88

SEPARATING THE TWO "BROOKMANS"

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVI. No. 395 Saturday, January 4 1930

FINE FOR BROOKMAN'S TRANSMISSIONS

The NEW ALL-BRITAIN 3

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

Use a Pentode you can trust!

RIGID! SAFE! LOCKED!

Use the *NEW* Cossor Pentode — RIGID — because its elements are firmly braced top and bottom—because every joint is electrically welded, SAFE—because of the rigidity of its elements which makes individual movement impossible. LOCKED — secure because of its wonderful Interlocked Construction System — an exclusive Cossor development which ensures uniformity of characteristics throughout its exceptionally long life. In *your* Receiver use the *NEW* Cossor Pentode, no other has such strength, rigidity or power.

The NEW Cossor PENTODE

The *NEW* Cossor 230 P.T. (2 volts, ·3 amp.) Impedance 20,000. Amplification Factor 40. Anode Volts 100-180. Price 25/-

Cossor 4 volt Pentodes are also stocked by all Wireless Dealers.

A. C. Cossor Ltd., Highbury Grove, London, N.5.

CA 2993

Don't Forget to Say That You Saw it in "A.W."

JANUARY 4, 1930. No. 395. Vol. XVI

Amateur Wireless and Radiovision

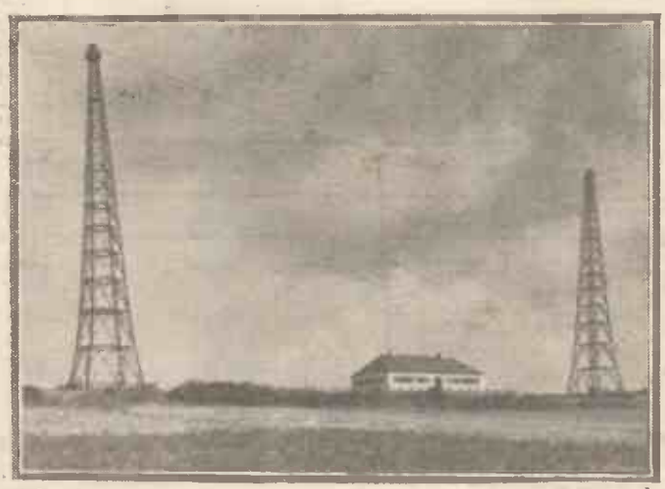
The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

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

That Self-Advertising—5SW's Good Deed—Radio from the South Pole—A Critic on Radio—Another Radio Link—The "British Broadcast Two"

That Self-Advertising — There is an old tag about little boys being seen and not heard, but evidently the B.B.C. does not apply this to itself, for we have had a sudden swamp of the most loathsome form of self-advertisement during the last few days. In the announcement preceding every test of the new regional stations the announcer gave out in sweet tones that those listeners who had any trouble in separating one station from another "will find helpful advice published . . ." Also the new B.B.C. pamphlet on the regional stations has been given more than usual publicity. As regular advertising is not permitted it seems like hitting below the belt for the B.B.C. to do its own "puffs." Of course, listeners get plenty of advertising broadcasts *via* Radio Paris.



Kaiserslautern, a 270-metre German station, works with only a power of 0.25 k.w., and is therefore a good test of reception—with Brookmans Park in the background. Here is the transmitter and aerial.

5SW's Good Deed—So many unkind things have been said about the Marconi station 5SW which the B.B.C. uses for its experimental short-wave transmissions, that it is welcome news that it has done at least one good turn ! Some time back when the Marchese Marconi broadcast an epoch-making speech, the trans-atlantic transmission from Savoy Hill was made *via* 5SW and also through the P.O. station at Rugby. This speech was relayed on the American side over a chain of stations and it was the short-wave 5SW and not the long-wave Rugby which was used for the re-transmission.

Radio from the South Pole—Elsewhere in this issue is described the radio apparatus on board the *Discovery II*, a boat which is now on a scientific trip towards the South Pole. *Discovery I*, the first boat to be so equipped, is now well down in the antarctic and listeners in this country should have no difficulty in picking up some of its messages. Transmissions take place on the 35 metres from 21.00-21.30 G.M.T. and the boat stands by on 21 metres for calls.

A Critic on Radio—"I often feel, when a Beethoven symphony is in progress at the Queen's Hall, that seven-tenths of the listeners-in will probably have turned off their sets in disgust after the first five minutes, prompted either by ignorance of the work that is being played or by mechanical flaws." So says the well-known music critic, Mr. Gordon Beckles. Surely, if the B.B.C. held this point of view they wouldn't trouble to give high-brow broadcasts of any kind? If one is to judge by the major portion of the music broadcast, a goodly proportion of listeners want broadcasts such as those from the Queen's Hall. There is another point too, in Mr. Beckles' criticism, namely his reference to the possibility of mechanical fault in a receiver dissuading a listener from attending a high-brow concert. We can only generalise and say that the man who takes sufficient interest in broadcasting to want to listen to good music will have a set to suit the purpose. But all listeners will forgive Mr. Beckles for saying what so many other critics are apt to scorn. "The B.B.C. has set music on its feet in this country True, it could have set it on its feet more solidly, but for what it has done may we all be truly thankful——"

Another Radio Link—The morning religious service from 10.15 to 10.30, which was formerly broadcast only from London and 5XX, is now relayed by wireless link to all stations except 5GB. The extension of this service is an experiment dependent for its continuance on technical results and on the demand which may be shown by listeners. The important thing to note is that a radio link is employed, and the B.B.C. appears to be making more than usual use of radio connections between stations.

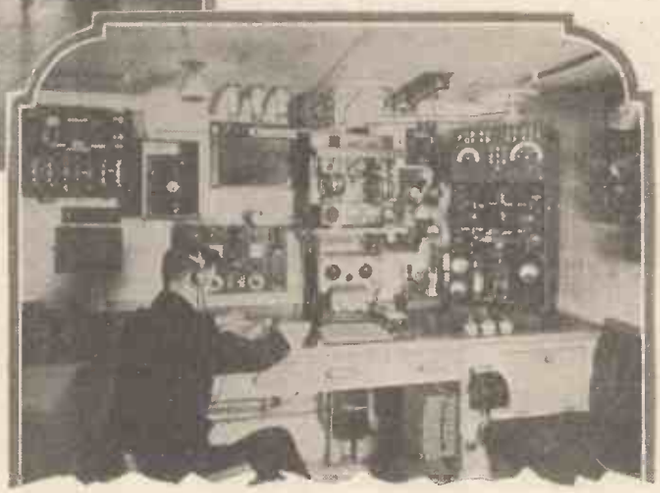
The "British Broadcast Two" —Some excellent "threes" have been given in recent issues. Next week will be described a receiver of a different type—a "hot stuff" two-valver designed to cope with 1930 reception conditions.

PRINCIPAL CONTENTS

Antarctic Radio

How Wireless is Assisting in a Scientific Trip to the South Pole

The new single-turn direction-finding aerials on the *Discovery II*



The operator at work in the well-equipped radio cabin of the *Discovery II*

EVEN to-day, hundreds of years after the so-called age of adventure, when wind-jammers, pirates, and what not were rife, there is still a spice of adventure—thanks to radio!

When examining the radio gear aboard *Discovery II*, a new research ship which is now bound for the Antarctic, I experienced something of this thrill of adventure (writes an AMATEUR WIRELESS Special Correspondent). The adventure may nowadays be cloaked in technical and scientific jargon, but it is there, nevertheless.

Is it not a bold adventure to explore the southern Polar regions, where the danger of death is as rife as ever it was? And is there not a thrill to be gained in the knowledge that all the time the explorers are carrying out their work they will be in radio touch with London!

The *Discovery II* is a boat fitted out with all manner of scientific gear—and the radio equipment will interest amateurs.

The radio cabin is a business-like affair, and one of the first things I noticed was a portable typewriter alongside the short-wave receiver for making a neat and accurate reception log!

Valve transmitters and receivers for short and long waves have been installed by the Marconi International Marine Communication Co., Ltd., together with a Marconi direction finder and a quenched-spark emergency transmitter.

The short-wave transmitter, using the same high-tension supply as the medium-wave transmitter, is capable of communicating at extreme ranges, and under favourable conditions communication may be said to be world-wide. For communication with other ships and with shore stations over distances of 1,000 miles or more on wavelengths between 600 and 800 metres, a transmitter of 1½ kilowatts will be used.

Two receivers are installed to cover wave ranges of from 15 to 80 metres and from 220 to 25,000 metres respectively, enabling *Discovery II* to listen-in to the principal short- and long-wave stations of the world.

A New D.F. Aerial

For the assistance of navigation, a Marconi direction finder is fitted in the chart room, this instrument having proved of particular value to navigation in Polar regions where the ordinary magnetic compass is subject to considerable errors. A new experimental type of D.F. aerial is employed, consisting simply of two small metal loops fixed at right angles to each other and mounted rigidly on a pedestal. This aerial is extremely efficient, in addition to being robust and inconspicuous.

The ship will be away about three years, and it is quite probable that the radio working over such immense distances will ultimately be of value to commercial and broadcast apparatus.

Fifteen-metre signals to the South Pole! Yes, the twentieth century has not knocked all the "kick" of adventure out of life!

K. U.

RADIO WEEK!

Sunday, January 12, 1930, to Saturday, January 18, 1930

THE world of wireless is looking forward keenly to the week beginning Sunday, January 12.

A committee representing the B.B.C., the chief wireless trade interests, the various wireless associations, and also the wireless press, which includes all the chief wireless papers published in this country, has been at work for some months arranging for this great week of wireless.

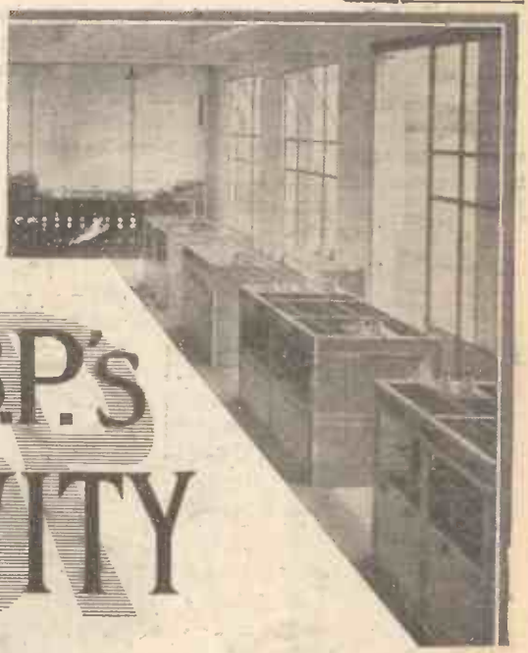
It is a week for everybody, and everybody will have something to do in it. The B.B.C. has the task of its life—it is expected to put on the finest set of programmes ever attempted. The trade—manufacturers, wholesalers, and retailers—are out to do their very best to popularise radio and, incidentally, to sell sets and apparatus; and the listener—knowing that the more radio becomes popular, the more, both in programmes and in apparatus, he will get for his money—is out to get his friends to listen; he is definitely a missionary, trying to make a convert of the man next door or anybody else who so far has looked askance at wireless.

We cannot yet give details of next week's happenings. Suffice it at this moment to say that the programme has many outstanding items in it. There will be something for everybody.

In next week's AMATEUR WIRELESS *we hope to be able to give all the best things from the programme.*

So be prepared. See that the set is in tune for Radio Week.

Now that both Regional Stations are working you will need very sharp tuning. Here is new light on the subject, and really practical advice



THE TWO B.P.'S AND SELECTIVITY

NOW that the two regional stations have been transmitting for several weeks, how do you fare with regard to interference?

For those not too near to the centre of the service area figure the new conditions will be quite satisfactory. Perhaps you are one of those lucky ones who now get both stations at good strength and without mutual interference. But a new point arises. Do you find that, owing to the high power of both transmissions, so large a part of the ether is rendered useless for reception?

Music or Noise?

Captain Eckersley has spoken of the desirability—as he told me recently—of getting "five programmes, and not fifty noises."

It must be remembered that there are hundreds of thousands of amateurs who could get a score or more stations all on the loud-speaker before both B.P.'s started. These folk—and you may be among them—do not welcome the enlargement of the B.B.C.'s programme service if it means the reduction of foreign-station reception.

Again, there are unfortunate folk who find that not only are they unable to get the distant stations, but that with each regional station there is a background of the other! This indicates old-fashioned sets, true; but there are many such on which it is poor fun playing this game of "Brookmans Buff."

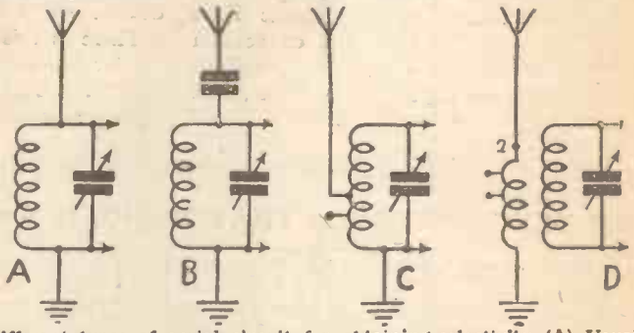
Now that there are two B.P.'s, I think it is high time the whole selectivity problem was reviewed. Previously, whenever I have spoken to the B.B.C. engineers their stereotyped advice to be conveyed to listeners was *shorten your aerials.*

Well, this isn't good enough now. The state of affairs has arisen when, to thousands of listeners within the swamping area and on the fringe of it, **signal strength from both stations is so great that the reduction of the aerial to a sufficient length to compensate for the increased local field strength means that the reception of foreign stations will be very difficult and hardly** worth while; alternatively, in old-fashioned sets, an H.F. stage will have to be added.

Thus we get a kind of vicious circle, in which to compensate for the reduced strength of foreigners an H.F. stage is called for, and such a stage is advisable in any case, for it introduces by itself a great selectivity!

Therefore it gives one "furiously to think" that most listeners anywhere in the neighbourhood of the wipe-out area will not get good reception from any set which does not have an H.F. stage. This may come hard to those who have to exercise the utmost economy in making up a set, but the average listener (if there is such a person) has no cause to grumble at being compelled by up-to-date conditions to have an up-to-date set—not necessarily expensive.

Listeners who realise that anything like a simple wavetrap won't do the trick of separating the two B.P.'s from the foreigners therefore have the choice of making up a set with an H.F. stage or of adding a little H.F. unit. Personally, I think that if your set was made at a time when an H.F. stage was not advisable, then by now there will be other improvements which could be made, and you will benefit by having a new set.



Different types of aerial circuit for obtaining selectivity (A) Usual circuit (B) Series condenser (C) Tapped coil (D) Tapped coupled circuit

When an H.F. stage is needed try a unit such as the Brookman's Separator ("A.W." 392)

An H.F. stage to add to an existing set should preferably have a dual-range coil in the aerial circuit so that the unit can be used with the set on the long waves as well as the medium. There is going to be a great advantage in this if you have, on a bad night, to fall back on 5XX and Radio Paris!

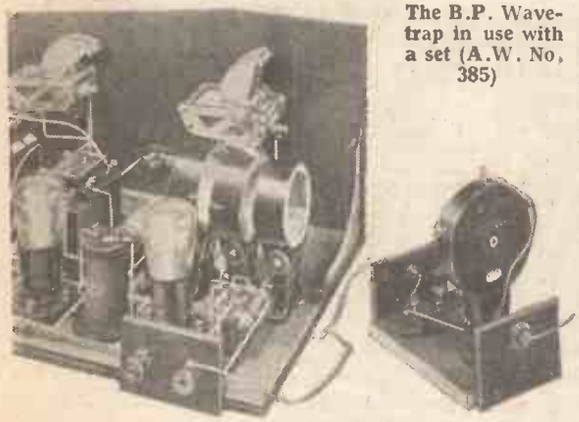
Cost of Selectivity

There is that big question of cost to consider. The H.F. unit will entail only about 22s. 6d. for the screen-grid valve, about 15s. for the coil, 7s. 6d. for the condenser, and say 10s. for the panel, baseboard. and

(*Continued on next page*)

other small parts. This makes a total of £2 15s., which you will be able to cut down if you have some of the parts in your junk box.

Per contra, an excellent wavetrap can be made for two or three shillings, and in most cases for nothing, because practically every amateur has an old plug-in coil and a spare small condenser.



The B.P. Wavetrap in use with a set (A.W. No. 385)

My advice to you is to make the best of a wavetrap before scrapping it in favour of an extra valve.

Don't forget that the connection of the aerial to the aerial coil can be varied to give the same result as actually changing the aerial characteristics. The little sketches overleaf show various ways in which the aerial can be tapped to the coil. One shows the aerial taken to the top of the coil, when you will get precious little selectivity; another shows a connection through a small fixed condenser; a third an intermediate tapping to the coil, and so on. It won't take you more than half an hour to try all these arrangements, with and without the trap.

The intermediate tapping to the coil can best be done by twisting the aerial wire around a needle, the business end of which can then be poked between the coil turns till a suitable tapping point is found. Then a permanent soldered connection can be made.

If you try out these simple little schemes you may find that a set which previously gave only a medley can, with a trap and a proper tap, give 5GB, Vienna, Budapest, Hilversum, Kalundborg, and the others, without serious Brookmans Park background. This should be possible even to listeners seven or eight miles away from Brookmans Park.

Incidentally, how far are you away from Brookmans Park? So many people have quaint ideas on the subject, and it might pay you to measure the distance on a map; a few miles make all the difference. Folks living Barnet way will be getting different reception from those living a little farther out—say, at Golders Green, for example.

You will find that the setting of the reaction condenser will, with most aerial arrangements, have a big effect on selectivity. With the vanes "all out," the two stations may swamp the dials, but a little reaction helps. Try a differential condenser.

There is this to note. A wavetrap, no matter what type it is and despite any fancy name given to it, will not make signals any stronger. It may in all probability result in weaker signals, and any aerial tapping device, such as those that I have mentioned, will most certainly cause reduction of signal strength. And if you add to this the fact that you have cut down the size of the aerial you will have a rather thin time of it in foreign-station reception.

This is a great argument in favour of an H.F. unit, which, apart from increasing selectivity, gives a boost to the weaker signals.

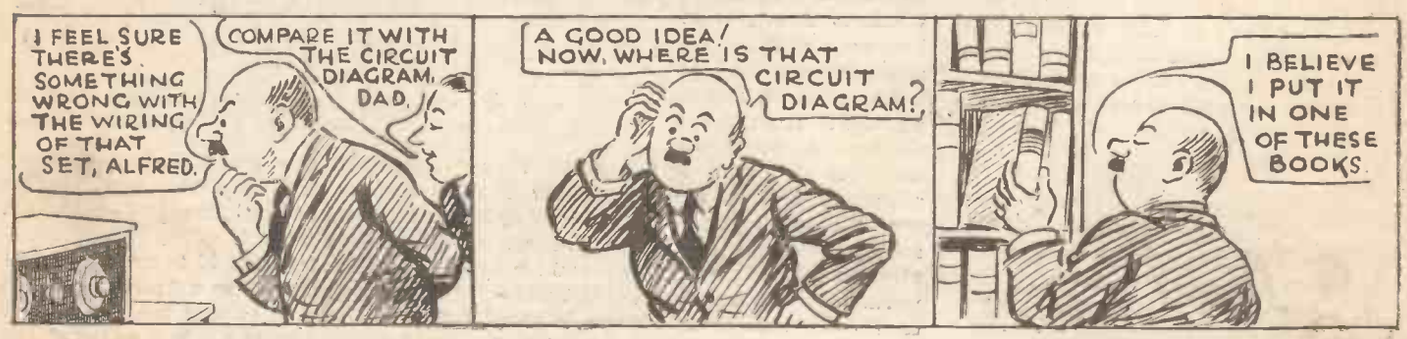
Any modern set, such as the "1930 Ether Searcher," "Everybody's Three," or the "New All-Britain Three" (all of which have an H.F. stage), is capable of getting both the regionals not only free from mutual interference, but with a sufficiently wide margin between so that the foreign stations are not wiped out.

On the "1930 Ether Searcher," for instance, when tested at the AMATEUR WIRELESS Laboratory at Fetter Lane the 356-metre transmission came in at 120 degrees on the dial (a 180-degree scale) and the 261-metre transmission at 62 degrees on the dial. The 356-metre transmission spread over 5 degrees each side of the maximum and the lower-wave station over 4 degrees each side. Therefore there was a clear space of 49 degrees.

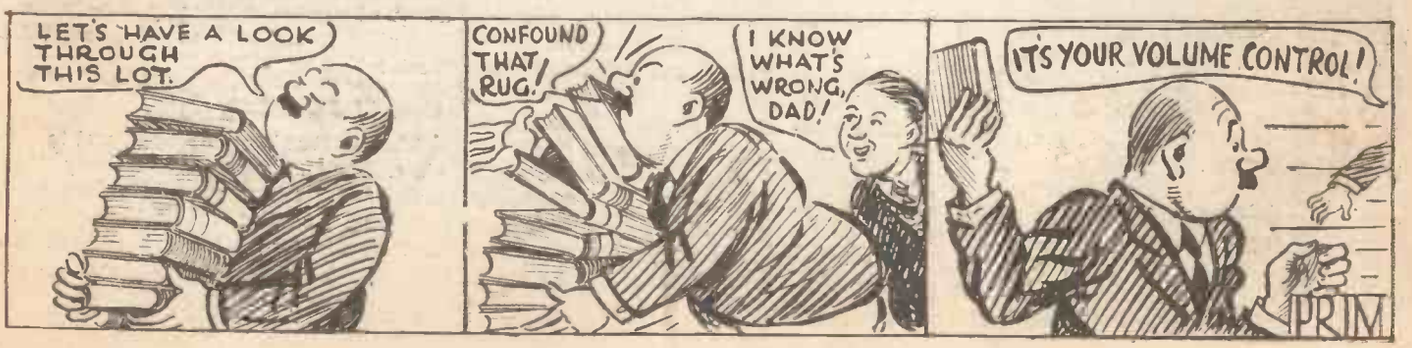
To conclude, then, if your set does not give such satisfactory results as this, then try (*a*) one of the little aerial tap schemes I have shown, (*b*) a simple wavetrap, (*c*) a combination of (*a*) and (*b*), (*d*) an add-on H.F. stage, or (*e*) don't grumble too much at being compelled to rebuild your set to include an H.F. stage, and other up-to-date improvements.

KENNETH ULLYETT

MR. FLEX DISCOVERS THAT THERE IS SOMETHING WRONG



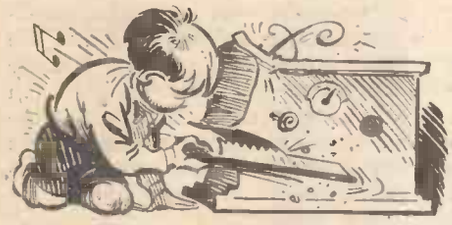
WITH HIS VOLUME CONTROL.



The Sheer Joy of Constructing

By R. W. HALLOWS

AN eminent authority upon wireless gave vent recently to the startling pronouncement that the day of wireless construction by amateurs was past. He said (or words to that effect) that we were interested now in the wireless set purely as a means of obtaining entertainment and that we did not in the least want to know how it worked or what was contained within its box. Now, such is my respect for eminent authorities that I hate to



. . . to know how things work.

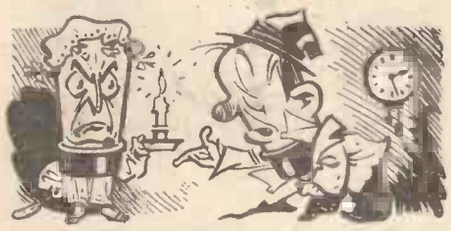
accuse any one of them of talking through his headgear. For my part, though, I believe that the day of home construction is not over and that it never will be over in this country, for we are by nature a people fond of tinkering with bits and pieces and of making things for ourselves.

We are inquisitive, too; we do like to know how things work, and we are fond of carrying out for ourselves all kinds of little improvements and adjustments. What man amongst us cannot remember the time when as a boy he took a clock or a watch to pieces and tried to put it together again? Who is there that has not at one time or another fiddled with a recalcitrant gas burner, geyser, lawn-mower, sewing machine, or bathroom tap?

Much the same thing was probably said of motor-cars and motor-cycles when they were first brought to such a condition that the man in the street could take one out without necessarily being a mechanic or an engineer. I have no doubt that at some function or other some fellow rose on his hind legs and said: "The motor-car is no longer a box of tricks on wheels. The public has come to regard it now merely as a means of transport and is not interested in what lies beneath its bonnet." But the public, for all that, has remained exceedingly interested in the technical side of ignition systems, engines, gear boxes, brakes, and all manner of other automobile affairs, as you may see for yourself by a glance through the pages of any of the motor journals.

The layman, too, enjoys getting into overalls (or even an old pair of pyjamas!) and doing for himself such jobs as draining the sump, adjusting the brakes, cleaning out the carburettor, or checking the steering alignment. A look through the advertisement pages of the papers mentioned also proves that he likes to improve his car or motor-cycle by adding to it all kinds of gadgets.

Wireless construction is one of the most fascinating hobbies that it is possible to



The story of the screen-grid valve

imagine, for it enables anyone, whether his mechanical skill and his knowledge of the use of tools are of a high order or not, to turn out apparatus whose appearance is so good that it makes him glow all over with pleasure and whose performances are such that he feels several inches taller whenever he mentions casually, "Of course, I made it myself."

The real expert can, of course, go one better by actually making for himself on his own lines many of the parts which the less skilled constructor purchases ready made. But both know something of the joy of creative work.

To me, and I expect to the majority of readers of AMATEUR WIRELESS, wireless would lose half its charm if I did not know just what was inside the cabinet of my

. . . its glossy panel shows just two—

receiving set, why each part was there, and what was its purpose. If by some queer stroke of fate the bringing in of wireless stations was limited for me to the mere turning of switches and knobs, and if I were not allowed to effect any alterations or improvements in my gear, I should feel that wireless had been robbed of by far the greater part of its charms. My own career as a constructor dates back not merely to the pre-valve days, but even to the pre-crystal days; to the time when if you wanted a condenser or a coil you had to make it; when about the only ready-made parts

(*Continued at foot of next page*)

Making a Turntable for the Portable

THOSE who have constructed a portable set will require a smooth-working turntable on which to mount it, and will like to know how to construct one for a trifling amount of money and labour.

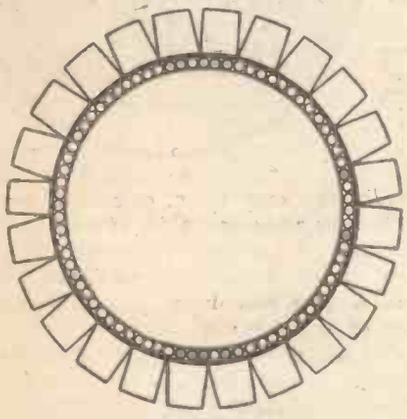


Fig. 1. Baseplate with balls in position

The chief materials required are a piece of tinned iron, the bottom of a large round tin, one or two pieces of wood, some ball bearings, and a short piece of 2B.A. brass rod with two nuts to fit.

It will be best to have as large a turntable as possible, and as the upright type of wireless cabinet has a width underneath of about 7½ in., any circular tin up to this size may be used. The writer used an old distemper tin, 5¼ in. in diameter. Obtain some such tin with a ridge of about ⅛ in. high round the bottom, cut right round the tin about 1 in. from the bottom, and snip the upstanding side with the shears so that the whole will flatten out as in Fig. 1. Do not damage the ridge or make the surface of the circle uneven.

Now get from the local cycle shop enough steel balls to go right round the bottom and of a size (in this case $\frac{3}{16}$ in.) to stand just above the ridge on the tin. A thick piece of wire must now be soldered right round just a little larger than the diameter of the balls from the edge, so that a groove is formed in which the bearings may rest so as to move freely (as in Fig. 1).

This is best done by first tinning the wire and bending it roughly to shape and soldering one end in position, using one of the bearings as a gauge. Then gradually solder right round, running the ball round while doing so; allow a slight amount of play between the outside rim and the wire. Cut off any superfluous wire and make a smooth joint, and see that the groove itself is clean and smooth.

A stout piece of square tin will form the top bearing, and this must be large enough to cover the circle (say 6 in. square). Drill a hole large enough to take the 2B.A. rod centrally through the bottom of the cabinet, the tin sheet, the circular lid, and a piece of three-ply wood (about 8½ in. by 12 in.), the latter being countersunk on the underside in order to let in flush the bottom nut on the brass rod. This nut had better be soldered on to the rod and filed smooth, after which the whole may be assembled.

Pass the rod through the prepared wood so that the nut is flush underneath. On this place the circular tin, groove upwards, in which place the steel balls so that they nearly fill the circle, and then vaseline them. Place the square piece of tin on top, and on this place the cabinet. Put a large washer on the rod in the case and then a nut.

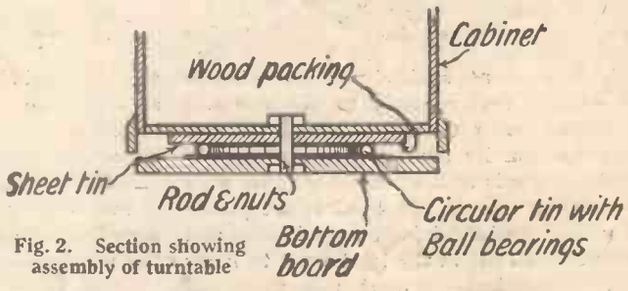


Fig. 2. Section showing assembly of turntable

If the recess under the cabinet is too deep to allow the turn-table to be tightened up, the matter may easily be adjusted by placing a piece of wood of sufficient thickness between the cabinet base and the square tin. Then tighten the top nut, see that the arrangement works properly (as in Fig. 2), and then the projecting rod in the cabinet can be cut off flush with the nut and filed smooth. If the top of the three-ply (which will show when the cabinet revolves) is stained and polished, and its underside covered with a piece of baize, the job will then be finished off nicely and the set may be turned with ease in any direction.

E. G. PORTER.

"THE SHEER JOY OF CONSTRUCTING"

(*Continued from preceding page*)

available were terminals. But I don't find that my interest is flagging; on the contrary, I am fonder of constructional work to-day than ever.

