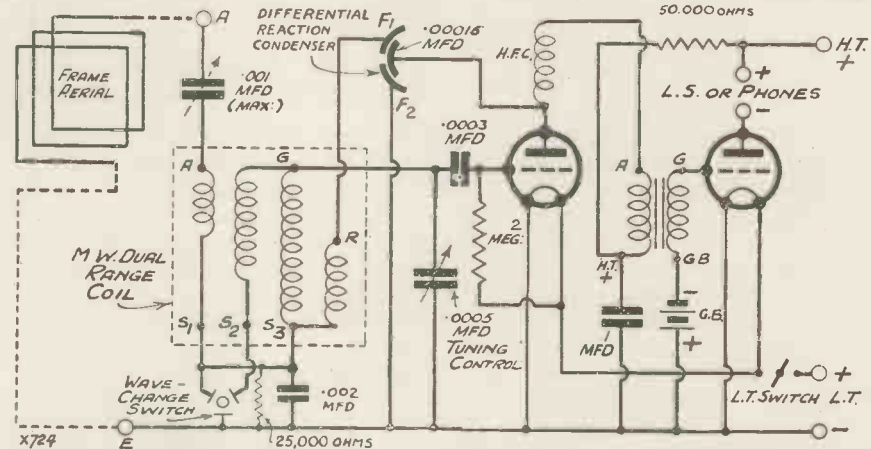
stage when running the set on the home aerial. Further reference to valve types will be made later.

One of the most interesting features of the circuit which further illustrates the versatility of the dual-range coil is the method of introducing the frame aerial when we want a self-contained portable. The problem was to devise a method which would not upset the tuning range of the coil unit or the reaction control.

Novel Frame Connections

The scheme finally adopted was entirely satisfactory. Connecting the frame to the A and E terminals is simple enough in practice, but not so simple in theory, which, however, we

TWO VALVES, TWO WAVE-BANDS, TWO PURPOSES



As you can see, the circuit is a straightforward 2-valve arrangement, using an "M.W." dual-range coil, which enables good results to be obtained on both broadcast wave-bands when using the set as a cabinet set. The frame aerial is only used when the set is used for the purpose of portable work.

THE PARTS USED IN THE "CONVERTIBLE" TWO

CONDENSERS

- 1 .0005-mfd. variable (Formo, or J.B. Cydon, Polar, Lotus, Igranie, Ready Radio, Ormond, Dubilier, etc.).
- 1 .00015-mfd. or over (up to .0002 mfd.) differential reaction (Ready Radio, or Dubilier, Igranie, Lissen, Ormond, J.B., etc.).
- 1 .001-mfd. max. compression type (Formo, or R.I., Sovereign, Polar, Lewcos, etc.).
- 1 .0003-mfd. fixed with grid-leak clips (Dubilier, or T.C.C., etc.).
- 1 .002-mfd. fixed (Dubilier, or Ready Radio, Telsen, T.C.C., Ediswan, Ferranti, Mullard, Igranie, Watmel, Formo, Graham-Farish, etc.).
- 1 1-mfd. fixed (T.C.C., or Ferranti, Hydra, Formo, Dubilier, etc.).

SWITCHES

- 1 3-point wave-change (Red Diamond, or Ready Radio, Bulgin, Keystone, W.B., Magnum, etc.).
- 1 "on-off" (Wearite, or ditto).

RESISTANCES

- 1 2-megohm grid leak (Dubilier, or Lissen, Ediswan, Mullard, etc.).
- 1 50,000-ohm Spaghetti (Bulgin and Magnum

or Sovereign, Keystone, Magnum, Ready Radio, Graham-Farish, etc.).

VALVE HOLDERS

- 2 4-pin (Benjamin, or W.B., Formo, Magnum, Wearite, Clix, Bulgin, etc.).

CHOKES

- 1 H.F. (Polar, or Lewcos, Varley, R.I., Lotus, Dubilier, Telsen, Magnum, Wearite, Parex, Ready Radio, Watmel, Keystone, etc.).

TRANSFORMERS

- 1 L.F. (R.I. Improved G.P., or Telsen, Lissen, Varley, Ferranti, Lotus, Mullard, Lewcos, Igranie, etc.).

COILS

- 1 "M.W." dual-range (R.I., or Formo, Keystone, Goltone, Parex, Magnum, Tunewell, Wearite, Ready Radio, etc.).

MISCELLANEOUS

- 1 wooden panel, 15 x 6 x 3/8 in., three-ply.
- 1 baseboard, 15 x 4 1/2 in.
- 1 attache-case (see text).
- 7 indicating terminals (Belling-Lee and Ealex, or Igranie, Clix, etc.).
- Battery plugs (Clix, or Belling-Lee, Ealex, Igranie, etc.).
- Glazite, flex, screws, ebonite terminal strips.

unusual dimensions of the panel and baseboard rather enhances the appearance of the receiver when housed in a suitable cabinet. The panel layout is also arranged so that a small slow-motion dial fitted to the tuning condenser shall improve the balance of the layout. Mounting the coil unit on the panel also effects an economy in baseboard space. This is also the best position for minimum coil losses when used as a portable.

Wooden Panel

For the panel of the original chassis I used a piece of ordinary three-ply. Besides being cheaper than ebonite, the high insulation resistance of the latter is not required. The appearance of the wood panel can also be

A New Idea in Portable Construction

made quite pleasing by staining it to match the cabinet and then polishing.

Normally the panel will measure 15 in. by 6 in., but if your fibre attaché case is slightly longer, or shorter, than the original, make the panel length just $\frac{1}{4}$ in. less than the inside width of the case. Notice, also, that the rear corners of the baseboard are rounded off so that the case lid can close easily.

Time-Saving Tips

Before screwing the drilled panel to the baseboard use it as a template for marking the positions of the holes to be cut in the side of the case. This saves much time later.

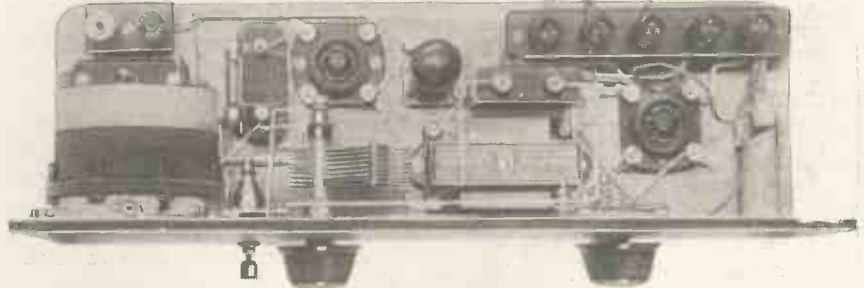
In connection with the specified components, I should mention that in the original chassis a .00035-mfd. tuning condenser was used as this was sufficient to carry the tuning range just above 480 metres. The .0005-mfd. condenser will give you the full medium-wave range, and here a component with the minimum pro-

jection behind the panel should be chosen.

In order to facilitate wiring up, I would suggest not mounting the panel until as much as possible of the wiring has been done. Later,

not thick it is a good idea to place a 4 B.A. nut under the heads of the two screws holding down the coil unit. Otherwise these screws may break through on the front of the panel, completely ruining its appearance.

SHOWING HOW SPACE IS ECONOMISED

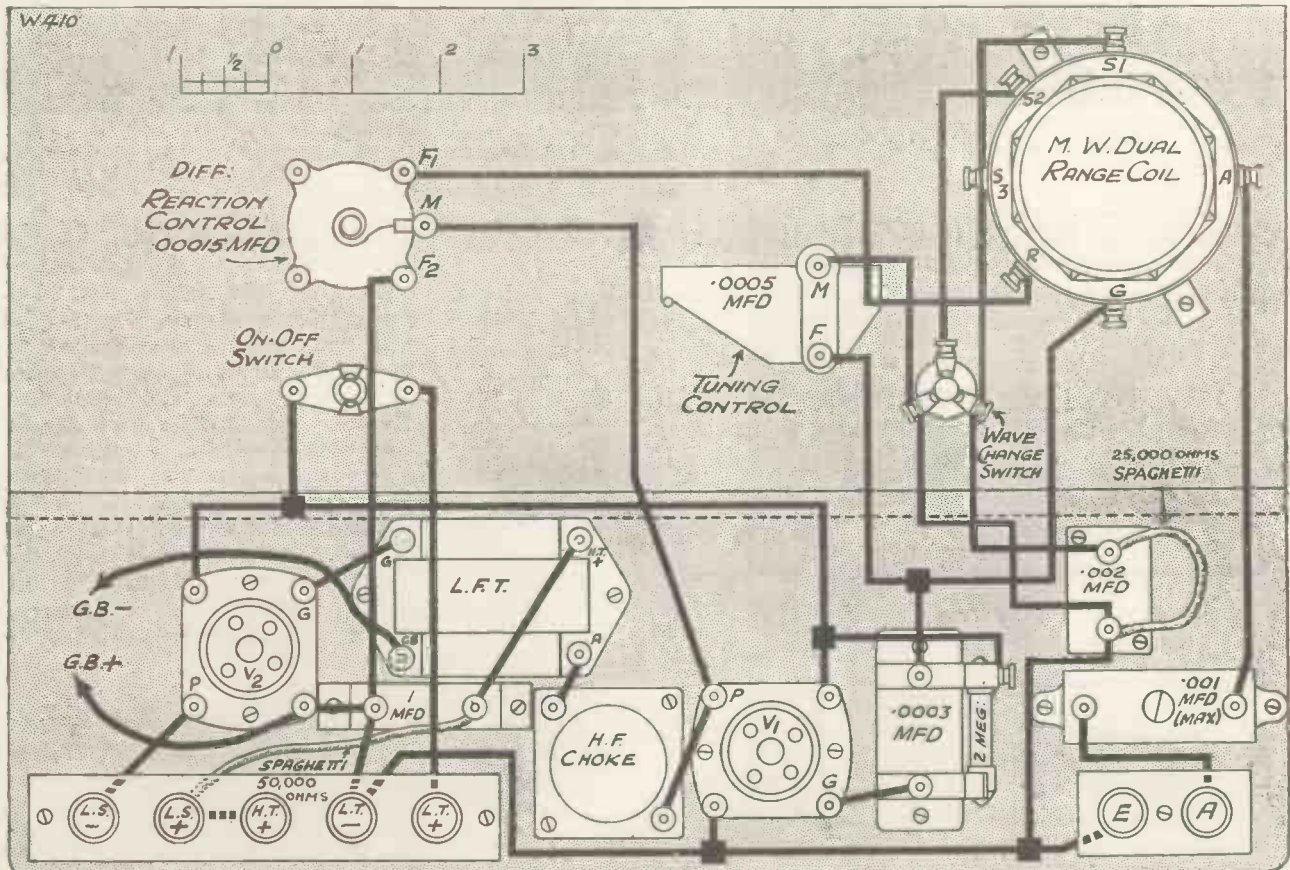


Naturally the size of the panel and baseboard assembly had to be kept as small as possible, and in connection with this the mounting of the dual-range coil to the back of the panel proved a great help.

when the panel is placed in position, do not forget that it is easier to wire up the "Interwave" condenser under the dual-range coil before this latter is fixed to the panel. As the panel is

Restriction of space in the portable assembly necessitates mounting the two terminal strips upright on the baseboard. This is done by supporting the strips on small pieces of wood,

ONE OF THE SIMPLEST POSSIBLE SETS TO CONSTRUCT

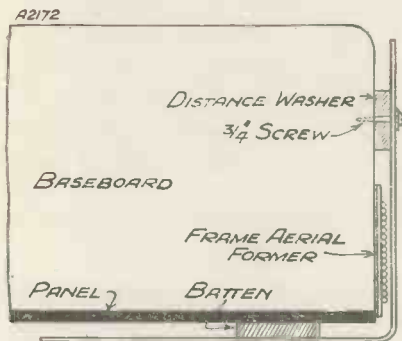


Mounting the components is a perfectly straightforward job, and the wiring is even easier. Both are clearly covered by this diagram, from which you will see that the terminal strip is mounted horizontally instead of in the more usual vertical position.

An Uncannily Sensitive Receiver

just thick enough for the terminal shanks to clear the baseboard, and screwing down with $\frac{3}{4}$ -in. screws. The rest of the construction is sufficiently straightforward not to require further description on my part.

FIXING THE FRAME



This little diagram shows how both the receiving part of the set and the frame aerial are placed and secured inside the attaché case.

Before passing on to the additional work for completing the portable side of the design, you will find it well worth while setting up the chassis and giving it a trial run on your permanent aerial system. This will reveal quickly any minor faults, in the unlikely event of such being present, and ensure that all is in proper working order before you fix the chassis in the case.

Suitable Valves

Special mention of the tuning arrangements is unnecessary here as these are the same as for other recent "M.W." receivers embodying the dual-range coil.

As regards valves, an H.F. type for detector and a small power valve in the output stage are the main specifications for use on an ordinary aerial. A pair of valves which I find particularly good here for securing a high degree of volume with excellent reproduction are the Mazda H.L.210 and P.220, the latter being both easy on the H.T. battery and capable of pushing plenty of power into the loud speaker.

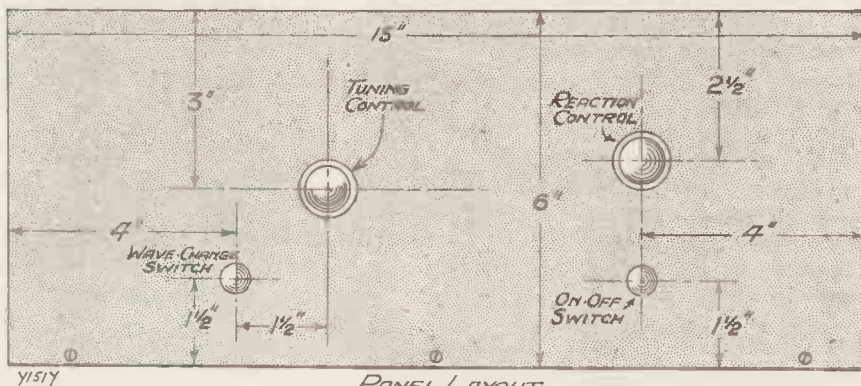
Having got so far, with the chassis working properly, the rest should be easy as there is not a lot of additional work to complete the portable itself. The first step, of course, is to cut out the four holes in the fibre case, the

have an expanding bit capable of cutting a $1\frac{1}{2}$ -in. hole. Alternatively they can be cut out with a fine key-hole saw, a razor blade or even a sharp penknife.

Preparing the Case

The next thing is to glue or Secco-tine two strips of $\frac{1}{4}$ -in. thick wood, 5 in. long and 1 in. wide, near each side of the case. The panel of the chassis rests against these two battens, which thus prevent the control knobs from projecting too far through the case. As you will see from the photos, the four knobs project just far enough for comfortable manipulation, without being too conspicuous.

THERE ARE ONLY FOUR LITTLE CONTROLS



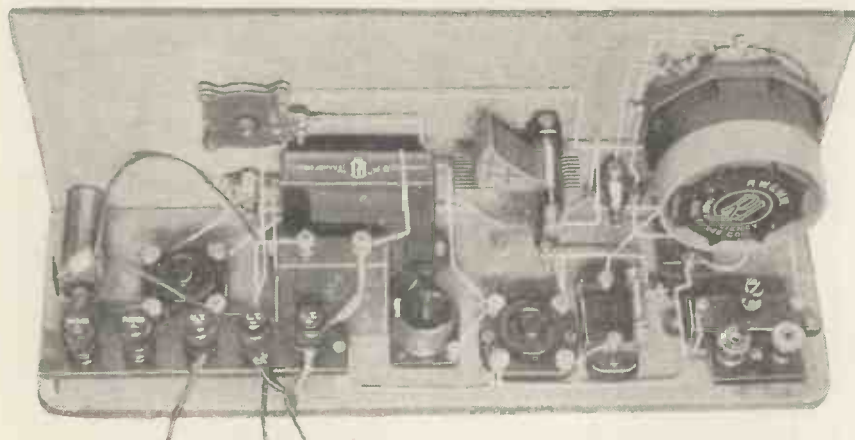
The drilling dimensions can be obtained from this diagram of the panel, which also shows the small knob that is used on the tuning condenser so that it can be made to poke through the carrying case conveniently.

position of which has already been marked out.