Take such a simple job as coil winding. One starts with a reel of wire and a former; one ends with a coil so neat looking that one must needs keep it on the mantelpiece for a day or two to admire, because it seems a shame to hide it away within the cabinet. Is there not a real fascination in the neat mounting of the terminals or valve pins for its connections and in the putting on of even, tightly-wound turns? And when the coil is finished, do you not find a genuine thrill in trying it out? You hope that it is going to prove far more efficient than the coil which it is designed to replace. If it does, you have all the joys of achievement; if it does not, you puzzle out the reason why, and then go on to make something better.

Can there be a more interesting business than laying out a new receiving set, whether you are working from published designs or those of your own devising? Each part is assigned to its place on the panel or baseboard. Already we can see what the set is going to look like when it is finished. If the design is your own you ponder over the first arrangement and discover that you can shorten the wiring by placing this component here instead of there, or that

Such a simple job as coil winding

you can avoid overcrowding by moving that one just a little in one direction or another. Is not wiring up a jolly job? You enjoy it, whether you are of those who have no time to spare and make their connections anyhow with d.c.c., or belong to the other school which likes its wiring to look professional and carries it out with stiff wire, carefully shaping each lead and making the neatest of neat loops at its ends. Can you refrain from lifting the lid and suggesting a look inside when even a non-expert friend is examining the finished set?

Then there is the joy of making improvements. About twice a year the genuine constructor starts with the fixed resolve that he will make the last word in receiving sets, with a minimum number of controls, and the simplest, but most efficient, circuits. When the set is finished its glossy panel shows just two, or possibly three, knobs. It works beautifully and everyone admires it.

A few evenings later the constructor discovers that, though the reaction control is distinctly good, it might be just a trifle smoother if the grid-leak return went to the slider of a potentiometer instead of to low-tension positive. Another knob makes its appearance upon the panel. Would it not be handy to be able to change over from leaky-grid to anode-bend detection? The addition of a switch makes this a simple matter. And what about cutting out a note-magnifier at will? This is easily done with a jack. . . .

And so the process of improvement continues until the panel is drilled to lace-

(*Concluded on page 32*)

On Your Wavelength!

'Nineteen-Thirty

To all readers—old-timers and newcomers; at home or in lands overseas—the happiest of happy New Years for 1930. May their potential energy be redoubled and their prosperity meet with neither impedance nor resistance; may their current accounts show no negative half-cycles; may their homes be happy; may their friends send them 'ampers full of good things; may they always obtain watt they desire and never be revolted by the reluctance of Fate to make their paths easy; may any one of them that is a poet write anode that will win him fame; may the cooks of all ensure a continuous supply for the plates by skilful use of the grid; may there be no domestic high tension; may views be undistorted and judgment unbiased. When the younger members of their families have been charged to capacity, may they never suffer from overloading or high-frequency choking; may lady readers cease from dieting and regain their characteristic curves.

The Coming Year

Every New Year since AMATEUR WIRELESS first made its bow to the public and leapt into instant popularity I have indulged in a little prophesying with regard to the coming twelve months. Sometimes I have been quite a long way out; but, though I says it myself, as shouldn't, I really have been rather good as a prophet in matters wireless, even if I cannot make the same claim for the Derby.

Startling Developments

For 1930 I prophesy some rather startling developments. I am not saying that they will be actually brought to the stage at which they become commercial possibilities before next December, but I think that we shall have thrilling news of important inventions and discoveries before the year is out. When you come to think of it, nothing really astonishing in wireless has happened since the invention of the three-electrode valve; and that took place at a time when little or nothing was known about the subject by the man in the street. Dr. Lee de Forest made no great stir in the world at large at the time with his vital discovery, since the public to which it appealed was so very small. For more than ten years now there has really been no change except in matters of detail in our receiving sets. We use now, as we were using then, high-frequency valves with tuned circuits, detector valves operating on the grid leak-and-condenser or anode-bend principle and note-magnifiers with untuned couplings.

What is Coming?

The time will certainly come when our present exceedingly inefficient methods of transmission are looked upon in much the same way as we regard the steam engine or the early "horseless carriage," for when we come to think of it nearly every part of our equipment is grossly inefficient. Yes, I *know* that the valve can respond to impulses that are almost incredibly tiny, but just think how it falls short of perfection. In the first place, its filament eats at least 70 milliamperes of current, and often as much as 250. The cold-emitter valve will certainly come one day, and we may hear something of it in the present year. But a much more important point is to be found in its high-tension arrangements.

Take the case of a high-frequency amplifier, whose mission in life is to pass on *voltage* variations to the grid of the following valve. If it were perfect it would require hardly any current in its plate circuit, since we don't want current. The only valve in which we do want current in the plate circuit is the output "toob"; and if the loud-speaker were not so lamentably inefficient we should not require much here. Actually less than one-thousandth part of the current pushed into the loud-speaker windings does useful work. To put it in another way, if we could contrive a really efficient loud-speaker, microamps would suffice where we now want milliamps. It is in valve design, though, that I foresee the biggest developments in the future.

Valves of the Future

In the old days a magnification factor of more than 20 was regarded as a practical impossibility. Then came the R.C. valve, which showed that even a triode could have a mag. factor of 60 or more, and the apple-cart was really upset when the screen-grid valve turned up. Some of the latest A.C. S.G. valves have amplification factors running into four figures. On the low-frequency side we have the wonderful pentode, which in my view is only in its infancy. It is, however, rather useless for valve designers to continue producing higher and higher magnification until we can make some use of it. At present the very highest actual amplification that we can get from a screen-grid valve on broadcast wavelengths is under 200.

High Anode Potentials

Another drawback to the present-day receiving gear is that for big H.F. amplification and big volume from the L.F. valves we must use ridiculously high anode potentials. Even a domestic receiving set often demands 150 volts H.T. or more, and for the really big fellow used in concert-halls and so on 400 volts is about the mark. Some time ago the four-electrode valve, containing a space-charge grid, showed how plate voltages might be very greatly reduced. I quite expect to see during 1930 valves with all the efficiency of those that we have now, but working with far lower plate voltages.

Future Circuits

I expect to see during the present year a big effort on the part of circuit designers to catch up with valve designers. As I have just mentioned, we don't yet know how to make use of the huge mag. factor of some valves. Very possibly that part of Dr. Robinson's Stenode invention, which deals with eliminating persistence from high-frequency circuits, may help to show us, as the politicians would say, fresh avenues that may be explored. I always love that phrase, don't you? I never read it without conjuring up a picture of fat ministers walking hand in hand and on tiptoe down long avenues of stately poplars. I should not be at all surprised to see also something revolutionary in the way of low-frequency interval couplings, for I cannot believe that the last word has been said with resistance-capacity, choke-capacity, or transformer coupling. Loud-speakers, too, offer a tremendous chance to the research worker with original ideas. Anyone who can turn out an instrument providing the quality of the present moving-coil, but capable of being toned down to quite small volume and needing no energising current, has a fortune in store for him. On the whole, I think that we are on the eve of quite revolutionary developments in wireless. That they will come is certain.

A Great Man

Wireless has suffered an irreparable loss by the death of that most versatile of men, Admiral Sir Henry Jackson. He was an old man when he died, but no one who heard him speak could have thought of him as such. A year or two ago I remember him speaking at a meeting of the Institute of Electrical Engineers when Sir Oliver Lodge had delivered a lecture dealing largely with the Quantum theory, which was then attracting the attention of all the students of electricity and of radiation. Quiet, modest, and unassuming, Sir Henry Jackson impressed one as having this and all other wireless subjects at his finger ends. It is not generally known that he was associated with Marconi in the latter's very early experiments and that he did a good deal towards making wireless a commercial possibility.

On Your Wavelength! (continued)

Worth Looking At

If you are wondering why your reception of foreign stations is not up to the mark just now, take a look at Old Sol's countenance. Don't try with the naked eye, but either use the dark portion of a photographic film negative as a screen or make a pin-hole in a sheet of cardboard and gaze through that. You will see one of the fattest collections of spots that there has been for quite a while. Nobody knows exactly why it is that sun spots have an adverse effect upon wireless reception, but everybody who uses a wireless set has ample evidence that they do. All round the sun is a glowing envelope of fantastically hot gases known as the photosphere Normally the outer surface of this is more or less unbroken, but sometimes a terrific upheaval takes place below, causing a kind of vortex to be set up which reaches the surface. A huge whirling cavity is thus formed, tens of thousands of miles in depth. Atoms in the sun are, we know, in a much less stable condition than they are upon this earth of ours. When a solar maelstrom takes place there is terrific electronic activity, and we feel the results, the best part of a hundred million miles away, when we try to get Vienna on the medium waves or Schenectady on the short. Sun spots seem in some curious way to upset the Heaviside layer and to interfere with the refraction or bending back to earth of wireless waves sent out by a transmitter.

Impromptu That Isn't

Really, I think that the most unsophisticated listener must have been conscious of a terrifically "heavy" atmosphere of make-believe during the recent broadcast of the noises and voices at a big newspaper office. Not for one moment did the voices of the various editors and printers sound "real," even though they were the "pucka" articles! Actors and actresses are the only people who can pretend to do the real thing and sound as though they're doing it; butchers, bakers, and candlestick-makers, when they are actually broadcast at work, sound too much like actors and actresses! Thus, when G. A. Atkinson and Hannen Swaffer (the latter in a very distant and bored voice) had said their "bits," there followed a little dramatic sketch from the 2LO studio depicting in sound a typical suburban breakfast-table scene between husband and wife. This was far more convincing than the "real" Fleet Street broadcast which preceded it.

The Golden Voice

The golden voice of one of the London announcers was utilised the other day in a sound film by an American talkie company. For the detection of acoustic faults in cinema theatres it was decided by this company that a special test film be made, on which hundreds of words and no picture would be recorded. On the completion of a sound film installation at a cinema, several typists, having no previous acquaintance with the list of words, are seated in various parts of the theatre and take down what they hear. The draping and acoustic treatment of the house then depends on the percentage of mistakes registered by the typists in their lists. Some parts of the auditorium might be 100 per cent. perfect, while other parts only succeed in reaching the 50 per cent. mark. The acoustic damping of the walls and roof is carried out until at least 95 per cent. intelligibility is achieved in all parts of the theatre. And in order to give the girls a chance to get the right "angle" on the voice from the screen, one of our own golden-voiced lads was taken to a London sound-film studio for the purpose of recording the all-important list of words.

Ex-B.B.C.

The "Old B.B.C.-ians" are forging ahead in the talking-picture studios at Elstree, and elsewhere R. E. Jeffrey, lately the B.B.C.'s dramatic director, is achieving success as a director of films; an ex-B.B.C. announcer is supplying running commentaries for the *Gaumont Sound News*; every member of the old Research Department is sound-film recording; and three successive B.B.C. directors of effects have been absorbed by the film studios. This week, *Splinters of* 1914, *Atlantic*, and *The Co-Optimists* are the chief films in which the sound recording has been carried out by ex-B.B.C. engineers.

I am told that Alexander Murray, a research engineer who used to build the first models of amplifiers and other gadgets, has achieved some remarkable effects in *Atlantic*, a film which is in the super class. It is a significant fact that the most thrilling moment in the picture is one in which the screen is in darkness and sound is heard alone. The sound is descriptive of what is happening on a great liner just before it is about to sink, when all the lights have just gone out.

Mains Peculiarities

I wonder how many people who have A.C. mains appreciate to the full, the benefit of having this form of supply available. It is possible with A.C. to isolate the mains entirely from the receiver and to make an absolutely clean start on the secondary side of the transformer. In such circumstances, quite apart from any question of safety, the problem of eliminating hum is greatly simplified and it is possible, without much difficulty, although possibly with a certain expense, to deliver silent power to the receiver.

There are, of course, instances where the D.C. is so nice and quiet that smoothing becomes almost unnecessary, as, for example, in those eminently desirable localities where batteries are used for supplying the juice during the night (there are such places, strange though it may seem). In the majority of instances, however, matters are not as simple as this, and we are presented with an assortment of hums and rattles, wheezes, and other curious noises from which to run our set.

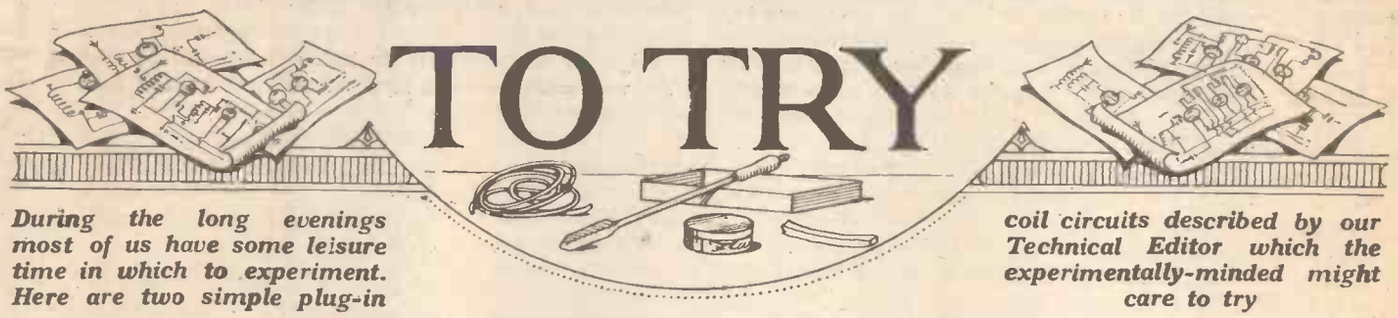
What is more, these sources of interference creep in by the back door, so to speak. You can put in a smoothing circuit, which is capable of removing anything up to a rectified A.C. wave; and, indeed, if you use the gadget for rectified A.C. you can obtain tolerably silent results, while if you try it on D.C. it will only laugh at you. Small wonder that most manufacturers walk delicately where D.C. is concerned.

A Case in Point

Mr Reyner was telling me the other day of a very puzzling example which he had come across where the positive main was earthed. The earth on the set was taken through a 2-microfarad condenser to the earth point in the circuit, which was actually connected to the live (negative) main. He was using the general method of connecting a large resistance across the mains and using the voltage drop on this for H.T., but, as long as the L.T. leads in the circuit were taken to the most negative point of this resistance, nothing he could do cured the hum. It was only when he hit upon the happy idea of shifting the earth point part way up the resistance that he got rid of it. He wasted some of his voltage before reaching the H.T.+ point and the remainder of it *after* leaving the H.T.— point, so that the receiver itself was not definitely tied down to either of the mains, but was, as it were, floating between the two. He told me that he subsequently discovered this was due to a serious difference in potential between the earth proper and the earthed pole of the mains, and he had arranged a sort of bridge balance in connecting the receiver as he had. It took him several days to locate and cure this elusive hum, which bears out my contention that those readers who are provided with A.C. ought to thank their lucky stars.

THERMION.

CIRCUITS FOR YOU TO TRY



During the long evenings most of us have some leisure time in which to experiment. Here are two simple plug-in coil circuits described by our Technical Editor which the experimentally-minded might care to try

THERE are some evenings on which one seems unable to do anything wrong. Station after station comes in at good strength, free from interference, and one feels that it would be possible to sit and enjoy the programmes from these foreign stations, quite as much, if not more, than one's own local station. Fading seems to be curiously absent on these "high-spot" nights and heterodyning seems to have retired into oblivion.

On other nights one finds just the reverse. The stations will not come in, whatever one does. There is an unpleasant jumble of stations all heterodyning one another, so that if one does obtain a station it is probably jammed either by a whistle or by some form of distortion.

It is, perhaps, this uncertainty which makes ether-searching such an interesting pastime, and therefore a few circuits which can be tried in spare moments will be doubly welcome at this period of the year. If you find the ether is dead the particular night you try, then leave the experiments till another evening, when perhaps conditions may have improved.

Constant Coupling

The first circuit which I am showing here is one which was devised by Mr. R. Tonks, one of my assistants, some time ago. It is a simple single-valve circuit which has the merit of being constant-coupled. Constant sensitivity over the whole of the tuning scale is a valuable feature, for it enables one to adjust the receiver near the oscillating point and then to run round the dial, picking out the stations without any danger of oscillation or interference with the neighbours.

This particular circuit is arranged, as nearly all constant-coupled circuits are, to give a combination of capacity and magnetic coupling. The two effects act in opposition, and by a careful balancing of the quantities it is possible to arrange a constant reaction effect. For the grid circuit a centre-tapped coil is used, and a similar centre-tapped coil is used in the anode circuit for reaction purposes. Between the centre-taps on each coil is connected a condenser of .0003 microfarad, as shown. A two-coil holder should, of course, be used for the coils L1 and L2, enabling the reaction effect to be increased by tightening the coupling between them. Increasing the value of the reaction condenser decreases the reaction effect in this case, and therefore the method of operation is as follows.

Connect up the circuit, as shown, set the

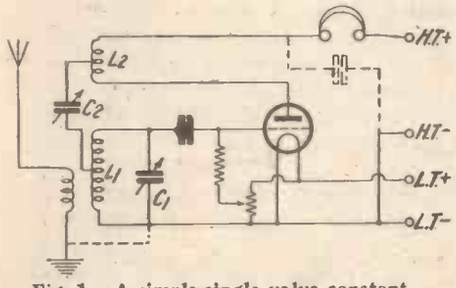


Fig. 1. A simple single-valve constant-coupled circuit

reaction condenser towards the minimum, and adjust the reaction coil L2 until the circuit is just about to oscillate. Notice the setting required on the reaction coil at the top and bottom of the tuning scale. It will probably be found that the magnetic reaction is predominating, which will mean that the circuit oscillates more easily at the bottom of the scale than it does at the top.

Now increase the coupling between the coils L1 and L2 by bringing them close together, and at the same time increase the setting of the reaction condenser C2. The

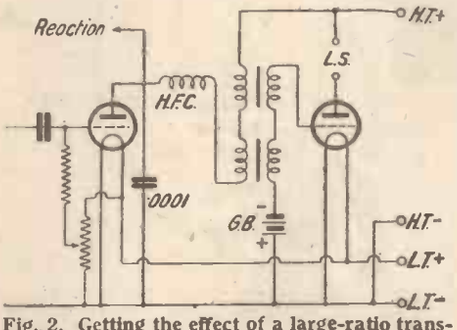


Fig. 2. Getting the effect of a large-ratio transformer by the use of two standard instruments

first action will increase the reaction effect, while the second will reduce it, and again we reach a condition where the circuit is just about to oscillate. It will probably be found now that the difference between the top and bottom of the dials is not so great as before, and by continuing in this manner a point can easily be reached where the setting is constant. Beyond this point, by coupling the coils very tightly and by using quite a large value of capacity for C2, we shall find that the circuit is capacity-reactive in that it oscillates more easily at the top of the scale than at the bottom.

The successful operation of the circuit depends largely upon the method of coupling the aerial, and a simple coupled winding is the best. It may be desirable to shunt a small condenser of .0001 to .0003 across the telephones, as shown; but this is a point which can easily be determined by trial.

Large Step-up Ratios

We hear quite a lot to-day about the use of large-ratio transformers. If one can obtain a high-primary impedance, there is no reason why one should not utilise a step-up ratio of quite considerable magnitude. It is just this difficulty in obtaining a high primary impedance that necessitates the comparatively high cost of large-ratio transformers.

The circuit of Fig. 2, therefore, will interest those readers who have odd bits of apparatus beside them, for it shows the use of two perfectly standard transformers connected in series. If the transformers are kept a little way apart, this is quite a satisfactory proposition, each one contributing its own quota to the total voltage applied to the grid of the last-stage valve. It is, of course, necessary to ensure that the secondary windings are in the correct direction, and this is a matter which can only be determined by trial, particularly if one is using two different makes of transformer. If the results are poor it is probable that the second transformer is applying voltage in opposition to the first, and the connections to the secondary of this transformer should therefore be reversed. Do not, of course, reverse the connections to both transformers or to primary *and* secondary, as this will put matters in exactly the same state as they were originally.

No tuning circuit has been shown in front of the detector valve with this circuit, because this is relatively immaterial, and the reader may hook up any tuning circuit he likes.

For the Newcomer to Wireless: ACCUMULATORS

MY accumulator does not seem to be holding its charge as well as it used. I wonder if you can tell me what is the matter with it?

How long have you had it?

Rather more than a year.

Then it ought to be in good condition if it has been properly looked after. What's its capacity?

Eighty actual ampere hours.

And what is the average drain on it for the set?

Rather less than half an ampere. That means—doesn't it?—that it should last for one hundred and sixty working hours or more.

Yes; say seven or eight weeks if you use the set on an average for three hours a night. Do you have it charged every two months?

No. I send it round whenever it runs down. I was away a good deal, for instance, early in the year and didn't use the set much so that the accumulator was only charged once in six months.

Well, that, you know, is pretty bad for it.

Why?

If you want to keep an accumulator in first-rate order give it plenty of work. At any rate never let it go for more than three months at the very outside without being recharged whether it is run down or not. Have you tested the electrolyte with a hydrometer?

What is a hydrometer?

Obviously you haven't! The hydrometer is an inexpensive little instrument which enables you to see at a glance the specific gravity of the acid. You should certainly have one, for there is no other way of keeping a check on the doings of the charging station. The makers give the proper figure for the sp. g. when the cells are fully charged, and the hydrometer should always show this reading when they return from the charging station. If the electrolyte is too weak or too strong the battery is likely to suffer and your trouble may be due to one of these causes.

I have noticed that a kind of muddy stuff is collecting below the plates in the cases of the cells. What is that?

It is usually known as sludge and it consists of small particles from the plates. Well-made plates should last for years without shedding their paste in this way unless the battery is ill-treated by being discharged or charged at too high a rate.

Well, I am quite sure that I haven't overworked the battery in the way of discharge.

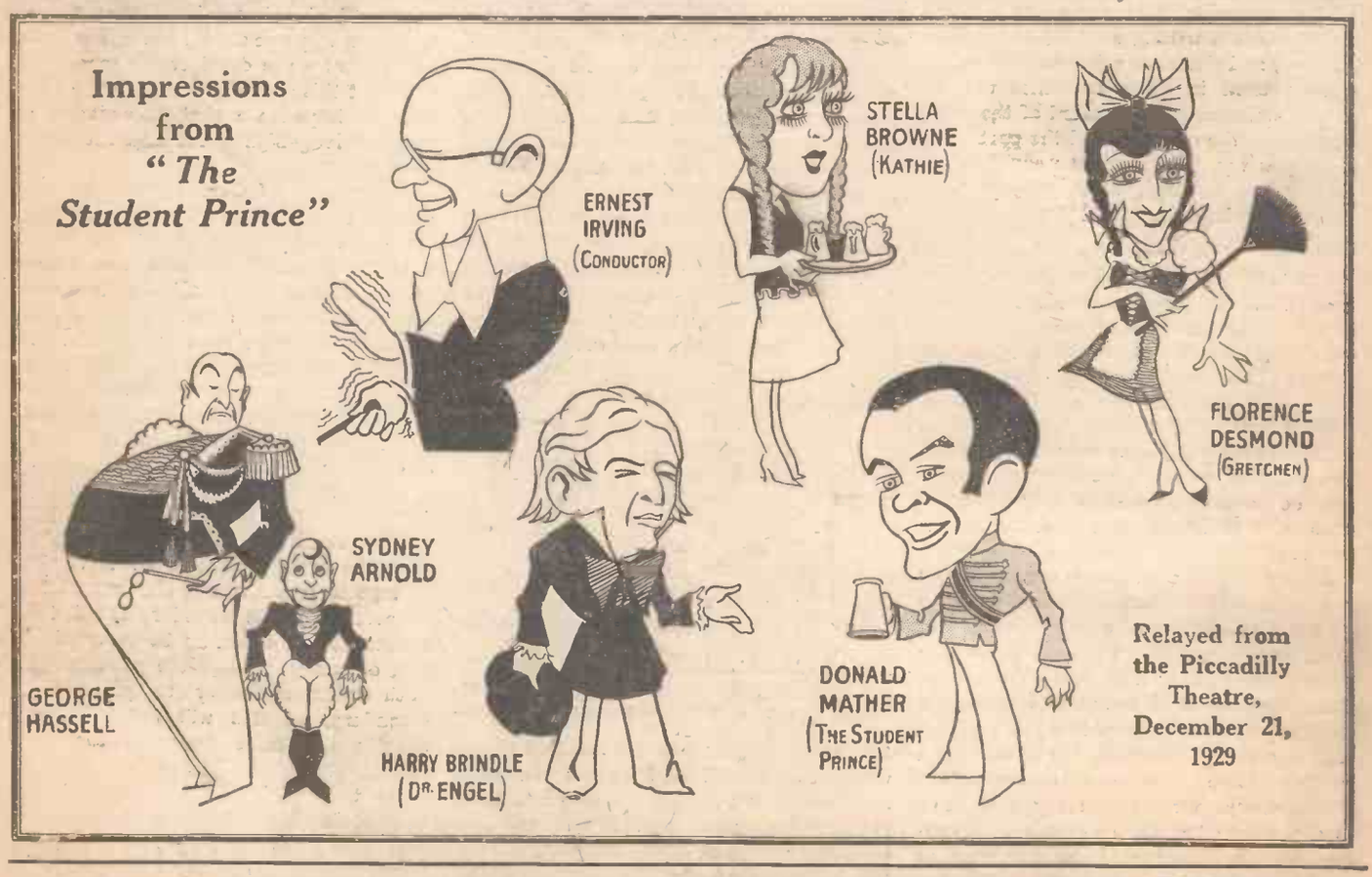
Then quite possibly charging is done with too heavy a current.

What is the proper charging rate?

It is usually stated on the label of the accumulator, but if it isn't, a good working rule in an accumulator meant for wireless purposes is that it should never exceed one-tenth of the ampere hour capacity.

What do you advise me to do?

If the sludge is allowed to accumulate it may eventually wreck the battery by causing an internal short-circuit. You had better have the cells cleaned out by an expert and ask him to report upon the condition of the plates. Find out, too, at what rate your station usually charges the battery and make sure that it is not excessive.



NEXT WEEK: "THE BRITISH BROADCAST TWO"

What You Should know— IF YOU INTEND USING the MAINS

A Helpful Article by W. JAMES

EVERY wireless receiver having valves must be supplied with electricity for the filaments of the valves and their grid and anode circuits; an accumulator is normally used for the filaments and a dry battery for the high-tension or anode circuits, whilst a smaller dry battery is employed for providing the grid bias.

No batteries are used with a mains receiver. The whole of the current required for running the set is obtained from the mains—the household supply of electricity. A mains-driven set, which is sometimes called an all-electric set, is therefore connected with a convenient electric-lamp holder or wall socket and is switched on or

The Regentone H.T. unit specially designed for portable receivers

off as an electric iron or other domestic appliance.

Mains Current

The current obtained from the mains is not suitable as to its voltage and nature for the *direct* operation of a set. This is because the current supply to the anode and grid circuits must be perfectly uniform and steady under working conditions. If the current (or voltage) varies a noise or humming sound will be heard from the loud-speaker.

An alternating current is varying all the time. At one instant the current is zero, a moment later the current has a value of, say, one unit. It increases in value to a maximum and then falls off to zero. Then it commences to grow; but in the opposite direction, reaches its maximum and then falls to zero once more. The current flows backwards and forwards through the circuit a given number of times per second. Thus, when the supply has a frequency of 50 cycles per second the current flows backwards and forwards once in every fiftieth part of a second.

Obviously, a current of this nature cannot be used for the grid and anode circuits. Neither can it be used for heating the filaments of the valves (excepting the last) when ordinary types are used, as the variations in the temperature of the filaments, combined with the other effects produced, result in a loud hum being emitted by the loud-speaker.

Even the so-called direct current of D.C. mains is usually of an uneven nature.

How A.C. Mains are used

Now let us see how the mains supply may be used. We will deal with alternating current supplies first. How are we to provide suitable current for the filaments? We may use a low-tension mains unit or a "power box."

The mains unit comprises a means for obtaining direct current at a suitable voltage. Therefore a transformer is used and a rectifier, these two parts providing direct current at about the right voltage. Then, in order that no hum may be heard, the current is passed through a smoothing system, which renders it quite smooth and free from irregularities. A mains unit of this type is rather expensive, but is perfectly satisfactory. The "power box" referred to above comprises an accumulator and a charger, which is so arranged that the battery alone supplies the receiver, whilst it is charged when the set is not being used. Ordinary battery type valves are used, of course.

A.C. Valves

The manufacturers have produced, however, two other types of valves especially for mains sets. They are so designed that their filaments may be heated with alternating current with every satisfaction. All that you have to do is to fit a transformer to adapt the voltage of the mains supply to suit the valves.

One series of valves has short thick filaments. They are rated at .8 volt, and are known as "Point 8" type valves. These valves take a current of .8 ampere, excepting detectors, which take a heavier current. The current taken from the mains is, however, very small because of transformer action.

Philips filament transformer for A.C. valves

As an example, if the valves together take .5 ampere at .8 volt, and the transformer is 50 per cent. efficient, the power consumed is only 8 watts—very much less than the consumption of one small electric lamp.

These special valves are, on the whole, not quite so effective as ordinary battery types. Nevertheless, they are perfectly

The Lissen mains unit employs a rectifying valve

"IF YOU INTEND USING THE MAINS"

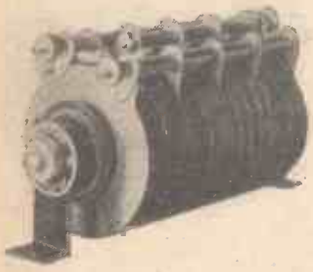
(Continued from preceding page)

satisfactory and are used in commercial sets.

The second type of mains valve is, without doubt, the most satisfactory type. Their characteristics are better than those of battery valves. They are reliable, being widely used. These valves are of the *indirectly-heated-cathode* type. The name is,

This is one of the well-known Ekco range of mains units

unfortunately, rather lengthy. Some call them A.C. valves, but this is not their correct name. These valves have a heating element which is supplied through a transformer from the A.C. mains. The heater is usually rated at 4 volts 1 ampere and its purpose is to heat the cathode (filament), which is coated with an emitting material that emits the electrons essential for valve operation



The Westinghouse metal rectifier made in many types for various mains purposes

This type of valve has five contact pins, two being for the heater, and one each for the cathode, grid, and anode. The heater merely raises the temperature of the cathode, which, therefore, remains sensibly constant with the result no hum or noise is introduced.

Mains sets for operation from alternating current supplies are therefore usually fitted with one of the two types of special valves. They are special only in regard to their filaments and were produced in order that they could be run from alternating current without the help of additional apparatus excepting, of course, a transformer whose function is merely to adjust the voltage.

We have still to consider the high-tension and grid circuits, therefore, and the following remarks are applicable to every type of valve. The high-tension supply must be of steady direct current, and as the various valves require different voltages, means must be provided for regulating the supply to individual valves when necessary. A transformer and rectifier is therefore used to convert the alternating into direct current. This current is further passed through a smoothing circuit and voltage-regulating devices. By this means a satisfactory supply is provided for each valve.

The rectifier itself may be of the valve or metal type. Both types are widely used with every satisfaction. Hum-free results are obtained by attention to the smoothing circuit, and the amount of the power supply is just a matter of the size and design of the parts used.

Any voltage and current within reason may be obtained. It does not matter, therefore, whether a supply of 120 volts or 1,000 volts is needed; it is readily to be obtained from a suitable mains unit.

The voltages for the grid circuits are obtained from a unit which is, in principle, identical with a high-tension unit. In the grid circuits we are mainly concerned with voltages. In consequence, a grid-bias mains unit need only supply the current taken by the potentiometers used for voltage adjustment. The actual voltage, too, is much less than that required in the high-tension circuits. The smoothing must be adequate, however, with the result a grid-bias unit is relatively fairly expensive.

In order to avoid this expense, some manufacturers manage so to design the high-tension unit and the set itself that the necessary grid-bias voltages are automatically obtained. This scheme is usually perfectly satisfactory when applied to two- and three-valve sets or to sets having but one low-frequency stage.

To sum up, alternating-current type mains sets may be divided into three groups. First, those fitted with ordinary valves. These have a high-tension and grid-bias unit, and a further unit for the supply of filament current.

Second, those sets having directly heated valves of the "Point 8" type. These sets

The Climax H.T. unit which employs a metal rectifier

have the usual high-tension and grid-bias units and a transformer for the filaments.

Third, those sets having indirectly-heated-cathode type valves, which otherwise are similar to sets of the second type.

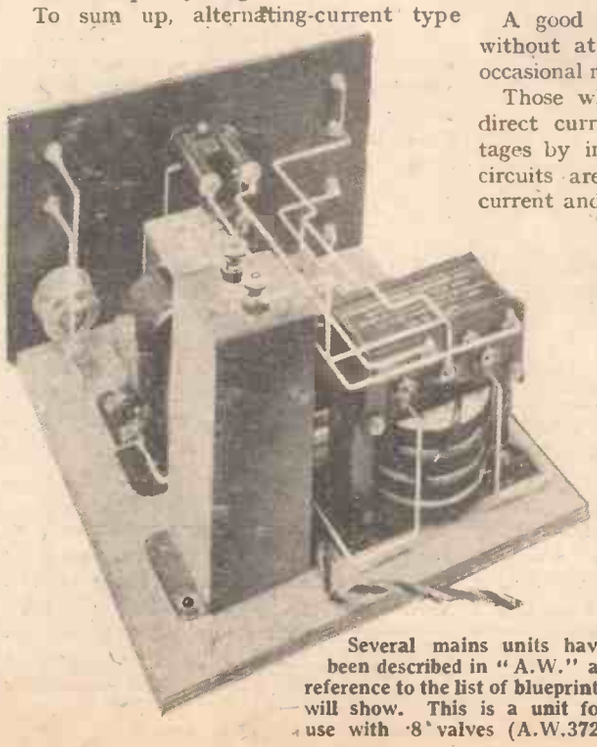
The advantages of mains-operated sets are low running costs, constancy of results, and usually more volume and sensitivity in comparison with battery sets having an equal number of valves. Maintenance is, of course, the very minimum.

The TeKaDe trickle charger

A good mains set will last for years without attention, apart from the very occasional replacement of a worn-out valve.

Those who have a domestic supply of direct current may enjoy similar advantages by installing a mains set. Special circuits are included for smoothing the current and making it suitable for heating the filaments of ordinary valves without hum or noise. Note that battery-type valves are used in a direct-current mains set. Their filaments may be wired in series, instead of in parallel, in order to minimise the current taken from the mains, and it is not possible for the actual high-tension voltage to be as much as the voltage of the supply.

A mains set should be properly equipped to be safe to handle. No parts carrying relatively high voltages should be exposed. Sometimes a metal case is used, the case being earthed.



Several mains units have been described in "A.W." as reference to the list of blueprints will show. This is a unit for use with '8' valves (A.W.372)

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

ISN'T it inconceivably stupid for the band to go on playing while the announcer is giving us details about the variety programme? What's the idea? If it is the intention of the band to *drown* the speaker, then why not ask him to shut up altogether until the band has had its innings?

Or, if it is really his intention to guide us as to the programme, for Heaven's sake get the band to stop while the announcements are being made.

◆ ◆ ◆

This calculated chaos is one more of those unnecessary irritants that are inflicted upon listeners. Why should there be this competition of noises? Obviously, the listener desires to hear what is being said to him. How on earth *can* he, when the speaker is being drowned by a number of instruments? This is one of those extraordinary innovations in which there is not a tittle of reason or common sense. Bur-rh!

◆ ◆ ◆

I wanted to add a postscript last week about Sir Richard Redmayne, who gave a series of talks on the coal mines.

Sir Richard certainly has a good broadcasting voice, although he nearly spoilt his peroration by beginning to say "palmist" instead of "psalmist"!

◆ ◆ ◆

And about Billie Manders and his Quambesques. So they won the first prize in the *Sunday Dispatch* competition for the most popular concert turn in the British Isles, and were advertised as Rhyl's Popular Entertainers. Now, who would have thought that? Or (to be ever so funny)—*rhylly*!

◆ ◆ ◆

My friend Harry Ainsworth, editor of the *People*, tells me he was listening at home in the bosom of his family when a comedienne sang about "being out last night with Harry Ainsworth," and described him almost to a "T." His wife glowered at him. And then the comedienne went on to say that his "good looks, curls, blue eyes, etc., belong to the past, and that he was now bald. That saved the life of an enterprising editor!

◆ ◆ ◆

The difficulty of fully appreciating clever comedians like Flotsam and Jetsam s that unless you can follow their words the whole points of the turn is lost. For instance, their old favourite, the "March Militaire," by Schubert, to which setting they used their own words, sounds jolly. But what the story is about—well, search me.

There was something, too, about a verse regarding the "criminal brains of U.S. brewers" which I thought might have been omitted.

◆ ◆ ◆

Glad to see we have had a little more Wagner lately.

The master is by no means to be considered a high-brow these days. Even the errand boy whistles *Tannhauser* and *Der Meistersingers*. Wagner is always a winner, but the recent broadcasts have been among the best I have heard.

◆ ◆ ◆

There is still a frightful lot of noise from studio and outside audiences. When will it be realised that wireless is an art unto itself and the beauty of the transmissions is in permitting one to remain *quietly* at home to listen to good music without the raucous noise one has to tolerate at a public concert?

◆ ◆ ◆

The Studio Choir Church Services may be the same, but they seem to be getting better and better.

Our Cartoonist's idea of Vivienne Lambelet

Why not revive *Veronique*?

◆ ◆ ◆

I always try hard to give light and shade to my criticism of the B.B.C. programmes. But there is no doubt that lots of people listen merely for the pleasure of "knocking" each and every item. At what I call my Listener's Club I sat and heard crabbed criticism for nearly two hours. Just in order to illustrate to you my meaning, I jotted down part of what was said:—

"Randolph Sutton's broadcast from the Coliseum earned for him a good deal of praise. Sorry, but I cannot join in the chorus. I agree that he is a hundred-percent. music-hall turn in voice and style, but I found that his breathless manner, forced laughter, and silly songs were rather irksome."

Sophie: "Heard Betty Hardy's character monologues for the first time. Her Cockney study was fairly good, but unoriginal, and like all the others. The impersonation of a North Country woman was certainly better, but at times she lapsed noticeably into her normal voice."

Esmond: "Found it difficult to laugh at Ivor Vintor's aged jokes. The only redeeming features about his show were his hunting song and a study of a little boy."

Uncle Toby: "When 'The Masks' began their turn the other night they started off in a most promising manner, and then deteriorated, not so much in their singing as in the songs they sang. Silly inconsequential nursery rhymes and other juvenile stuff which was suitable for the Children's Hour, but not for an adult audience at 10 p.m."

◆ ◆ ◆

On the other hand, here are a couple of bouquets:—

Macnab: "Herewith and hereunder do I add Betty Warren to the list of successful impersonators who have broadcast. In fact, I am inclined to give her top marks.

Jazz Fiend: "Frank Johnson is a saxophone player with a technique which rouses my admiration. Anyone who has studied the complicated rows of keys, pads, holes, and rods which adorn a saxophone will realise how clever Mr. Johnson must be to play—faultlessly, too—all that rapid-fire stuff. There is only one drawback: lack of expression. A little more of this and his performances would be greatly improved."

More about The New ALL

A Set for the New Conditions—

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

WE have become so accustomed to the use of screen-grid H.F. stages that one rather tends to regard neutralised H.F. as a back number. Judging by the performance of the "New All-Britain Three," however, this is not by any means the case, for I was able to tune in over twenty stations at good loud-speaker strength on a small indoor aerial, despite the fact that Brookmans Park was radiating his 30 kilowatts only six miles away.

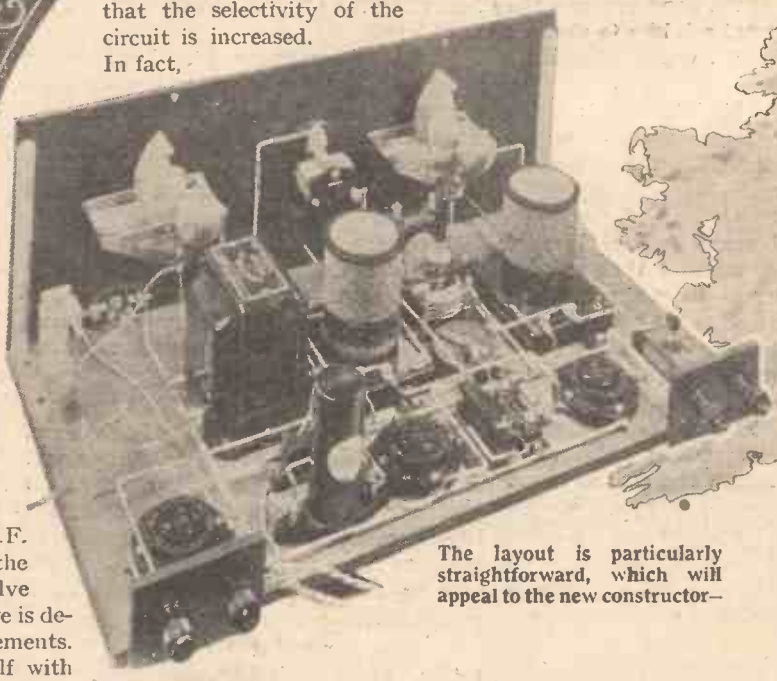
A list of some of the stations which were tuned in is given in this article, together with tuning charts showing how the coils cover the two wavelength bands. Any reader who is not living in a wipe-out area and uses a somewhat larger aerial will doubtless be able to exceed my test report with ease.

Those readers, therefore, who have not yet taken up the screen-grid valve will find in the "New All-Britain Three" a set admirably adapted for their use It is efficient in operation, selective in tuning—it will, as I think I mentioned last week, separate the two Brookmans Park transmissions at Elstree

Valves to Use

The valves in use should be an H.F. for the first stage, an H.F. for the detector, and a suitable power valve for the last stage. The valve used here is determined entirely by readers' requirements. If he is prepared to content himself with reasonable volume, then a small power valve, such as the PM2, will be satisfactory. Six to 9 volts grid bias should be provided on this last valve, according to the value of H.T. employed, which may be anything up to 120 volts. If, on the other hand, rather larger volume is required, then a valve capable of handling more grid swing should be used, such as the DEP240 or some equivalent valve. This, of course, will require more grid bias, and will also take more current from the H T battery; but this is always a price which one must pay for volume and quality.

I have only mentioned 2-volt valves; but, of course, the receiver will work equally well on 4- or 6-volt valves, corresponding types being used in each case. With 2-volt valves the potentiometer to which the grid leak on the detector valve is connected should be set approximately in the midway position. For 4- and 6-volt valves the slider should be placed approximately one-quarter of the way round from the negative side of the potentiometer, thus applying approximately 1 or 1½ volts respectively to the grid. These settings are such as to give the most efficient rectification without causing excessive detector damping, so that the selectivity of the circuit is increased. In fact, it will be found that as the slider is moved round towards the negative end of the potentiometer, the selectivity increases slightly, but after a certain point the quality begins to deteriorate, this being usually accompanied by a falling off in the strength.

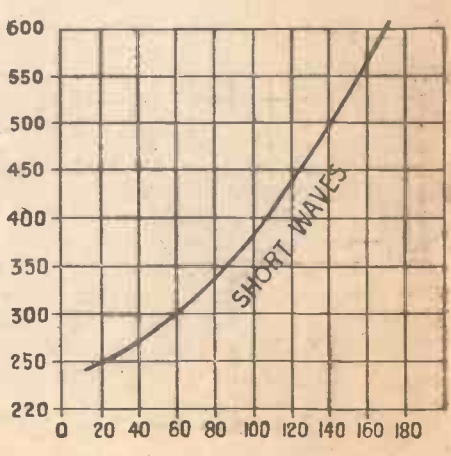


The layout is particularly straightforward, which will appeal to the new constructor—

Neutralising

Having adjusted the potentiometer to the position indicated, the next operation is the neutralising. First of all, see that both coil switches are in the same position. Actually it has been found necessary to mount the coils in the reverse direction from what is usual, so that terminals 1, 2, and 6 are away from the panel. With this arrangement the switches must be pushed in for the short waves and pulled out for the long waves. This is the reverse of the usual arrangement, but, provided one knows this, there is no disadvantage. It is, of course, necessary to remove the small coupling link from its normal position on the switch rod and to screw it to the other side so that the extension rod through the panel may be connected up.

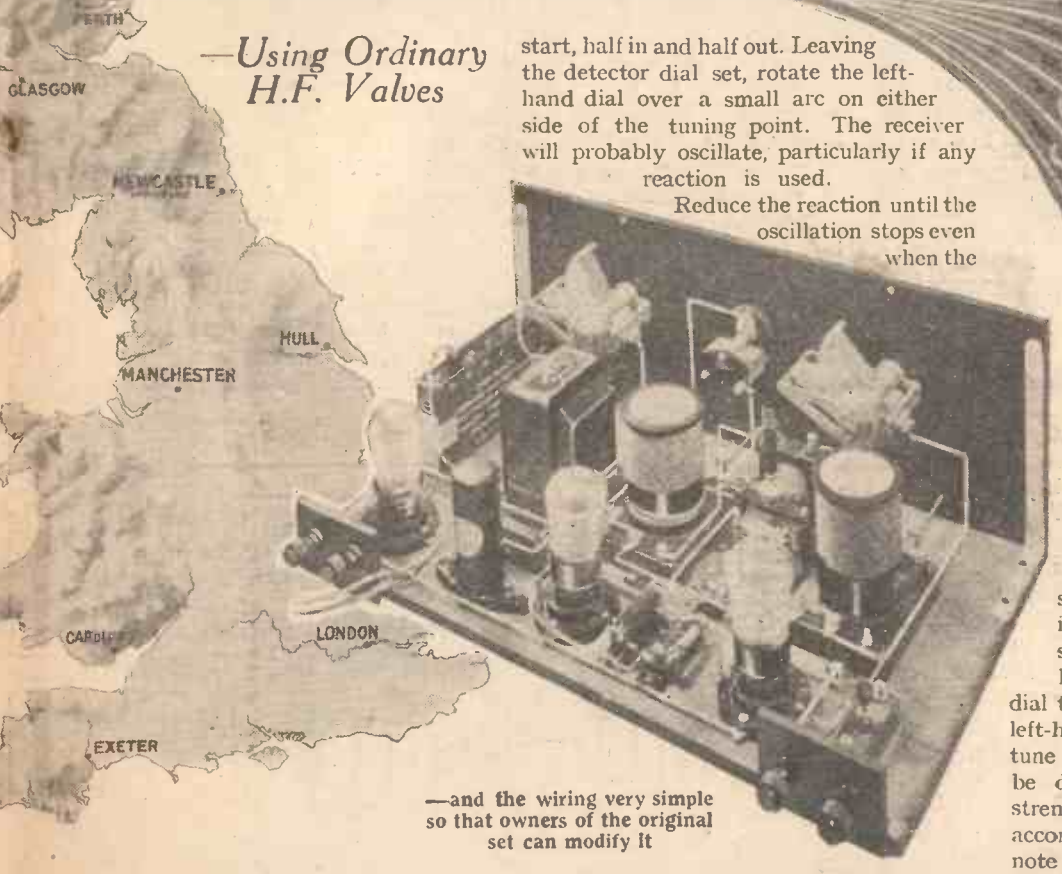
It is best to neutralise on the long waves, and therefore the two switch rods should be pulled out. Then, on switching on, the



Tuning graphs for

BRITAIN 3

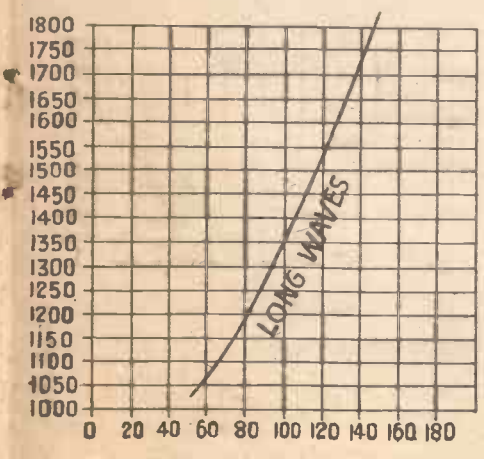
—Using Ordinary H.F. Valves



—and the wiring very simple so that owners of the original set can modify it

receiver will be found to tune to the long-wave scale without difficulty. Set the dial readings approximately together The neutralising condenser may be set, for a start, half in and half out. Leaving the detector dial set, rotate the left-hand dial over a small arc on either side of the tuning point. The receiver will probably oscillate, particularly if any reaction is used.

Reduce the reaction until the oscillation stops even when the two dials are in tune. If it does not stop even with the reaction right out, then reduce the value of neutralising capacity slightly until the oscillation ceases. Now move both tuning dials 10 or 20 degrees towards the bottom of the scale and repeat the performance.



short and long waves

Stable Reaction

In this way it is possible to go from top to the bottom of the dial, keeping the condenser in tune and making sure that the circuit does not oscillate at all, provided the reaction condenser is set at its minimum position. If there is any difficulty in determining when the two circuits are in tune, increase the reaction slightly until the circuit oscillates. Then on bringing the left-hand dial into tune with the right-hand dial the circuit will oscillate, and it should cease to oscillate when the reaction is brought back again to the minimum position. As previously mentioned, if this is not so, then the neutralising condenser must be reduced slightly. This is a fairly useful method of neutralising, which does not depend upon the use of a local station in order to get a balance-out. In my own receiver the setting of the neutralising condenser was about a quarter of the way round and was fairly sharply defined.

Tuning

I have described this operation in a fair amount of detail. It is not intended to convey the impression, however, that the operation is difficult, because it is not, and actually only takes a minute or two; but I thought that by going into it carefully it would save a certain amount of trouble in carrying out the neutralising. Having set the neutralising in this way, the receiver is now ready for use. Tuning is effected in the following manner:—

Set the right-hand dial approximately to the position required. The left-hand (aerial) dial should also be set approximately to the same reading. Increase the reaction, if one is looking for a distant station, until the receiver just oscillates. On rotating the right-hand dial the carrier wave will be heard and the left-hand dial should be rotated into tune with the right-hand dial. This will be determined by an increase in the strength of the carrier wave, probably accompanied by a sudden change in the note as the two circuits come into tune. Then, on reducing the reaction until the oscillation ceases and retuning on both dials, the station required should be found without difficulty.

Final Adjustments

If the receiver has been neutralised correctly the reaction will be found to be smooth and without back-lash. If it is ploppy and back-lash is present—that is to say, the setting of the reaction to stop oscillation is 5 or 10 degrees behind that required to start it—then the receiver is not quite neutralised, and a slight readjustment of the neutralising condenser one way or the other should be made in order to overcome this difficulty. It should be emphasised that small alterations only are necessary in this instance. It is possible that in certain circumstances the neutralising condenser may have to be increased instead of decreased; but generally the foregoing instructions will be found correct.

I carried out the majority of my tests

using the aerial coupled through the pre-set condenser, this being adjusted to give a satisfactory value of selectivity. The more one unscrews the condenser, the less is the coupling to the aerial itself, and so the more selective does the receiver become, although the signal strength also falls off after a certain point. It is therefore a matter of personal choice as to exactly

The "New All-Britain Three" ready for test

where the condenser is set. It will be found that, using this method of aerial coupling, the condenser dials fall out of step towards the bottom of the tuning scale, but they are together over the majority of the scale. If any reader wishes to try he can, of course, connect the aerial to terminal No. 4 on the coil. This should be found to give excellent results on the long waves and somewhat more selective results on the short waves, but there is a danger of slight instability. This does not occur on all aerials, however. Below is repeated the list of components required.

Components Required

Ebonite panel, 18 in. by 7 in., and two strips, 3 in. by 2 in. (Lissen, Trolitax, Trelleborg, Raymond); or 2 Junit terminal strips.

Baseboard, 18 in. by 10 in. (Pickett, Camco).

Two .0005-microfarad variable condensers with slow-motion movement (J.B., Lissen, Dubilier, Ormond).

.0001 - microfarad reaction condenser (Bulgin, Lissen, Keystone, Burton).

Push-pull filament switch (Lotus, Benjamin, Lissen, Bulgin).

Panel brackets (Bulgin, Lissen, Raymond, Camco).

Two "Q" coils, types Q.A.T. and Q.S.P. (Lewcos, Wearite).

Baseboard-mounting neutralising condenser (Peto-Scott, Igranic).

Three valve holders (Lotus, Lissen, Benjamin, W.B., Igranic).

Pre-set condenser, .0003-microfarad maximum capacity (Formodenser type J, Igranic).

.0001-microfarad fixed condenser (Graham-Farish, Lissen, Ormond, T.C.C., Dubilier, C.D.M.).

.0003-microfarad fixed condenser (Graham-Farish, Lissen, Ormond, T.C.C., Dubilier, C.D.M.).

Two-megohm grid leak (Lissen, Dubilier).

High-frequency choke (Lissen, Tunewell, C.D.M., Lewcos, Keystone, Sovereign, Watmel).

400-ohm baseboard-mounting potentiometer (Lissen, Igranic, Sovereign).

Low - frequency transformer (Varley Heavy-duty, Igranic, Lissen, Telsen, Ferranti, Lewcos).

Four terminals, marked : Aerial, Earth, L.S.+, L.S.— (Belling-Lee, Eelex, Burton).

Five wander plugs, marked : G.B.+, G.B.+1, H.T.—, H.T.+1, H.T.+2, (Belling-Lee, Eelex, Clix).

.01 - microfarad fixed condenser (Lissen, Dubilier, T.C.C., Ormond).

Two spade terminals, marked : L.T.+, L.T.— (Belling-Lee, Eelex, Clix).

Eight yards of thin flex (Lewcoflex).

Two dial indicators (Bulgin).

Connecting wire (Glazite).

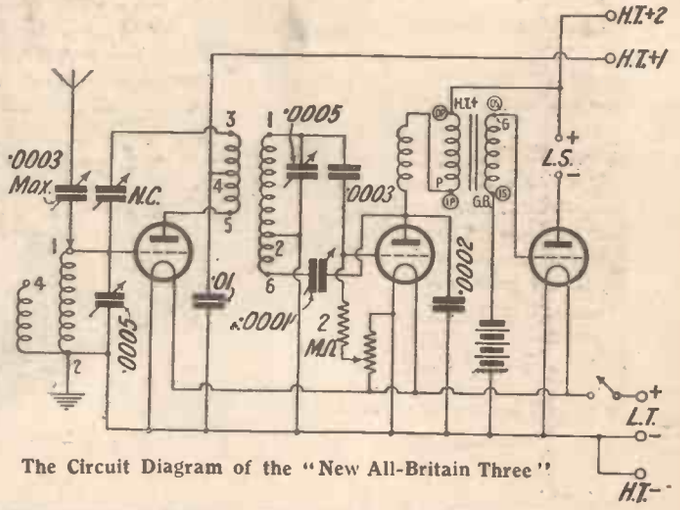
Pair of grid-bias battery clips (Bulgin)

Stations Received

Stations received on "New All-Britain Three" with 30-ft. indoor aerial.

SHORT WAVES :	
Gleiwitz	San Sebastian
Copenhagen	Langenberg
Turin	5GB
Cardiff	Milan
Göteborg	Brussels
London	Vienna
Berlin	Budapest
Rome	Hanover
LONG WAVES :	
Hilversum	5XX
Kalundborg	Radio Paris
Motala	Huizen
Eiffel Tower	

Do not forget that, as with all AMATEUR WIRELESS sets, this "New All-Britain Three" is on show in the Somerset Street windows of Messrs. Selfridge & Co., Ltd.



The Circuit Diagram of the "New All-Britain Three"

YOUR IDEAL SET

PRIZE COMPETITION RESULT
THE UNEXPECTED HAPPENS

IN the Christmas Number, published December 5, and in the following issue we announced an easy prize competition. We set a list of twelve questions and invited readers to answer them. Readers whose attempts agreed or most nearly agreed with the majority result would win the prizes totalling to at least £26 15s. 6d. We offered a first prize of ten guineas and various other prizes down to a seventh prize of 10s. 6d. Further, we stated that the names and addresses of prizewinners would be announced, if possible, in the issue of Amateur Wireless just before Christmas.

Now we will tell you what has happened. We have been hidden under a deluge of entries. They came from everywhere in Great Britain and it was simply out of the question to arrive at the result in time for publication in the issue which reached readers just before Christmas.

We are doing the next best thing in publishing the result one week later. It took days and days—and then days—to get at what readers regarded as their ideal set and to find which of the entries agreed with the ideal.

In previous competitions of this sort we have rarely had more than one or two competitors whose entries agreed in every detail with the ideal result, and in the past most of the prizes have had to be given to those who were nearest. But on this occasion we have no less than seventeen readers giving correct results and we have hundreds with only one or two errors.

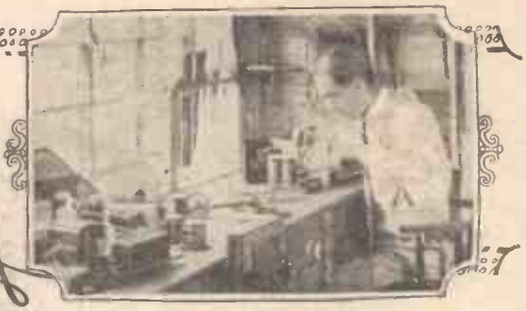
The only course we think is to divide the total prize money between the seventeen successful readers and to send each of them a cheque for one-and-a-half guineas.

Fortunately it was possible to post these cheques before Christmas, and we hope that in most cases the cheques reached the Christmas breakfast table.

We are not, at this time, stating what the ideal set is; we are contenting ourselves with keeping our promise and publishing the names and addresses of the winners, to every one of whom, as we have stated, a cheque for £1.11s.6d. has been sent.

J. J. Armitage, Ainlea, South Lane, Elland, Yorks.
Edwin A. H. Arscott, 10 St. Gabriel's Road, Easton, Bristol.
H. Briscoe, 43 Woodgrange Avenue, North Finchley, N.12.
J. F. Duplantin, 1 The Avenue, Blackheath, S.E.3.
Wm. A. Holden, 174 Victoria Road, N.22.
Arthur Hunter, 1 Clifton Terrace, Merefield, Rochdale, Lancs.
L. Jackson, 11 Central Avenue, Littleborough.
John L. King, Sefton Villa, Aston Road, Wem, Shropshire.
R. Lisle, 19 Raby Gardens, Primrose Hill, Jarrow-on-Tyne.
H. D. Lofty, 297 Clarence Buildings, Gt. College Street, N.W.1.
Robert N. Sawyer, 11 Lancaster Road, Edmonton, N.18.
H. Taylor, Muffins Den, Sutton Coldfield.
Alfred Bruce Tollerton, 1 Nevill Road, Crowborough, Sussex.
Harold F. Trustam, 98 Hartley Road, Luton.
J. A. Walsh, 19 South St. James Street, Edinburgh.
Leonard Wright, 31 Oak Grove, Penge, S.E.20.
P. A. Wright, 34 Burnaby Street, Chelsea, S.W.

My Wireless Den



Weekly Tips—Constructional and Theoretical—by W. JAMES

Better Fixed Condensers, Please!

IT is, I think, about time that certain types of fixed condensers were improved. They want modernising.

We do not get value for our money when we buy some patterns and use them in a high-frequency circuit, for instance. This is because the condensers have appreciable resistance and inductance as well. A condenser ought really to have capacity only, although we know that in practice there must be losses which are the equivalent of resistance.

The impedance offered by a condenser ought not, for example, to be very different from the quantity, 6.3 times frequency times capacity, the whole being divided into 1. Many types are quite good at low-frequencies, but are not satisfactory at the higher frequencies. A 1-microfarad condenser should offer an impedance of not much more than .3 ohm at 500 metres (600,000 cycles).

I wonder how many would have an impedance of less than 1 ohm? For high-frequency work the rolled-foil type having only one connecting point to each electrode is not very satisfactory. The better types have many connecting points, and therefore have a reasonably low resistance and inductance.