The two smaller holes can be drilled out with a $\frac{1}{2}$ -in. wood bit, as also can the larger ones if you happen to

For the frame-aerial you require a winding of 16 turns of silk or cotton-covered No. 32 gauge wire on a rectangular cardboard former. As it is not intended that the set be used on the long waves as a portable, only the one frame-aerial winding is necessary. It will be necessary to work out the size of this former to suit your own carrying case. As a guide the former made up for the original model measured $15\frac{1}{4}$ in. by $9\frac{3}{4}$ in. overall. Strips of cardboard $\frac{1}{2}$ in. wide were cut, allowing an extra $\frac{1}{2}$ in. at each end of the longer pieces for bending over and gluing to the other two.

EFFICIENT LAYOUT PRODUCES NEAT WIRING



The reason why there appears so little wiring is because the components are so placed that the leads are all kept as short as possible. The result of this is good results whether the set is being used as a portable or in the home.

Fitting Up

Now for the assembly of the portable itself. Having inserted the frame in position at the bottom of the case, which should be raised above the bench on shallow boxes, lower the chassis into position and close the

(Continued on page 548.)

INCREASING YOUR RANGE



Do you want more programmes? If your set is neither selective nor sensitive enough to enable you to get them, you should find the following article of particular interest.

THERE must be many amateurs who have two- and three-valve outfits in operation that are not quite as selective as they need to be, adequately to cope with modern conditions. And, in addition, their owners may often feel that they could usefully employ a certain degree more of amplification in order to increase the strength of stations already being received and to bring in others that are quite out of reach.

Getting the Set Right

An obvious remedy is to build a new and more powerful receiver. But there are often objections to this. Perhaps it has taken a good deal of experimenting with different valves and H.T. and G.B. voltages, in combination with one or two well-liked loud-speakers, to achieve what is considered to be a really satisfactory quality of reproduction, and it is felt, rightly or wrongly, that all this would have to be gone through again in order to get similar results should a new set be installed.

Again, extension leads and battery wiring may have been arranged that the amateur would like to retain and which would be upset by a new outfit.

Alterations Not Wanted

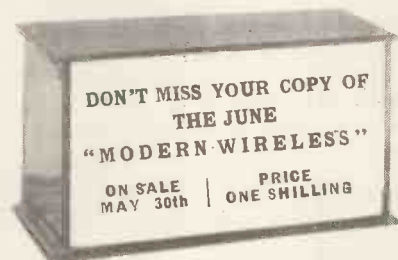
Further, the present set might be installed in a very convenient cabinet tucked away in a corner of a room where there would not be comfortable accommodation for the bigger cabinet necessitated by a bigger set, and H.T. and mains chargers perhaps exist to make a drastic change unpalatable.

As a final possible argument against

building a larger and more modern outfit there is the question of cost, and many of us find this a very serious question these days, worse luck

But there is an alternative to the construction of a completely new set that might appeal to many of you that face the problem. And that is the use of an H.F. unit. Many H.F. units have been described in the past, but they have all suffered from one serious drawback, and that is that they almost invariably tended to fail in amplifying powers. They would add selectivity without pulling their full weight in the adding of sensitivity.

That meant you could, if you used such an instrument, get the existing stations with less interference but not add to your programmes to any real degree.



The reason is fairly obvious. An H.F. unit has always used only one valve, and the usual procedure is to arrange some coupling compromise that would facilitate the addition of the unit to any set.

New Type of Unit

A certain amount of extra amplification follows. Indeed, we think we can safely say that the "M.W." H.F. units that have been described generally did miracles in view of the

technical limitations imposed upon them.

We now feel that the time is ripe for the introduction of double-valve broadcast-wave H.F. units, especially in view of the fact that such can be so designed that they are very little more expensive either to build or to run than equivalent one-valvers.

Little Extra Needed

The prices of valves are down, and filament consumptions, too, have been reduced so much that one extra valve imposes but negligible additional drain upon an accumulator. And if you go about the designing in the right way there are only one or two extra components needed.

And the result is that you have one H.F. valve that can pull every ounce of its full weight, assisted by a second H.F. valve that also amplifies just as much as does the valve in any ordinary one-valve H.F. unit.

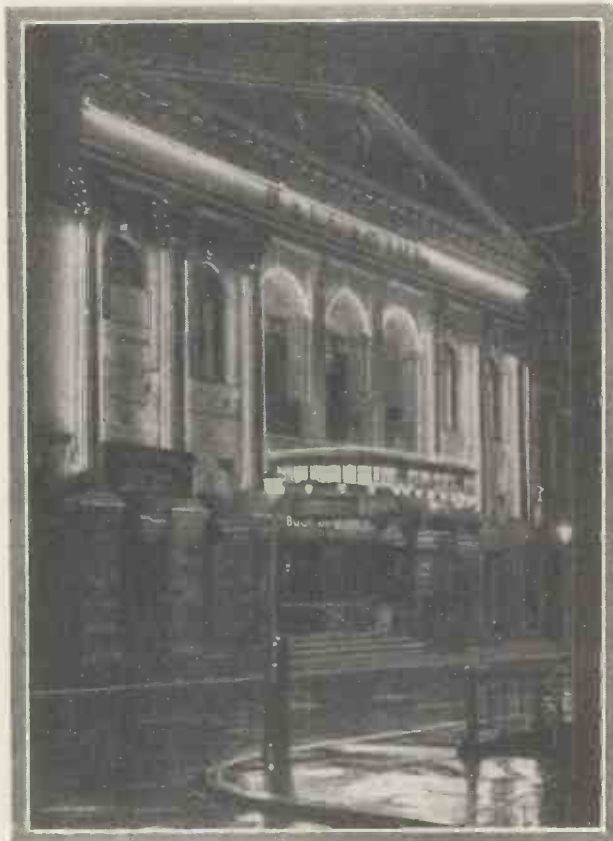
And an extremely high order of selectivity can be built up without any great complication either in the design of the unit or in the controls.

Widens Scope of Reception

Such a unit, instantly adaptable to any set, will be detailed in the next issue of MODERN WIRELESS, and we are confident that it will arouse considerable interest, and that it is destined to widen the scope and enjoyment of reception for many constructors who would otherwise have had to battle with modern ether conditions using well-tried, well-loved, but somewhat inadequate outfits.

We also hope to give details of a special adaptor for adding to any set having H.F. stages, in order to turn it into a short-wave superhet.

STAGING THAT



"We are now taking you over to the Palladium . . ."

THE announcer's voice: "We are now taking you over to the Elite Theatre for an excerpt from the musical comedy, 'The Dancing Lady.'" An interval; then the orchestra of Jack Payne or Gershom Parkington fades out into the magical atmosphere of the theatre. Here we are in the heart of the West End. How ubiquitous is broadcasting!

Most of us realise this latter fact, but how many have appreciated the planning and real hard work that have gone to make a brief thirty-minute theatrical relay a success? Few, I'll wager. Yet for the people who plan it, this broadcast is probably responsible for as many disappointments and vexations as any dozen other outside broadcasts of a more straightforward nature put together.

At one time, of course, the B.B.C. had many more difficulties with which to contend. Some managements seemed disinclined to assist in experiments, and various stage effects required a special technique which could only be developed on a trial and error basis, so it is really a miracle that in those early days any excerpt from a current musical comedy was more than a success of curiosity.

"The Play's the Thing"

Even now there are numerous obstacles to overcome. Although that "metallic" quality of sound so familiar to listeners in the past is now largely under control, there are still many factors guaranteed to reduce the expectation of life to those concerned!

Most of us enjoy a microphone visit to the footlights, and are thrilled by the roar of the huge audience, the shuffle of the chorus, and the exciting swing of a successful show.

Only a few know of the special difficulties of such a broadcast, but here is a peep behind the scenes which shows the snags that may confront the engineers.

By HAROLD A. ALBERT.

First, there is the play to be chosen. Even this is not so easy as it might appear.

Suitability for the microphone is of paramount importance, and this is not a common feature of the average theatrical production. There may be too much movement, too much dancing, too much visual byplay, while the humour perhaps may not be suitable for the vast and varied public that forms a radio audience.

Preliminary Tests

Nowadays, when a suitable piece is found the management concerned is generally willing to co-operate, and thorough tests are made by the B.B.C. engineers while performances are actually taking place. Normally, three "mikes" are installed along and within the line of the footlights, one centre stage and one on each side, halfway between the centre and the wing.

These three are generally sufficient to pick up the greater part of the show and maintain a correct balance for the orchestra, but for emergencies two other microphones are suspended invisibly on either side of the proscenium opening, about six feet above the level of the stage. Invisibility of microphones, needless to say, must always be an important consideration.

All these microphones are connected up separately with an amplifier "potentiometer" in the wings, whence an engineer sends the collected sounds via a line beneath the stage to the control room at Savoy Hill. At each point of the line where things may conceivably go wrong engineers are present, and a further listening circuit, with loud speaker, is laid to a convenient room near the stage, where the officials in charge of the programme can listen with a certain degree of detachment from the usual stage traffic.

She Kicked the Mike!

The footlight microphones, incidentally, are placed on felt mats to reduce "edginess" resulting from the proximity of the microphone to the stage surface, and any vibration which the chorus or the principals might set up when "in action." On one occasion a chorus girl kicked over a "mike."

A terrific crash might have been heard by listeners, but owing to the presence of mind of the engineer on control in the wings the movement was anticipated by a fraction of a second, the circuit cut out, and no one noticed anything peculiar about the transmission. Even the audience in the theatre did not appear to notice the

THEATRICAL RELAY

hand that presently popped up from the orchestra and silently set poor Mike upon his feet.

Unexpected technical difficulties are always being met. For broadcasting purposes, a closed-in set (that is, a small scene taking up little space with the action taking place down stage close to the footlights) is better than an open set, say, a large garden or ballroom scene.

"Roll Away, Clouds"

But this nearness can be overdone. The colour and life of the chorus of "Roll Away, Clouds," from "Virginia," for example, was lost owing to the necessity for fading down the microphone current to prevent blasting; the whole chorus being massed down stage while another scene was being set.

The difficulty, though anticipated, could not be prevented. The Outside Broadcast Director knew that if an excerpt did not include this famous chorus, one of the best things in the show, listeners would want to know why. Explanations would be useless, for such things cannot be explained in a letter, and so the B.B.C. for once decided to let "microphone suitability" go hang!

Turn to another side of the question. Listeners sometimes ask why certain very successful shows are not broadcast. It may be for one or more of a dozen different reasons.

Microphones are not like human ears, that can sort out and select sounds, aided by the eye, so that the brain can receive the effect intended by the producer. At the loud-speaker end, the result of a gay, crowded scene can quite easily be a meaningless jumble of sounds. Similar problems arise in making talkies, but the production in this case is arranged especially for the microphone.

Those Funny Men

Another factor is the artistic temperament of the artistes, who are always ready to help, but who sometimes forget their invisible audience when it comes to the crucial moment. A comedian who in the ordinary way works off his patter near the orchestra, and in a position for the "mike," may erratically wander away up stage.

Bless him, he always tries to remember, but it is when he forgets that the damage is done. His voice fades away, and listeners can know of no reason for it. To them it is as if the engineers had faded-out the transmission.

There is another side to the picture. Once when engineers were awaiting a variety broadcast, a well-known singer, about to go on the stage, saw the microphones fixed for the turn following her own.

"Take them away!" she howled. "Take them away!" A B.B.C. official delicately pointed out the impracticability of this suggestion. "Ah!" screamed the lady. "You say the microphone is dead, but how am I to know? You're broadcasting me. You people will



"But owing to the engineer's presence of mind . . ."

do anything. Take them away, I say, take them away!"

It was some time ere anyone could convince her that the microphones were not being used to give her marvellous voice to the world. And the next day, to add ironical point to the situation, the lady in question turned up at Savoy Hill for a studio audition.

That is one extreme, but sometimes people are too helpful. There was the producer who was most willing to assist the engineers, yet when it came to the push he was too pushing.

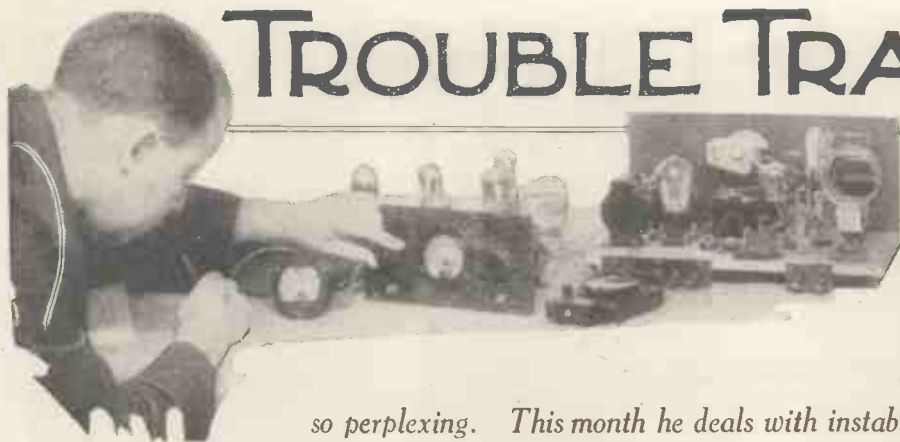
"Black Out, Bill"

On the great night he thought that he would give the microphone every chance, and so, unbeknown to the engineers, he ordered his entire chorus to sing as close to the instrument as they could. Result: a very loud noise!

And ceaseless vigilance is required to see that the microphones overhear nothing they should not. They rarely do. You may have heard the stage hand who remarked to the British Isles: "Black out, Bill."

Somewhere an O.B. engineer was tearing out his hair.

TROUBLE TRACKING



On this page the Chief of the "M.W." Query Dept. discusses, month by month, some of those common difficulties and troubles which can be

so perplexing. This month he deals with instability in the low-frequency stages.

IF I were asked to state what were the most common troubles with the average home-constructed set employing three valves or more, I would at once say "motor-boating, and general L.F. instability." Perhaps I would also add poor volume due to unsuitable H.T. voltages.

Why should these troubles be so prevalent?

The reply is: "because of the increasing use of mains units and in many cases small-size H.T. batteries which are incapable of supplying an adequate current."

Anode Current

The larger type of receiver is the chief offender.

Take, for instance, a four-valve set with an S.G. H.F. stage and two efficient transformer-coupled L.F. valves. The overall magnification is very high, and the total anode current consumption is probably between 20 and 25 milliamps., depending, of course, upon the valves and H.T. voltages. With some super-power valves the consumption may be in excess of this figure.

Bearing these facts in mind it is interesting to consider what type of mains unit or battery the average listener uses for his source of H.T.

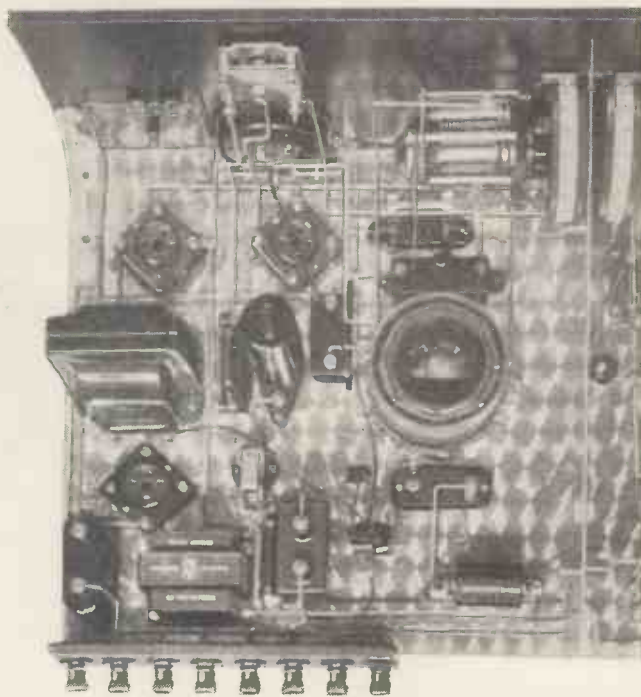
Overloaded Units

I will give a few details of my own impressions formed by handling many hundreds of queries. A large percentage of readers have mains units designed for a 20 milliamps. output, and having one power tapping of 120-150 volts. These units are quite

satisfactory in all respects, but they are not intended for big sets, especially if a super-power valve is employed.

Consequently they are frequently overloaded by listeners who have no idea of the probable anode current demands of their receivers. This overloading can only lead to one thing, viz., inefficiency.

HAVE YOU TRIED THIS?



If you are troubled with "motor-boating" or L.F. instability try a larger de-coupling condenser. A 4-mfd. condenser instead of one of 2 mfd. will often remedy the fault.

Then we come to dry H.T. batteries. The initial cost of the battery is often the deciding factor, and the smaller types are chosen in preference to the double- or triple-capacity ones. This is false economy, since the smallest-sized cells cannot supply the current, except for a short period, and so finally the listener is compelled to purchase a battery with larger cells in order to get results.

I receive many queries on these lines: "I built a four-valve set a month ago, and at first it worked perfectly. Just recently signals began to get distorted and now all I hear is a high-pitched whistle, which completely spoils reception." Yes, and the answer is: "The H.T. battery is running down." If the set in question incorporates a de-coupling device, the presence of the high-pitched whistle at once tells me that the battery should be replaced.

"But after a month?" the querist will say, not realising that it is not the fault of the battery but simply because he has purchased one only intended for use with sets employing up to three valves, and not those which include a super-power valve.

A Larger Condenser

There are, of course, receivers which become unstable even when a suitable mains unit is used. If such sets as these have decoupling devices, each consisting of a resistance and a 2-mfd. by-pass condenser, it is advisable to try a higher value resistance and a 4-mfd. condenser. A larger condenser is often adequate and remedies the trouble.

If, however, this alteration in values does not overcome the difficulty, it is a good plan to cut down the magnification on the L.F. side. For instance, in cases where an "H.F." type of valve is used in the first stage an "L.F." type having a lower magnification factor may be tried instead.

In addition, if two transformers are employed see that their ratios do not exceed 1-3.5.

ALL YOUR RADIO FROM READY RADIO

"M.W." PORTABLE FOUR

	£	s.	d.
1 Black polished ebonite panel, 14" X 7" X 3/16"	4	6	0
1 Cabinet to specification	2	0	0
2 J.B. .0005-mfd. Tiny No. 2 condensers	17	0	0
1 ReadRad .0001 Brookmans reaction condenser	2	6	0
1 Bulgin X.7 neutralising condenser	4	9	6
1 Bulgin 4-spring wave-change switch, S.29	3	6	6
1 Wearite double-pole change-over switch	1	0	6
1 ReadRad on-off switch	1	6	0
1 ReadRad link resistance, 25,000 ohms	1	6	0
1 ReadRad link resistance, 50,000 ohms	1	6	0
1 Link resistance, 1,000 ohms	1	0	0
1 Link resistance, 2,500 ohms	1	0	0
1 Link resistance, 5,000 ohms	1	0	0
1 Graham-Farish 2-megohm grid leak with terminals	2	0	0
1 ReadRad .5 megohm grid leak and holder	1	4	0
2 Telsen 4-pin valve holders	2	2	6
2 W.B. H.V. valve holders	2	2	6
2 T.C.O. 1-mfd. fixed condenser	11	6	0
2 T.C.O. 2-mfd. fixed condensers	2	0	0
2 Telsen .001-mfd. fixed condensers	2	0	0
1 ReadRad .0003-mfd. condenser	3	0	0
1 T.C.O. .01-mfd. fixed condenser	3	0	0
1 ReadRad "Hilo" H.F. choke	4	3	6
1 Telsen H.F. choke	1	0	6
1 Atlas output filter choke	1	8	6
1 Telsen "Ace" L.F. transformer	2	3	0
1 Graham-Farish 200,000-ohm resistance with terminals	5	0	0
1 ReadRad coil to specification	2	0	0
4 oz. No. 32 gauge D.S.O. wire for frame winding	3	4	0
4 oz. No. 26 gauge D.S.O. wire for frame winding	2	5	6
1 Packet of "Jiflinx" for wiring	2	6	0
1 Mullard portable loud speaker unit and chassis	1	8	6
7 Belling-Lee wander plugs	1	2	3
2 Spade terminals	2	7	6
4 Valves to specification. S.G., Det., L.F. and Power	1	0	0
2 Clix sockets, flex, screws, etc.	1	0	0
Total (including valves and cabinet)	£12	0	0

RECOMMENDED ACCESSORIES:

1 Fuller W.O. P.100 H.T. battery	15	0	0
1 Fuller W.O. 9-v. G.B. battery	1	6	0
1 Fuller JAP 11 portable accumulator	13	6	0
Total	£1	10	0

KIT "A" (Less valves and cabinet) **£7:12:6**

or 12 equal monthly instalments of **14/0**

KIT "B" (With valves less cabinet) **£10:0:0**

or 12 equal monthly instalments of **18/4**

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or 12 equal monthly instalments of **4/8**

KIT "C" **£3:3:6**

(Complete with valves and cabinet)

or 12 equal monthly instalments of **5/10**

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KIT "C" **£2:18:0**

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or 12 equal monthly instalments of **5/4**

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*Which is the best?—Storing records—A good scheme to adopt—
The Wates "Star" Pick-up.*

By "TONE ARM."

"WHICH is the best make of record?" asks a reader. What a terrible question to answer! Obviously, one cannot mention any one particular manufacturer, for the type of record that suits one person does not suit another.

For instance, Brunswicks have always been noted for their bass recording, but this is usually best demonstrated in "hot" dance numbers, and not everybody likes such syncopated enthusiasm as is evinced by such bands as Red Nichols'.

For brilliance I vote for H.M.V. and Parlophone, while Columbia run them very close, especially on dance band recordings. It is a matter of each to his own taste, and if you are after any particular number you should endeavour to hear it as played on two or three makes of records.

No More Breakages!

While on the subject of gramophone records, I wonder how many of my readers have trouble in storing their records.

The ideal method is that used in the gramophone shop—to keep the records in fairly stiff folders, and keep them packed up tight together standing on their edges. This is not always convenient in the average house, as it takes up considerable space, and is not particularly pleasing in appearance, unless one has a cupboard in which to hide the records, or shelves across which a curtain may be pulled.

But there is an interesting system on the market under the name of the "Jussrite" Record Filing System, in which every record is supplied with

a separate container, which is reinforced at the top by strips of strong cardboard one-eighth of an inch thick.

Pick Your Programme

Instead of standing on the floor of the cabinet, of which various types are available, these containers are hung on two steel rods which are passed through the holes, and by pulling a tab on the lower front of the container the latter rotates slightly, pivoting on the rear rod for

about one inch, thus it is delightfully easy to get the required record.

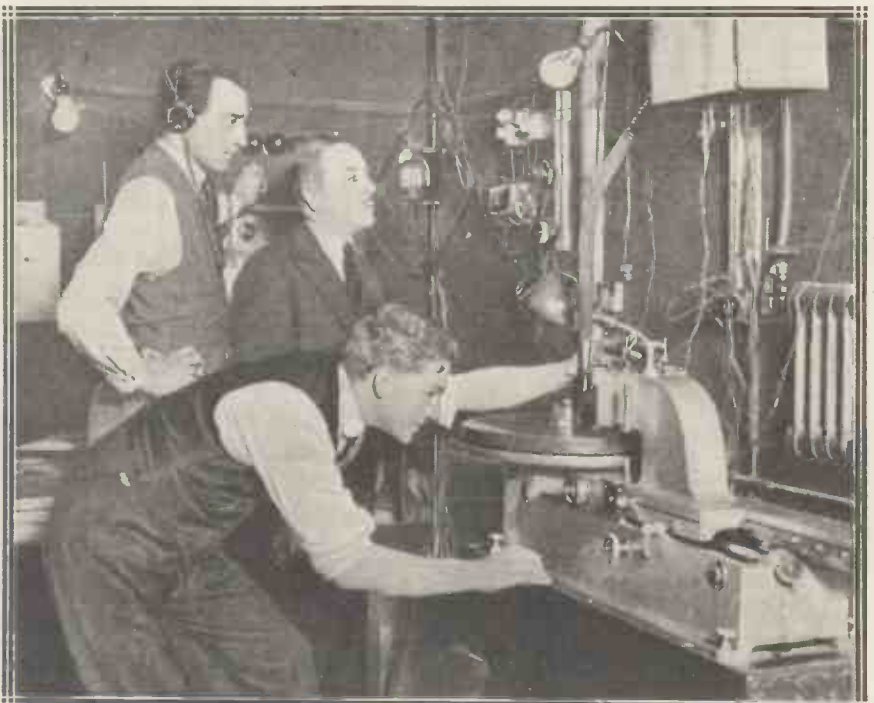
All sorts of cabinets are available, from large capacity units in oak and mahogany capable of filing two hundred records, to a bookcase library scheme which you can build yourself in sections made up from unit type cabinets with room for fifty records. An index is given away with every cabinet for complete sets, so that records can be found quickly and with the greatest of ease.

A Real "Star" Turn

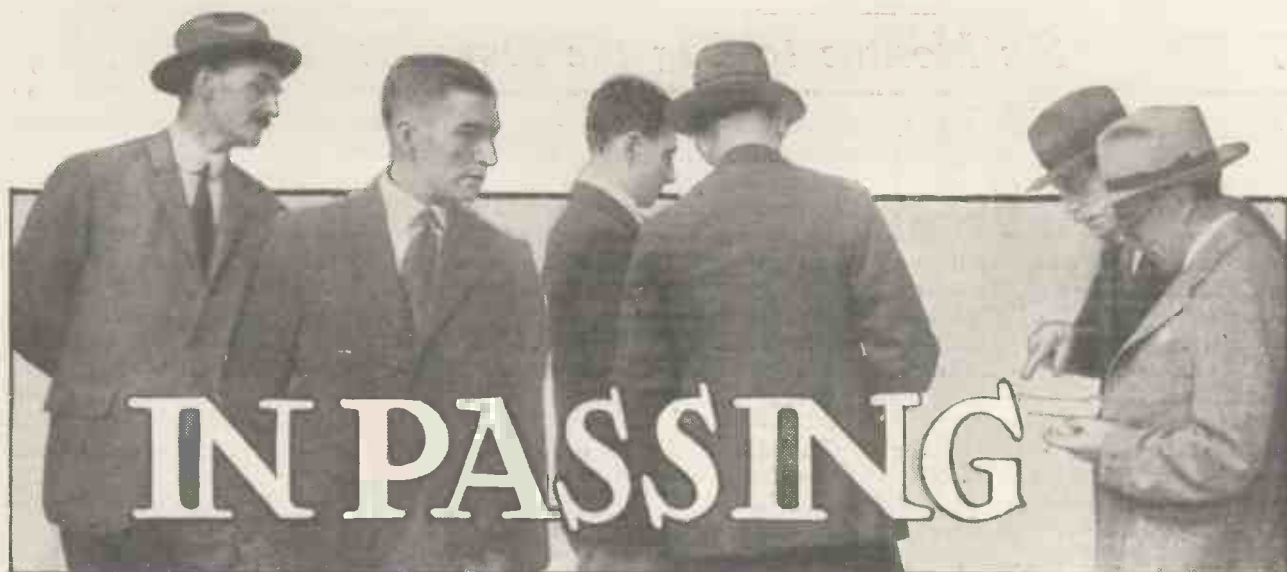
And now I want to bring to your notice a little pick-up which I have recently tried, the Wates "Star" pick-up, which at 18s. 6d. is remarkable value for money. It is sensitive and the model which I tested had no serious peak, while it is designed to fit upon any type of ordinary gramophone tone-arm. It was perfectly silent in operation, so much so that a friend of mine who is a very keen pick-up worker decided to use it on a small Decca gramophone of the portable variety, in conjunction with his ordinary radio set.

Anyone who knows the Decca will realise what this means, for the lid cannot be shut, and so the pick-up was exposed the whole time it was playing, and it justifies to the silence of that model when one realises that fact.

RECORDING A B.B.C. BROADCAST



The film of the Boat Race this year was synchronised with the running commentary broadcast from the "Magician." Here we see the recording taking place.



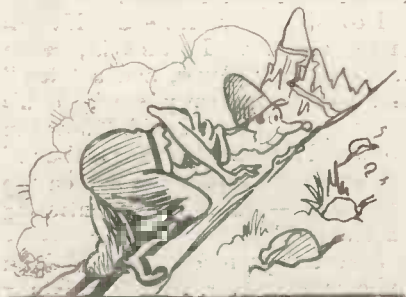
The Story of a Strange Signal

By dint of prodigious energy and accurate astronomical observation last year, I determined to the ultimate centimetre the two contiguous metres of my left-hand garden border which receive the maximum attention from the sun. There, I told myself, in the privacy of the summer-house—I don't count earwigs or spiders, but otherwise I was quite private except for my sonlet's fishing-rod—I told myself, I will plant, tend and bring to a triumphant flowering the finest clump of sweet peas ever seen in this village.

A Bad Bet!

Yesterday morning, during the process of dressing, I wrestled mechanically with a stud, and, as is my wont, I strolled to the window and gazed complacently at my garden, all dug up and ready for husbandry.

AN 'ELEVATING' PASTIME



Rolling a peanut up Pike's Peak!

"I'll bet," I remarked, "that those sweet peas will be two inches in diameter," and descended to breakfast.

Halfway through that meal—five minutes for bacon and eggs, and

five for finding my pipe and gloves—a Certain Party remarked that my selected two metres had also been selected, by the Certain Party, for the cradle of an extra-special brand of snapdragons which needed all the sun there was coming.

There is not a particle of hope for one if one struggles against the decisions of Certain Parties who cook to match one's palate and (mark you well what I do say!) who bungs up the holes in one's socks. So I gave in. So much for my bet!

Talking of wagers, I've heard of some rummy bets in my time. By the way, you never hear of a woman wagering anything useful till the event is over. And then she wants to argue! Well, there was the mad ass who undertook to roll a peanut up Pike's Peak (U.S.A.) with his nose.

I believe that he did it, though halfway up he had to procure a nose-guard, and he has not since assumed an erect posture, but earns a thin living in a dime show as the Human Hairpin. (Yeah?)

High Capacity!

Under my own observation came the man who swore (evens—at £1) to eat twelve ordinary restaurant size pancakes at a sitting, and he who alleged his capacity to take down twenty bananas at one go. Both of these lunatics cashed in, three degrees short of explosion point. You just try those blooming bananas! Extraordinary! You simply cannot ram the little blighters down after about Number 10!

The underworld of literature runs,

definitely, to the bizarre. I knew that through sharing diggings with a fellow who made a smallish pile out of suicides, premature burials, and death-mask articles. So that when I looked into "The Arches" and found MacSloe prancing on a barrel and gnashing fruitlessly with the few ivories left in his Neanderthal jaws, I was sure that I had struck some new thing.

After MacSloe had fallen off the barrel, he said "Verwey!" This in a tone of admonition.

Distorted Output

"Very—er—what?" I asked, passing him a glass of water.

"Verwey! Dushman! Dear ole Al! Hosh Nash! Y'know, Hosh Nashdin? Fi'f'ler! Hosh! Dushman!"

HAROLD'S ROMANCE



Harold Harker and Gwladys Smilk.

Light dawned upon me as slowly as rosy-fingered Aurora does her chores in "Don Quixote." He was referring to the Dutchman, Albert Verwey's classic excerpts from the stories of the Hodja Nasr-Eddin. And dear old Mac was trying out the ear-biting

Six Months to Log the Most Stations

yarn in which the Hodja proves that, though a man cannot bite his own ear he can dislocate his own jaw and break his own head in trying to do so.

"'S a bad bet, lad," he said. "The Dushman's let me down. But you are anchor and sign-post. Wash time poste gwowte? Laddie, I've a reeche reewardd forr-r such as ye. To be brief, I've a scoop in the hollow of ma hand."

"Let me bung you on to your bus," I said. "Actually, all you have in the hollow of your hand is a cork-screw belonging to the 'Arches.' Leggo! And kimmon!" So he came.

By Bus to Benfield

As we rumbled along on the bus he revealed a mighty bet that he was watching, in Benfield, N.E.13. How he got on to it I do not know. Primarily it concerned the loves of Harold Harker and Gwladys Smilk, but to a man like MacSloe the passions of the Harkers and Smilks of this world are but as the love play of butterflies, and there was evidently more behind the Bet than a lot of calf-love.

WORDS PASS BETWEEN



A row with MacSloe about it.

He revealed how that Papa Smilk could scarcely bear to breathe in any place containing Harold Harker, a fact which did not smooth the primrose path. Papa was an amateur wireless man, and Harold worked in a radio shop, and therefore was counted as of professional status.

Harold made the first ill-move when he inspected Papa's wireless den and assumed a patronising tone of voice, alluding foolishly to "Us as are in the Trade." That got right through Papa's skin.

Then Papa began his campaign to show up Harold. First he bet that he knew more about radio than did

Harold's entire self, family and ancestry. Harold dodged that very accurately-aimed brick by alleging that practise counted for more than book-learning. Out flew Papa at this, the light of battle gleaming from behind the thick lenses of his spectacles, and challenged Harold to active warfare—and then The Bet was born.

Harold "Hits Out"

Harold, with the rashness of youth under the gaze of the gentle gazelle, stated that he could log more stations than could Papa. Had that proposition been accepted as it stood the war would never end and Gwladys would die uncomforted.