How They Vary!

A few days ago I had to test a set comprising three valves of the indirectly-heated type having a separate mains unit. This unit was placed by the side of the set, as it supplied the low-tension as well as the high-tension current.

The results were perfectly satisfactory when first I tested the arrangement, there being no hum and no noise. The reception was, in fact, very good, thus showing that the filter circuits provided in the mains unit were doing their work correctly.

Upon taking the set home, however, and once more connecting it to the supply, I was greeted with a very loud hum. It was not low-pitched, but had a medium frequency, and was to be heard very plainly even when tuned to Brookmans Park.

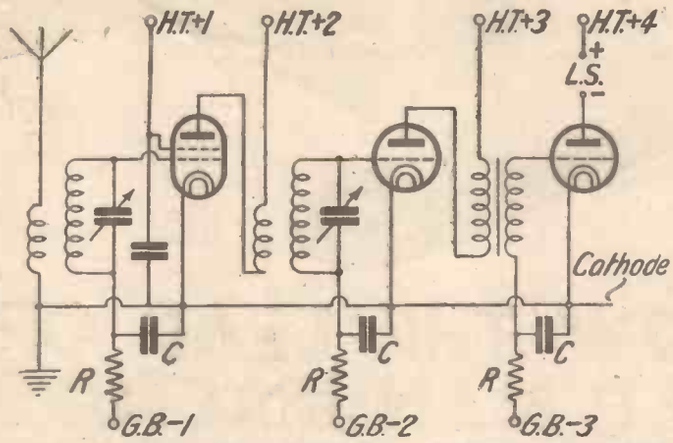
I thought at first something had broken down, but everything was satisfactory. Earthing the metal case of the unit stopped the hum entirely. This seemed a very simple cure, but there was no doubt about it. There was not a trace of hum when the case was earthed.

On the following day I returned to where I had made the first test, and satisfied myself there was no hum whether the case was earthed or not. Such is the difference between alternating-current main supplies!

My Grid-filter Idea

Most amateurs are able to convert a battery type set to an "all-electric" one, as they are often called, provided a grid-bias battery is used.

They often find that a hum is introduced when grid bias from the mains is used. This is often due to the fact that no grid



A useful arrangement to prevent mains hum when G.B. is obtained from the power supply

circuit filters are included. They comprise resistances R and condensers C, as in the accompanying diagram. The resistances may be of the grid-leak type, of 100,000 ohms, and the condensers have a capacity of 1 microfarad.

If these filters are included good results should be obtained, as they effectually prevent couplings between one grid circuit and another. I have used this method for a considerable period with great success, and may therefore recommend it.

When Valves Warm Up

A question that is sometimes asked is why does a mains valve of the indirectly-heated type take so long to reach its working state after the current is switched on? An alternative is, why are signals received for a few seconds after the filaments of mains valves have been switched off?

The answer, of course, is because of the peculiar construction of the valves. They are not fitted with a filament in the ordinary sense of the word. Instead, they have a heating element through which the alternating current is passed.

This heater is of relatively thick wire, as the current is usually 1 ampere at 4 volts, and it does not supply the electrons for the operation of the valve. The heater is used to maintain the temperature of an element, which is usually cylindrical in shape and surrounds the wires of the heater. Being coated with an electron-emitting material, the element supplies the necessary electrons when its temperature is raised to a certain point.

Naturally, if its temperature varied at all, due to the alternating current, a hum would be set up with the signals. It is, therefore, so constructed with the heater that its temperature remains practically constant.

A few seconds elapse between the time of switching on the current and hearing signals because the heater and the surrounding material take these few seconds to reach their working temperature. When switching off, a few seconds pass before the parts so far cool off that the flow of electrons ceases.

When testing valves of the indirectly-heated type, time must be allowed for the cathode, as the electron-emitting element is called, to reach its normal temperature, or wrong conclusions may be drawn.

Bias for S.G. A.C. Valves

Most battery valves are so constructed that grid current commences to flow at about zero grid bias.

This is not true of mains valves, however. In these types, there being two—the directly and the indirectly-heated—grid current often continues to flow until a grid bias of negative 1 volt is applied.

It is therefore essential to bias a shielded valve of this type. Failure to do so will result in unselectivity and poor signal strength.

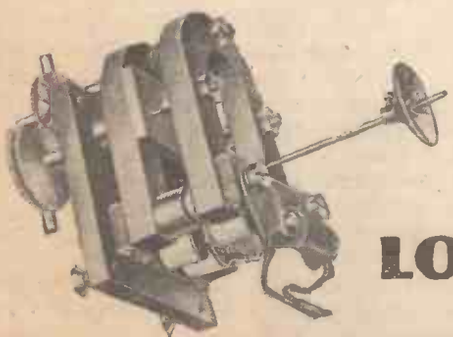
No other reproducer

can give you such magnificent fidelity, reality and purity of tone.

Listen to the fascinating rhythm of dance music—the stentorious roar of the crowd, the bewitching note of the 'cello, or the human voice—nothing is missed, nothing is exaggerated, you hear only the truth! Hear it at your dealer's. Fully descriptive literature sent free on request.

Complete Speaker in Cabinet
OAK - - £4 - 0 - 0
MAHOGANY £4 - 6 - 0

WATES STAR UNIT
12 poles. Double Magnets, 4 coils. Upper adjustment for magnets, lower for armature **36/-**



WATES STAR LOUD SPEAKERS

WATES STAR Double Cone Chassis, with brackets, specially designed for use with the Wates Star Unit **12/-**

THE SHAFTESBURY RADIO CO. (Dept. A.W.)
184/188 Shaftesbury Avenue, LONDON, W.C.2

M.B.

"A.W." TESTS OF APPARATUS

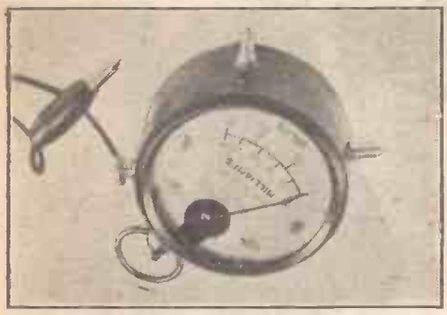
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Sifam Pocket Meter

WE have received for test and report a neat triple-range pocket meter, made by Messrs. Sifam Electrical Instrument Co.

The three ranges provided have been chosen carefully to suit the average user. On one range there is a full scale deflection of 15 volts suitable for measuring L.T. and grid-bias potentials. The reading proved to have an accuracy within 3 per cent.

The second range extends from 0 to 150 volts and is suitable for measuring H.T. voltages; the accuracy on this range was within 5 per cent. The final range gives a current reading from 0 to 50 milliamperes and should provide an excellent check for



A new Sifam instrument—a pocket meter for measuring H.T. and L.T. voltage, and anode current

measuring the emission of valves and determining whether distortion is occurring, due to overloading or to faulty grid bias on the final valve of an amplifier.

The movement of this meter is well-balanced and settles down quickly to a steady reading. The instructions printed in black lettering on the dial are quite clear and it should be almost impossible to make a mistake in connecting up; this is an important feature in a triple-range meter when one is likely to become confused by the number of terminals.

The maximum resistance is 5,000 ohms, a value sufficiently high for checking the voltages of H.T. batteries and accumulators. It is a practical instrument which can be recommended.

Ekco D.C. Eliminator

ALTHOUGH the normal 200-volt D.C. mains supply has its limitations for use with high voltage amplifiers, it is ideally suitable for the standard type of set which does not require more than 150 volts H.T. The majority of set-owners certainly do not require a higher voltage, whilst valve manufacturers, except under special circumstances, do not cater for voltages above 150.

The compactness and low price of an eliminator capable of operating efficiently off the D.C. mains is a factor which should make these articles far more popular than they actually are. Messrs. E. K. Cole, Ltd., who have had wide experience of all eliminator work have produced a complete eliminator model 3F.20, housed in a metal cabinet with overall dimensions of only 5½ in. by 3 in. by 2¾ in. high; this gives excellent results on a standard three-, four-, and 5-valve set with hardly a trace of hum or background noise.

The tapping points are mounted on a small insulated panel and provide voltages for the screen of a screen-grid valve, 60-volt tapping for the detector and 120 to 150 volts for the final power valve. Two insulated terminals are also mounted on the case, one for connection to earth and the other to be taken to earth connection on the set. In the instruction book which is supplied with each unit, it is emphasised strongly that the earth should be disconnected from the set and taken to the extra terminal.

On this particular model, the makers claim an output of 120 volts 15 milliamperes and 150 volts at 11 milliamperes. We connected the eliminator up with a wireless set and fully substantiated these claims. We found that with an output of 140 volts, the milliamperes were 13 and with 130 volts, 15.

The ripple in the D.C. mains was successfully smoothed out and was perceptible only by putting one's ear to the speaker.

In this unit Messrs. E. K. Cole, Ltd., have supplied all that the average man requires for operating his set at a price of £1 17s. 6d. and it can be recommended to readers.

A G.E.C. Wavetrap

THE principle of the wavetrap, properly applied, lends itself admirably to solving the selectivity problem for it may be inserted in any existing receiver without alteration other than disconnecting the aerial.

We have received a Gecophone selectivity unit for test and report from the General Electric Co., Ltd., of Magnet House, Kingsway, W.C. This component is distinctly novel for it combines a normal wavetrap with a coupled circuit which when connected to the standard type of set forms a loose-coupled tuner. The advantage of this coupling unit can be appreciated when it is understood that a wavetrap only operates effectively on the particular wavelength to which it is tuned. On the other hand, the Gecophone coupler can be tuned simultaneously with the main aerial condenser, providing selectivity throughout the lower broadcast range of 200 to 600 metres.

The component may be used alternatively as a trap or a loose coupler according to the connections taken to the six terminals. Full instructions and diagrams are supplied. When employed as a wavetrap, the rejector effect may be adjusted by taking the aerial to one of three terminals. At a distance of 6 miles from the Brookmans Park stations, the most selective tapping gave the best results and it was possible to separate completely the two 2LO transmissions even when using a single circuit tuner.

This Gecophone wavetrap will be found useful whenever selectivity is poor. Note the thumb control

When connected as a loose coupler, the selectivity throughout the tuning range was of a high order. Here again three variable tappings are provided and with the medium tap we could quite easily separate the Brookmans Park transmitters and pick up a number of foreign stations, with the same simple tuning circuit and one low-frequency stage.

The unit is robustly constructed and excellently finished.

At a price of 18s. 6d. it represents good value.

The Cossor Valve Works

IN view of the fact that in a number of Sunday papers (December 22) it was reported that the factory of Messrs. A. C. Cossor, Ltd. (manufacturers of Cossor valves and Cossor wireless sets) was completely burnt out on the previous night, Messrs. A. C. Cossor, Ltd., desire to make it quite clear that this factory does not belong to them. The works in question belong to Messrs. A. C. Cossor & Son, who are, it is understood, manufacturers of thermometers, etc., and neither firm has any connection with the other.

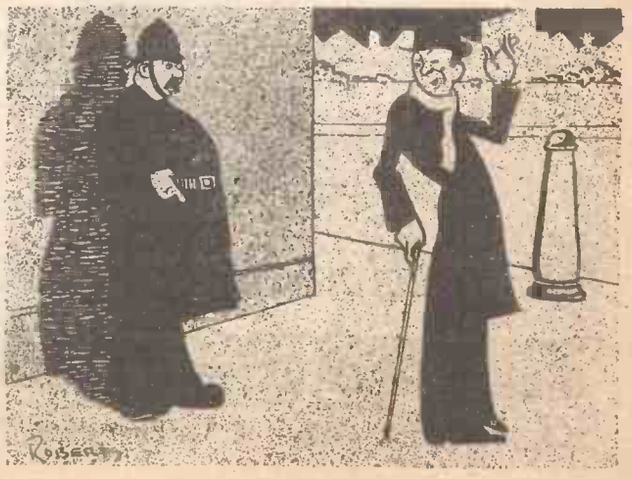
BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
		GREAT BRITAIN	
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
261	1,148	London (2) tests	5.0
*288.5	1,040	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
356	842	Brookman's Park	30.0
*377	797	Manchester (2ZY)	1.0
*393	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
1,554	193	Daventry (5XX)	25.0
		AUSTRIA	
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
		BELGIUM	
206	1,460	Antwerp	0.4
208	1,440	Radio Conference, Brussels	0.15
216	1,391	Charleroy (LL)	0.25
244	1,229	Ghent	0.5
250.9	1,196	Schaerbeek-Brussels	0.25
294	1,020	Liege	0.1
312	961.4	Arlon	0.25
339	887	Velthem	8.0
*509	590	Brussels	1.0
		CZECHO-SLOVAKIA	
*263	1,139	Moravska-Ostrava	10.0
*279	1,076	Bratislava	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
		DENMARK	
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.5
		ESTHONIA	
*296	1,013	Reval (Tallinn)	0.7
		FINLAND	
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
		FRANCE	
31.63	9,479	Radio Experimental (Paris)	1.0
175	1,714	S. Quentin	0.1
214	1,400	Fécamp (Radio Normande)	0.5
220	1,364	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
248	1,211	Nice-Juan-les-Pins	0.5
*272	1,103	Rennes (PTT)	0.5
*288	1,049	Montpelier (PTT)	0.2
286	1,049	Radio Lyons	0.5
288.5	1,040	Mont de Marson	0.3
*294	1,020	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
305.5	981.7	Agen	0.25
308	973	Radio Vitus	1.0
*316	950	Marseilles (PTT)	0.5
329	914	Grenoble (PTT)	0.5
329	914	Petit Parisien	0.5
363	828	Algiers	12.0
368	815	Radio LL (Paris)	0.5
375	803	Caen	0.5
*381	788	Radio Toulouse	8.0
412	727	Radio Maroc (Rabat)	2.0
447	671	Paris (Ecole Sup. PTT)	3.0
468	640	Lyons (PTT)	5.0
1,350	222.2	Tunis	0.6
1,444	207.5	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
		GERMANY	
*218	1,373	Flensburg	0.5
*227	1,319	Cologne	4.0
*234	1,283	Münster	3.0
*239	1,256	Nurnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Königsberg	2.5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*319	941	Bremen	0.35
*325	923	Breslau	1.5
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
533	563	Herzogstand (Bavaria)	0.5
*533	563	Munich	1.5
*560	536	Hanover	0.35
560	536	Augsburg	0.25
570	527	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
		GRAND DUCHY	
223	1,346	Luxembourg	3.0
		HOLLAND	
31.4	9,554	Eindhoven (PCJ)	25.0
*298	1,004	Hilversum (until 5.40 p.m. G.M.T.)	6.5
*1,071	280	Hilversum	6.5
*1,071	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Huizen (after 5.40 p.m. G.M.T.)	6.5
		HUNGARY	
550	545	Budapest	20.0
		ICELAND	
*1,200	250	Reykjavik	1.0
		IRISH FREE STATE	
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
		ITALY	
291	1,031	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (1GE)	1.0
*441	680	Rome (Roma)	60.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
		YUGOSLAVIA	
308	973	Zagreb (Agram)	0.7
430	698	Belgrade	2.5
574.6	522.1	Ljubljana	2.5
		LATVIA	
*525	572	Riga	3.0
		LITHUANIA	
*1,935	155	Kovno	7.0
239	1,256	Radio Nimes	0.25
244	1,229	Juan-les-Pins	0.3
*255	1,175	Toulouse (PTT)	1.5
*265	1,130	Lille (PTT)	0.7
268	1,121	Strasbourg	0.3
		NORWAY	
241	1,243	Rjukan	0.18
268	1,121	Frederiksstad	0.7
*283	1,058	Notodden	.05
364	824	Bergen	1.0
447	671	Aalesund	0.3
453	662	Tromsö	0.1
453	662	Porsgrund	0.7
*493	608	Oslo	60.0
		POLAND	
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	8.0
		ROUMANIA	
*394	761	Bucharest	12.0
		RUSSIA	
720	417	Moscow (PTT)	20.0
800	375	Kiev	20.0
938	320	Moscow (C.C.S.P.)	100.0
1,000	300	Leningrad	20.0
1,075	279	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
*1,304	230	Kharkov	4.0
1,481	202.5	Moscow (Kom)	40.0
		SPAIN	
251	1,193	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ9)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
424	707	Madrid (EAJ7)	2.0
453.2	662	San Sebastian (EAJ8)	0.5
		SWEDEN	
231	1,301	Malmo	0.6
*257	1,160	Hörby	10.0
270	1,112	Trollhattan	0.45
*322	932	Göteborg	10.0
332	905	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
		SWITZERLAND	
*403	743	Berne	1.0
*459	653	Zurich	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
		TURKEY	
*1,219	246	Stamboul	5.0

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

CONVIVIAL WIRELESS "UNCLE" (*returning home after dining well but not wisely*): "Hic — 'Hallo twins'!"



OUR INFORMATION BUREAU

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

Using a Pentode.

Q.—*I have constructed the "Everybody Three" receiver, and it has certainly exceeded all expectations in regard to reception of different stations and the power with which they are received. In fact, on some stations, the volume is so great as to cause distortion, and it is for this reason that I write. I am using a PM2 power valve with adequate H.T. supply and I have proved that I am overloading the grid of this valve. In view of this, should I use a pentode valve, or should I get a larger power valve? I wish you to bear in mind that I want purity, but also economy in working.—D. L. (Staines).*

A.—If you want purity and you are already overloading the grid of a PM2 valve, then a pentode type of valve is not to be recommended. Granted that it has a larger grid swing than a PM2 valve, there is still the possibility that even the grid of this valve will be overloaded. We suggest that you use a super-power valve of the ordinary type, such as the PM252 or any other make of super-power valve. A super-power valve will be somewhat more economical in working than a pentode valve.—B. C.

The "1930 Ether Searcher."

Q.—*I should like to construct the "1930 Ether Searcher," but should like to make use of an ebonite panel and wooden baseboard instead of the metal panel and metal baseplate. Is there any objection to this, and can you advise the necessary extra connections required to make good those now completed through the metalwork?—G. D. (Aylesbury).*

A.—It will be quite in order to use an ebonite panel and wooden baseboard, but it is essential to retain the original amount of screening in the set. The reason for this is rather obvious in that any set having metal screening necessarily damps the efficiency of the set and to make good these losses, it is necessary to increase the amplification of the individual receiver circuits. If this latter is done and the screening is removed, then the whole set becomes unstable. From this it will be gathered that the original amount of metal in the construction of the set is really essential. Therefore, if an ebonite panel and wooden baseboard are used, a sheet of copper or copper-foil should be arranged behind the panel and bent to lay over the top of the baseboard. All connections made to the copper through metal screws should be augmented by soldered joints or by soldering tags clamped down under the heads of screws.—C. A.

When Asking Technical Queries

PLEASE write briefly

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

LETTERS TO THE EDITOR

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

"Clarion 3" Success

SIR,—Congratulations on your "Clarion 3." I made it up some months ago, and it has passed all the "regional scheme" tests. I can tune in or out either station with only a few degrees on the dial. It gives good volume even with an iron bath as aerial. E. H. H. (Thornton Heath).

A Criticism

SIR,—The following paragraph appeared in a recent issue of AMATEUR WIRELESS: "Lord Robert is a practised speaker, and it would have been a good thing if Mr. Barnard had listened to him, for the latter has an irritating habit of dropping his voice to a whisper at the end of every sentence; which was, no doubt, meant for a dramatic effort, but it was entirely lost."

The word "latter" leads to confusion, I think It is intended to refer to Mr. Barnard, but in the context actually refers to "him," viz., Lord Robert."

G. M. C. (Thornton Heath)

Regional-station Reports

SIR,—Perhaps my experience with the two 2LO's may be of interest, my aerial being approximately 180 miles from Brookmans Park

"2LO—356" was received on the "Clarion 3" (modified to a "four" by one stage of R.C. coupling) splendidly for his first three days, then for a period over ten days or so gave very bad fading, since when he comes in as steadily as our local, 2ZY, and with a quality far ahead of 5X.X. At this range he has no "cut-out" effect.

"2LO—261" is very weak and wobbly. His power may not as yet equal "2LO—356" and it may be too early to judge his range. H (Ashton-under-Lyne).

SIR,—Doubtless I am only one of very many "provincials" who are glad to see the recent letter of H.H. (Carlisle).

As one who has had to content himself with a two-valve set and phones, and who is sixty miles from Daventry, seventy-five Cardiff and London, and fifty from Bournemouth, I can say that the great power from the Brookmans Park transmitter is a gift from the gods compared with the whisper we got from the Oxford Street transmitter.

Of course, I am well situated as regards "wipe-out,' being seventy-five miles from Brookmans Park; so that my little set —D. and one L.F (swinging coil reaction— will give me Hamburg perfectly free from London.

After all, London is not the only place in England!

G. (Marlborough).

THE morning religious service from 10.15 to 10.30 p.m., which up to the present has only been broadcast through 2LO and 5XX, is now being fed to all B.B.C. stations by wireless link. The experiment is dependent for its continuance on technical results.

On January 2, 5GB will revive *Hip Hip Hooradio*, a revue presented at Birmingham last spring. Such scenes as "The Potted Concert," "Faust Up-to-date," and "'Erbert and Gertie at the Pictures" will be played by Leonard Henry and Evelyn Crewe, supported by a wireless star cast.

Manchester on January 2 will relay to its listeners a circus performance taking place at Belle Vue, in which the ringmaster is to be heard over the microphone.

The final test match at Swinton, between the Australian Kangaroos Rugby League Team and England, on January 4, will be the subject of a running commentary broadcast through Manchester.

Considerable progress is being made in the reorganisation of Switzerland's broadcasting system, and orders for the two high-power transmitters have already been placed with English firms. It is understood that work on the necessary buildings is to be started without delay, and it is hoped to bring the new stations into operation by the autumn.

CKGW (Toronto) has been purchased for inclusion in the National Broadcasting Company of America network, and now relays the WEAF and WJZ programmes broadcast from New York, Washington, and other cities. Its power is 5 kilowatts and wavelength 434.8 metres (690 kilocycles).

Owing to the thousands of picture characters possessed by the Chinese language, transmissions in the native tongue could not be made in the morse code. A solution to this problem has now been found in picture transmission, as by this method Chinese characters can be reproduced at a distance in the same manner as any ordinary print or photograph.

The Hotel New Yorker, a new building

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

CRYSTAL SETS (6d. each)

B.B.C. Brookmans Park Set	AW206
Regional Crystal Set	WM176

ONE-VALVE SETS (1s. each)

B.B.C. Official One	AW208
Reinartz One	WM127
A.1	WM153

TWO-VALVE SETS (1s. each)

Loud-speaker America Two	AW190
Talisman Two (D, Trans)	AW194
Hyper-selective Two (D, Pentode)	AW198
Pentector Two (P. det, RC)	AW213
Clipper Two (D, Trans)	WM135
Continental Two (D, Trans)	WM143
Stay-put Two (All AC, D, Trans)	WM155
Ether Ranger (D, Trans)	WM156
ABC Two (D, Trans) with copy "WM"—1s. 3d.	WM160
Brookmans Two (D, Trans)	WM168
AC Two (D, Trans)	WM175

THREE-VALVE SETS (1s. each)

All-Britain Three (H.F., D, Trans)	AW158
The Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
Broadcast Three (SG, D, Trans)	AW192
James dual-range Three (HF, D, Trans)	AW196
All-wave High-mag. Three (D, 2 Trans)	AW199
Knife-edge Three (D, RC, Trans)	AW201
Talisman Two-three (D, RC, Trans)	AW203a
Wide World Short-wave Three (HF, D, Trans)	AW207
Everybody's Three (SG, D, Trans)	AW209
1930 Ether Searcher (SG, D, Trans)	AW211
New All-Britain Three (HF, D, Trans)	AW214
Standard Coil Three (HF, D, Trans)	WM117
Wide-world Short-waver (SG, D, Trans)	WM120
New Year Three (SG, D, Pentode)	WM123
Lodestone Three (HF, D, Trans)	WM129
Simple Screen Three (HF, D, Trans)	WM131
Dynamic Three (AC—SG, D, Trans)	WM136
At Home Three (D, 2RC)	WM141
Short-Wave Link (D, RC, Trans)	WM142
Binowave S.G. Three (SG, D, Trans)	WM152
Fanfare (D, 2 Trans)	WM157
Brookmans Three (SG, D, Trans)	WM161
Community Three (D, RC, Trans)	WM164
New Q3 (SG, D, Pentode)	WM167
Brookmans Push-pull Three (HF, D, Trans) 1/6	WM170
Celerity Three (SG, D, Trans)	WM173

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

Overseas Short-waver (HF, D, 2 Trans)	AW133
Clarion All-electric Three (SG, D, Trans, AC Rectifier)	AW200
*Music-lover's Gramo-radio (SG, D, RC, Trans—1s. 6d.)	AW202a
*Music-lover's Gramo-radio (Loud-speaker—1s.)	AW202b
*Music-lover's Gramo-radio (Motor-board—9d.)	AW202c
Binowave Four (SG, D, RC Trans)	WM119
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
Short-wave Adaptor for Dominions Four	WM140
Music Player (HF, D, RC, Trans)	WM144
Arrow (SG, HF, D, Trans)	WM154
1930 Monodial (2SG, D, Trans)	WM158
Electric Four (All AC—SG, D, RC, Trans)	WM162
Outpost Four (SG, D, 2 Trans)	WM165
Brookman's Four (2 SG, D, Trans)	WM174

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

Fidelity Five (HF, D, 2RC)	WM130
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146
1930 Five (2HF, D, RC, Trans)	WM171

AMPLIFIERS (1s. each)

A.W. Gramophone Amplifier	AW205
Beginner's Amplifier (1v.) 9d.	AW210
Brookman's Separator (HF Unit)	AW212
Signal Booster (HF Unit)	WM128
Auditrol Amplifier	WM132
Concentrator (HF Unit)	WM169

MISCELLANEOUS (1s. each)

Short-wave Adaptor (1v.)	AW183
High-tension Battery Charger	AW191
Mains Unit for S.8 Valves	AW193
Simplest H.T. Unit	AW197
B.P. Wavetrap (6d.)	AW204
H.T. Unit for A.C. Mains	WM125
Lodestone Loud-speaker	WM126
James H.T. Unit for D.C. Mains	WM133
Two Ampere Low-tension Unit	WM147
A.C. Mains Amplifier	WM149
A.C. Mains Unit for All-wave Lodestone Five	WM151
H.T. Unit for A.C. Mains	WM159
"W.M." Linen-diaphragm	WM172

PORTABLE SETS

Arcadian Portable (SG, D, 2 Trans) with linen-diaphragm loud-speaker (half scale)	AW177	1/6
£5.5.0 Portable (D, Trans)	AW181	1/6
Holiday Portable Three (D, RC, Trans)	AW188	1/-
Music Leader (SG, D, RC, Trans) with copy "AW"	AW203	-/4
Wayfarer Portable (Super-het)	WM139	1/6
1929 Chummy (SG, D, Trans, RC)	WM145	1/6
Enchanter Portable (2HF, D, RC, Trans)	WM150	1/6

The three prints are obtainable for 2s. 6d. post free

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

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

in New York, has equipped its 2,500 rooms with loud-speakers fitted with a switch. This arrangement gives the residents a choice of four local programmes "broadcast" through a central receiving station. It is also possible to listen to the musical programme supplied by the hotel restaurant and ballroom orchestras.

Requests were recently broadcast from WENR (Chicago) for listeners to indicate whether they select programmes by referring to the newspapers or whether they merely "dial around" until they find something of interest. Compilation of the replies resulted in the following statistics: 75 per cent. of the listening audience refer to programmes printed in newspapers, 20 per cent. use lists made up by themselves or from sources other than newspapers, 4 per cent. merely "turn the dials" and 1 per cent. listen regularly each week to programmes or stations that are their favourites and do not attempt to find either new stations or new programmes.

WIRELESS IN PARLIAMENT

(From Our Own Correspondent)

SIR WILLIAM MITCHELL-THOMPSON asked the Postmaster-General what call-sign was being allocated to the second station at Brookmans Park and when it was anticipated that a full alternative programme would be transmitted from this station.

Mr. Lees-Smith said it had been agreed that, for the time being, the London call-sign, "2LO," should cover both transmitters at the Brookmans Park station. He understood that when two programmes were transmitted simultaneously, they would be referred to as "London Regional" and "London National" respectively. The tests which were now being carried out in the transmission of alternative programmes for short periods would be continued for some weeks; but the British Broadcasting Corporation was not yet able to state the date on which they expected to be in a position to transmit full alternative programmes from the station.

Mr. Benson asked the Postmaster-General if he would state the cost of issuing a wireless receiving licence and upon what basis the cost was calculated.

Mr. Lees-Smith said that the average cost during the last financial year was about 1s. 1d. per licence. This cost was based upon returns of the time occupied, and it included provision not only for the issuing, recording, and renewing of annual licences, but also for headquarters work and for such duties as the detection of unlicensed stations and any subsequent legal proceedings.

"THE SHEER JOY OF CONSTRUCTING"

(*Continued from page 6*)

work, whilst knobs and switches jostle one another. The set is well-nigh perfect now, but obviously it can be simplified. The potentiometer setting, once found, requires no alteration; therefore, one can use a semi-fixed pattern mounted upon the baseboard. And so with many of the other added controls.

Home construction is not dead. It is as much alive as ever it was, and it will continue so long as the love of making things and altering things persists—that is one of the characteristics of our race.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

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

PREPAID ADVERTISEMENTS

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

DEPOSIT SYSTEM

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

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

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to
"AMATEUR WIRELESS," ADVERTISEMENT DEPARTMENT,
58/61 FETTER LANE, LONDON, E.C.4.

PATENTS.—Trade Marks, Advice Handbook free.—B. T. King, Regd. Patent Agent, 146 Queen Victoria St., London.

WIRELESS OPERATING APPOINTMENTS—Fees payable after qualifying (for boarding students). Morse Classes. Wireless School, Manor Gardens, Holloway, N.7.