But it was at this stage that MacSloe became Manager of The Bet. He saw quite clearly that the conflict must be confined to a specified time and that the word "stations" ought to be defined. Hence by consent of both parties the period of the contest was fixed at six months, and "stations" was defined as "stations situated in Great Britain, Northern Ireland and the Isle of Man, which are duly licensed as experimental transmitters."

Evidence of "logging" was to be the production of a suitable document signed by the proprietor of the transmitter, and MacSloe was to be the scrutineer and arbitrator. When I came upon the scene the wager had been in action for five months.

At the word "Go!" away they went, snaffing up stations like a couple of chickens in a corn bin. At the end of a month they were neck-and-neck, though Harold had three outstanding cases of "refused to reply," and Papa had one instance of "addressee gone away."

Amateurs Get Scarce

At the end of two months they were still level, and each had a few outstanding cases on the books. Amateur stations yet to be picked up now began to get scarce. The combatants watched the new issues like cats watching mouseholes, and occupied the third month in clearing up their reserve cases. Papa found an unlicensed station and there was a row between him and MacSloe about

it, Papa being desirous of getting a licence for the station at his own expense. Papa lost!

Then Harold produced two cases in which the stations had closed down the day after he had logged them. MacSloe gave a ruling in his favour, whereupon Papa handed in six instances of stations which he had logged but without the required confirmation; he had, however, written confirmation from other amateurs who had heard the same

IT ISN'T DONE!



You can't receive your own signals!

signals. MacSloe compromised and allowed him three.

Next, Harold submitted that three of Papa's stations had had their licences cancelled for reasons originating prior to the date of Papa's logging them. A smart bit of detective work, which MacSloe rewarded by allowing the objection in each case.

A Sticker at Radio

At the end of the fifth month the thing had become too hot for Mac to hold; besides, his journalist's soul cried out for a "story," and his own line was gardening, pets, freemasonry and railway accidents. So he raked me in as I have described and I went to inspect The Bet.

I could not love Harold. He was more cunning, I thought, than fundamentally clever, and a "fag" end was permanently stuck to his lower lip. "Mac," I said, "how can you stand this pimply young artisan?"

"Only by keeping my eye on the ball, laddie—that is, by concentrating on The Bet."

I liked Papa much more. A keen radio man; clever, though painfully slow; certain notions of education had come to him and, above all, he had

(Continued on page 550.)



UNDY MULTIPOLE Super Dynamic "8"

**FAR IN ADVANCE OF ANYTHING EVER
PREVIOUSLY ATTAINED IN LOUD SPEAKERS**



There is nothing to equal it in the world of radio—an advance in design and capacity which denotes the pinnacle of loud-speaker production. Equally suitable for all from "All Mains" to the smallest "battery" receivers.

Not only is the "Undy" SUPER DYNAMIC fitted with a magnet of unequalled power, but the three tapings on the incorporated auto-transformer enable the perfect adaptation of the A.C. resistance of the speaker to any type of valve, and consequently 100 per cent. result in all cases. This means that whether a low, medium, or high resistance valve is employed in the final stages, the "Undy" Super Dynamic '8' can be adapted to work in complete unison. No other speaker can claim this.

The provision of the volume switch enables the loud speaker to stand a constant anode current of 200 milliamperes and anode voltages of over 500 volts without injury.

On Sale Everywhere

**Greater Volume!
Greater Strength!
Greater Sensitivity!**

British Patent No. 336,930.

PRICE:

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COMPLETE.

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Scientifically tested and absolutely reliable, it is rapidly becoming the most popular coil for radio constructors. In real moulding, with ample base.

Price **12/6**

Insist on 'Formo' for Efficiency in Radio.

Obtainable from all Radio Dealers. Leaflets from—

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Golden Square, Piccadilly
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A PERFECT EARTH AT THE TOUCH OF A MATCH!

Cup containing solder and flux. Twist earth wire round here. Then—

—fill this cup with methylated spirit and apply match—that's all.



The new Wearite Earth Tube gives perfect earth contact and is provided with a most ingenious device by which a perfect and lasting soldered joint is obtained just by striking a match! Every listener who has attempt-

ed to make a good soldered joint out-of-doors will appreciate this special Wearite feature. Made of solid drawn copper of substantial thickness and fitted with cast-iron driving head.

Price, **3/6** only

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Telephone: TOTTENHAM 3847.

A RADIO RECKONER

By
W.A. BARCLAY
M.A.



Here is the third of the series of valuable time-savers which take all the sting out of tedious radio calculations. These charts enable you to obtain all sorts of useful information without the bother of working out involved calculations. This month they deal with resistances in parallel.

In examining the wiring diagram of a modern receiver it is often convenient to regard it from the standpoint of the different kinds of current which are carried in the various parts of the circuit.

Tracing the Currents

Thus we may trace the path followed by the tiny H.F. aerial currents as they pass from the aerial via the tuner to earth. Again, we may follow the different paths which the H.T. current may take to and from the H.T. battery or mains unit, or else there are the paths taken by the comparatively large and steady L.T. current delivered by the accumulator or other source to the filaments of the valves.

In any given circuit we may take one feature fairly well for granted. In performing the journey from the source around the circuit, the current will split up along several alternative paths, so that a part only of the total current goes by any one route.

Filament Connections

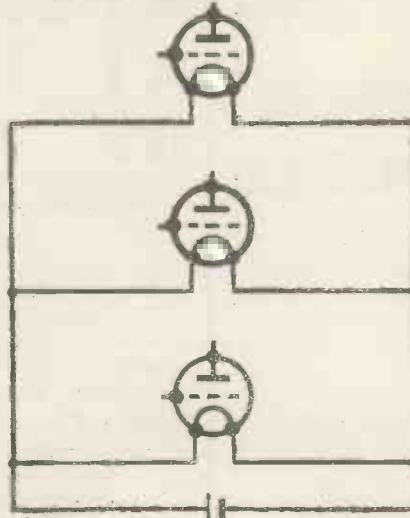
Such alternative routes are said to be "in parallel" with each other. As a simple example, let us take the case of the ordinary valve filament supply for several valves. When the source of L.T. current is a battery, it will usually be found advisable to connect the valve filaments "in parallel," as is shown in an accompanying circuit.

Then, as is obvious, the current in its journey to and from the battery has three different routes through the three filaments, and the total

current delivered by the source will be the sum of the three separate currents through each of the branches.

Let us now consider the simple branched circuit shown on the next page, where two resistances R_1 ohms and R_2 ohms are connected in parallel, an E.M.F. of E volts being applied across the whole as shown.

PARALLEL PATHS



A2159
The usual method of supplying L.T. current to valves; the filaments are arranged in parallel.

Then, by Ohm's Law, we can find the amount of current which flows in each of the branches, since the resistance of each is known, and the same voltage is applied across both. If C_1 amperes be the current flowing through the top branch, we shall have $C_1 = \frac{E}{R_1}$; and, similarly, if C_2 amperes

be the current through the lower branch, we shall have $C_2 = \frac{E}{R_2}$.

If we call C the total current supplied by the battery, we shall thus have the equation:

$$C = \frac{E}{R_1} + \frac{E}{R_2}, \text{ or}$$

$$C = E \left(\frac{1}{R_1} + \frac{1}{R_2} \right) \dots (1)$$

Single Equivalent

Now let us replace the branched circuit by a single resistance, as shown, and enquire what its value must be in order that the same current of C amperes may pass as before. If we call the value of this single resistance R ohms, we can easily see from Ohm's Law that the current flowing will be $\frac{E}{R}$ amperes,

that is, $C = \frac{E}{R} \dots (2)$.

In virtue of equations (1) and (2), we may therefore write:

$$\frac{E}{R} = E \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$$

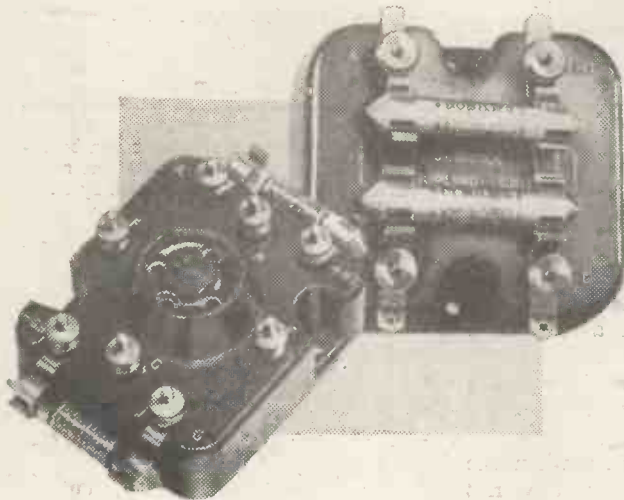
or, more simply,

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

An Important Equation

This equation is a very important one in radio work, and gives us the means of finding the value of the single resistance R , which is equivalent in its action to the combined resistances R_1 and R_2 when these are arranged in parallel.

HEAR THE HIGH NOTES



HEAR THE LOW NOTES WITH DUBILIER R.C. UNITS



It is common knowledge that well-designed resistance coupling has an even response over a very wide range of audio frequencies and at far less cost than transformer coupling. Build your set round Dubilier R.C. Units and be assured of reproduction that is without equal.

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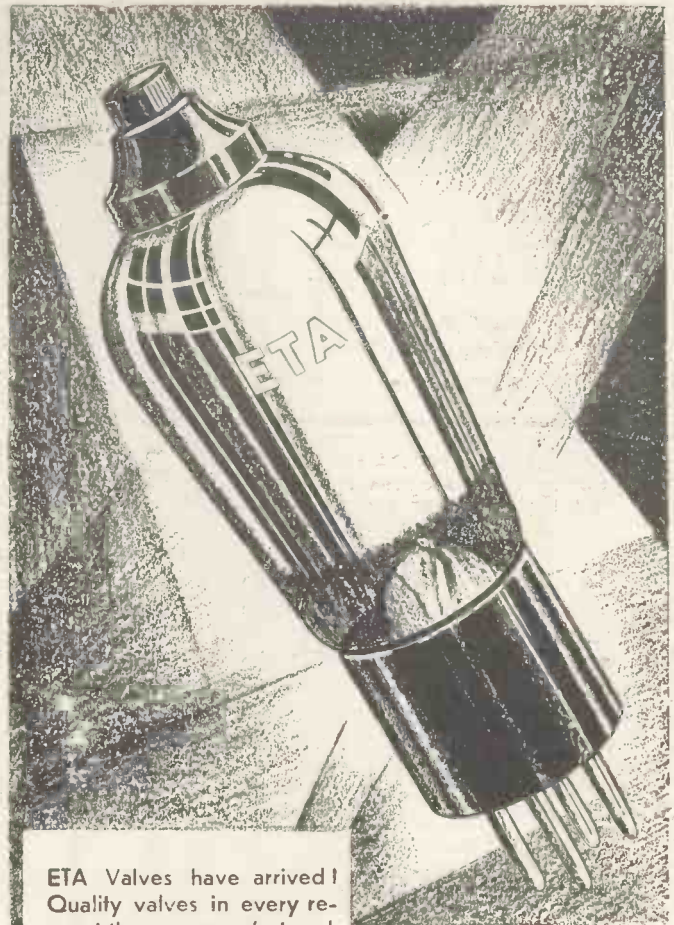
- Model No. 1 - (without valve holder)
- Model No. 2 - (with valve holder)

Either Model complete with two Dumetohms

7/-

DUBILIER COMPONENTS

Dubilier Condenser Co. (1925) Ltd.,
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ETA Valves have arrived! Quality valves in every respect, they are manufactured with the greatest care and tested again and again before they leave our works.

ETA Valves are sold at a price that will place them high in the esteem of radio-lovers. For purity of tone, dependable efficiency and low current consumption fit ETA Valves. They more than justify their claim of being "the best between aerial and earth." Prices from 7/-

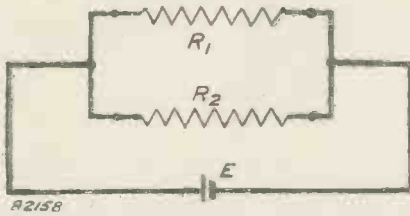
Ask your Radio dealer for particulars of the ETA Valve to suit your set.

ETA VALVES

THE ELECTRICAL TRADING ASSOCIATION LIMITED,
ALDWYCH HOUSE, ALDWYCH, W.C.2.
Telegrams: Eltradax, Estrand, London. Telephone: Holborn 8139

For instance, if R_1 in Fig. 2 were 3 ohms, while R_2 were 6 ohms, we should have $\frac{1}{R} = \frac{1}{3} + \frac{1}{6}$; so that $\frac{1}{R} = \frac{1}{2}$, and, therefore, $R=2$.

THE FIRST STEP



The two resistances R_1 and R_2 are in parallel. The total current applied by E is divided, part flowing through R_1 and part through R_2 .

We could thus replace the two resistances in parallel by a single resistance of 2 ohms.

It is interesting to note that the value of the equivalent or "resultant" resistance is always less than either of the two branch resistances.

The alignment charts which accompany this article are designed to provide a rapid means of ascertaining the value of the equivalent resistance of a parallel circuit of two branches, when the branch resistances are known.

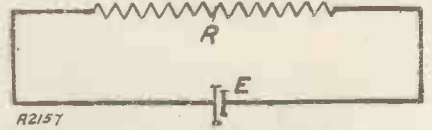
The two charts each consist of three scales. The two outer scales on each diagram carry values of the two branch resistances, while the inner scale carries values of the "equivalent" single resistance.

For Two Small Resistances

The manner of using these charts is the same as previously described. As an example, if the branch resistances are 18 ohms and 6 ohms respectively, a straight-edge placed across these values on the first chart will intersect the centre scale at 4.5 ohms, the required value of equivalent single resistance.

This is intended for use when the two parallel resistances are not very different from each other in value; for widely differing values of

EFFECTIVE RESISTANCE



The circuit shown in column 1 can be redrawn as above, where the resultant resistance of R_1 and R_2 are denoted by R .

serve for the limited range of resistances which are shown. If the resistances we are dealing with happen to be larger than the range of values provided for, we need only multiply all the values shown on the diagram by 10, 100, 1,000, etc., as the case may require.

Another Use

Suppose, for example, that we wish to ascertain the resistance which if placed in parallel with an existing anode resistance of 120,000 ohms would reduce the effective value of anode resistance to the value 50,000 ohms.

It will be seen that since the effective resistance of the parallel combination is known, the required value of the unknown component will be sought on one of the outer scales.

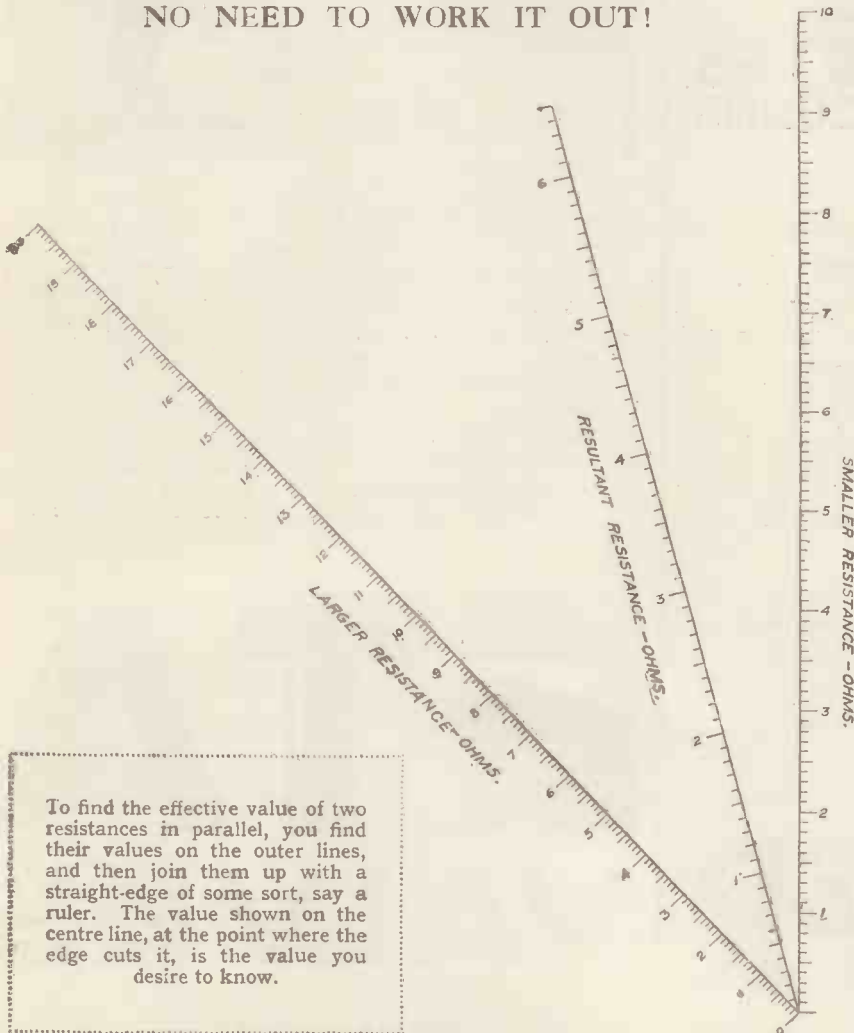
Using the first chart and multiplying all the values shown on it by 10,000, we place our ruler across the point 120,000 on the left-hand scale and 50,000 on the centre scale. These points, of course, are simply those marked 12 and 5 on the diagram, but we now imagine them to represent the larger figures.

A Charging Problem

This position of the ruler now meets the right-hand scale in the point marked 8.57, so that multiplying by 10,000 we arrive at the figure 85,700 ohms as the value of the resistance required.

Let us further consider an application to the charging of an H.T. accumulator direct from D.C. mains. We shall suppose that we have to charge a 120-volt accumulator from 220-volt D.C. mains, it being essential that the safe charging current should not exceed 30 milliamps. Let us further suppose that the only two resistances in our possession are 5,000 ohms and 10,000 ohms respectively.

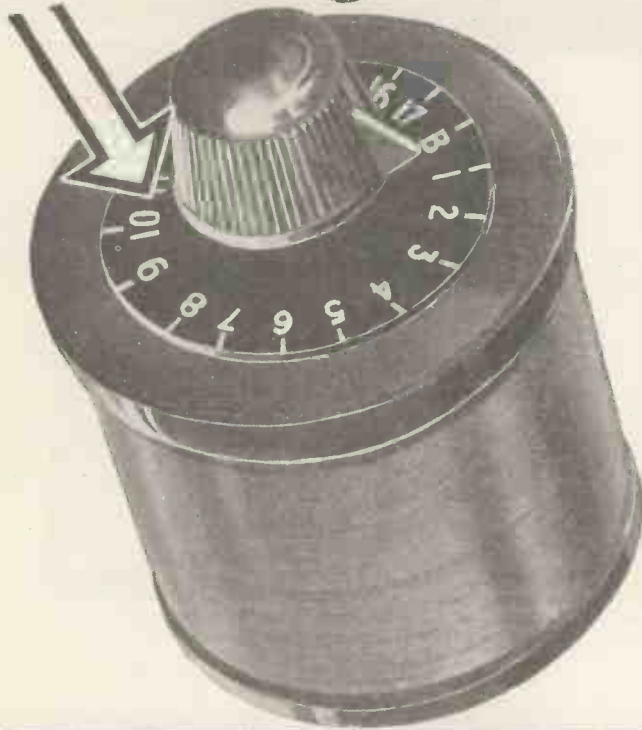
NO NEED TO WORK IT OUT!



To find the effective value of two resistances in parallel, you find their values on the outer lines, and then join them up with a straight-edge of some sort, say a ruler. The value shown on the centre line, at the point where the edge cuts it, is the value you desire to know.

This diagram gives you details for parallel resistances of fairly low value.

That Engraved Dial is important



The New Improved "P.W." & "M.W." SELECTOR COIL

WITH AN ENGRAVED SCALE SHOWING THE EXACT POSITION OF THE TAPPINGS

The highly selective reception you expect to obtain by the employment of a "P.W." Selector Coil depends upon the critical accuracy observed in the maker's observance of the designer's specification, and ability to improve details of construction and finish.

R.I. have succeeded in creating a model beyond even the designer's expectations, by a feature available only in the R.I. design—a beautifully engraved dial which enormously increases the ease of operation and indicates the position of the tappings as a guide to different stations. Additional features are high-grade double silk covered wire, wound on a bakelite moulding, and, finally, the infallible laboratory tests as previously applied to the R.I. Dual Range Coil.

12/6

Thus do R.I. pre-determine your results, and you know for certain that if you **INSIST ON THE R.I. SELECTOR COIL WITH THE ENGRAVED DIAL** you will secure the best, and therefore biggest value.

Get a copy of the latest R.I. Catalogue—it is the best component reference obtainable.

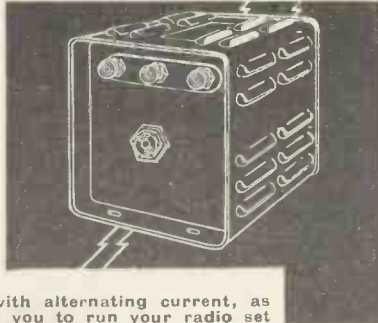


EFFICIENCY, VALUE & CERTAIN RESULTS

Radio Instruments Ltd., Madrigal Works, Purley Way, Croydon.

Phone: Thornton Heath 3211.

MAKE YOURS A MAINS SET FOR LESS THAN £3



If your house is supplied with alternating current, as little as £2 15 0 will enable you to run your radio set from the mains—less than you would spend on dry batteries alone during the course of a year. As you know, a rectifier is necessary when employing alternating current to run a wireless set. Of the many types of rectifier obtainable, none can claim so many virtues as the "Westinghouse." It is all-metal—substantial—compact—never needs attention—and its life is so prolonged we haven't yet been able to determine its limit. The H.T.5, priced at 15/-, is a particularly popular style. Most good radio-dealers sell Westinghouse Rectifiers, but if you find any difficulty in obtaining the Rectifier, or advice as to the most suitable unit for your particular purpose, write to us and we will give you the name of your nearest stockist.

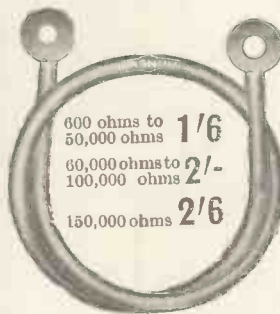


METAL RECTIFIERS

The Westinghouse Brake & Saxby Signal Co., Ltd., 82, York Road, King's Cross, London, N.1. Telephone: North 2415.

MAGNUM PRODUCTS

WIRE-WOUND SPAGHETTI RESISTANCES



600 ohms to 50,000 ohms 1/6
60,000 ohms to 100,000 ohms 2/-
150,000 ohms 2/6

Specified for the M.V.W.3, "M.W." Portable, "Contra-Wave" One, and hosts of other modern receivers.

All "M.W." Sets can be supplied ready wired and tested, as constructional kits, or parts separately.

Full range of lists with leading short-wave stations—free on request.



SHORT-WAVE CONVERTOR

Enables you to enjoy the short-wave stations on your present set, if battery operated, without any alterations or extras. Try it yourself, without obligation to purchase. Including coils. Sent on 10 days' free trial against cash **£3.15.0**

BURNE-JONES & CO. LTD.

"MAGNUM" HOUSE,
296, BOROUG HIGH STREET, LONDON, S.E.1.
Telephone: Hop 6257 and 6258.

Scottish Agent: Mr. Ross Wallace, 54, Gordon Street, Glasgow, C.1

All the Calculations Done For You

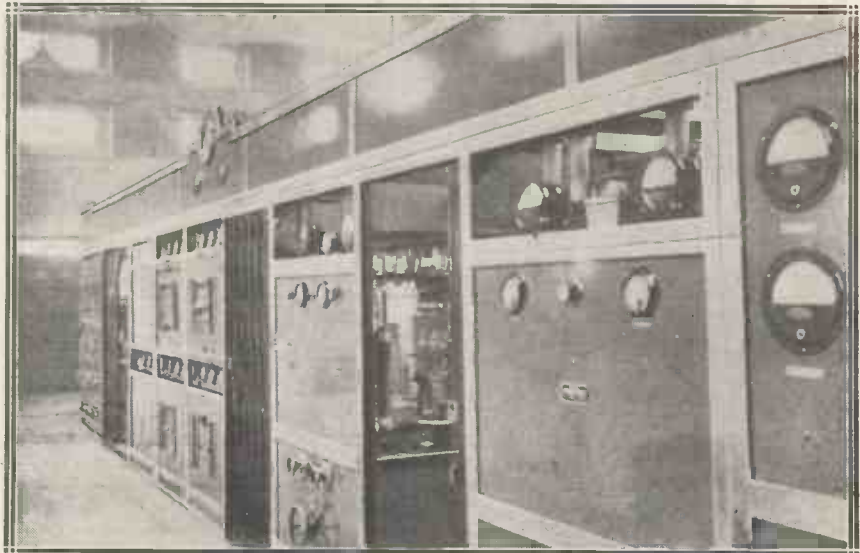
LISTEN FOR LEMBERG

Now, the available charging voltage is 220—120, i.e. 100 volts. If, then, we use a charging resistance of 10,000 ohms, we find by Ohm's Law that the current taken will be $\frac{E}{R}$ or $\frac{100}{10,000}$ amperes; that is, 10 milliamps. Again, if we use the 5,000-ohm resistance we shall have a charging current of $\frac{100}{5,000}$ amperes, or 20 milliamps.

Series Not Suitable

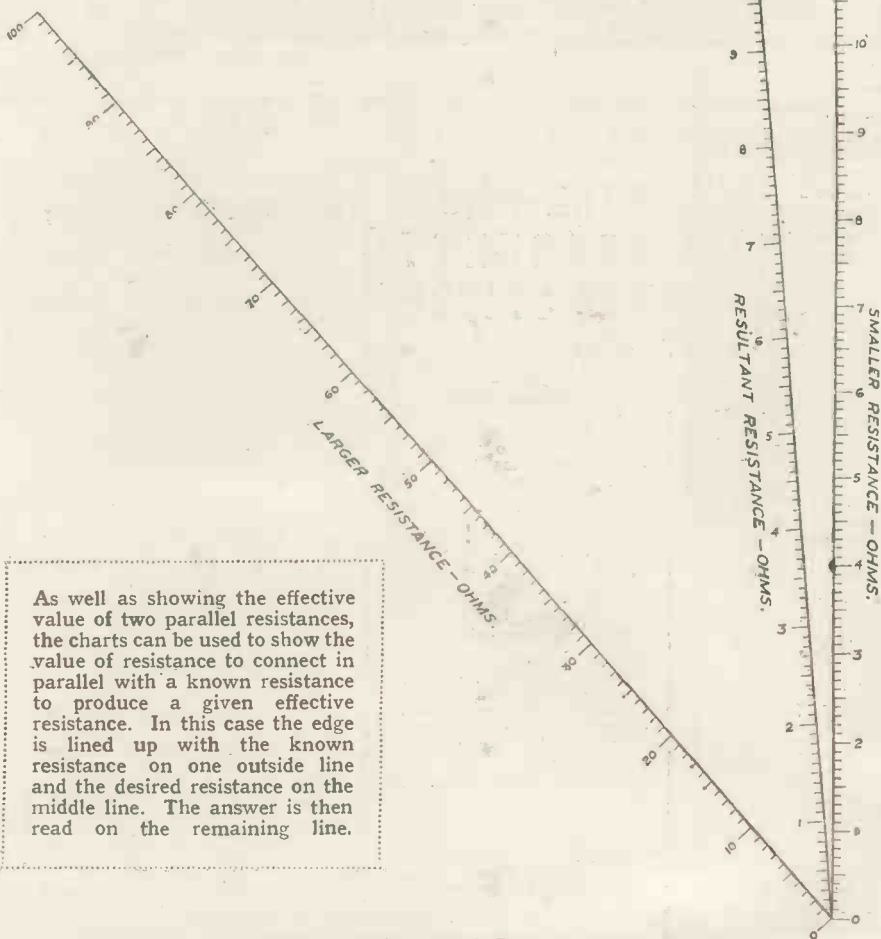
If we place our two charging resistances in series we should have a value of 15,000 ohms, and the charging current would be $\frac{100}{15,000}$ amperes, or 6.67 milliamps., so that we should be still worse off.

If, however, we place the two resistances in parallel we shall find that they are equivalent to a single



A neat and accessible layout is employed in the Marconi station at Lwow (Lemberg). Here we see the main panels. The power is 21 kw.

WHAT IS THE RESISTANCE?



As well as showing the effective value of two parallel resistances, the charts can be used to show the value of resistance to connect in parallel with a known resistance to produce a given effective resistance. In this case the edge is lined up with the known resistance on one outside line and the desired resistance on the middle line. The answer is then read on the remaining line.

resistance of 3,330 ohms. Hence the charging current will now be $\frac{100}{3,330}$ amperes, or 30 milliamps. The parallel combination of the resistances is thus most suitable for the purpose.

GREAT IMPROVEMENTS

A reader's experiences with the "Kendall" Rejector and the "Filterphone."

Sir,—It is now over a year ago that, thanks to MODERN WIRELESS, I was able to make my set super-selective by constructing your excellent "Kendall" Rejector. Since first using this rejector I have built another receiver consisting of 2 S.G., H.F. det. and pentode, but still the same "Kendall" Rejector is doing me wonderful service.

The object of this letter is not only to tell you that I am still getting good results with the above, but to thank you for another improvement, and a great improvement it indeed is; I am referring to the "Filterphone." The results are truly amazing.

I find it delightful to search the ether with the headphones, and can do so now without being subjected to those head-splitting shrieks.

Yours faithfully,

F. FRANCKE.

Hammersmith, W.6.

You can tell in a tick the resultant resistance of two or more resistances in parallel by using this alignment chart and that on the previous page.



EXACT CAPACITY IS GUARANTEED

The Capacity rating of Helsby Condensers is guaranteed accurate within 10%. For a small extra charge, accuracy can be guaranteed within 5% or 2%.

Keen experimenters delight in working with Helsby Condensers—the engineers—built components of constant reliability. Each is vacuum-dried, impregnated with non-hygroscopic material, and tested to double working pressure. Supplied to the G.P.O. and Admiralty for the past thirty years. If any difficulty in obtaining from your local dealer, please send us his name and address.

2 μF
650V. A.C.
WORKING



HELSEBY
CONDENSER

Helsby
condensers
BRITISH INSULATED CABLES LTD
PRESCOT... LANCASHIRE.
MAKERS OF B.I. CABLES

USE
"GOLSTONE"
COMPONENTS
FOR
BEST RESULTS
SPECIFIED AND
RECOMMENDED BY
"MODERN WIRELESS"
AND
"POPULAR WIRELESS"



GOLSTONE

**STAR TURN
SELECTOR COIL**

Built to rigid specification, with Engraved Dial. One Hole Fixing. For Flexi-Coupling and other Circuits. Laboratory Tested to give **10/6** highest possible efficiency. No. R8/106.

From all First-class Radio Stores. Refuse substitutes. If any difficulty write direct. Large illustrated Radio Catalogue **FREE** on request.

"GOLSTONE"
"P.W." & "M.W."
DUAL RANGE
COIL

Specified and recommended by Designers.

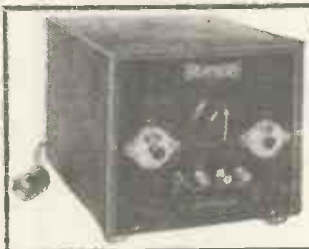
DW/12. **10/6**

Ward & Goldstone
PENDLETON MANCHESTER LTD

You can always get Better Results if the famous Golstone "N.O.M.A.S.T." Aerial be fitted. Price 24/- Pamphlet with Testimonials and full particulars on request.

HEYBERD ALL-ELECTRIC UNIT

At last! Heyberd's Radio Technicians have evolved the most efficient, economical and all-embracing Unit yet offered the British public. Study the features of one of the most popular Models and its remarkably low price.



MODEL E. 150

H.T. 150 volts at 25 ma.
L.T. 4 volts 4 amps for A.C. Valves.
L.T. 2 volts Trickle Charger.

Three H.T. tappings—one variable Westinghouse rectification. Mottled black Steel case with Bakelite Panel containing silver-embossed H.T. and L.T. control switches, Pilot Lamp and all tappings.

Price complete Ready to Plug in **£5 - 10**

There is an All-Electric Model E. Unit for Every Receiver.

Send 3d. stamps for list 956 giving full details of the special Model suited to your particular Receiver.

F. C. HEYBERD & Co., 10, Finsbury Street, LONDON, E.C.2

**SHORT WAVES
On Any Battery Set**



37/6

Complete C.O.D. (You pay the Postman; we pay a 1/- charge) or CASH.

Kelsey Short-Wave Adaptor Whatever your Radio requirements, send them to Peto-Scott for quotation by return. Established in 1920, we hold the largest stock of components in London.