THE PROPRIETOR of Patents Nos. 263752 and 263753 "Variable Directional Electric Wave Generating Device" and "Directive Projecting and Receiving System for Use in Wireless Telegraphy or Telephony" is desirous of entering into arrangements by way of Licence or otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country. All communications should be addressed in the first instance to:—J.-E. Evans-Jackson and Company, Registered Patent Agents, Bath House, 57 to 60, Holborn Viaduct, London, E.C.1; and 34, Dame Street, Dublin, Ireland.

ENGINEERS.—Can't we get together? All we ask is the chance to prove that you can earn £300, £400, £500 per year and more. Other men are doing it and you can do the same. We have an unrivalled and world-wide organisation waiting to help you, whether you be novice or expert. If you wish for something more than a "bread-and-butter" job, you owe it to yourself to investigate our service. Our handbook, "ENGINEERING OPPORTUNITIES," has pointed the way to better things to over 20,000 of your fellows. It contains details of A.M.I.Mech.E., A.M.I.C.E., A.I.E.E., A.M.I.A.E., A.M.I.Struct.E., C. and G., G.P.O., etc. Exams., and outlines Home-study Courses in all branches of Electrical, Mechanical, Motor, and Wireless Engineering. In a brilliant article, Professor A. M. Low shows clearly the chances you are missing. The book and our advice are quite free. We guarantee "NO PASS—NO FEE." Don't miss this opportunity; send a post card NOW (state Branch, Post, or Exam.).—British Institute of Engineering Technology, 109 Shakespeare House, 20 Oxford Street, London, W.1.

Amateur Wireless COUPON Available until Saturday JANUARY 11, 1930

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61, Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, January 4, 1930

300

OLD SETS AND THE NEW TRANSMISSIONS

Amateur Wireless

and Radiovision

Every Thursday 3d.

Vol. XVI. No. 396 Saturday, January 11, 1930

BRITISH BROADCAST 2

AN ECONOMICAL LOUD-SPEAKER SET

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

LOCKED for SAFETY — LOCKED for LONG LIFE

THE ONLY SCREENED GRID VALVE WITH INTERLOCKED CONSTRUCTION

LOCKED top and bottom—braced to a girder-like rigidity—the elements of the *NEW* Cossor Screened Grid Valve are definitely immovable. This Cossor system of Interlocked Construction ensures a remarkable degree of strength—far greater than ever before attained in any valve. As a result the *NEW* Cossor Screened Grid Valve has an exceptionally long life — it is shock-proof, noise-proof and break-proof. Use the *NEW* Cossor Screened Grid in your Receiver — it is Britain's strongest and most dependable Screened Grid Valve.

2-volt type now available.

Cossor 220 S.G. (2 volts ·2 amp.) Anode volts 120-150, Impedance 200,000 Amplification Factor 200. Price . . . **22/6**

Cossor 4 and 6 volt Screened Grid Valves are also available with similar characteristics at the same price.

A. C. Cossor Ltd., Highbury Grove, London, N5

The NEW Cossor Screened Grid Valve

3096 CA

JANUARY 11, 1930. No. 396. Vol. XVI

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

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

A Gift to You—Tatsfield's Good Work—A Radio Night—Radio on the Road—The King's Broadcast—A Difficult O.B.—A 5SW Broadcast

A Gift to You—A present, useful to every reader, is being given with next week's issue of AMATEUR WIRELESS—a Free thirty-two-page Book, giving specifications, brief notes, circuit diagrams, layout diagrams, and other illustrations of *twenty* approved receivers and speakers of a thoroughly up-to-date kind. Every piece of apparatus described has been tried out and is known to give fine results. Remember, this book is being given free with next week's issue. Make sure of your copy now, to avoid disappointment. Further details on page 38.

Tatsfield's Good Work—Tatsfield is being used extensively nowadays by the B.B.C. And perhaps because Keston has put on new clothing, as it were, it seems that more than usual jobs are being given to the B.B.C. listening post. Tatsfield was responsible for a very good American relay recently, in which we understand a rather novel method of short-wave reception was employed. Also on a recent occasion the Danish high-power station, Kalundborg, was picked up at Tatsfield, relayed to Savoy Hill, and broadcast from London and Daventry. Probably there is no other broadcasting organisation in the world which has such an efficient reception post as has the B.B.C. Tatsfield is certainly a feather in the Corporation's cap.

A Radio Night—Radio entered largely into New Year's Eve festivities. At many of the large hotels in London, notably the Hotel Cecil, the Savoy, and the Carlton, the Marconiphone Co. installed loud-speakers so that the revellers could listen to Big Ben and also to the switch-over to New York, which carried them back again for a few minutes to 1929. Radio fans who had to put up with humbler festivities on New Year's Eve doubtless made good use of their sets. The B.B.C. certainly did do its bit properly on this occasion.

Radio on the Road—The Hon. Mrs. Victor Bruce, the well-known woman motorist, who is competing in the transcontinental Monte Carlo rally next week, is taking with her on a hazardous four-day trip a complete "Eskimo" outfit, picks and shovels, emergency rations, and a radio set! These precautions are necessary because she is starting for Monte Carlo from a small village on the fringe of Lapland. Just what part the radio set will play it will be interesting to watch.

The Hon. Mrs. Victor Bruce with her portable set before setting off on a Lapland-Monte Carlo run. (See accompanying paragraph.)

The King's Broadcast—That H.M. the King is shortly to broadcast is welcome news. It is, of course, His Majesty's first broadcast since his illness. The relay is being made from the Royal Gallery of the House of Lords, and the only previous occasion of a relay from there was way back in 1926, when H.R.H. the Prince of Wales broadcast.

A Difficult O.B.—The O.B. department is making special arrangements for this broadcast by the King. Ten microphone extensions will be placed in the Royal Gallery, and these will be taken to a listening point just outside the door. Thence the lines will pass to the private branch exchange of the House of Lords, and so to the transmitter. Therefore, when you hear the King speaking you will now know the devious routes through which the speech currents are passing. The broadcast is being given between 11 a.m. and 1 p.m. on January 21.

A 5SW Broadcast—In order that the King may have the largest possible audience, the B.B.C. has arranged to broadcast the ceremony from 5SW Through the International Broadcasting Union at Geneva, facilities have been offered for relaying the proceedings by telephone line from Savoy Hill, or by wireless link from Daventry 5XX, to broadcasting organisations throughout Europe. In spite of the inconvenient hour for American longitudes, the National Broadcasting Company is arranging to relay the speech through its chains of stations. Th whole world will be able to hear.

PRINCIPAL CONTENTS

RADIO FLYING LESSONS!

How Wireless is being used to Teach Flying

Flying instructions being transmitted to a pupil pilot

I SUPPOSE everybody knows what a large portion of the progress and safety of aviation nowadays is due to radio, writes an AMATEUR WIRELESS correspondent All commercial and most private aeroplanes, and all R.A.F. machines are radio-equipped; and now a new use has been found for radio in connection with flying

Radio flying lessons are now given at the Heston Air Park School, in Middlesex, one of the most important training and R.A.F. centres in this country. In brief, the aeroplanes in which pupils are taught to fly are fitted with very simple sets, so that a pupil pilot can listen, while in the air, to orders given by an instructor on *terra firma*

This is a great innovation, because it is

A double microphone is used to obviate breakdowns

a most important connecting link in the teaching of an air pilot. When a man has been taught the rudiments of flying and can "taxi" on the ground, he undertakes a number of flights in a dual-control machine, with the instructor taking the leading hand and being ready in case of emergency. But it is the pupil's first solo flight which has in it the element of danger; for the first time he is on his own—or at least he was until the Heston School installed this radio link!

What will interest readers most is not the way in which the radio link is employed, but rather the type of receiver used, which is of the simplest possible design. All the radio parts are manufactured by Messrs. Alfred Graham & Co., Ltd, of Slough.

Simple Receivers

The transmitter, which has been fitted at the Heston centre solely for the teaching of pilots, is used largely for transmitting speech and not morse. Each aeroplane is fitted with a simple four-valver, having two stages of screen-grid amplification, a leaky-grid detector, and one L.F. stage. The whole is contained in a small metal cabinet, thoroughly shielded and attached to the instrument board in the cockpit. The tuning is semi-aperiodic, in that only one tuning control has to be operated, and this has a simple lock, so that it need not be moved and cannot get out of adjustment while the 'plane is in flight.

Preventing Interference

All the valves are fitted in shock-absorbing holders, and the screen-grid stages have holders at the anode-terminal ends to prevent undue vibration. The set is well shielded inside, and a rectangular metal sheath fits over each valve stage, so that there is no possibility of interaction between one stage and another.

There is a great necessity for this shielding, too, in a receiver which is operated close to electrical mechanism, as is a radio receiver in an aeroplane. Were the valve stages, H.F. and L.F., not properly shielded, together with their associate circuits, magneto interference would be picked up so loudly as to drown reception.

Projecting through the front of the panel is an on-off switch, and this is really the only control which the pilot has to worry about.

Transmitting Arrangements

Reverting once more to the transmitting end, the transmitter itself is installed at the top of the control tower at Heston aerodrome. A dual microphone arrangement, using carbon "mikes" of a special type, prevents any possibility of this section of the transmitter breaking down, which might be very dangerous for a novice pilot relying on the radio instructions.

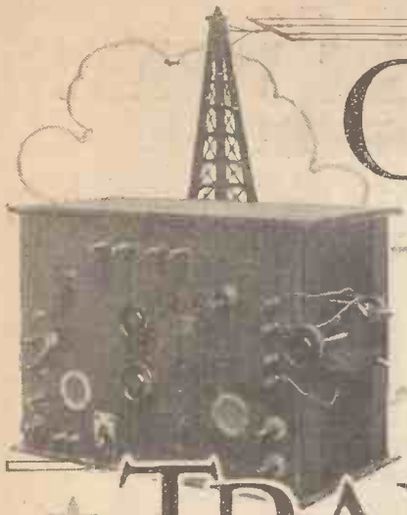
On the top of the control tower, above the

The four-valve receiver in the cockpit

transmitting room, is a simple double-wire aerial, which has not a very marked directional effect, so that the receiving strength does not vary according to the respective positions of the 'plane and the transmitting aerial.

Mullard valves are used in this equipment, and it is interesting to note that one 'plane, fitted with one of these receivers, crashed mildly, owing to bad handling by an inexperienced pilot. No part of the receiver was damaged and, complete with the original valves, has since given over 100 hours' service! KENNETH ULLYETT.

It is reported from Paris that the Petit Parisien broadcasting station has been taken over by a French syndicate with a capital of some twenty million francs. The transmitting plant will undergo many improvements.



OLD SETS AND THE NEW TRANSMISSIONS

ANGLERS are proverbial prevaricators, golfers are proverbial profaners, and—so it would appear—radio men are terribly careless. There seems to be a large section of listeners who, once having made a set which works, either rest on their laurels or sit amazed at such a stroke of luck in that it does work!

Anyway, they wait till it is quite out of date before again having the temerity to touch it, juggle with its innards and make it work like a good set should.

The coming—almost at once—of the "B.P.'s" has caught many of these dreamers napping.

Just take the case of a simple two-valver, in connection with which I was asked last week to give some helpful advice. It was not a very old set—perhaps only eighteen months or so—and it had been rigged up by an "expert" at a time when London and 5GB were the only stations which this set owner needed. It had replaced a crystal set.

The first snag was that a second "expert" who had installed the crystal set had done his job thoroughly and there was a full 100-foot aerial—I believe we used to call them P.M.G. aerials—and the earth lead was short, fat, and well-nigh perfect. The whole aerial and earth system was so efficient that I should think several milliamps of rectified current would be obtainable with a crystal detector using this super antenna.

Therefore you can guess what a job it was to get good selectivity with a valve set on this aerial now that the B.P's have started.

For some obscure reason only a single-range coil was fitted so that despite the fact that the ether is now so congested on the medium waveband the owner of this two-valver was not able to "escape" on occasions to the long waveband, there to get interference-free reception from 5XX.

No Selectivity

Of course, the aerial was taken direct to the grid end of the coil, and there was no suggestion of any centre-tapping or similar device to lessen the aerial damping. Grid-leak rectification was employed with a very doubtful-looking grid leak connected across the condenser terminals.

Apart from the fact that this is not the most efficient way of arranging a leaky-grid system for selectivity, the detector valve was hopelessly overloaded in this particular set and it seemed to me that the only solution was to change to anode-bend rectification, or to use a pentode valve as the detector, in a manner similar to that employed in a recent AMATEUR WIRELESS set, the "Pentector Two."

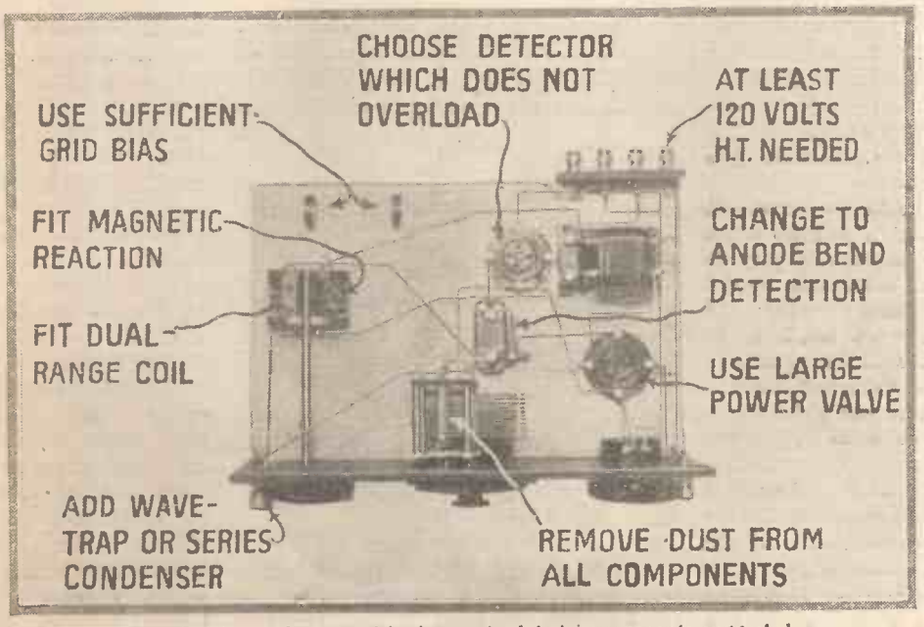
The power valve was a power valve, I will admit, but it should be remembered that the term "power" is a very indefinite one. This particular valve did not have a characteristic curve capable of accommodating the much greater grid swings now obtaining owing to the greater strength of the Brookmans Park transmissions.

Although electric light mains were installed in the house, a small-capacity 100-volt dry battery was used for H.T. When under former conditions the received strength was not regularly so great, the valve worked well with only 100 volts, but with the advent of Brookmans Park an extra 20 volts was obviously required. A better plan would have been to have installed a mains unit giving a 150-volt output with a useful flow of current capable of putting the small-capacity H.T. battery to shame.

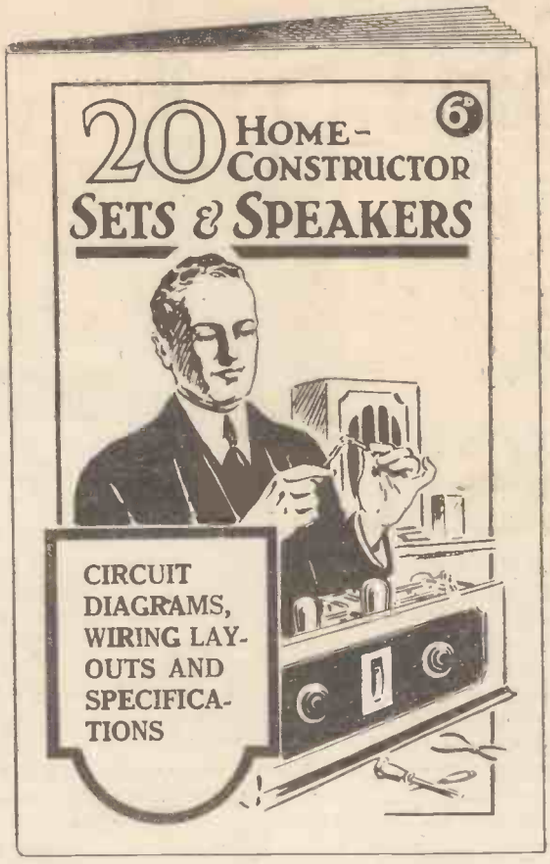
A minor trouble was that 5GB was received at such poor strength that London had to be relied upon almost entirely. Therefore the tuning condenser was hardly ever turned! Dust had settled between the condenser vanes and also on the other components of the set, causing high resistance "shorts," resulting in broad tuning.

I have chosen this example because it

(*Continued at foot of next column*)



A typical two-valve set, with nine up-to-date improvements suggested



FREE, NEXT WEEK!
32-PAGE BOOK

HERE you have both the subject and the title of the free 32-page book which we shall give to every reader of AMATEUR WIRELESS next week.

With *every* copy of AMATEUR WIRELESS a copy of this book.

What will the book contain? Specifications, brief notes, circuit diagrams, layout diagrams, and other illustrations of twenty approved receivers and speakers of a thoroughly up-to-date kind, which any home constructor can make and use with the least trouble and the most pleasure.

Every piece of apparatus in the book has been tried out and is known to give fine results.

You will be glad to have at hand for easy reference this collection of data, diagrams, and descriptions, and you will welcome the opportunity of making known to your friends that this booklet is to be had *free* with AMATEUR WIRELESS, published next Thursday morning, January 16.

The issue itself will be as good as ever—readable, useful, authoritative—and readers, new and old, will be glad to have it for itself alone.

On every occasion when we have given away a book of sets and circuits we have run out of print before publication. Although we are printing more than ever next week, we expect exactly the same to happen again. Once the shops and stalls have used up their first supplies it will be difficult for them to get more; thus you may be disappointed of *your* copy unless you make sure *now* by ordering in advance.

Please get your friends to do the same.

Price as Usual, 3d.

THIS BOOKLET IS AN INDISPENSABLE PART OF THE HOME-CONSTRUCTOR'S OUTFIT

"OLD SETS AND THE NEW TRANSMISSIONS"

(Continued from preceding page)

seems to contain most of the faults which many listeners' sets seem to harbour; perhaps not all, but some of them. People are waking up to the fact that there is now greater power in the air, and shortly there will be more stations available. An old-type set which would receive, say, London and 5GB at good loud-speaker strength, and perhaps 5XX if a dual-range coil was fitted, will not necessarily receive regional transmissions satisfactorily. Selectivity is only one of the new needs.

Salient facts which should be remembered are the following: Aerials put up when one aimed at getting as near as possible to the 100-foot mark, must now be cut down in order to get sharp tuning; and with modern valves one will not lose any strength: every set should be capable of receiving on the long waves as well as on the medium waves, for more use will have to be made of the long waves as high-power stations cause an increasing degree of wipe-out on the medium band. A final point is that, at a rough estimate, 50 per cent. of the sets operated in the service area of the regional transmissions will suffer from overloading in one form or another. If it is the detector valve which overloads, then a solution will be found in anode-bend or pentode-valve detection. If it is the L.F. side which is overloading, then higher H.T. and a power valve with a more capable characteristic are called for.

An accompanying photograph illustrates a fairly old-fashioned set—a "winner" in its time—which will need a little touching up here and there in order to make it really serviceable under the new conditions. Several points at which improvements could be made are indicated, and the improvements suggested. Are some of these points to be found in *your* set?

U.

A Lissenden impression of Vernon Bartlett

BROADCASTING IN JAPAN

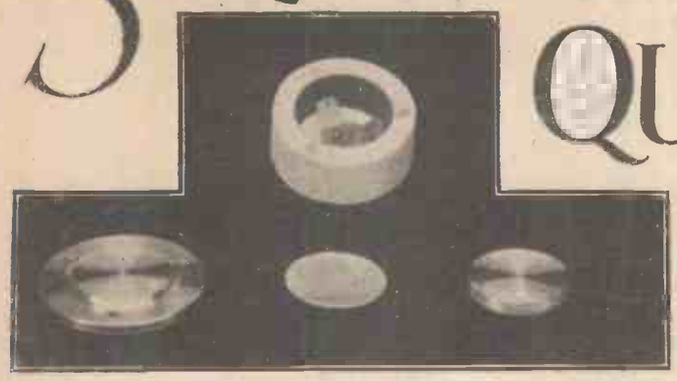
THE Japanese broadcasting system now possesses six 10-kilowatt transmitters installed at Tokio, Osaka, Hiroshima, Kuamoto (Kuushi), Sendai, Sapporo (Hokkaido). In view of the number of licensed listeners—namely, over 700,000—the tax has been reduced to 1 yen per month (about 2s.).

Plans have been drawn up for the construction of a 10-kilowatt station at Nagoya to replace the smaller plant now in use, and a further transmitter is to be erected at Kanasawa. The Japanese authorities have also extended broadcasting facilities to Korea by the opening of a station at Dairen, and a 10-kilowatt plant is destined to the Island of Formosa.

With the exception of Sapporo, situated on the Island of Hokkaido, which takes its programmes by wireless link, all stations are connected up by cable with the capital.

Generally speaking, the Japanese nation has enthusiastically welcomed these radio entertainments, the older generation showing their appreciation of the true native music, whereas their offspring claim a larger share of European or American up-to-date syncopated melodies. GRIDDA.

Simple Facts About QUARTZ CRYSTAL OSCILLATORS



A Quartz Crystal and its holder

RADIO channels have need for a source of frequency whose absolute value is known to a high degree of accuracy and whose relative variations are held to within very narrow limits.

The reasons for this rigid frequency specification are obvious to everyone who has used a transmitter. Absolute accuracy and freedom from slow variations of large magnitude are necessary to keep the station at the assigned position in the frequency spectrum and thus avoid interference. Rapid variations must be eliminated if good quality is to be maintained at the receiver.

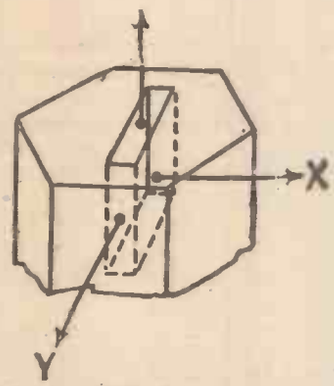


Fig. 1a. Method of cutting crystal

The usual means employed for frequency generation consist of a valve oscillator in which the oscillations set up in a tuned circuit are sustained through the medium of a valve. The frequency of such an oscillator is affected by a number of factors, such as supply voltages, the load impedance, the temperature of the circuit elements, and so on. The frequency change of this oscillator as ordinarily set up is greater than a tenth of 1 per cent. for a 1-per-cent. change in H.T. voltage. The modern operating requirements require a constancy of five thousandths of 1 per cent or better, taking into account all the factors that affect the frequency This oscillator is thus unsuitable for carrier frequency generation without some radical improvement in stability.

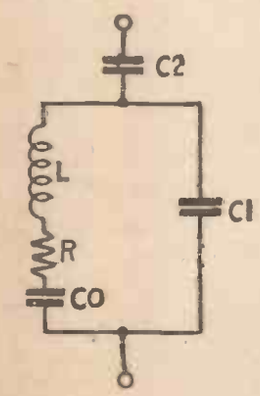


Fig. 2. Electrical circuit equivalent to Quartz oscillator

Valve Oscillator Stabilisation

A large amount of experimental and theoretical work has centred about the stabilisation of valve oscillators for supply-voltage and load-impedance changes, and a number of circuit arrangements have been devised which result in a material improvement. Some of these schemes involve the balancing of one disturbing factor against another, while others make use of phase-correcting networks. The most desirable scheme from the standpoint of simplicity uses a circuit whose reactance and resistance change very rapidly with frequency. This implies a sharply resonant circuit—that is, one with very low damping. Such a system can accommodate itself to a new set of conditions, such as changes in valve-supply voltages or load impedance, with a small frequency change, to an extent depending upon how much the damping has been reduced.

A good measure of the reduction of damping is the ratio of the inductive reactance of the circuit element to its resistance. For well-designed coils this ratio may be as high as 300, but mechanical vibrators can be constructed whose equivalent ratio of reactance to resistance is of the order of 30,000. If, then, a mechanical system can be used for the oscillator circuit, a hundred-fold improvement in damping is to be expected with a corresponding increase in frequency stability.

The use of mechanical vibrators was confined to the low frequencies in the audible range, until it was pointed out that the piezo-electric effect in crystals could be used to furnish the necessary coupling at higher frequencies. The term "piezo-electric effect" describes that property of a certain group of crystals by which electric charges are generated on particular surfaces when the crystal is stressed mechanically. Of this group of crystals there are only a few which possess the mechanical qualities necessary for a standard of frequency. Quartz is the most suitable of these, because it is easy to obtain at a reasonable cost, offers no serious difficulties in preparation, and has very low electrical losses.

Quartz-crystal vibrators can be constructed for any frequency from a few kilocycles to 10 megacycles, but the ordinary useful commercial limits are from 50 kilocycles to 6 megacycles. As usually prepared, the vibrator consists of a plate or bar cut from the quartz crystal. Coupling to the element is secured by means of metallic electrodes placed in light contact or in close proximity to the major faces of the quartz. Fig. 1a shows one of the typical methods of cutting a plate with respect to the original axes of the crystal structure, and Fig. 1b illustrates the relative position of quartz plate and electrodes.

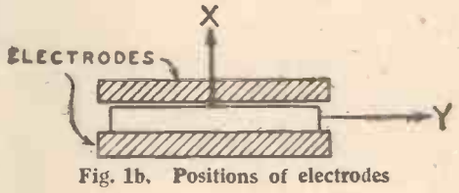


Fig. 1b. Positions of electrodes

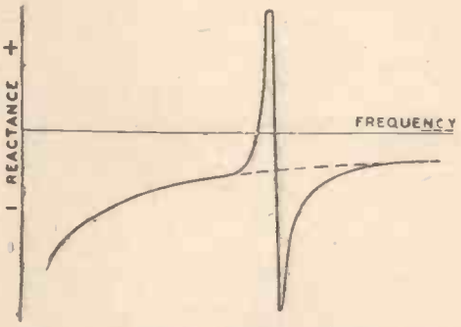


Fig. 3. Reactance curve of oscillator system

The process by which the plate is set in vibration can be described briefly as follows. When a potential is applied to the electrodes, the crystal plate, by reason of the piezo-electric effect, expands in the direction Y and contracts along the direction X. Along the third direction Z of the plate, which corresponds to the direction of the optic axis of the crystal, there is no motion. When the potential is removed, the crystal contracts and develops a voltage of opposite sign on the electrodes. For a

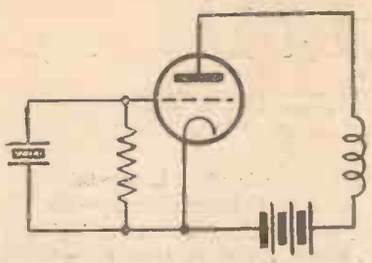


Fig. 4a. Circuit including high-frequency crystal

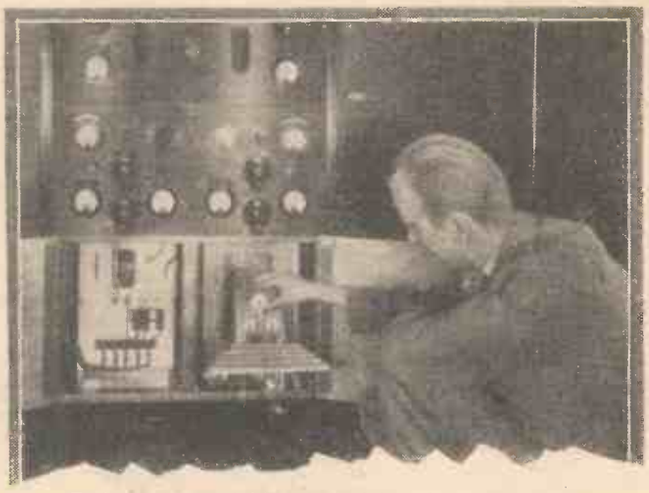
steady potential, the magnitude of this effect is small: of the order of 6 by 10^{-7} centimetres for a potential of 3,000 volts. But when an alternating potential having a frequency corresponding to one of the mechanical vibration frequencies of the plate is applied, the familiar phenomenon of resonance builds up the amplitude of vibration to a level at which the forces acting are very considerable. The motion of the surface is sometimes so violent that the crystal "walks" around between the electrodes, and it is not uncommon for a crystal to shatter when vibrating.

The equivalent circuit of a quartz vibrator in the region of one of its mechanical vibration frequencies, or "normal modes" of vibration, is shown in Fig 2 The elements L, R, and C represent the electrical equivalent of the mechanical vibrating system C1 is the capacity of the plate itself—of a condenser with the quartz plate as the dielectric. C2 is the capacity of the air gap between the quartz plate and the electrodes. For a million-cycle vibrator, L may be of the order of a half a henry; R, 100 ohms; and e0, C1, and C2, 0.06, 1.0, and 5.0 micro-microfarads respectively The reactance curve of such a system is shown in Fig. 3; except in the region of a mode of vibration, the crystal acts as a simple capacity.

High-frequency crystals are usually used in a circuit similar to that shown in Fig. 4a. The equivalent electrical circuit of this arrangement is shown in Fig. 4b. This type of circuit will only oscillate when the equivalent circuit element on the grid side is an inductive reactance, and, as the crystal is only an inductance in the region of its mechanical period, oscillations can only take place at the natural frequency of the crystal.

Assuming that the low damping of the crystal system is sufficient to reduce the frequency change with change of supply voltages and load impedance to a negligible amount, there are other factors which affect the frequency which have to be considered. Among these are the temperature of the quartz crystal and possible change of position of it with respect to the coupling electrodes. To take care of these factors the crystal has to be held at a fixed temperature and supported in a holder that it is free to vibrate but cannot change its position.

The designer of a frequency generating system involving a quartz crystal, therefore, must know the relation between the dimensions of the plate and the frequency at which it will vibrate; the decrement of that vibration; its temperature co-efficient of frequency; the type of vibration; and, finally, the fact that the voltage developed by the plate while vibrating will be adequate to ensure sufficient coupling between the mechanical and the electrical systems. If a crystal plate could be so cut as to respond to only a single frequency, it would be simple to determine this information for this mode of vibration and write the complete specification Unfortunately specification is not as straightforward as this.