PLUG the lead of the Kelsey Short-Wave Adaptor into the Detector Valve Socket of your Battery set and the Valve itself into the Adaptor. You are then instantly ready to tune in Short-Wave stations from 16-52 metres from all over the world. Transatlantic reception on 2-valves is easy with this unit. No extra batteries, valves or trouble with the Kelsey Short-Wave Adaptor.

77 City Road, London, E.C.1
Clerkenwell 9406

PETO-SCOTT CO. LTD.

62 High Holborn, London, W.C.1
Chancery 8266

WAVE-METERS FOR LOW FREQUENCIES

We are all familiar with wave-meters of the buzzer and heterodyne types which are used on high or radio frequencies, but there is another type of wave-meter known as a frequency-meter. This is used to indicate the number of cycles per second of an alternating current, and there are several different principles on which it can work.

IN radio work frequency-measurement is usually taken to mean the measurement of radio frequencies, and is generally carried out by means of a wave-meter. This consists essentially of a combination of inductance and capacity, forming an oscillatory circuit which, by adjustment in the usual way, can be made responsive to any radio frequency within its range; the adjustment necessary, after the instrument has been calibrated, being an indication of the frequency concerned.

Just as radio frequencies are easily measurable, so ordinary alternating current frequencies can be measured by means of comparatively simple instruments, and it is sometimes useful to check up the frequency of an A.C. supply.

Three Distinct Types

Alternating current frequency-meters, whilst simple in design, are quite ingenious in principle. There are three main types of frequency-meter, which may be described as the vibrating-reed type, the differential voltmeter type and the iron-needle type.

The vibrating-reed meter simply comprises a number of spring-steel reeds which are carefully tempered and adjusted so that each has a definite natural mechanical vibration-frequency, precisely like the strings of a harp or a piano. In close proximity to the reeds are electro-magnets through which the alternating current passes.

Magnetically Controlled

It is obvious that when the A.C. current is passing through the magnets the reed which has a natural vibration frequency nearest to the frequency of the magnetic impulses will vibrate most strongly. The two reeds on either side of this one will usually vibrate to some extent, whilst the reeds further removed will scarcely vibrate at all.

The reeds are, of course, marked to indicate the A.C. frequency which sets

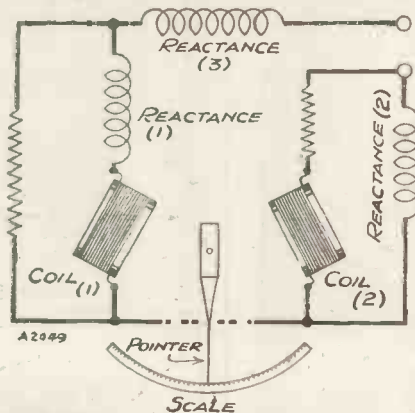
them most strongly into vibration. A glance at the instrument then enables us to pick out the most strongly vibrating reed and to tell at once the frequency of the A.C. current which is passing through the instrument.

In the differential voltmeter type of frequency-meter two induction voltmeters are used in combination. Two special electro-magnets act in opposite directions upon a metal disc, the whole constituting a differential voltmeter.

Differential Principle

The winding of one of the electro-magnets has an inductance in series with it, whilst a resistance is included in series with the other. You will realise at once that the current in the circuit which includes the resistance only will be virtually independent of the frequency, since the (non-inductive) resistance will be independent of

THE IRON-NEEDLE TYPE



This diagram illustrates the internal connections of a low-frequency meter which depends for its working upon the varying reactance of a coil at different frequencies and the shunting effect of a resistance.

the frequency, but the current in the circuit which includes the inductance will decrease as the frequency increases. Consequently the aluminium disc is caused to rotate in accordance with the frequency of the A.C. current, which can therefore be at once determined.

The iron-needle frequency-meter (which is illustrated in the accompanying diagram) employs two coils which are placed with their axes at about right-angles to one another, whilst a needle is located at an intermediate position, so that the iron armature of the needle is acted upon by the fields of both coils.

Relative Current Effect

A reactance is included in series with one coil and a resistance in series with the other coil. The first coil with reactance is shunted by a resistance, whilst the second coil with its resistance is shunted by a reactance. The whole instrument is connected to the A.C. supply via another main, or regulating, reactance.

"It is sometimes useful to check up the frequency of an A.C. supply, and just as radio frequencies are easily measurable, so mains frequencies can be measured."

You will see by looking at the figure that when the frequency is low the shunting effect of reactance (2) is large, whilst the current which can pass through reactance (1) is comparatively large, so that coil (1) has an advantage over coil (2). As the frequency increases, however, the shunting effect of reactance (2) becomes less whilst reactance (1) increases, thus passing the advantage more from coil (1) towards coil (2).

The Main Reactance

The needle will, of course, take up a position which indicates the relative advantage of coil (1) and coil (2), and it is therefore possible to graduate the scale in terms of the frequency.

The series reactance (3) helps to cut down the higher harmonics in the A.C. supply, and the instrument can be so designed as to be virtually independent of fluctuations in the main A.C. supply.

MAKING PORTABLE SETS SELECTIVE

Sir,—Re article on page 23 of your January issue. Has any manufacturer tried using a frame aerial with suitable tapplings? I experimented with this when the double transmissions first started from London, and found that by providing plenty of tapplings it was possible to separate the transmissions.

Yours faithfully,
G. MOLLE, A.M.I.E.E.

W.8.

FORMO
ARTHUR PREEN & CO. LTD.

VERNIER DIAL 3/6

MIKA-DENSOR 6^d

MID LOG VARIABLE CONDENSER 4/6

FORMO-DENSOR 1/6

MIDGET CONDENSER 2/9

MAINS CONDENSER CAP. 2 3/3

DUAL RANGE COIL 12/6

THE wonderfully smooth action and fractional accuracy of the Formo Vernier Dial used in conjunction with Formo variable condensers makes tuning of close stations a simple operation with the certainty of clear-cut reception. The scientific thoroughness of Formo condenser construction is your assurance of the best possible results from any set. High performance is further assisted by the enclosed and protected pigtail within the shaft and minimum eddy current losses. In 4 capacities. *Catalogue of the complete range of Formo components sent on request.*

ARTHUR PREEN & Co. Ltd., Golden Square, Piccadilly Circus, London, W.1. *Factory: Crown Works, Southampton.*

The Thrilling Truth about ASIA'S SECRET SOCIETIES

A victim of the sinister organizations which dominate the East reveals, in this Month's CASSELL'S MAGAZINE, their terrible methods and menacing search for power. Never before has such a candid history of Asia's Inner rulers been published.

IN PROOF OF MANHOOD

is a fine long complete novel of the Adventure and Romance which meet a couple who test Fate by flying into the Frozen North. It is written specially by ELIZABETH MARC.

"PRINCE OF PROSPERITY"

is a penetrating study of the Prince of Wales and his great services to Britain—specially written by R. C. SHERRIFF, the world-famous young author of "Journey's End."

CASSELL'S MAGAZINE

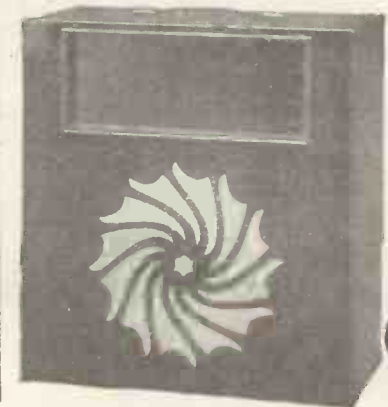
For MAY - - - - Now on Sale—1/-



SPECIALISTS IN MAINS RADIO SINCE 1924

Write for FREE Art Booklet, "The Simple Way to All Electric Radio."
 REGENTONE LIMITED, Regentone House, 21, Bartlett's Bldgs., London, E.C.4. Telephone: Central 8745 (5 lines). Irish Free State Distributors: Kelly and Shid, Ltd., 47, Fleet Street, Dublin

THE FAVOURITE CABINET FOR YOUR PORTABLE



For your portable you must have a first-class cabinet— attractive yet not cumbersome, handsome yet strong and sturdy. The CAMCO "Favourite" fulfils all these conditions— you can house your set in it with full confidence. Price, in oak, 40/-; in mahogany, 44/6. Send for catalogue giving full particulars of this and other Camco Cabinets to:—

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 Hatton Garden,
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 Works: S. Croydon.

"FAVOURITE"

RADIO NOTES and NEWS of the MONTH



Big Money

NEXT year the B.B.C. will have a total income of £1,194,500. This compares with £1,060,000 for 1930. It's a very nice sum of money, isn't it?

And, furthermore, we must add to it £22,500 as an additional grant to the Corporation in connection with the Covent Garden Opera Scheme. And, again, we must add £150,000—profits from publications, plus a few odd thousands by way of "sundry receipts."

The B.B.C. Budget

In all, it means that the B.B.C. will have next year approximately £1,370,000 to spend. Certainly listeners ought to get something good for this amount of money.

The First "Uncle"

By the time this issue is on sale you will probably have heard Uncle Arthur—the first official announcer for the old Broadcasting Company. Uncle Arthur—in real life Mr. Arthur Burrows—may certainly claim to be the most famous of all the uncles the B.B.C. has known. For some years past now he has occupied an important position on the Secretariat of the International Radio Bureau.

Mr. Burrows lives at Geneva, but it is hoped that one day he will come back to London and again resume active duties at Savoy Hill. Certainly the B.B.C. could not do better than re-engage Uncle Arthur.

Really Short Waves

A lot has been written in the papers lately about the micro-ray. A demonstration was given before experts a few weeks ago of transmitting minute energy on an abnormally short wave-length, using an aerial about one inch in length.

This micro-ray is regarded as a possible solution to the ether-congestion problem.

Only Seven Inches

Of course, every amateur knows that experiments on short waves from 50 down to 5 have proved very satisfactory, but now experiments on 18-centimetre wave-lengths are being made, or, roughly, wave-lengths of 7 in.

The one drawback to the micro-ray at the moment is that its range is less than 100 miles, although experts think that by the use of reflectors the range can be increased.

Fantastic Frequencies

The generation of these extraordinarily short wave-lengths necessitated the production of oscillations of approximately 1,600 millions a second. To achieve this tremendous period, a micro-radion tube is used.

(Continued on page 544.)

INTRODUCING LEWCOS^{Regd.} SPAGHETTI FLEXIBLE RESISTANCES

LIKE all other "LEWCOS" products, the Spaghetti Resistances maintain a high standard of quality—the result of over fifty years experience in Wire Manufacture. The terminals of this new product are constructed to prevent loose connections, and the blue sleeving is made of a special material which eliminates the possibility of cracking. The values of the twenty different resistances, which are suitable for use in all circuits, are printed below.

Two Lewcos 1,000 ohms Spaghetti Resistances are specified for the "M.V.W." Three receiver, described in this issue.

"If it's 'LEWCOS' it must be good."

Resistance Ohms.	Capacity M/amps.	Resistance Ohms.	Capacity M/amps.
300	50	10,000	10
600	50	15,000	7.5
750	30	20,000	6
1,000	30	25,000	6

Centre-tapped resistance, 100,000 ohms, 2/8 each. (The value of the resistance is shown on the sleeving.)

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS, LIMITED,
CHURCH ROAD, LEYTON, E.10.

FACING FACTS
Spells superiority

Cheaper Radio!

Everlasting High Tension for a trifle over the cost of 2-120 Volt Batteries



The Neatest & Cheapest A.C. Unit ever made

Model A.C.244.

With alternating-current electric lighting in the home it is now possible for you to banish your Radio troubles and assure H.T. for your Set for a lifetime at a little more than the cost of a year's supply of Batteries—the secret is the "ATLAS" new Unit A.C.244. A development of the famous "ATLAS" Olympia Winner—Model A.C.188. It is no larger than a 60v. Battery, and no matter what your Set is—from one to four Valves, Standard or Portable—the facilities and output of A.C.244 will be found more than satisfactory. Three Tappings are provided—60/80 Volts for Screen Grid Valve, 90/100 Volts for Detector Valve, and 120/150 Volts for Pentode or Power Valve. Output: 120 Volts at 20 m/A or 150 Volts at 15 m/A. It incorporates the Westinghouse Metal Rectifier, and is complete with Wander Plugs and Earth Terminal, and fully guaranteed for 12 months.

59'6
CASH PRICE

"CLARKE'S ATLAS"

MAINS H.T. UNIT—A.C.244

Ask your Dealer for a demonstration of this amazing Unit, and, in case of difficulty, write direct for Folder No. 56 to the makers:—

H. CLARKE & Co. (M/CR), Ltd., Atlas Works, Old Trafford, Manchester.
LONDON OFFICE: 60, CHANDOS STREET, STRAND W.C.2.
GLASGOW OFFICE: 24, OSWALD STREET.

LITTLE STORIES OF GREAT MOMENTS



"I never saw such an idle boy!"

Little did James Watt's well-meaning aunt guess that if her dreamy nephew had heeded her reproaches, the invention which transformed the entire life of mankind would not have been made! But young Watt would not be deterred, and, after long years devoted to doing one thing and doing it well, he solved at last the riddle of his mother's kettle, and the steam engine became a reality.

It is this same spirit of "doing one thing and doing it well" which has for years been behind all T.C.C. endeavour. That is why T.C.C. have never made anything but Condensers, and that is why T.C.C. Condensers are unmatched—for accuracy and for dependability.



One of the many types is shown here. It is the T.C.C. 1 mfd. type (for maximum working voltage of 1500 D.C. peak value.) Price 10/-



TELEGRAPH CONDENSER CO., LTD., N. ACTON, W.3.

8211

RADIO NOTES AND NEWS OF THE MONTH
 —continued from page 542

Another curious thing about the micro-ray is that it travels in a direct line, like light, and cannot be bent to the curvature of the earth unless a prism be used to bend or refract the ray. There is undoubtedly a good deal of experimental work to be done with the micro-ray, but it certainly does hold interesting possibilities.

America's Latest

More news is to hand of the marvellous Radio City which is to be built in New York. It will include a group of buildings which will accommodate 50,000 people. They will have their own mayor, and every scientific device that ingenuity can invent will be included in the building. This architectural phantasy will cost £50,000,000, and it owes its origin to the imagination of Mr. John D. Rockefeller, Junr.

A Radio City

Radio City has been designed on what is known as the trinity of air,

light and utility, and the idea is to make it the most famous amusement centre in the world.

Fifteen floors of the central tower will be occupied by the National Broadcasting Corporation of America, and by a novel arrangement twenty-seven studios will be suspended in outer rooms by wires. They will be more or less rooms within rooms, the space between being insulated with rubber and felt. All doors will be of lead, 2½ in. thick, and the windows will have triple panes of glass set in rubber.

Four Years to Build

Light will be supplied for the streets by the modern synthetic sunshine, and the air will be warmed in winter and cooled in summer.

It is expected that Radio City will take four years to build, but it will certainly be a modern wonder of the world when it is finished.

Proof of the Plugging

Allegations have been made by the associated British Authors and Composers that the B.B.C. is guilty of song-plugging, especially in connection with the broadcasting of dance music.

Sir John Reith, in reply to this

charge, asked for proof, which we understand has been promised.

Sir John for U.S.A.

On May 15th Sir John Reith sails for America on the Aquitania. In the States he will participate in important conferences on education in relation to broadcasting. Sir John has been to America before, for after he was wounded during the war the British Government sent him to America to handle certain big contracts.

At one time Sir John had 1,500 inspectors beneath him. Sir John is bound to make a sensation in New York, where vivid personalities are always welcome.

Germany's Giants

Germany's chain of broadcasting stations continues to grow. The idea is to keep the German ether free from foreign wireless invasion, and when the circle of defence is complete it is reckoned that no interference from British stations, France or Italy will be noticeable.

Five to Follow

Heilsberg and Mühlacker, two 75-kw. stations, have already been
 (Continued on page 546.)