Trying out a crystal in a typical American transmitter

In the first place, any mechanical system of three dimensions possesses a large number of degrees of freedom. The crystaline nature of quartz further complicates its vibration, for the various elastic constants in a given direction vary as that direction changes with respect to the axes of the crystal structure. As a result, a quartz plate has a large number of possible modes of vibration, some of them within a few hundred cycles of each other The frequencies of these modes depend upon the orientation with respect to the crystal axes and shape and ratio of dimensions of the plate. The decrement, temperature coefficient, voltage developed, and so on are all functions of the particular mode of vibrations set up in the crystal, and sometimes have values that are widely different for modes of vibration that are of very nearly the same frequency. Moreover, a slight change in temperature or a variation in the circuit to which the crystal is attached will sometimes cause it to "hop" from one of these modes of vibration to another.

A large amount of work has been done, both in the Bell Telephone Laboratories and by other investigators on the factors

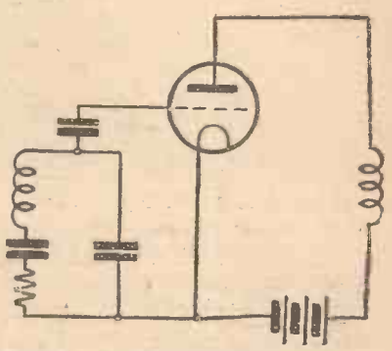


Fig. 4b. The equivalent electrical circuit of Fig. 4a

that determine the relative frequency spacing, activity, and other constants of these modes of vibration.

Crystals are now being produced on a commercial basis. Of the means now known for securing accurate frequency control, the quartz crystal appears to be the best. As radio requirements become more rigorous, their application will doubtless be extended. By resort to harmonic and subharmonic generation, the frequency range to which crystal control can be applied becomes virtually unlimited.

TUNING BY SIGHT

THOSE who have any difficulty in discovering by ear whether a station has been tuned in to its best possible strength should make use of a milliammeter. Watch its needle as you tune in and see what happens. If your detector is of the anode-bend variety you will find that there is quite a definite increase in the reading as resonance is approached. The needle travels to a maximum position at resonance and then falls back to normal.

With the grid-leak-and-condenser rectifier just the opposite happens, the needle making a pronounced dip at the resonance point. The milliammeter tip is especially useful if you are calibrating a set, for it enables you to discover to a hair's breadth the tuning of any particular station. It will also show you whether your detector is being overloaded when the local station is coming in. The needle should remain perfectly steady. If it waggles, then the detector is being asked to handle more than it can deal with properly.

Certainly-experiment with your set

BUT NOT WITH *the* COMPONENTS

Always use the best—

BENJAMIN

VALVE-HOLDERS

Clearer Tone	2/-
Vibrolder	1/6
5-Pin Holder	1/9
Pentode	2/3

SWITCHES

Push-Pull	1/3
Rotary	1/9

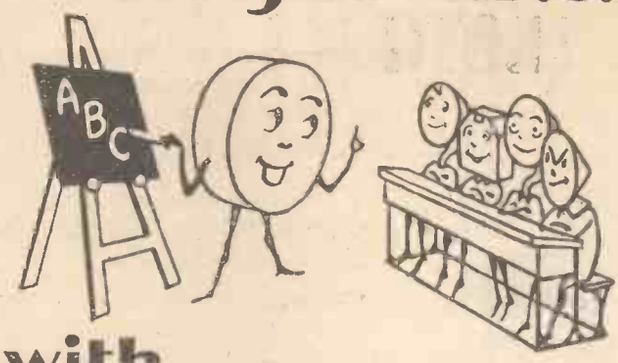
TURNTABLE

Ball-bearing and equipped with hinged and folding legs .. 7/6

Send P.C. for fully illustrated leaflet No. 2003.

THE BENJAMIN ELECTRIC LTD.
BRANTWOOD WORKS, LONDON, N.17

it's easy as A.B.C.



with FLUXITE

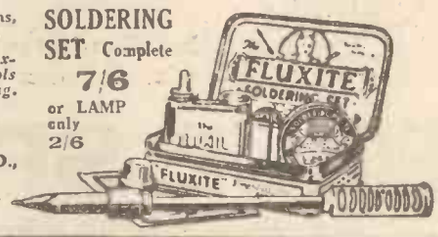
FLUXITE is sold in tins, price 8d., 1/4 and 2/8.

Another use for Fluxite: Hardening Tools and Case Hardening.

Ask for Leaflet on improved methods.

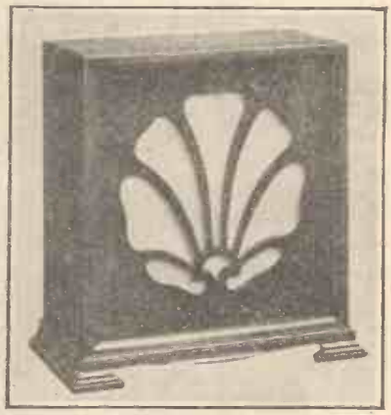
FLUXITE LTD.,
(Dept. 326)
Rotherhithe, S.E.15.

SOLDERING SET Complete **7/6** or LAMP only **2/6**



– IT SIMPLIFIES ALL SOLDERING

For better results use The



CAMCO CASEWORK — REG. TRADE MARK

"Melodee" Loud Speaker Cabinet and Unit Holder

No. 1. Size 15½" x 13" x 7¼"

Oak, 22/- ; Mahogany, 24/-

No. 2. Size 15½" x 15" x 10"

Specially suitable for BROWN'S VEE UNIT, Large BLUE SPOT, ORMOND ULTRA, etc.

Oak, 30/- ; Mahogany, 33/-

This cabinet has been constructed on technical lines. Special care has been taken to avoid resonance. The front of the cabinet is of sufficient thickness to carry a chassis.

The Camco Unit Holder as recommended saves cost of chassis, and is drilled to take Unit. Complete with fixing bolt and nut. No. 1 Size, 1/-. No. 2 Size, 1/3.

Call and see full range of Camco Cabinets at NEW London Showrooms.

CARRINGTON MANUFACTURING Co., Ltd.
New Showrooms: 24, Hatton Garden, London, E.C.1
Telephone: Holborn 8202. (A 3104

GET THEM BOTH TOGETHER . . .

When getting your 66K Unit, ask your wireless dealer to demonstrate the Blue Spot Chassis.

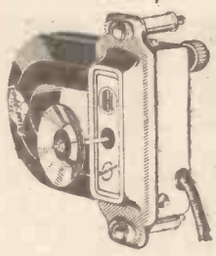
You will then hear what the 66K Unit really can do—for it is working under ideal conditions, driving a chassis specially made for it.

The Blue Spot Chassis is made in two sizes complete with cone :

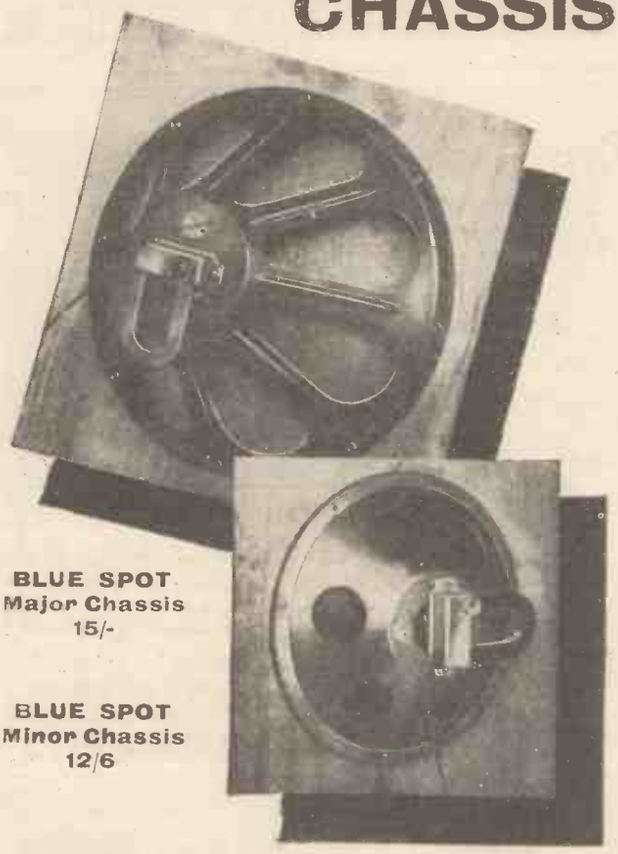
The Major (13" cone) 15/-
The Minor (9½" cone) 12/6

Both Blue Spot and both the finest value obtainable.

66K
UNIT 25/-



BLUE SPOT CHASSIS

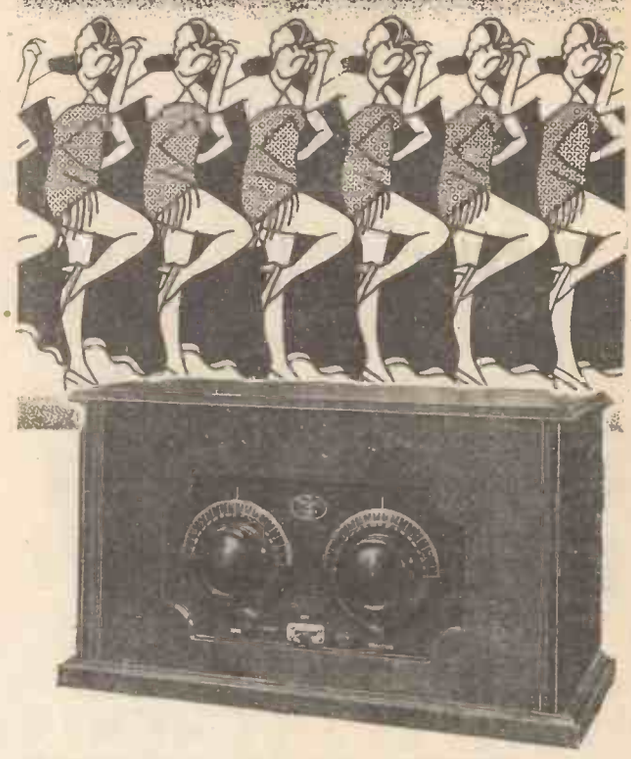


BLUE SPOT
Major Chassis
15/-

BLUE SPOT
Minor Chassis
12/6

F. A. HUGHES & CO., LIMITED
204-6 GT. PORTLAND ST., LONDON, W.1.
Phone: Museum 8630 (4 lines)
Distributors for Northern England, Scotland and North Wales,
H. C. RAWSON (SHEFFIELD & LONDON) LTD.,
100 London Rd., Sheffield ('Phone: Sheffield 26006); 22 St. Mary's Parsonage, Manchester ('Phone: Manchester City 3329).

TEAM WORK-



—THE FORCE BEHIND PERFORMANCE !

Every dancer working in harmony, a fine performance, a great show.

Every component working in harmony, a great set with a fine performance.

Every component in the "Empire 3" a BurTon component . . . in the right place, doing the right job; the whole a perfect synchronisation, *a perfect set!*

£5 10
Valves, Batteries and Royalties extra.

ALL MAINS MODEL
(self-contained)

Price of Set - - - - **£11 : 5 : 0**
Price of valves (Mullard A.C.) **£3 : 10 : 0**
(Royalties extra)

Identical in appearance to the Battery Model

THE BURTON EMPIRE 3

EVERY PART A BURTON PART

C. F. & H. BURTON, Progress Works, Walsall, Eng.

On Your Wavelength!

Echo—and Our Sets

AS the years go by and the quality of reproduction on our receiving sets improves, echo is added more and more to the British broadcasting transmissions. It seems an extraordinary fact that broadcasting studio reverberation and receiving sets should have any such complementary effect upon one another, but it is so. In the early days of broadcasting, only headphones and loud-speakers having doubtful response curves were available. The resonances in these reproducers coincided with the resonance of the low-frequency amplifiers of the time, resulting in a high amplification of frequencies between 600 and 1,000 per second, and with poor reproduction of sounds below or above this range. The reverberation of small rooms, particularly those with plaster walls, also emphasises the same range of audible frequencies. The final result of a transmission made from an undraped studio or room in those early days was a reproduction so "rich" in echoes, that speech was hollow and almost unintelligible and music was a mere "nasty noise."

Enter the Bass

Heavily draped studios were used by the B.B.C. right up to the end of the general use of the horn loud-speaker. The cone loud-speakers and the earliest moving-coil speakers demonstrated the fact that the transmissions were too "dead" and were also lacking in bass. Hitherto, the magnetophone microphones had given pleasing results on the best horn loud-speakers, and the fact that they did not pick up bass notes very well did not matter; the receivers and loud-speakers could not have reproduced them. And so, with the improvement at the receiving end, more and more bass and echo have been added to the transmissions. At the present time the B.B.C. uses nothing but Reisz and condenser microphones, instruments which give equal output voltages for the equal air pressures applied, the converse of what the ideal loud-speaker should do.

Reisz versus Condenser

Condenser microphones have been used experimentally by the B.B.C. for a number of years, but it was only until a few months ago that they were brought regularly into use on the transmissions. The greatest advantages of the condenser microphones are the absence of blasting and background hiss. On many transmissions, these qualities place it ahead of the Reisz and other high-grade carbon microphones. But the musicians of the B.B.C. are loath to give up the Reisz, on the grounds that this well-tried instrument gives a brilliance to orchestral music which has not yet been achieved with any other microphone; judging the result on the best-quality loud-speakers.

Both types of microphone are now being used, carbon and condenser, and it may be of interest to listeners to try and identify what type of microphone is doing the job at the "other end." The condenser microphone has practically no background noise and is ever so slightly metallic in tone; the Reisz carbon microphone is more "woody" in tone, but gives a brilliant reproduction of the high harmonics of the violin and other musical instruments. The Reisz also has, alas, a rather objectionable background hiss, which is very noticeable during announcements and silent periods when the microphone is still "live."

Film Microphones

In the talking-film world there exists the same uncertainty in regard to the relative merits of the carbon and condenser microphones. The British Acoustic recording system, which has made a marvellous improvement in the quality of its recordings, uses condenser or carbon microphones, according to the type of sound to be picked up. I believe that Amplion or Reisz carbon microphones are generally used for orchestral music. The R.C.A. and Western Electric sound-film systems use condenser microphones only. The condenser microphone possesses an additional advantage in talking-film work; it may be moved about during the taking of a scene without introducing undue rustling and "ponging."

A "Moving" Sight

I was an interested spectator at a film studio the other day and saw the inspiring sight of one of these microphones (complete with its three-stage amplifier!) literally follow a talkative actor all round a large "set." The "mike" was in a small metal box, about 8 in. square, which also contained a three-stage resistance-coupled amplifier, and the complete instrument was suspended on sorbo rubber from a long bamboo pole. The pole was mounted, crane fashion, on a heavy pneumatic-tyred tricycle. The whole assembly rather reminded one of an inspiration of Mr. Heath Robinson, but I must confess that it certainly enabled the recorder to have his microphone suspended in the best position above that talkative actor, no matter where he walked. I was informed that the use of such a contrivance would have been impossible with a carbon microphone, as the inevitable shaking up it would get when being moved about would introduce most unpleasant crackles and bangs.

Home Cinemas

The home cinema has made great headway as a national hobby during the last year or so, but it has not reached the heights of popularity achieved by radio. Still, there are thousands of machines in use, taking various gauges of films, from the 9 mm. Pathé stock to the 35 mm. width of standard-size film. Hitherto, the home users of standard-size films have depended on the supply of pictures which have made the rounds of the cinemas and have been put on the "retired list." The overwhelming popularity of talkies and gradual disappearance of the silent film threatens to dry up this source of the amateurs' supplies. Talking pictures are dull and useless without the accompanying sound; the actors remind one of gold fish opening and closing their mouths!

—and Home Talkies

A large number of wireless men possess amateur cinema apparatus, and doubtless they will have been wondering if they can connect up the projection machines to their wireless sets. They have been asking themselves how they should convert their cinematographs to take gramophone disc or sound-on-film talkies. Each method of reproduction has its interesting problems, advantages, and disadvantages, so far as the amateur is concerned. Disc reproduction requires the least amplification and fairly good results may be obtained by running the discs on a non-synchronous turn-table revolving at 33⅓ turns per minute. In this case the operator keeps his film "in step" with the sound by ear. Better results can be obtained by mechanically coupling the gramophone to the cinematograph, bearing in mind the fact that the film has to travel 90 ft. in the same time that the record revolves 33⅓ turns. This method is much more difficult, for it brings with it the job of running the machine at a perfectly constant speed and the working out of elaborate gear ratios. So that the majority of "home talkists" will probably make use of the simpler (and vastly intriguing) method of keeping their projection machines in time, with a separately played record, by ear.

Sound from Film

The picking up of the sound from the track on the edge of the film is much more complicated from the electrical point of view, though it does not bring great mechanical problems, such as does the mechanically coupled turn-table. The film, after passing through the picture gate, has to pass through a sound "tank." This "tank" is nothing more or less than a box containing a photo-electric cell and a

On Your Wavelength! (continued)

special gate or drum round which the film has to travel. A powerful light of the motor-car headlight type projects a light slot of 1 mil. by 80 mils. on the centre of the sound track, the variations of the density of which affects the photo-electric cell behind. It requires about four stages of valve amplification to magnify the impulses from the photo-electric cell up to good loud-speaker strength. On the whole, the picking up of the sound from the film is the most interesting for the experimenter, though it is probable that the finest-quality results will be obtained from discs.

The Supplies

Before deciding which method of "talkies" he will use, consideration should be given to the types of talking films available. At the moment, it must be admitted, few second-hand talking films are available to amateurs. These, too, are of the sound-on-film variety. Film companies have the annoying habit of returning old discs to the gramophone companies to be ground up into composition for new discs, leaving the synchronised film without its sound. The sound track on the film cannot be separated from the picture, fortunately, and this type of film goes intact to the second-hand and junk film dealers, the chief suppliers of standard-size films to amateur cinematographers.

The "Radiotec"

Our police, I see, are to make greater use of wireless in the very near future for the purpose of preventing crime and for tracking down wanted men. For quite a long while the vans of the Flying Squad have had small transmitting sets enabling them to keep in touch with headquarters when out on the warpath—or should one say the peace-path, since the object of their activities is to preserve peace? Now there is to be a wireless link between police headquarters in all parts of the country, which should be of the greatest service to the authorities. Some time ago the police tried out the Fultograph to see whether it could be used satisfactorily for transmitting from place to place, both photographs and finger prints of people whom they desired most earnestly to interview. The results were most successful, and probably still-picture transmitting and receiving gear will form part of the new equipment.

How Wireless Helps

The sending of pictures of the wanted from place to place by radio would, of course, be an enormous help, for written descriptions are seldom definite enough to be of much real value. Has it ever struck you on reading through such a description in your newspaper how exactly it might fit—YOU? I remember once having quite an uncomfortable time in a London tube. A hue and cry was out after some fellow or other and his description was published in the morning paper. I noticed several people looking at me rather queerly, and couldn't think why it was until my eye fell upon the personal details of the fellow in question. Height, age, eyes, hair, and even dress fitted in remarkably well with my own. As quite a fat reward was offered, your "Thermion" probably had a narrow escape from being hauled off to a police station to give an account of himself. Wireless will also be of the greatest help owing to the speed with which communications can be broadcast all over the country. Just think of the difference in time between one transmission via radio from a central station and the score or more of long-distance calls on the telephone that would otherwise be necessary.

But Once a Year

Probably you, dear reader, suffered, as I did during the festive season, from the doings of the fellow next door, who had given himself a new set as a Christmas present! What so utterly astonishes me is that anybody *can* howl in the place where I live when trying to receive Brookmans Park, for these transmissions come in with real punch even on a crystal set. Yet two or three chappies with new valve sets simply could not find Brookmans Park, but went wandering up and down the cat-call scale in search of the silent point. Why people will start searching for powerful signals with reaction full on I have never yet been able to discover, though I suppose there must be some abstruse reason for it. At the time of writing most of these squeakers seem to have got the hang of things more or less, but it was a pretty wild week whilst they showed their novitiate.

Why Not?

It seems to me that the time has now come to put howling on the same basis as driving an improperly silenced car or motor-cycle. The fellow who is fined for using his horn unnecessarily disturbs dwellers in only one street, but the wireless howler creates pandemonium over a radius of several miles. With the very wide use of the screen-grid valve nowadays sets can be made completely howl-proof, and I don't see why it should not be a punishable offence to rend the welkin with screams and squeals. One little point has long puzzled me: Why *does* the B.B.C. recommend in its official circuits the construction of sets with the reaction coil coupled slap on to the aerial?

Worth Trying

In the last week or two I have discovered a tip which enables many rather old-fashioned sets to be made selective enough to meet the requirements of the twin transmission from Brookmans Park at medium or short range. The trouble with a very large number of sets designed before B.P. got to work is that the aerial-tuning arrangements are not sufficiently selective. Sometimes a direct-coupled aerial is used, sometimes the "aperiodic" method, but the coils themselves, designed at a time when 2LO was using 3 kilowatts or so, are not good enough for the much higher power of the new station with its twin transmission. One method is to scrap the set and rebuild it, but that may be rather an expensive business, and not everyone has the time to carry out the work. My tip is to remove the existing tuning coils from the aerial and the grid of the first valve and to substitute an aerial transformer of the best modern type. Generally the alterations in the wiring are so simple that they can be carried out in half an hour or so, and the cost of a really good transformer is quite reasonable. The difference that one genuinely selective circuit can make to the working of the set is astonishing.

A "Spotlight" Combination

It is really surprising how a development in one branch of a science can be seen to have an application in another branch. One example of this came to my notice the other day, for I read that one American broadcast, which happens to be a weekly feature, was noted for its splendid artistic presentation, and the success of this was attributed largely to what has been called a concentration microphone. This instrument is so arranged that it can be pointed towards the source of sound wherever it may be located in the studio. In fact, it acts like a spotlight and is actually referred to as the "spotlight mike" in the studio. Mounted on a high platform with a megaphone attachment directed from it towards the studio, the microphone receives the sounds to which it is pointed.

This scheme does away with the necessity of placing several microphones in various parts of the studio, all operating at the same time in order to make certain of catching all the necessary sounds, for undoubtedly this, on occasions, produces a certain woolly quality in the broadcast. What I was particularly interested in was the suggestion that the spotlight microphone may be the forerunner of the kind used when both aural and sight effects are broadcast simultaneously. In that event some such instrument will have to be arranged so that shots from big scenes can be taken and transmitted at the same time that the sounds come from them. Thus, with the microphone perfected so as to be focused on any part of a large scene the television transmitter device may be set up on the same type of stand as the microphone so that both can be operated and controlled together. THERMION.

KITS FOR THE 1930 ETHER SEARCHER

TESTED BY
J. SIEGER and A. S. HUNTER

SINCE we gave full working details of the "1930 Ether Searcher" in the December 7 issue of AMATEUR WIRELESS, several enterprising firms have arranged to market complete kits of parts for readers desiring to construct the set with the least possible trouble in obtaining the components. Incidentally, all the parts utilised in the original set are readily obtainable through the ordinary channels. The metal chassis is obtainable through most dealers.

We have received from Peto-Scott Co., Ltd., of 77 City Road, E.C.1, a complete kit of parts for building the "1930 Ether Searcher." The price of this kit, including the three specified valves, is £8 2s. 1d. As we have mentioned in previous articles, the low cost of the "1930 Ether Searcher" is one of its big attractions.

The Peto-Scott kit does not include all the components as originally specified. Keystone push-pull switches are used; a Philips low-frequency transformer has been substituted for the one originally specified; the volume control in the Peto-Scott kit is a 30-ohm Ezistat; the fixed condensers are of another make than was specified; a Keystone high-frequency choke is also used.

To make allowance for the substitution of these components, the chassis drilling has been slightly modified. The layout of the original "Ether Searcher" has been followed and the process of assembly can therefore be fully understood by reading the constructional articles in the December 7 and December 14 issue of AMATEUR WIRELESS.

The Peto-Scott kit was assembled at the Fetter Lane laboratory with considerable ease. We encountered no snags. On test the completed kit set gave a performance well up to standard. The dial readings on the Peto-Scott set corresponded almost exactly with those of our standard "Ether Searcher." Of course, the same tuning coils and gang condenser are utilised in all the "Ether Searcher" kits. We have plenty of evidence proving that the manufacturers of both the coils and the gang condenser are turning out really accurate products.

The quality of reproduction with the Peto-Scott kit was very pleasing. We found it best to use an R.C. valve as detector with 114 volts applied to the anode. We have every confidence in recommending this kit of parts to those who are contemplating the assembly of an "Ether Searcher."

From H. & B. Radio Co., of 34 Beak Street, Regent Street, W.1, we have also received a kit of parts, which can be obtained by AMATEUR WIRELESS readers for £5 6s. 6d. This is without valves. Even so, the price is distinctly competitive.

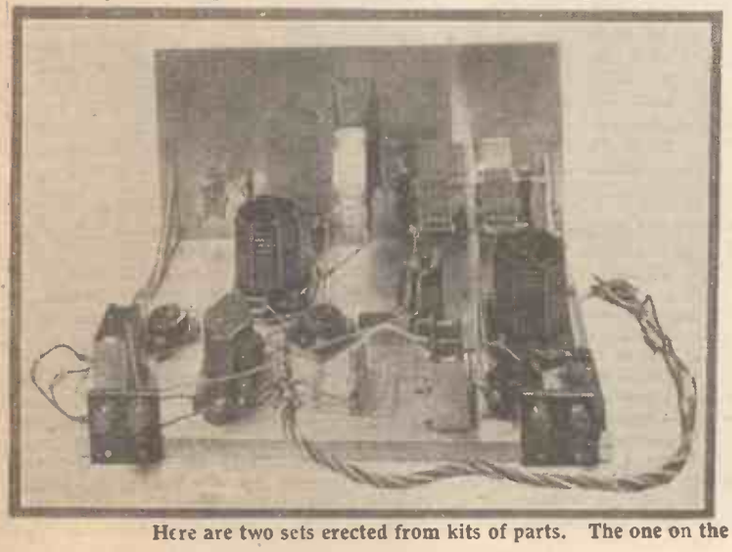
The kit is supplied with the metal panel already mounted on the metal baseplate by means of brackets. A special drum-dial, different from that specified, is already fitted to the panel, as is the Formo gang condenser and volume control. The constructor's work has been still further simplified by the fixing of the terminal strips to the baseplate.

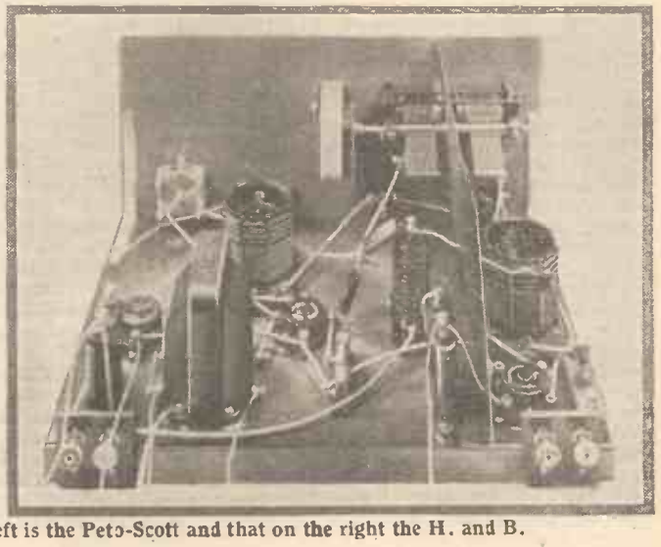
The kit is very attractive in appearance, and complete in every detail.

The assembly of the H. & B. kit follows our original specification.

On test we were impressed with the smooth working of the drum dial. The performance was well up to standard in every way. With the exception of the dial and the metal chassis, the H. & B. kit includes all specified components. We can heartily recommend it to intending constructors.

The parts of the H. and B. "1930 Ether Searcher" kit





Here are two sets erected from kits of parts. The one on the left is the Peto-Scott and that on the right the H. and B.

THE "RADIO WEEK" PROGRAMMES

SUNDAY, JAN. 12, to SATURDAY, JAN. 18.

BELOW we give some excerpts from "Radio Week" programmes," omitting the regular items and any of minor interest. It will be seen that every day has one or more first-rate items well worth listening to. "Go Home and Listen!" That is the slogan. Arrange for some of your friends to go with you—friends who up to now have looked "down their noses" at wireless and have wondered whether any good could come out of the B.B.C.

Next week provides an opportunity for all wireless devotees to make converts. Every home in the land should have its wireless set. ***"GO HOME AND LISTEN."***

SUNDAY, JANUARY 12

2LO London and 5XX Daventry

3 to 3.30.—Church Cantata, Bach.

4.30 to 6.15.—Orchestral Concert: Dora Labbette (soprano); Hubert Eisdell (tenor); the Wireless Orchestra, conducted by John Ansell.

7.55.—Religious Service, from St. Martin-in-the-Fields.

9.5.—Albert Sandler and the Park Lane Hotel Orchestra; Olive Groves (soprano).

5GB Daventry

4.30.—Military Band Concert: The City of Birmingham Police Band, conducted by Richard Wassell.

9.5.—From the Oratorios: the Birmingham Studio Chorus and Augmented Orchestra (leader, Frank Cantell); Stiles Allen (soprano); Astra Desmond (contralto); Eric Greene (tenor); Howard Fry (bass).

MONDAY, JANUARY 13

2LO London and 5XX Daventry

12.—Organ Music, by Edgar T. Cook, relayed from Southwark Cathedral; Gladys Currie (soprano).

1.15 to 2.—Concert by the National Orchestra of Wales. (S.B. from Cardiff.)

3.—Concert: Ella Gardner (soprano), Cuthbert Smith (baritone).

3.30—Dance Music: Jack Payne and B.B.C. Dance Orchestra.

4.15—Light Music: Alphonse Du Clos and His Orchestra, from the Hotel Cecil.

7.45.—Request Programme: Suzanne Bertin (soprano); The Wireless Orchestra, conducted by John Ansell.