Experts again specify—"IGRANIC"

Don't take risks by embodying in that set you are building inefficient transformers or chokes. Use what the experts specify, and be assured of perfect performance—**quality of reproduction.**



IGRANIC
"J" TYPE TRANSFORMER
PRICE 17/6

IGRANIC
"J" Type Transformer

PRICE: 17/6

IGRANIC
MIDGET L.F. CHOKE

PRICE: 10/6

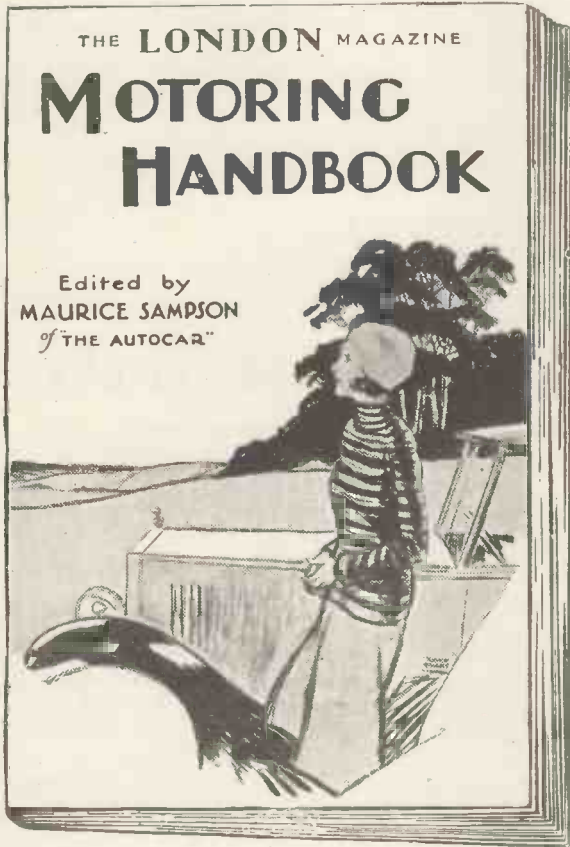
Specified for the
"M.V.W." THREE and
"MODERN WIRELESS"
PORTABLE 4

If you are unable to obtain Igranitic components locally write direct to us to Dept. J.1125.




IGRANIC
MIDGET CHOKE
PRICE 10/6

64 Page Motoring Handbook **FREE**



Every user of the road will welcome this invaluable motoring handbook. Edited by Mr. Maurice Sampson of "The Autocar," it is a veritable mine of useful information. Sixty-four pages of advice and hints from acknowledged experts, five road maps printed in two colours and numerous black-and-white illustrations amplifying the text. Such is the LONDON MAGAZINE MOTURING HANDBOOK, a copy of which is presented FREE with the MAY Number of this splendid magazine. A few of the contents, listed below, will give you some idea of the utility of this amazing gift.

MOTORISTS and INSURANCE
RUNNING-IN the NEW CAR
DO's and DON'T's for DRIVERS
BATTERIES and their BURDENS
CAUSE and PREVENTION of FIRE
TOURS in DEVON, NORTH WALES, etc.
TYRES—BRAKES—IGNITION
Useful TOOLS for CAR and GARAGE
MOTORISTS AND THE LAW

Apart from the free gift, which is alone worth far more than the price of the magazine, there is the usual programme of fiction—the finest work of the best-known writers—articles interesting, amusing and splendidly illustrated, and many other fascinating features. Don't miss this bumper issue of

Among a big selection of brilliant stories in this issue of The LONDON you will enjoy especially
"ROOM 700"
an amazingly dramatic new novel by Mary Hastings Bradley.

The NEW LONDON Magazine

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Anode Resistances. All values, 100 ohms to 500,000 ohms.

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Ohmite and Megite Resistances are constant in value, of negligible self capacity and non inductive. Dead silent and always reliable, they provide the most effective resistance on the market, giving the full range of values required. Supplied with vertical or upright holders of superior brown bakelite construction 6d. extra. Graham Farish components carry a written guarantee of accuracy.

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Grid Leak. All values, 1 megohm to 5 megohms.

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Ask your dealer to obtain, or write direct to

GRAHAM FARISH

LIMITED. BROMLEY, KENT

RADIO NOTES AND NEWS OF THE MONTH
—continued from page 544

completed, and it is expected that five more will be completed by the end of the year—at Breslau, Leipzig, Munich, Langenberg, and Königswusterhausen.

Despite the high cost of licences in Germany, broadcasting is still increasing; but we wonder what British listeners would say if they were charged 24s. a year instead of 10s.

considerably by logging L S 2, Buenos Aires; a station that tallied with L S 9, Buenos Aires; X E X and X F G, Mexico City; W R N Y, New York; W S P D, a 500-watt station at Toledo, Ohio; W J A Z, Chicago; W O W O, Fort Wayne, Ind.; W J B T, Chicago; W J J D, Moosejaw, and many I have received before. My log is now 58 American stations on medium waves.

Best Received Americans

W T I C, W P G, W J Z, W R V A and W J J D are the best-received American stations at present, and W J J D has given some really startling volume on several occasions.

LOOK OUT NEXT MONTH

for another

“INTER-AXIAL” Loud Speaker

Based on “M.W.’s” famous new suspension system, this fine cabinet cone speaker will be fully described in

THE JUNE

MODERN WIRELESS

On Sale May 30th.

Price 1/-.

It is reckoned that there are about three and a half million licensees in Germany, and the official Broadcasting Company holds 49 per cent of the shares, the other 51 per cent being held by the Government.

W L W L has twice been received at good strength on the moving-coil loud speaker.

On one or two occasions W B Z-W B Z A, at Springfield, have come in well. I have only heard K D K A definitely once, and then at not too good strength. W A B C has put in a fair signal on several occasions. W N A C, Boston (1,000 watts), has given remarkably powerful results.

A mystery station has been heard by me on several occasions in the region of 244 metres. This station announces in Spanish and the call is “Radio Prion, III.”

On a Portable

I recently received W T I C with no aerial, but an earth. Signals were just distinct enough to hear a word here and there. With an aerial the whole family was awakened!

W T I C also turned out to be the station I was receiving in the following experiment:

I had been “seeing to” a three-valve portable (of which the makers claimed a range of 25 miles), and suddenly thought I would see whether I could receive America upon it. At 3 a.m. I started to try. There

(Continued on page 547.)

MORE LONG-DISTANCE WORK
Another interesting letter from an enthusiastic correspondent.

Sir,—Since you have given my letters considerable prominence, and because I have received so many letters from readers who have read them, I feel sure that a large majority of your readers find them interesting reading, which, needless to say, I hoped they would. So once again I am writing to you with more of my reception details, which, I think you will agree, do not lack in “thrills.”

I have still been carrying out a considerable amount of “candle burning” on medium waves and results have been much to my liking, though at the time of writing results have decreased very much in connection with American stations. However, I have swelled my log

MORE LONG-DISTANCE WORK
 —continued from page 546

were three distinct carrier-waves, but I could evolve nothing from them.

However, as I was trying to evolve the "fattest" of them, the strength improved, and I managed to hear music and announcements from WTIC. The set only used a small frame aerial and had no radio-frequency stages, merely detector and 2 L.F. In this case, like the above, every precaution was taken against interaction with the larger aerial, and I can definitely say that interaction was not the cause of this remarkable reception.

More Thrill on S.W.

From previous letters from me you will realise that though I carry out a considerable amount of experimenting on medium and long waves, I also do so on short waves.

Indeed, I prefer short-wave to medium-wave reception as there is more thrill in it, and you are so apt to get what you don't expect.

I have frequently heard DX short-wave stations without aerial or earth, and these include 3 LO, Melbourne; 2 ME and 2 FC, Sydney; P LE, PLF, Java; 2 XAF, 2 XAD, 8 XK, 2 XO, 2 XK, WNC, WMI, WND, LSX, etc. However, on the 29th of March I heard W-2 XAF on half a 'phone.

It was like this. I had some visitors in to hear the radio, and one of them was particularly interested in my short-wave receiver. It is enough to raise interest, being efficient but odd in appearance. No vernier dials, .0005 reaction condenser, .0003 tuning, a row of dry cells running the length of the base-board (these supplying the "B" power), and L.F. accumulator.

"K.D.M." a Veteran

Truly an experimenter's set! Nevertheless, despite this set's appearance, I look upon it as a friend and companion. I can always rely upon it. When my broadcast receiver will not get me a musical programme this little set will.

I have nicknamed it "K.D.M.," which is short for "Key to Distant Musical Programmes." An odd name, perhaps, but a name that says a lot.

As I was saying, my friend was very interested in "K.D.M.," and I

(Continued on page 548.)



J.B. NEUTRALISING CONDENSER

J.B. NEUTRALISING CONDENSER—extremely simple design, cannot go wrong. Minute capacity changes made with ease. The slotted knob can be adjusted with a screw-driver and hand-capacity effects eliminated. Maximum capacity, 20 m.mfd. Minimum capacity, 1.5 m.mfd. Price 3/6

J.B. DIFFERENTIAL REACTION CONDENSER, for smooth reaction control. Carefully shaped vanes ensure equal capacity changes for both halves. *Insulated centre spindle*. Bakelite dielectric between vanes makes short-circuits impossible. Pigtail to rotor. '0001, 4/- '0015, 4/- '0002, 4/3 '0025, 4/3 '0003, 4/6

ACCURATE CONTROL MADE EASY



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Advertisement of Jackson Bros., 72, St. Thomas' Street, London, S.E.1.

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"The nicest I have seen," says "Wireless Constructor."

The sort people desire to possess and keep. Tasteful beauty—Piano finish—advantages also of **PIANO-TONE** baffle chamber.

The **BETTER REPRODUCTION** that your Set is really capable of gives you a joyous sense of achievement.

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THE BEST IN THE WEST

FOR ALL MAINS COMPONENTS AND ACCESSORIES.

The new Paillard Junior De Luxe Gramophone Induction Motor, £2.5.0, or with Motor Plate, £2.15.0.

Complete range of Mains Transformers and Chokes for all types of Rectifying Units and Valves.

The Super-Sixty Super-Net, has set up a new standard in radio. All parts in stock, including Weatite, £2.2.0.

Frame Aerials, Lewcos, £1.12.6.

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 Phone: Regent 0921/2.

QUIS?

If you had to devise an experiment to show quantitatively how a sprung valveholder damped out vibration which a solid holder transmitted to the valve, how would you set about it?

There are no prizes, but as a test for your ingenuity you might care to sketch out an idea and then write to us for a little booklet, "The Elimination of Pong," which describes how a well-known scientist set about the job—and what he found.

THE BENJAMIN ELECTRIC LTD.,
 Tariff Road, Tottenham, N.17

BENJAMIN

The Picture Paper with the **MOST News**

SUNDAY GRAPHIC

PLEASE be sure to mention "MODERN WIRELESS" when communicating with Advertisers. **THANKS!**

A NEW W.B. PERMANENT MAGNET MOVING-COIL SPEAKER for £4:10:0

So sensitive that any 2- or 3-valve set will drive it! No mains or batteries needed. Identical in design with the very successful model introduced earlier this season.

Don't be put off — insist on a demonstration.

Type PM2 chassis, assembled with 11 1/2" x 11" baffle board, £4 : 10 : 0.

If fitted with a double-ratio step-down transformer, 15/- extra.

Ask your dealer for the free colour-folder, or write to us direct.

Made by the Makers of the famous W.B. Cone Speakers, Switches and Valve Holders.

Whitley Electrical Radio Co., Ltd., Radio Works Nottingham Road, Mansfield, Notts.
Irish Free State Distributors: Kelly & Shiel, Ltd., 47 Fleet Street, Dublin.



MORE LONG-DISTANCE WORK

—continued from page 547

consequently volunteered to show what it was capable of.

I logged W-2 X A F and Rabat, Morocco, at good strength. I then disconnected the aerial and earth and, each having half the 'phones, with a little difficulty tuned-out W-2 X A F at about R.3. Rabat came in at R.5-6. Short-wave fans will realise that this is a much greater achievement than hearing with a pair of 'phones, as roughly twice the volume has to be obtained to hear the programme distinctly.

"Terrific Strength"

Using an O.V.4, I have been logging W-2 X A D, 2 X A F, 3 X A L, 8 X K, 9 X F, W N D, W M I, Rabat, etc., at terrific strength on a moving-coil loud speaker. Indeed, on several occasions W-2 X A D has been mistaken for London.

If I went more into my short-wave reception here I would be encroaching seriously upon your valuable space, so I will now desist hoping that I have not bored you, but, on the contrary, interested you.

Yours faithfully,

LESLIE W. ORTON,
President, Anglo-American Radio Society.

Uxbridge.

VALVE LIFE

Sir,—Mr. K. D. Rogers, in his article "Valves I Have Tested," says: "So you very rarely hear anything about the life of a valve when reading through our pages." I think possibly the following extract from a letter received from the Mullard Wireless Service Co. may interest your readers.

This letter was sent in reply to a request for a test to be made of a P.M.6 valve which I had had a long time and which I thought possibly could, with advantage, be replaced. I had, however, no cause to complain of the working of the valve.

Letter dated April 2nd, 1931 (Ref. S3313):

"One P.M.6. On test, however, we find this valve to be satisfactory in every respect. . . . For your information we would add that the P.M.6 valve is nearly four years old."

Yours faithfully,
A. GOYDER SMITH.

Wootton, Oxon.

THE "CONVERTIBLE" TWO

—continued from page 524

lid. This should hold the chassis sufficiently firmly in position for the case to be raised so that it can be seen if all four knobs clear the sides of the holes.

Finishing Touches

If all is well here, mark the positions at each side of the case for screws to pass through into the baseboard. One 3/4-in. round-head screw each side is sufficient, with a washer under the head to provide a good grip on the case itself. Before screwing home place a distance washer, a piece of 1/4-in. wood with an 1/8-in. hole to clear the screw, between the edge of the baseboard and the side of the case.

All you now require to complete the portable outfit is a 60- or 66-volt H.T. battery, a small 2-volt unspillable accumulator, and a pair of lightweight 'phones, also short battery leads. You will note no H.T.—terminal is provided, connection being made from H.T.— to L.T.— on the batteries themselves, or by placing H.T.— and L.T.— leads on the same terminal. The end wires of the frame aerial are connected to aerial and earth terminals, but make sure they are the right way round. The correct connection is that which gives the lowest dial reading on any particular station, while the 'phone leads can come out under the lid of the case when closed. If a temporary aerial is used at any time, the frame leads are, of course, disconnected for the time being.

Plenty of Punch

To commence operations stand the case upright, pull out both small knobs, wave-change and L.T. switches, and then tune in the ordinary way. You should have no difficulty in finding the local stations, which at anything like close ranges come in almost too loud for comfort.

After this the adjustment of the aerial series .001-mfd. condenser can be attended to. According to the wave-length of reception, there is a setting of this condenser which necessitates a considerable increase in reaction. The proper adjustment is then a slight clockwise turn of the knob, when reaction becomes normal.

If you set this condenser for a wave-length near the upper part of

(Continued on page 549.)

(PAREX)
COILS AND COMPONENTS
as recommended for
THE "M.W." THREE
The "M.W." PORTABLE FOUR
THE "CONTRA-WAVE" ONE
THE "CONVERTIBLE" TWO

"M.W." Dual Coil
APPROVED BY "M.W." **12/6**
Each coil tested and calibrated on actual broadcasting. Delivery by return.
Panels, 14" x 7" - - 4/6
" 7" x 7" - - 2/6
Drilled to specification.

DIFFERENTIAL REACT. CONDS., each, 4/6
600-ohm RESISTANCE with holder " 2/6
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SOLVE ALL H.T. TROUBLES

Per doz.	No. 1.	No. 2.
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Jars (waxed)	1 3	1 6
Sacs	1 2	1 9
Zincs	10	11
Rubber Bands (24)	4	4
Terminals	8	10

Trade Supplied.

WET BATTERIES
TAYLEX
— SELF GENERATING —

LONG LIFE : SILENT : ECONOMICAL
Sample doz. (18 volts), complete with bands and electrolyte. No. 1, 4/1; No. 2, 5/- post 9d., terminals extra. No. 3, with terminals, 7/6 (10,000 milli-amps) sample unit 5d. Orders 10/- carr. paid. Well illustrated catalogue post free. Bargain List of Receivers, **FREE** Amplifiers and Components.
M. TAYLOR, 57, Studley Road, Stockwell, London.

THE "CONVERTIBLE"
TWO

—continued from page 548

the tuning range, then the receiver will be sufficiently sensitive all round the dial, so that for general work this control requires no further attention.

For the maximum sensitivity on any one particular station you will, of course, need to re-set this condenser, which operation is a matter of moments once you get the hang of the idea. On the other hand, if you do not wish to bother with this extra adjustment, you can wind a frame aerial of 24 turns, connecting it to terminals E and G on the coil. The only drawback of this method, however, is some restriction of the tuning range, while selectivity is not quite so good.

RECENT RECORD
RELEASES

—continued from page 518

we give you below details of a selection of records from this list which are worthy of a place in the most exclusive record library.

Out of the popular numbers we have chosen a record by Maurice Elwin. This month he has recorded two new numbers: When It's Sunset on the Nile and Waiting by the Silvery Rio Grande, on No. 5828.

No. 5834 is another record of the popular kind. This is by the inimitable Bud and Joe Billings. Their titles this time are: When Your Hair has Turned to Silver and I'm Alone Because I Love You. The last-named title has also been recorded on a Zonophone dance record this month.