9.20.—Discussion: "Should the Speed Limit be Abolished," between A. P. Herbert and Gerald Barry.

10.15.—Recital: Lionel Tertis (viola); Berkeley Mason (pianoforte).

11 to 12.—Dance Music.

5GB Daventry

12.—Ballad Concert: Eva Neale (soprano); Leslie Win Jones (baritone).

6.40.—Light Music: Caroline Hatchard (soprano); The Gershom-Parkington Quintet.

7.30.—Dance Music: Jack Payne and his B.B.C. Dance Orchestra.

8.35—Pianoforte Recital, by Maurice Cole.

9.—From the Musical Comedies (from Birmingham), Pattison's Salon Orchestra, directed by Norris Stanley, relayed from The Café Restaurant, Corporation Street; Emilie Waldron (soprano), George Dawkins (baritone).

TUESDAY, JANUARY 14

2LO London and 5XX Daventry

12.—Ballad Concert: Hilda Blake (soprano; Robert Beresford (baritone.

12.30.—Organ Music, played by Edward O'Henry, relayed from Tussaud's Cinema.

1 to 2.—Light Music: Leonardo Kemp and his Piccadilly Hotel Orchestra, from the Piccadilly Hotel.

3.—Ballad Concert: Esther Coleman (contralto); William Heseltine (tenor); Joyce Ancell (pianoforte).

4.—Light Music: Fred Kitchen and Brixton Astoria Orchestra, with Pattman at the organ, relayed from the Brixton Astoria.

7.45.—Edward German Programme: Mavis Bennett (soprano); Stuart Robertson (baritone); Wireless Chorus; Wireless Orchestra, conducted by Stanford Robinson.

9.35.—Vaudeville: Will Hay (the schoolmaster comedian); Tommy Handley (comedian); Mr. Flotsam and Mr. Jetsam; Mabel Constanduros and Michael Hogan in *The Whale*, by Mabel Constanduros and Michael Hogan; Jack Payne and his B.B.C. Dance Orchestra; variety items from the Alhambra.

5GB Daventry

6.—Birmingham Studio Chorus, conducted by Joseph Lewis, in "Fireside Songs" (from Birmingham).

6.40.—Organ Recital, by Dr. Harold Rhodes, relayed from Coventry Cathedral.

7.15.—*The Wrecker*, by R. L. Stevenson and Lloyd Osborne.

9.5.—Chamber Music: The English Ensemble; Marjorie Hayward (violin); Rebecca Clarke (viola); May Mukle (violoncello); Kathleen Long (piano).

WEDNESDAY, JANUARY 15

2LO London and 5XX Daventry

12.—Ballad Concert.

1 to 2.—Light Music: Frascati's Orchestra, directed by Georges Haeck, from the Restaurant Frascati.

3.45.—Light Classical Concert:

4.45.—Organ Music, played by Reginald New, relayed from the Beaufort Cinema, Washwood Heath, Birmingham.

7.45.—*The Wrecker*, by R. L. Stevenson and Lloyd Osborne. After the "News."—Excerpts from *The Show's the Thing*, with Gracie Fields, Archie Pitt and Tommy Fields from the Winter Garden Theatre.

11 to 12.—Dance Music.

5GB Daventry

1.30.—Light Orchestral Programme (from Birmingham): The Birmingham Studio Orchestra, conducted by Frank Cantell.

6.40.—Vaudeville (from Birmingham): Frederick Chester in dialect songs and stories; Walter Lanham (the human ark); Eva Floyer (the entertaining soprano); Philip Brown's Dominoes Band.

8.35.—Military Band Concert (from Birmingham): the Birmingham Military Band, conducted by W. A. Clarke.

THURSDAY, JANUARY 16

2LO London and 5XX Daventry

12.—Concert.

1 to 2.—Organ Music, played by Reginald Foort, relayed from the Regent Cinema, Bournemouth.

3.—Evensong, from Westminster Abbey.

3.45.—Concert: Doris Vane (soprano); Philip Bertram (baritone); the Wireless Military Band, conducted by B. Walton O'Donnell.

7.45.—Vaudeville: Marie Burke (comedienne); Ronald Frankau (entertainer); Wish Wynne (in character studies); Albert Sandler Trio; Muriel George and Ernest Butcher (in folk-songs and duets); Jack Hulbert and Cicely Courtneidge; Bransby Williams (in character impressions); Jack Payne and B.B.C. Dance Orchestra.

9.20.—The Toast of "The Immortal Memory of Sir Walter Scott": proposed by the Rt. Hon. Stanley Baldwin, at the annual dinner of the Edinburgh Sir Walter Scott Club, relayed from the North British Station Hotel, Edinburgh. (S.B. from Edinburgh).

10.—Pianoforte Recital, by Harriet Cohen.

10.30 to 12.—Dance Music.

5GB Daventry

12.—A Ballad Concert.

1.—Light Music: Maurice Toubas and his Orchestra, from the Kit-Kat Restaurant.

2.30 to 3.—Organ Music, played by Reginald New, relayed from the Beaufort Cinema, Washwood Heath, Birmingham.

6.40.—Programme of Old Memories, by the Birmingham Studio Chorus, conducted by Joseph Lewis.

7.—*Helmet and Haversack* (from Birmingham): A Page of Military History, recalling Waterloo, The Crimea, South Africa, Flanders. Arranged by Charles Brewer, presented by Vincent Curran, Egar Lane, William Hughes, Donald Davies, Harry Saxton, and John Rorke; the Birmingham Studio Chorus and Orchestra, conducted by Joseph Lewis.

7.45.—Concert: Margaret Balfour (contralto); Leonard Gowings (tenor); Wireless String Orchestra, conducted by John Ansell.

9.5.—From the Popular Operas (from Birmingham): the Birmingham Studio Chorus and Augmented Orchestra (leader, Frank Cantell); conducted by Joseph Lewis; Marjorie Parry (soprano); Hughes Macklin (tenor); Paul Eugene (baritone); Joseph Farrington (bass).

FRIDAY, JANUARY 17

2LO London and 5XX Daventry

12.—Sonata Recital: Maurice Blendel (violin), Mirian Duncan (pianoforte).

12.30.—Organ Recital, by Reginald Goodall, organist and director of the choir, St. Alban's, Holborn, relayed from St. Mary-le-Bow.

3.—Ballad Concert: May Blyth (soprano), John Buckley (baritone), Elsa Karen (pianoforte).

4.30.—Light Music: Moschetto and his Orchestra, from the May Fair Hotel.

8.—Symphony Concert IX: Relayed from the Queen's Hall; solo violin, Joseph Szigeti. The B.B.C. Symphony Orchestra.

10.35 to 12.—Dance Music.

5GB Daventry

12.—Lunch Hour Concert (from Birmingham): The Birmingham Studio Orchestra, conducted by Frank Cantell.

1.15.—Light Music: Moschetto and his Orchestra, from the May Fair Hotel.

(*Continued on page 62*)

MY IMPRESSIONS OF AMERICAN BROADCASTING—BY CAPT. ROUND

RECEIVER DEVELOPMENTS

Automatic Tuning and Volume Control

OWING to the very sharp tuning that is necessary in American receivers, the problem of the audio characteristic does not seem to have been solved very satisfactorily. The voltage outputs of some of the receivers dropped off fairly rapidly above 1,000 cycles, and apparently use has been made of the rather rapid rise of efficiency of the moving-coil speaker above 1,000 cycles, due to diaphragm resonance, to counter this effect.

The general result of this combination, in a cabinet with a definite element of cabinet resonance, was not a quality I liked personally, but as all the receivers I heard gave very nearly the same quality, it seems to be one that is liked by the public.

All the sets have ample power output, with the result that blasting in a receiver need never occur and this is one of the nasty characteristics that we, with our dry batteries, have to contend with, and one which I seldom heard in American receivers.

The ease with which these receivers can be handled is really extraordinary. Any child can manage them, as all the operations have been reduced to the one tuning knob and the volume control, except in those cases of the more expensive sets where there is an automatic volume control, and this is added as a third knob.

A rear view of a typical American receiver—the Victor. Note the efficient screening

Automatic Volume Control

This automatic volume control is very amusing and, I think, a very valuable device. In parallel with the rectifier of the receiver is another rectifier, and the output of this second rectifier is smoothed off and allowed to alter the grid volts of the high-frequency valves, so that as the input strength goes up, the grid volts of the H.F. valves are made more negative, and the whole characteristic is arranged so that a certain maximum volume can be obtained and then, after that, signals are level.

At first, the use of this second control knob is a little puzzling. For instance, if the automatic control knob is set all out, that is, at no control at all, one can control on the usual hand control, and this simply reduces the sensitivity of the receiver so that if one is up to mush it can be reduced until the mush is inaudible, but now as you go through the tuning curve with the tuning handle every now and then you hit an extremely powerful station, the fully-tuned-in volume of which is too loud. You can, if you like, reduce this station to the strength required by the hand control knob, but you can also reduce it with the automatic control knob, and then if the signal tends to fade up and down on the input, there is no change in volume at all from the loud-speaker. So that, if one turns the tuning knob over the scale, the ultimate sensitiveness of the receiver is set by the hand-control knob, but the maximum loudness is set by the automatic-control knob.

Obviating Annoyance

On very sensitive receivers I have used in this country, one of the most annoying features is that when a very powerful station, such as the local, is run into, there is a terrific roar which annoys all the rest of the people in the house. I know at my own house this is often the cause of cross words, but it is practically impossible to avoid doing this, at least, occasionally. When the automatic volume control is set at a certain degree, the strength of a near-by station is no louder than that of a distant station, and if you are set at the maximum sensitiveness of the receiver, the most distant stations come in just as well as do the near-by ones, while the latter are any strength you like to make them, which naturally in the initial search is fairly weak.

I believe the cost of inserting an automatic control in a set is fairly small, and as it cures fading when it is of not too excessive a character, it is, of course, of immense value. I think that next year every receiver will have an automatic volume control, but this season only the more expensive models carry them. I have been told that there are some snags in the operation of these automatic controls, but during the time I used them I could find none. One of the chief defects I am told is the behaviour of the arrangement during strong atmospherics.

All the American sets have come to practically the one shape of cabinet, that of an oblong box on four legs. Sometimes the loud-speaker is below in the cabinet, and sometimes it is above the chassis.

Other Novelties

Several manufacturers this year were attempting novelties in the way of distant control, and various methods of automatic tuning, but these, of course, raised the prices of sets very considerably. By distant control, I mean not only that of strength but also of tuning.

Automatic tuning consists in initially determining a number of settings over the dial for certain stations and arranging the mechanism so that by pressing a button afterwards, the dial will set itself at any one of the stations previously determined. I understand that such a device was on show at our exhibition this year, but so far I have not seen anything like them and very much doubt whether they will ever be extremely popular.

By the way, all American receivers have illuminated dials and, of course, this is quite easy when power mains are in use, and what is more, most of the American sets are aerial run and portables are hardly existent. I rather think our portables, especially in the neighbourhood of New York, would have rather a thick time unless they had more than one tuning control, because of interference between stations.

There is a very strong tendency towards the practice of directly running the power valves from the rectifier—a practice I have personally been very fond of for some time—but they have gone almost entirely to push-pull output and, in consequence, resistance-capacity coupling is replaced by a slightly damped split transformer. Various tricks are used in the receivers for the purpose of maintaining moderately constant amplification over the wave range. We all know the troubles with cascade tuned circuits, because the amplification steadily rises as the wavelength gets shorter. This trouble is cured in various ways, one method I saw being the introduction of an additional stage of ampli-

(*Continued at foot of next page*)

For the Newcomer to Wireless: CAPACITY AND INDUCTANCE

YOU said not long ago that you would tell me why turning the knob of a condenser alters the wavelength of a circuit.

Right you are! The wireless tuned circuit consists, as you know, of a coil and a variable condenser. The coil has a property known as inductance.

What is that?

Have you ever watched a fireman's hose when the water is first turned on?

Yes. It's flat to begin with and you can see it swelling as the water runs down it.

Just so. And when the water is turned off the hose doesn't go flat at once—does it?—but returns gradually to its original shape as the water leaves it.

That's so, but how does this fit in with inductance?

A wire behaves in very much the same way when an electric current is switched on or switched off.

But a wire can't *swell*.

It doesn't, but round the wire is built up an invisible magnetic field which surrounds it just like a sleeve. Until this field reaches its full development current can't flow unimpeded. In the same way when current is switched off, the invisible field has to collapse, just like the hosepipe, before current stops flowing.

I see, then you mean that a wire has a property which opposes the starting or the stopping of a flow of current?

That's it, and this property is called inductance. Actually it opposes not only the starting and stopping, but also any change in the rate of flow. And if you wind a wire into a coil this property becomes very much more marked. Electrically it is the equivalent of mass or weight.

How do you mean?

To set a wagon in motion requires a great effort, to keep it in motion a comparatively small effort, to stop it a great effort again, for its mass when at rest possesses inertia and when in motion has momentum.

I follow that quite well.

Now watch this table knife, whose point I place under a paper weight close to the edge of the table. I press its handle down and release it. The knife oscillates up and down rather fast. Here's a two-ounce weight and a rubber band. Fix the weight to the handle of the knife and see what happens.

Why, it moves up and down much more slowly.

In other words by adding weight we decrease the frequency.

That is so.

Similarly in wireless, by adding inductance—that is by putting more turns on to a coil—we decrease the frequency or increase the wavelength. And now for another experiment with the table knife. Push it farther under the weight so as to decrease its springiness and again see what takes place.

It vibrates more quickly.

You will find that you can actually adjust the rate of vibration by altering the springiness.

Yes, I see that you can.

Well, capacity may be taken as the electric equivalent of springiness in a circuit. When we turn the condenser knob we are increasing or decreasing the springiness. The "weight" or inductance remains the same; but by altering the capacity or springiness we tune the circuit by varying its frequency or the rate of oscillation.

Couldn't we do it by varying the inductance and using a fixed capacity?

Yes. This was done in the old sliding contact coil and it is still seen sometimes in the variometer, but it is generally found more convenient to use a variable condenser since this allows the circuit to be made up in very compact form and also enables minute adjustments in the wavelength to be made.

AMERICAN RECEIVER DEVELOPMENTS (*Continued from preceding page*)

fication with a transformer tuned to a little above the longest wavelength received on the set, and the efficiency of this transformer falling off as the wavelength was shortened, balances the general rise of the remainder of the set towards the shorter-wave stations.

In a country where the number of valves is not an important factor, and where the public do not worry about how many valves they have in a set, this is a very good solution of the difficulty.

Aperiodic coupling through a coupling valve of the antenna was used to some extent, but for various reasons I rather think it will fall out, one reason being that it very definitely increases the ground noise in a receiver.

Mass Production

The manufacture of the various receivers that are on the American market takes place in factories where mass production is carried out to the very limit, and it is only by producing the receivers in these very large numbers that the prices are kept down to the extremely low figures which rule.

I think one of the most interesting characteristics of these American factories is the way they have brought the testing of the various parts of a receiver and also the testing of the final apparatus, down to a fine art. For instance, the setting of the intermediate transformers for super heterodynes is carried out by girls who have nothing to do but turn a screw until an oscillagraph indicates the right curve. These oscillagraphs are quite elaborate instruments and are actually used in large numbers out in the shops. Then, again, in the testing of condensers, coils, tuning curves, sensitivity, and all these like operations, large numbers of young men sitting along benches have delivered to them along shielded cables, five or six standard wavelengths generally "piped" round the factory like electric light. Each of these wavelengths is produced from a small power-house by a crystal oscillator and a power amplifier, delivering 50 watts output. On each bench is an attenuator which enables the testing men to get anything from volts to microvolts on any of these wavelengths. It is surprising to see how these laboratory operations have been brought down to mass testing practice. Audio-frequency responses, particularly of loud-speakers, are handled in the same rapid way. Loud-speakers travel on endless belts from where they are mounted to the testing cabins on the side of each of which is a round hole and as each loud-speaker arrives in front of the hole, it stops. The man inside the cabin passes it through its paces and I should say that a minute is all that is given to each loud-speaker, then it travels on the belts to somewhere else to be mounted in a cabinet.

Testing

The individual testing of all parts of a receiver bit by bit in the factories is so complete that final testing does not seem to be of major importance, and in the final testing shops I saw dozens of receivers being tested on actual stations side by side, and as all these sets were receiving different stations, I hardly think the testers could have got a fair judgment of the performance.

It will be good news to readers to learn that the French P.T.T. stations are being equipped with quartz crystal control, with a view to the maintenance and checking of their allotted wavelengths.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

I LIKED Miss Violet Sackville West's spirited and, in my view, unanswerable reply to those who had criticised her talks on books. Although I adhere to the idea (exclusive and patented) that there should be a highbrow *and* a lowbrow critic on books and plays, I think she has made her talks of wide appeal.

◆ ◆ ◆

I daresay I have said and written more appreciative things about the B.B.C. talks than most people, but I am doubtful whether in the height of recent festivities we were in the mood to listen to a miniature biography, even though the hero was of topical interest. In order to do justice to any talk one must concentrate; and how the dickens can you, with crackers going off?

◆ ◆ ◆

The Mendelssohn programme was welcome, not forgetting the ever-sweet "A Midsummer Night's Dream." We don't hear this often.

◆ ◆ ◆

Did I omit to mention to pay a much-deserved tribute to Hastings for its Municipal Orchestra, conducted by Basil Cameron? This broadcast of popular music was a refreshing seaside breeze.

◆ ◆ ◆

Mr. A. B. Luckett (Birmingham), answering my Smethwick correspondent, declares that "the Grange Orchestra is far above the Norris Stanley combination in balance and everything else. I should welcome more programmes from them."

◆ ◆ ◆

I see they announced *each* of Olive Kavann's songs separately, which was both unnecessary and interfering.

◆ ◆ ◆

Here are further interesting comments regarding dance music. You will remember that I suggested not long ago that the reason why we hear the same dance music is due to the B.B.C. having more than one band playing in one evening. Now here is more evidence of this system—which appears to be getting no better.

◆ ◆ ◆

When I last wrote about this business I said we were getting three bands in one evening. Now I have just heard *four* different bands from one station within sixty minutes. There was Alan Green's, Art Gregory's, Jerry Hoey's, and the Piccadilly Players. And they have all been playing popular stuff for all they are worth.

◆ ◆ ◆

Naturally, there is repetition, for all bands like to play the most popular airs.

Again I heard many of the bands during the afternoon and evening, recently, and I was struck by the predominance of one particular tune. I had better not mention its name lest the publishers get annoyed, but it was noticeable that each and every band I heard featured it without fail. At first I thought it a pretty, tinkly sort of tune. Now I loathe it.

◆ ◆ ◆

H.B.G. pays a compliment to Christopher Stone for his judicious selection of dance records. He says that whereas the common or garden record broadcast usually features jazz records which are apparently calculated to instil into the mind of the listener a deep hatred for everything syncopated, Christopher Stone seems to choose dance music which, while a joy to the dancing fiend, cannot possibly offend even the most elevated brows.

◆ ◆ ◆

Which reminds me of a point I intended to mention last week. Who on earth is responsible for those broadcasts of the latest American "hot" records? Even my lowbrow friends agree that the stuff featured is most offensive. I thought that type of rubbish died out years ago. Fancy Savoy Hill fostering it! We must look out for this sort of abuse.

◆ ◆ ◆

To revert to Christopher Stone for a moment. A week or two ago I heard him announce a certain tune "by special request of mother of a child of six." I should like to inquire—exactly what was the idea? The record proved to be a scratchy indifferently played one and the tune was banal. What next? Shall we hear "I am now going to play 'Itchykoo,' by special request of a father of Siamese twins"?

◆ ◆ ◆

The interchange of programmes with Schenectady came off splendidly and credit is due to all concerned. As far as reception goes, the American programme came over well, and I am not sure that it was not the best relay so far. The fare served up by our transatlantic friends was enjoyable, as well as being a change from the very *nace* formality of our own way of doing things—which, if you please, I prefer.

◆ ◆ ◆

I have been listening to two plays, *Rupert of Hentzau*, arranged for broadcasting by Holt Marvel and produced in the studio, and *The Student Prince*, relayed from the Piccadilly Theatre—two totally different productions, but giving me one more opportunity of pointing out how preferable a studio production is to outside broadcasting. The noise, laughter, and cheers from the theatre spoilt the production for me.

◆ ◆ ◆

It was a good idea, however, to give the production in two parts; the first taking place at 8.10 and the second at 10.50. The interval for relaxation was taken up by the news, Mr. Gerald Barry, and a vaudeville programme.

And, by the by, I must not forget to pay a tribute to the incidental music in the *Rupert* play, which, as is usual in Holt Marvel's productions, was quite appropriate.

The narrator, too, was actually understood!

Nancy Lovat—our cartoonist's impression

BRITISH B

A CHEAP AND ECONOMICAL TWO-VALVER

BY THE "A

THIS title certainly sounds rather ambitious. Yet it has always been the policy of AMATEUR WIRELESS to give to sets titles which really do convey something either of the performance which may reasonably be expected, or of the use to which each receiver can be put in order to give satisfactory results.

Much has been said recently anent "new conditions," and certainly it is true that the advent of high-power transmitters situated still too close to populated centres has resulted in the need for greater than ever selectivity. This is generally obtained by the use of an H.F. stage. Three-valvers are, therefore, in the greatest light of popularity. It may reasonably be asked, therefore, how it is that such an ambitious title as "British Broadcast" can be applied to a simple two-valver.

A "Two's" Scope

The justification for the name depends entirely on how and where the receiver is operated. This two-valver will properly fill the needs of those who live not too close to Brookmans Park, while it will have a rather more limited but nevertheless efficient scope with those listeners who have at present to use wavetraps and similar devices in order to get knife-edge selectivity on the Brookmans Park transmissions.

For instance, if on your old-type set at present you can just manage to get the 261-metre transmission free from interference from the 365-metre transmission, and vice versa, and you feel the need for an up-to-date set, economical to work, which will give greater selectivity and which will enable you to get more foreigners while the local stations are working, then this two-valver will suit you.

The aerial and tuning arrangements of this "two" are such as to provide a reasonably sharp degree of tuning. Were this set a "three" and not a "two," then the added amplification might be sufficient to cause the sharpness of tuning to be unsatisfactory, but with only one low-frequency stage such a condition should not obtain.

This set, too, is a useful one in any case where it is desired to use an indoor aerial. A good indoor aerial will enable this little receiver to give good signal strength and to maintain a degree of selectivity comparable with that evinced by a three-valver having an H.F. S.G. stage and working on an outdoor aerial.

In brief, no fears need be entertained by the large majority of listeners that this simple receiver will not be selective enough or will not give sufficient strength.

The Circuit

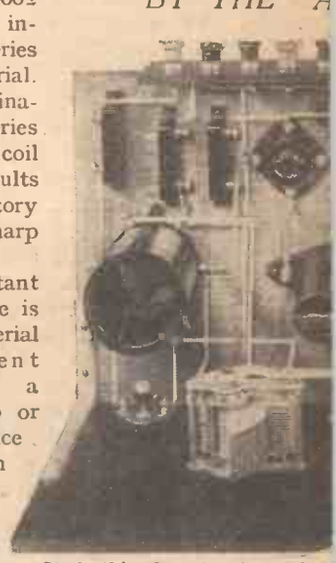
The set is designed for loud-speaker working. The inter-valve coupling and power valve arrangements—with a separate tapping for the anode of the power valve—are such that excellent loud-speaker reproduction is given

Glance at the theoretical circuit diagram to see how the various features are arranged.

Tuning is carried out by means, of course, of a dual-range coil. A type of coil is used in which the long and short-wave sections are wound on the same former, the long-wave section being "shorted" by a switch on the panel when reception on the medium waves is desired. The windings and characteristics of the coil are so arranged that no loss of efficiency is caused by the presence of the "dead" long-wave winding.

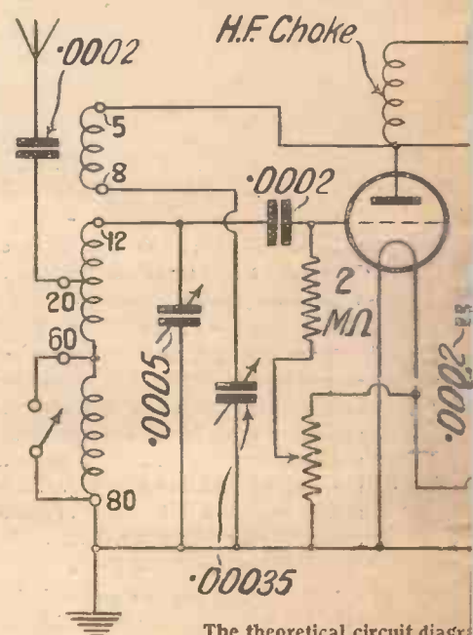
The coil is tapped in order that the aerial damping shall not have any serious effect on the sharp tuning of the coil itself. The tapping is taken to an intermediate point on the winding of the short-wave section. Further, to increase selectivity, a .0002 condenser is included in series with the aerial. This combination of series capacity and coil tapping results in a satisfactory degree of sharp tuning.

An important point of note is that this aerial arrangement still allows a wavetrap or similar device to be used in cases of extreme "wipe-out."



Study this plan view in conjun

Simplicity and low cost are special features of the British "Broadcast 2"



The theoretical circuit diagr

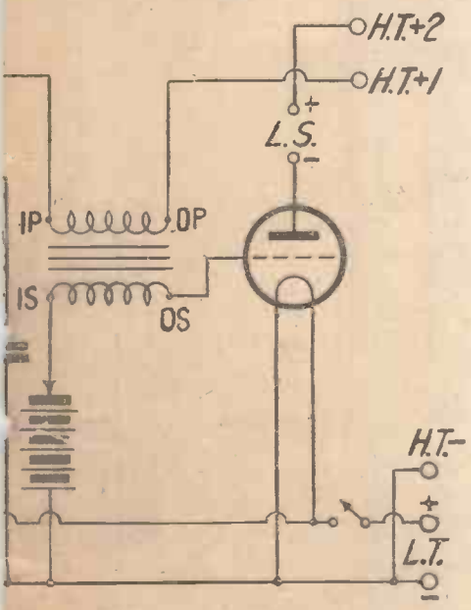
BROADCAST

SPECIALLY DESIGNED FOR THE NEW CONDITIONS

.W." STAFF

ction with the wiring diagram

Therefore, this two-valver can be used in areas in which a normal set, without a wavetrap, would be hopelessly unselective But for all normal purposes the aerial tapping and series condenser arrangements given in this design will be found sufficient without the need for any additional "selector" or wavetrap. The method of detection deserves mention. Leaky-grid rectification is employed, but the grid leak is not connected between grid and positive L.T., as is the usual practice with this form of detection.



m of the " British Broadcast 2 "

A Semi-fixed " Pot "

In order to enable the detector valve to operate with greater than usual efficiency, the grid leak has its lower end taken to a semi-fixed potentiometer. This, in a simple receiver of the present type, is more suitable than a fully variable potentiometer, and, moreover, the full range of variation is not required. The potentiometer used has tappings to allow of tappings being made to two points on the winding.

The whole winding is, of course, connected across positive and negative L.T. The connections are so arranged that no current can flow through the "pot" when the receiver filament switch is in the off position. There is thus no danger of current being allowed to flow through the potentiometer when the receiver is left unattended. The current consumed is, of course, very minute, but over a long time the continuous connection of the winding when the set is not in use would result in appreciable power waste. When the set is in use the current passed by the "pot" windings is not appreciable in comparison with that taken by the valves.

Detector Bias

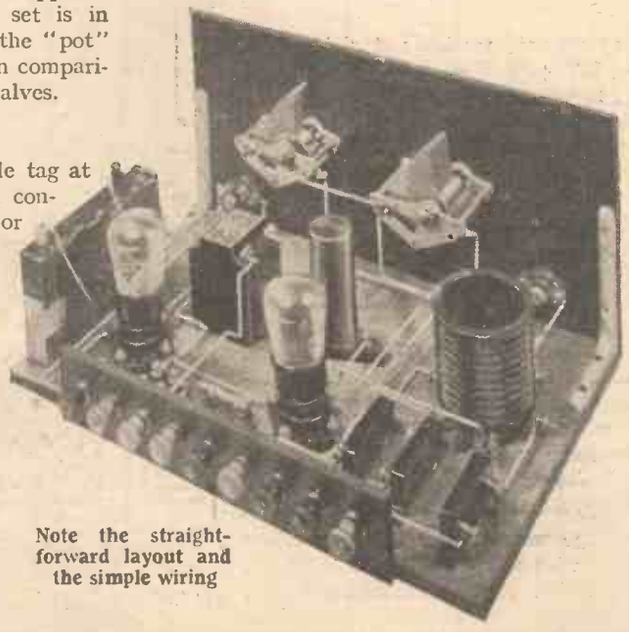
A flex tapping, with a spade tag at the end, enables the grid-leak connection to be made to one or other of the two terminals, thus giving a choice of bias to the detector. When the receiver is working it will be found that one or other of the two will give the better results, depending on the type of valve used, the H.T. voltage, and so on.

The reaction is of the normal capacity type, and the balance of capacity and inductance is such that smooth reaction is obtained—or, rather, will be obtained if the battery values are correctly chosen—over the entire wavelength range. This is an important point if the set is to be used for the reception of fairly weak foreign stations, either at the top or bottom ends of the condenser scale.

The Controls

The two condensers, for tuning and reaction respectively, are mounted on the panel, and have convenient dials with short handles to facilitate operation. Below, at one extreme end of the panel, is the wave-change switch, which is pulled out for the short waves and pushed in for the long waves; at the other end of the set is the switch cutting off the L.T. current and, as has been explained, which also puts the potentiometer out of circuit.

An accompanying list shows the components required for the construction of this receiver, and it should, perhaps, be explained that the first-mentioned component in each case is that used in the original receiver illustrated by the accompanying photographs. Following this first choice are alternatives, in many cases, which can be used without serious modification of the design. These will be found to give similar results to those claimed for the "British Broadcast 2" in its original form, and readers are most definitely recommended not to try alternatives of their own in any case where there is room for doubt as to electrical characteristics. Undoubtedly a great deal of trouble experienced by some constructors who have made up receivers in almost any form is due to the fact that they will not accurately follow the published description. No apology is needed, surely, for devoting space to this



Note the straightforward layout and the simple wiring

"THE BRITISH BROADCAST 2" (*Continued from preceding page*)

warning in connection with a simple receiver of this type, which, it is reasonable to expect, will be made up by many novices.