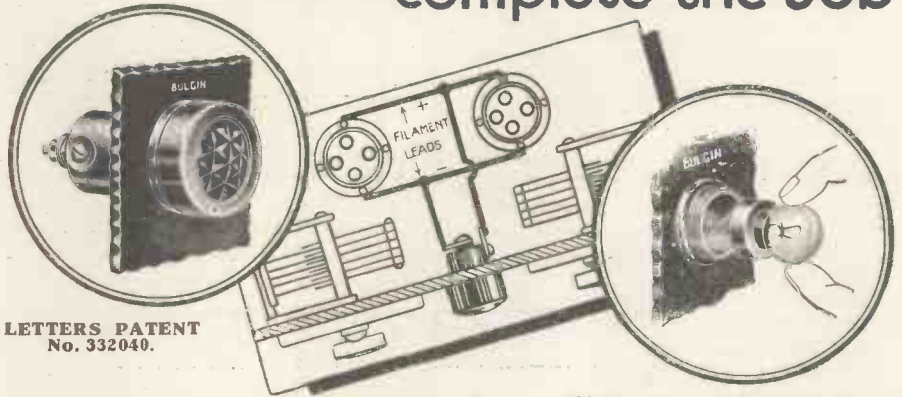
Next comes the dance section. Five records are offered this month, numbers and titles of which are as follow: Love is Like a Song, Foxtrot (Film, "What a Widow"); Japanese Sunshade, Foxtrot with Vocal Refrain (5838); by Rhythmic Eight. Betty Co-ed, One-step with Vocal Trio; Tears, Waltz (5839); by Rhythmic Eight. The Peanut Vendor, Foxtrot with Vocal Refrain; On a Little Balcony in Spain, Foxtrot (5840); by Orpheus Dance Band. Sweet Jenny Lee, Foxtrot; You're Driving Me Crazy, Foxtrot with Vocal Refrain (5841); by Orpheus Dance Band. Underneath the Lovers' Moon, Waltz; I'm Alone Because I Love You, Waltz with Vocal Refrain (5842); by Orpheus Dance Band.

The two we think the best are Nos. 5839 and 5840. Vallec's Betty, Co-ed is delightful, being another "Stein Song", in lighter vein.

Then we have a re-recording by the famous Black Diamonds Band of a very old record, Blue Danube, Waltz, and Carmen, March (5849).

And, finally, a record by the celebrated International Novelty Quartette: Nights of Gladness and Valse Septembre (5832), will be welcomed by many.

Two Simple Connections complete the Job



LETTERS PATENT
No. 332040.

NOTE THE LAMP EXTRACTOR

BULGIN FLASH SIGNAL LAMPS are fitted in a few minutes—ons hole to drill, two connections to make. They save their cost over and over again. By inadvertently leaving the set switched on, not only are the batteries exhausted, but the valves are submitted to strains by overwork, and, therefore, lose emission. The red glow of the Bulgin Signal Lamp is a visual indication that the filaments are switched on, and the low consumption bulb imposes an insignificant load on the L.T.

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Of ingenious construction allowing easy replacement of the bulb. Projection only 1/8 inch. Type Dg, Price 2/6. Special Bulbs, 2, 4, or 6 volt .06 amps., Price 6d. extra.



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"PORTABLE"
FOUR

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Condenser . . . 4/9
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SWITCHES ARE
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Latest model illustrated. Easily breaks 3 amps. at 250 volts. Q.M.B. action. Indicating. Live parts are insulated from lever. One hole fixing. Nickel finish. Small. Neat. Guaranteed fully.

- No. 728 with Soldering Tags . . . 2/- each
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MANY OTHER TYPES.

Send for Free Booklet "Switches for Radio and Power," with 20 new circuits.

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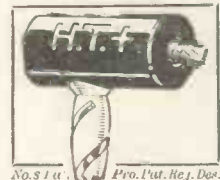
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If unable to obtain locally please forward name of dealer to us.
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THE POWER UNIT THAT SUPPLIES THOSE EXTRA VOLTS—SAY SIX-SIXTY FOR 200 VOLTS H.T. Automatic Grid Bias, too, safeguarding your valves. Replaces existing batteries in a moment—takes no more room. Price £6 : 6 : 0. An extra winding for L.T. enables you to use the unit at any time as a complete mains-drive for A.C. Valves.

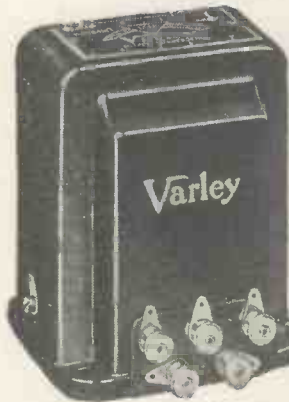
Write for FREE BOOKLET giving full details of the whole Six-Sixty range.

Six-Sixty Radio Co., Ltd., Six-Sixty House, 17/18, Rathbone Place, Oxford Street, London, W.1.

Tel.: Muscum 6116/7.

IS YOUR SPEAKER MATCHED TO YOUR OUTPUT VALVE?

Make your Speaker better still—strengthen the bass, get greater volume without distortion and protect the windings—with a Varley Impedance Matching Output Transformer. Two Models, giving a wide choice of ratios, and enabling you to match any speaker and valve exactly.



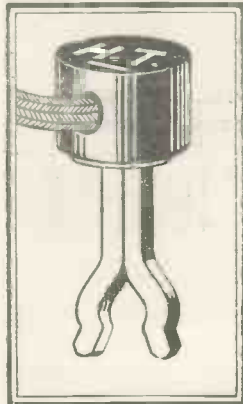
VARLEY IMPE-DANCE MATCH-ING OUTPUT TRANSFORMERS.
 Type D.P.20. 5 ratio (for high im-pedance speakers), 22/6
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Write for Section D of the Varley Catalogue for full particulars of all Varley Output Transformers and Chokes.

Varley

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

A NEW BELLING-LEE SPADE TERMINAL FOR



2^d.

All British. Handles permanently engraved. Side entry—the whole flex gripped, copper, rubber and tray.

Patent Nos. 329465 & 12423/30

Use it for neat and permanent connections to receiver terminals, tapped coils, L.T. accumulators, etc.—for hook-ups, clipped on to any screw or wire!

The new Belling-Lee Spade Terminal clips on to any terminal stem and makes good contact with its powerful spring prongs. Connecting up becomes a one-hand job.

See it at your dealer's.

BELLING-LEE
FOR EVERY RADIO CONNECTION

Advertisement of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex.

NEW WAVE-LENGTHS FOR BROADCASTING

—continued from page 466

In this case the distance between the aerial and the transmitting hut is about 40 ft.

With this transmitter employed under the conditions outlined above, the current obtainable at the centre of the transmitting aerial is of the order of half an ampere for wave-lengths between 5 and 10 metres. While this current may not seem to be very large for the input power employed, it has to be remembered that the radiation efficiency of a half-wave aerial is very high, and that therefore the bulk of the power supplied to the aerial is radiated from it in the form of useful electromagnetic waves.

Little Energy Wasted

This factor is one of the great advantages which short-wave working has over operation on longer wave-lengths, where a large proportion of the energy supplied to the aerial system is dissipated as heat in the ohmic resistance of the aerial wires themselves.

In the two-valve oscillator described and illustrated, and which is built up on the circuit diagram of Fig. 2, the condensers C_1 and C_2 act as retroaction couplings from the anode of one valve to the grid of the other.

An alternative mode of connecting two valves in "push-pull" arrangement is shown in the circuit diagram of Fig. 4. In this arrangement the retroaction condensers are not required, as the mutual inductance between the anode and grid coils may be made to provide the necessary retroaction.

While this type of oscillator has the disadvantage that there are two circuits to tune, and that it is difficult to vary the coupling between the grid and anode coils, it has been found useful in the construction of small low-power oscillators when working at extremely short wave-lengths.

Valve Limitations

With two-valve oscillators, using the circuit shown in Fig. 4, it has been found possible to obtain oscillations at various wave-lengths down to a lower limit at about 1.5 metres. Beyond this region it is practically impossible to make an oscillator using ordinary voltages on the electrodes.

Two factors account chiefly for this limit; one is the capacity between

the electrodes in the valve itself. This capacity is in shunt across the oscillatory circuit and so limits the range of the oscillator.

The other is the finite time that the electrons take to travel from the filament to the anode. The period of the waves produced by the valve must be greater than this time in order that the current through the valve may respond repeatedly to the changes in potential of the grid and anode.

IN PASSING

—continued from page 532

no cunning. I had as good as decided to act as his Consultant—when I found Gwladys, sniffing and tearful, behind a beaded screen and my chivalrous nature gave my hard old head clean away. She wanted Harold, she said; and as I had no time for him myself I promised her that she should have her "expert"—if only she would not sniff any more. Whereupon she rallied magically and showed me her "bottom drawer." It ran too violently to pink and mauve, I thought.

KEEP YOUR EYES OPEN FOR

NEXT MONTH'S
"MODERN WIRELESS"

As good as ever
and

including full details of
AN ALL-BATTERY RADIO-GRAM

DON'T MISS IT!

OUT May 30th. PRICE 1/-

Having committed myself to providing Gwladys with one wireless fitter, complete with quiff, I threw myself wholeheartedly into the task. I began by getting the affair into the radio press, but I kept Harold in the background and "featured" Papa heavily, including one blurred photograph of him, taken at Dover in 1898! How the dear old boy just ate it!

Step by Step

Then I told him a few secrets which enabled him to get three up on Harold. And there I left him and turned to Harold, who was on the verge of despair.

In a week I had Harold level with

(Continued on page 551.)

IN PASSING

—continued from page 550

Papa again, and Papa was trembling for his reputation in the radio press. Side bets, too, I suspect were on his mind. By the simple expedient of cajoling friends who had licensed sets, but who had not been "on the air" for some time, I secured a number of new transmissions, which I divulged secretly to both of the combatants, thus keeping them level and in a state of nervous excitement.

The Final Flutter

One night I rigged up my own ancient set and tootled on it long enough for Papa—who was waiting for me—to rope me in. Papa one up! Another night I told Harold of a special "experimental" programme which was to be radiated from Marcanti's Works at Rugby. He thus drew level again.

At last we came to the final forty-eight hours; a dead-heat and each man glued to his telephones, imagining "howls" and "X's" to be signals! I chose this time to seek private talk with Papa. I told

him that the reputation not only of himself but of the entire amateur movement hung upon him, and that the A.A.R.R.L. was waiting to flash news of the result round the globe. That he would never live it down if Harold beat him. That there was still time to pull off the job if he would let me help him.

Papa Gets Suspicious!

Papa was greatly impressed, but not convinced. How could I? Was it fair? Why?

I told him that it would be quite fair, because the parties to The Bet had to tune stations in; anyone was free to advise them where the stations were.

"But why do you do this for me?" queried Papa.

"Well, you see—Gwladys—"

"But," he burst in, amazed, "but that young Harold is her—"

"Precisely!" I said. "If you win—does Harold get Gwladys?"

"Er—NO!—that is—if you think—"

"Absolutely made for each other," I replied.

The very last few hours. Harold, I knew, was hopeless—but I made sure by taking a few small trifles out of his set. Then I repaired to

Papa's, where we played about round a really fine transmitter. MacSloe sat cross-legged on a table and drank stout. I wanted the Arbitrator there for a special reason.

At 11.45 p.m. I sat down and sent out a few letters in Morse. At 11.50 p.m. Papa handed me a note, to which I gravely scribbled a reply. At midnight we called young Harold round and MacSloe declared the time expired and announced that Papa had won The Bet by one point.

"Wah-what station did he get to-night?" asked Harold in a very suspicious tone.

**NEXT MONTH
THE ADVANCE OF
THE EXTENSER**

A special article on the wonderful new tuning system.

"3GS2XZ," replied Papa.

"Whose is it?" snapped Harold.

"Mine," answered Papa, opening more stout for MacSloe.

"That's not fair! You can't receive your own signals," protested the lover.

"But he did, old son," I put in. "He received them right round the world."

LOTUS VALVE HOLDERS



Specified in the "Modern Wireless" Portable Four, Lotus Valve Holders are constructed to give immediate and lasting connection when the valve pins enter the valve sockets. Extremely strong, yet resilient enough to absorb any external shocks, they afford the most positive form of contact possible.

Prices: Miniature Type Sprung Anti-Microphonic Valve Holder, 4-pin (with or without terminals) 1/6
Rigid Type Valve Holder for A.C. Valves 5-pin (with terminals) 1/-
" (without terminals) 9d.
Other Types, from 1/6

From all Wireless Dealers.

Lotus Radio Ltd., Lotus Works, Mill Lane, Liverpool.

THE "M.V.W." THREE
 —continued from page 515.

change switches pulled out so that the three contacts are together), let us go over to long waves. We push the two switches "in" and turn the selectivity condenser right over to minimum (to the left), in which position, as we said before, it is shorted out.

Long-Wave Selectivity

Now tune in 5 X X, and see if you can easily separate him from Radio Paris and Eiffel Tower. If so, and the strength is perfectly satisfactory, there is no need to touch the .002-mfd. compression-type condenser we mentioned controlled the selectivity on the long waves. But if you are troubled on this point, switch off the set, open it, and adjust this condenser so that the plunger travels downwards. But remember that although the maximum position of this condenser gives the maximum selectivity, it also provides minimum sensitivity; and, in actual practice, you want to balance between sensitivity and selectivity so that you get the desired results on the long waves.

Using a Pick-Up

There is another operation which we have to come to, and that is the pick-up. You will notice there is a pick-up jack employed in the detector grid circuit, and by insertion of the plug the grid circuit is broken in the radio sense and connection is made from the grid through to the pick-up. Incidentally, holes have to be cut in the cabinet's back for the pick-up jack and also the aerial and earth sockets.

With regard to the circuit of the detector valve, you may have wondered why the grid leak is taken direct to the cathode, whereas the return from the pick-up is taken through the .25 meg. to the side of the 1,000-ohm biasing resistance which is farthest away from the cathode.

The reason for this is that when the valve is being used as a detector for radio we do not want any negative bias on the grid, therefore the grid leak is taken direct to the cathode in the usual way; but when the valve is to be used for pick-up work and has to be operated as an L.F. amplifier, we need a certain amount of negative bias, and therefore the usual series biasing resistance has to be used.

Control of Volume

You will probably notice that no volume control on the L.F. side of the receiver has been incorporated. That is because in radio there is no need for the volume control, because the selectivity control on the panel can be used; but for pick-up work it is necessary to have a control of volume, and the best scheme here is to have the volume control on the gramophone motor board.

In this case you will have the pick-up connected across the volume control, one side of which is taken to that part of the plug which makes contact with the bottom side of the jack (that is, the side going to the .25 meg. and the 2-mfd. condenser), and the slider of the volume control can be taken to that part of the plug which on insertion in the pick-up jack makes contact with the top portion.

Then the volume is controlled at the pick-up end, and there is no possibility of either V_2 or V_3 being

overloaded due to the very strong modulations on the record.

You will find that contrary to quite a number of cases of battery sets the two valves are quite sufficient for pick-up work, because of the extra magnification obtained due to the A.C. valves.

Fine Quality Obtainable

There is no need to switch off the H.F. valve when the pick-up is in use, because any economy obtained would be quite negligible from the point of view of the power taken from the mains, and the decrease in heater and anode current would upset the balance of the output from the mains transformer, and you would find that the heater current for the two remaining valves would go up, and probably the anode voltage would also increase. Consequently, in all A.C. receivers it is usual to leave the H.F. valves running, although radio is not being employed.

A final word about the pick-up—choose a good one! The reproduction from this receiver is of a high standard, and you will be very disappointed if you buy an inferior pick-up and find that due to this fact the reproduction of your newly-acquired radio-gram transportable was not so good as that obtained from the average gramophone.

Many Stations on Speaker

You will find the handling of this receiver just like that of any battery set of the wave-change variety, with the slight difference that very much more sensitivity is achieved; and you will also find that distant stations will come in with a volume that will surprise you. With a good aerial and earth you should have no difficulty in logging twenty or thirty stations at good loud-speaker strength.

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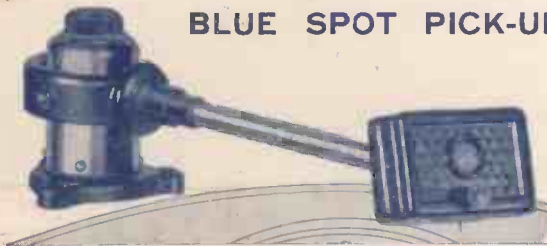
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