Do not forget, also, that, as is the case with all AMATEUR WIRELESS receivers, a blueprint is available which makes child's play of the work of construction. This can be obtained, price 1s., post free, from the Blueprint Department at the offices of AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. No correspondence is needed. Simply ask for blueprint No. 215. The print, of course, gives all the components full size, so that it can be used as a guide to the mounting of parts, the drilling of the panel, and so forth. The wiring is shown, too, so that no difficulty should be experienced in this connection. Most novices are fond of imagining that wiring is a night-mare job, but this illusion is dispelled if the connections are made with a full-size AMATEUR WIRELESS blueprint at hand while the soldering iron is being wielded.

List of Components

Ebonite panel, 14 in. by 7 in., and strip, 9½ in. by 2 in. (Lissen, Trelleborg, Raymond, Trolitax).

.0005-microfarad variable condenser (Ormond, Lissen, Formo, Lotus, Burton).

.0003-microfarad variable condenser (Ormond, Lissen, Formo, Lotus, Burton).

Two push-pull on-off switches (Lissen, Bulgin, Junit, Lotus, Pioneer, Benjamin).

Panel brackets (Bulgin, Keystone, Lissen).

Baseboard, 14 in. by 9 in. (Pickett, Camco).

Low-frequency transformer (Varley, Nicore 11, Lissen, Telsen, Lotus, Igranic, Ferranti).

Grid-bias battery clips (Bulgin).

One red and one black wander plug (Clix, Belling-Lee, Eelex).

Nine terminals, marked: Aerial, Earth, L.T.−, L.T.+, H.T.−, H.T.+1, H.T.+2, L.S.+, L.S.− (Burton).

Connecting wire (Glazite).

Two valve holders (Benjamin, W. & B., Igranic, Lissen).

.0002-microfarad fixed condenser (Lissen, Dubilier, T.C.C., C.D.M.).

.0003-microfarad fixed condenser (Lissen, Dubilier, T.C.C., C.D.M.).

Dual-range coil (Tunewell, Watmel, Formo).

High-frequency choke (Lissen, Bulgin, Lewcos, Tunewell, Sovereign, C.D.M., Watmel).

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

Grid-leak holder (Lissen, Bulgin).

Fixed potentiometer (Polar, Lewcos).

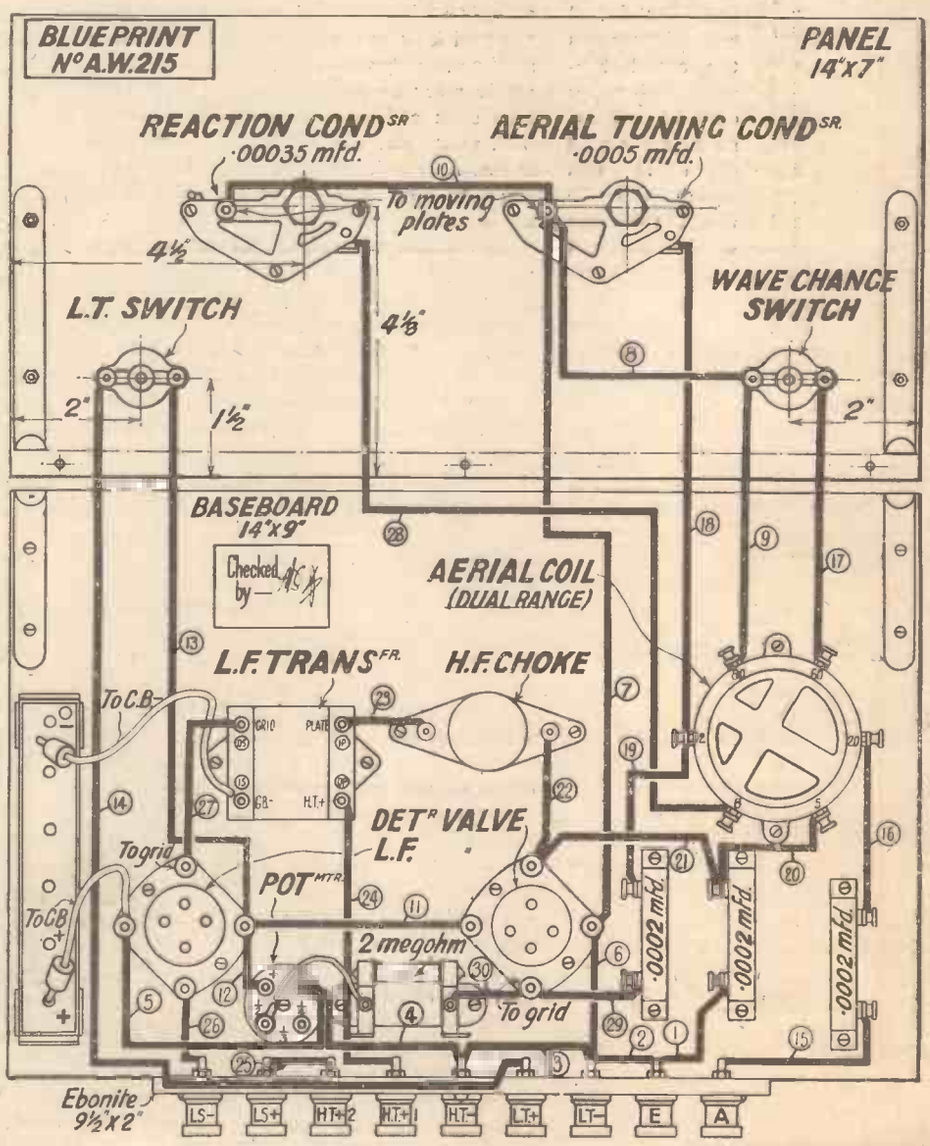
The large majority of the connections are made with stiff, rigid, insulated wire, such as Glazite. Flex connections, however, are used for the grid-bias battery leads and for the short connection from the grid-leak holder to the two tappings on the semi-fixed potentiometer. The use of insulated wire for the main connections in a set of this type obviates the possibility of short circuits. The extra trouble involved in making connections with covered wire, in baring the ends neatly, and so forth, is, therefore, well repaid by the impossibility of a short-circuit resulting from the wires touching.

The connections to the aerial coil must be made with due care, for a wrong connection might conceivably result in a short-circuit of the H.T. The blueprint shows the connections clearly, and these are also explained in the instruction leaflet given by the manufacturers of the coil.

The detector valve used with this receiver should be of the medium impedance type—an "HL"-type valve, with an impedance of about 20,000 ohms, is suitable. The method of using a tapped potentiometer, and the provision of a separate H.T. tapping for the detector has the effect of making the choice of a suitable detector valve not very critical. About 60 volts H.T. should be applied to the detector tapping H.T.1 In some cases a lower voltage will be found advisable.

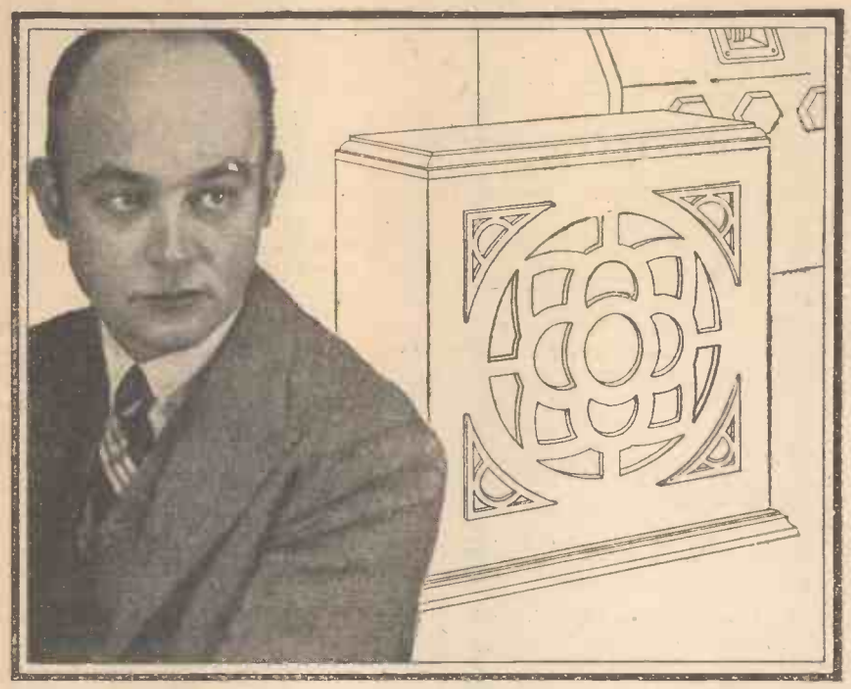
The power valve, which should have an impedance of about 9,000 ohms or less, will need 120 volts applied to the anode for the best results. A voltage of 100 can be applied to the anode, but the best results cannot be expected unless the full 120 volts is used.

If there are any constructional points about which you have doubts before, perhaps, obtaining the full-size blueprint, take advantage of the fact that the original receiver can be seen in the Somerset Street windows—the radio department—of Messrs. Selfridge & Co., Ltd., Oxford Street, W.



The wiring diagram of the "British Broadcast 2." A blueprint is available, price 1/-

MISCHA LEVITSKI hears 'the impossible'!



"I have heard what I thought impossible," says Mischa Levitski, the brilliant pianist—"the true authentic notes of a piano coming from a radio loud speaker. The radio was a Marconiphone, and so was the speaker."

Choose your programme—orchestra, dance music, a speech. On a Marconiphone loud speaker it will come through clear-cut, flawless. Sir Edward Elgar, Theodor Chaliapine, Albert Coates, many other famous musicians, have found in the Marconiphone tone and volume unrivalled today.

Marconiphone engineers make these speakers. All the skill of thirty years' leadership in wireless is in their construction. Ask any dealer for a demonstration. If there is no dealer near you, write to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

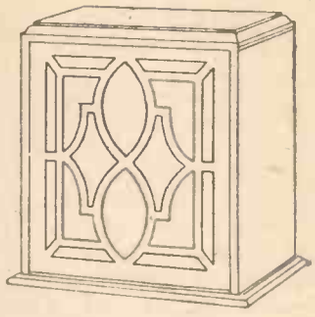
THE FIRST AND GREATEST NAME IN WIRELESS

Listen with a

MARCONIPHONE LOUD SPEAKER

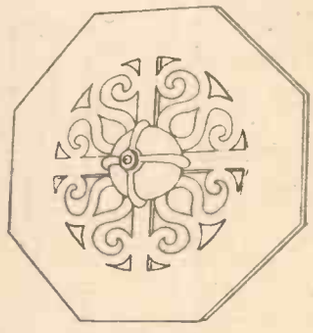
MODEL 60 CABINET CONE
(shown on left)

Obtainable at the very moderate price of £3, the Model 60 is an extremely efficient "all-purpose" speaker. Embodying the Marconiphone reed system, it is outstandingly clear in tone.



THE FAMOUS MOVING COIL SPEAKER

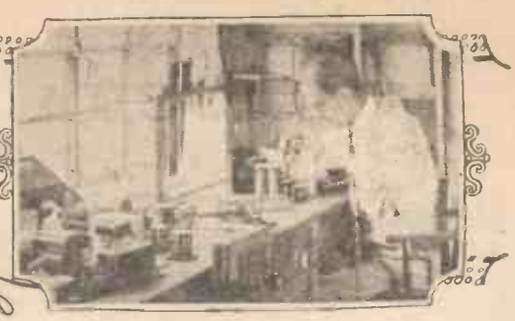
The highly accurate centring of the Moving Coil and the one-piece fibrous diaphragm ensure absolutely accurate reproduction. Units from £4.10.0. Cabinet models: for 6-volt accumulator, £7; for D.C. mains, £7.10.0; for A.C. mains, £12.12.0.



ONLY 30/-!

The Octagon Cone gives excellent reproduction equally from a 2- or a 5-valve receiver. Made in two different and pleasing designs, it can be placed on the table or hung from the wall.

My Wireless Den



Weekly Tips—Constructional and Theoretical—by W. JAMES

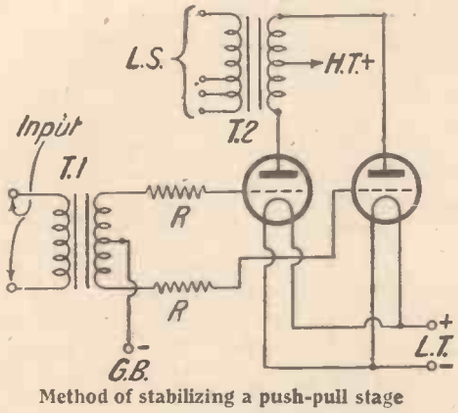
Use Ample H.T.

GOOD quality of reception is sometimes obtained simply by using plenty of high tension. There are many sets in use to-day which magnify almost without distortion until the last valve is reached. This valve, being overloaded, distorts and spoils the quality.

The high tension should therefore be increased in order to raise its power-handling capacity. Too often the volume obtained is in excess of what the set is able to provide without, say, 160 volts instead of the 100 or 120 that is used. The addition of the extra voltage, particularly to the last valve, often results in a wonderful improvement in the quality. Naturally, the grid bias must be increased in proportion, or the expected benefit will not be obtained.

Making Push-pull "Safe"

The trick of putting a grid leak of about 100,000 ohms into each grid wire of a push-pull stage is fairly well known, but yet I find that these are sometimes omitted.



Method of stabilizing a push-pull stage

I have, therefore, sketched a push-pull circuit, showing the two grid leaks, R. Transformer T1 is, of course, the input and will usually have a ratio of 3 or 4 to 1. It may, however, have a ratio of less than this, according to the circuit values of the remainder of the set. The output or loud-speaker transformer is T2. This is shown with a tapped secondary, as it is rather important to use the correct ratio in order to obtain the maximum output with the least possible distortion.

When a tapped output transformer is used it is an easy matter to determine by experiment the best connections for the loud-speaker. When two loud-speakers are used, a different ratio will naturally be found better. Here, then, are two advantages of the tapped output transformer.

The cores may have to be earthed in order to assist stability, but when the parts are properly spaced, there is not likely to be any real need to earth the parts.

Push-pull amplification is very convenient when the power supply is available, as quite a fair amount of volume is to be obtained with a high tension of about 200 volts. Owing to the fact that the pair of valves used may not be identical, however, it is necessary to include the resistances, or self-oscillation may occur, with disastrous results.

Detector Anode Volts

A point in the design of a wireless set that seems often to be lost sight of is the provision of a margin of safety against the high-tension battery running down.

This is more especially applicable to the detector circuit of a set.

It is all very well arranging the detector to perform nicely with a high-tension of 120 volts, giving smooth reaction, and so on. But where are we when the voltage of the battery falls—say, to 100. Nowhere at all—unless there is a generous margin in the reaction circuit.

When the detector voltage is fixed at 90 volts, however, and the circuit is correctly arranged, it is a relatively easy matter by re-setting the detector H.T. wander plug to maintain this voltage as the battery discharges. The detector valve, with its rectifying apparatus and reaction circuit, is really a rather delicate part of a set, and it should, therefore, always be given special attention. Little is lost by using the lower voltage, and the advantage of consistent operation over a period is worth having

Dead-end Effects

Tuning coils of the dual-range type often give trouble unless matters are so arranged that the effect of the long-wave part, when it is tuning over the lower wave range, is negligible.

It sometimes happens that the natural wavelength of a short-circuited long-wave coil, for instance, lies in the tuning range of the lower range coil. This results in flat tuning and loss of signal strength. Perhaps the reaction provided will not cause the circuit to oscillate about this point; but, in any case, the effect is one to be avoided so far as is possible.

The difficulty does not arise when one or both of the windings are sufficiently astatic, and naturally much depends upon the position of one coil with respect to the other I always look with suspicion upon coils not so constructed, however, as I know how serious are the effects produced by unskilled design.

An Advance in Reaction

How many readers, I wonder, have tried out for themselves the differential method of reaction control, such as was used in the AMATEUR WIRELESS "1930 Ether Searcher"? Probably the majority of receiving sets at the present time employ capacity-controlled reaction, and a very big improvement in the smoothness of the reaction coupling can often be made by the simple process of exchanging the present "plain" condenser for one of the differential type. With a plain condenser there are only two paths open to the H.F. component of the detector valve's output. When the condenser is at its maximum setting, the bulk of it passes through the reaction coil; at the minimum setting this path is almost closed and it must travel to earth through the windings of the transformer primary or of the coupling resistance, unless, of course, a shunting condenser is provided. Now, we certainly don't want the H.F. component in the L.F. department, and, personally, I am not very keen on shunting condensers, because they have a way of cutting out high notes unless one is rather careful. The differential condenser has two sets of fixed plates close to one another, but each separately insulated. One set of these is connected to the reaction coil and the other to earth, the moving vanes going to the plate of the detector. With the condenser at its minimum setting the moving vanes are meshed with the fixed set connected to earth. At the mid-way reading the moving vanes are in mesh equally with both sets of fixed. This provides an exceedingly delicate and smooth form of control, which I can strongly recommend.

Have you seen the Gift Announcement on page 38?

CONTROL

READINGS.
0—150 VOLTS
0—6 VOLTS
0—30 MILLIAMPS
Resistance 5,000 ohms.

Standard Model	Panel Model	Milliammeters 0—25 or 0—50 M.A.
8/6 Case 2/6 extra	13/9	9/6

WATES "three in one" VOLT-AMP RADIO TEST METERS

Avoid hit or miss radio. Get a Wates Meter and control your set like an expert. It gives you the three essential readings; volts on the H.T., L.T. scales and milliamps. Look for the name engraved on the dial, and be certain of obtaining only the genuine Wates Meter. Sold by all Radio Dealers, Halford's Stores, and Curry's Stores.

Descriptive literature sent free on request.

PATENT Nº 322558

THE STANDARD BATTERY CO. (Dept. A.W.), 184/188 Shaftesbury Avenue, LONDON, W.C.2

W.B.

"A.W." TESTS OF APPARATUS

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

Pertrix H.T. Battery

AMONG the apparatus for test this week is a Pertrix H.T. battery. This battery is made in a compact size, having overall dimensions of 6 in by 5¼ in. by 3 in The cells are protected by a stout card-

A long-life H.T.—the Pertrix

board container, with small holes over the tapping sockets. The voltage can be varied from 3 up to 10½ volts at intervals of 1½ volts. This enables grid bias, in addition to H.T. potential, to be obtained from the battery. From 10½ volts there are tappings at every additional 10 volts up to the maximum of 60 The sockets are clearly marked with their correct voltage.

During our tests the battery was discharged at a 7-milliampere rate, corresponding to a standard economical rate for the size of the battery in question. The discharge continued until the voltage fell to half its original value: this it did after 294 hours continuous use. The capacity obtained under such conditions was 1,540 milliampere hours, a figure well above the average for standard size cells.

The battery should, therefore, have a long life and can be recommended to readers.

Eureka L.F. Transformer

A WIDE range of Eureka transformers is available for incorporation in sets. The standard range includes a first and second stage "Concert Grand," with step-up ratios of 4 to 1 and 3 to 1 respectively, and a first and second stage "Baby Grand," having step-up ratios of 4.5 to 1 and 3 to 1 respectively. The windings and iron core of these components are enclosed in thick copper screens with a circular ebonite top panel. The ends of the windings are taken to four terminals on the panel placed in an accessible position.

In circumstances where a fairly high primary winding is necessary, the "concert grand" is most suitable; this sells at 10s. 6d. for the first stage article and 9s. 6d. for the second. The "baby grand," although having a comparatively low primary impedance, will function quite satisfactorily in the average set. We have previously used amplifiers in which two of these transformers were placed in cascade and obtained quite successful results from them.

The Eureka transformer submitted for test was a second stage "baby grand," costing 8s. 6d. The primary inductance of this article varies from 7.6 henries without D.C. polarising current to 6.2 henries with 10 milliamps flowing through the winding. Since in a second-stage amplifier the transformer will generally follow a low-impedance valve, a high value of primary inductance is not always necessary; whilst the fact that the change in inductance is very small for values of D.C. polarising current up to 10 milliamps indicates that the iron circuit will not saturate when following a low-impedance valve.

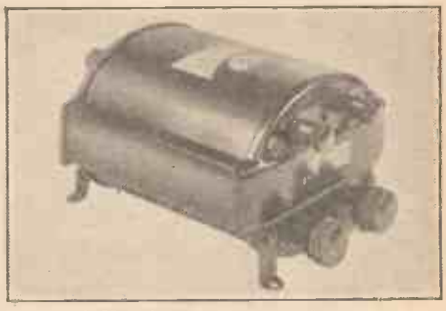
One of the range of Eureka L.F. transformers

Readers will find this transformer a serviceable instrument.

Heayberd Power Transformer

MESSRS. HEAYBERD, of 10, Finsbury Street, London, E.C.2, have had long experience with mains apparatus for wireless and battery-charging work, and articles bearing their name can be relied upon to give good service. We have recently received for test and report a compact little mains transformer suitable for 200, 230, and 250 volts A.C. input at 50 cycles. One of the output windings gives approximately 135 volts on no load, whilst a second provides 4 volts at 3 or 4 amps. and is intended as an L.T. supply for the filaments of the standard 4-volt A.C. valves, each of which takes 1 amp.

The transformer is designed primarily for use with the HT4 Westinghouse metal



A Heayberd power transformer

rectifier. This incorporates a novel device by which the voltage alternately charges two condensers placed in series across the D.C. output and provides an output voltage almost double the input.

This Heayberd transformer is designed to give an output of approximately 70 milliamps A.C.; the D.C. output on full load is less by approximately 30 milliamps, due to the absorption of the rectifier and reservoir condensers. During our tests on this instrument we took voltage readings on load and found that with an A.C. consumption of 40 milliamps, the A.C. voltage was 120, indicating that the regulation of the transformer is quite satisfactory for average purposes.

With regard to the design of the transformer, this is certainly a neat and compact unit. The windings and core are completely enclosed in a metal case with the A.C. input terminals at one end and the A.C. output at the other. The overall dimensions of the transformer are approximately 4¾ in. by 3½ in. by 2½ in. high. This is a useful component and can be recommended to readers.

A religious body calling itself the Mission Méthodique Evangeliste at Antwerp (Belgium) has erected a ½-kilowatt transmitter in that city for the purpose of broadcasting sacred services and talks thrice weekly. Although the official call-letters are ON4ED, the call is "*Radio Eglise du Christ*, and transmissions are carried out on the common wavelength of 205 metres. For the present, concerts are limited to Sundays, Wednesdays, and Thursdays, at 5.45 p.m., services being broadcast on those days at 10 a.m

NEXT WEEK:

A WONDERFUL

FREE GIFT

Full particulars on page 38

APOLOGY

To :

The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2.

With reference to the recent advertisements appearing under my name in Wireless Journals, wherein I have used the words "*Mullard Master* 3* *Circuit* (*Simplified*)," I regret that I have caused such advertisements to appear and appreciate that such advertisements would lead the public to believe that these sets were manufactured by you which is contrary to the fact.

I undertake that I will not in future repeat these advertisements, or any similar advertisements, nor sell any goods under your name, unless they are manufactured by you, and I apologise to you and to the public for having published advertisements which I now realise were entirely misleading.

(Signed)

K. RAYMOND.

Trading as RAYMOND'S, 27/28 Lisle Street, London, W.C.2.

WARNING

All Goods manufactured by the Mullard Company are clearly marked "Mullard" and the Trade and the Public generally are warned that proceedings will be taken against anyone attempting to pass off other goods as being of "Mullard" manufacture.

FOR ELIMINATOR CIRCUITS

You cannot afford to use any but the best Condenser in an eliminator circuit.

HELSBY CONDENSERS

are made and guaranteed by a firm with 30 years' experience in condenser making, from small telephone and radio condensers to Power Condensers weighing upwards of 2 tons.

Guaranteed working voltages :-

Type M	–	–	150 volts D.C.
Type 2A	–	–	350 volts D.C.
Type 3A	–	–	450 volts D.C.
Type 4A	–	–	600 volts D.C.

All Helsby Condensers are vacuum dried and impregnated with a special non-hygroscopic material which renders them moisture proof.

If unobtainable from your dealer write to us giving his name and address.

BRITISH INSULATED CABLES LTD

PRESCOT - LANCS.

Makers of PRESCOT and HELSBY cables

OBTAINING A.C. from D.C. MAINS

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

Owing to the fact that a number of districts still remain on D.C. supply, there is a steady demand for some means by which residents can partake of A.C. benefits. This has led to the introduction of equipment for supplying A.C. from the D.C. mains which is described in the article below.

THE greater proportion of the mains apparatus of to-day is designed to operate from A.C. mains. Alternating current periodically reverses its direction, flowing first one way and then the other, usually about fifty times per second. At first sight it might appear that this was less convenient for use with a wireless receiver than a source of steady supply, but this is not the case. In the first place, direct current is only on very rare occasions steady and unvariable. Secondly, one is limited to the voltage of supply, so that if the supply pressure is 200 it is not possible to obtain more than this value.

Advantages of A.C.

With alternating current, on the other hand, one can transform the voltage up or down as required. Thus it is possible to take the mains voltage, as it were, and split it up to a number of small pieces, each of which does its appropriate task. A small portion is told off to supply the heating current for the filament. Another portion will be told off to supply the grid bias, while a third and larger portion will be detailed to provide the high-tension supply. Each of these different portions will conduct its own business independent of the rest, and the three may be linked together as required by the necessities of the circuit without any difficulty.

Conversion Principles

Apparatus for the supply of alternating current from direct-current mains is of a rotating character and draws power from D.C. mains at one end, supplying alternating current at the other. The first and obvious way of achieving the results is to drive a small A.C. generator with a D.C. motor, the two being suitably coupled together. This, however, is not usually done for two reasons. The first is the question of cost of running, for the efficiency of a small generator capable of delivering 50 to 100 watts rarely exceeds 50 per cent., although it may, with good construction, be raised as high as 70 per cent. Therefore a generator giving 100 watts out will require about 200 watts input. To drive this we require a motor which will develop 200 watts of mechanical power, and if this has a 50 per cent. efficiency also, then we shall have to put 400 watts in. Thus we have had to put in four times as much power as we take out, which is not an economical proceeding.

The second objection to the system is the first cost, for we have two entirely separate machines. If we could obtain what we require with only one machine, we should reduce the cost by more than half, for, as we have now only one machine, the efficiency would be higher, so that the whole machine would be smaller. It is thus distinctly more economical to use one machine instead of two if this can be done. The question is, can it?

Anyone who has studied the subject knows that it can, and there are on the market one or two makes of machines which take in D.C. at one end and give A.C. out at the other. They are known as single-armature machines, for they possess only one rotating part which has connections at each end. It will be interesting to see how such a machine can work.

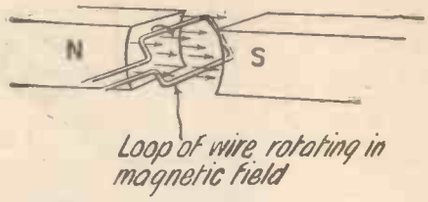


Fig. 1. Principle of the alternator

Let us consider, first of all, a simple alternator for supplying alternating current. We have, first of all, a powerful magnetic field in which is rotated a loop of wire as shown in Fig. 1. The movement of the wire in the magnetic field sets up a voltage, and it will be clear from the figure that if we rotate the loop continuously we shall induce a voltage first in one direction and then in the other for every half revolution the loop is twisted completely round.

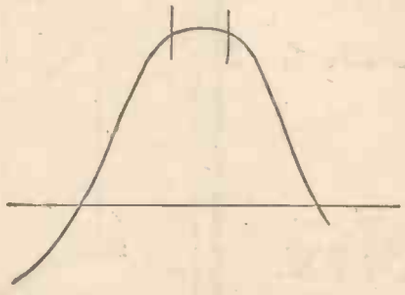


Fig. 2. The armature can rotate an appreciable distance with little variation of the current

We thus have an alternating voltage induced, and this is the principle on which the alternator works. A practical machine consists of a number of loops of wire wound in slots in an iron former, known as an armature. The object of this is partly to hold the loops in position and partly to strengthen the magnetic field, so that the only air gap existing is the clearance necessary between the rotating armature and the field system.

The Practical Alternator

Our practical alternator, therefore, carries a number of coils of wire all connected together, with the ends brought out to two collecting rings or slip rings, as they are called. Collecting brushes ride on these rings and draw the current away to the terminals. Then when the armature is revolved we get voltages induced, which alternate backwards and forwards, depending upon the speed at which we rotate the armature. Suppose, however, we do not wish to obtain alternating current, but require direct or uni-directional currents. What sort of machine would be necessary then? Actually the same construction would be adopted, but a different method would be employed for collecting the current.

Commutation

Suppose, instead of connecting the coils in series, we connect each coil to two contacts on a multi-contact switch. We can imagine the contacts as consisting of slots placed round the periphery of a large ebonite disc, and for convenience we will assume that the collecting brushes are placed one on each side of this switch so that the beginning and end of any one coil must be brought out to two diametrically opposite studs.

Let us now arrange that the collecting brushes make contact with one of the coils at the particular instant when it is passing through the point at which maximum voltage is induced. At the top of the swing, as it were, the armature can rotate quite an appreciable distance with very little variation in the current. Reference to the curve of a typical alternating current, given by Fig. 2 will illustrate this point. We can allow the armature to rotate, therefore, and the brushes will still collect current from this particular coil until the voltage begins to fall. When it does this the brushes will automatically change on to the next pair of contacts to which the next coil is connected. The same process is then repeated, so that we are continually taking out the current from successive coils at the particular instant when they have their maximum voltage induced. Consequently, we shall obtain a current always in the same direction.

Thus, we see that the same machinery is capable of producing either direct or alternating current, according to how we arrange our connections, and we could, if we desired, place slip rings at one end and a rotating switch or commutator, as it is called, at the other, and obtain both

alternating and direct current from the same machine. Carrying this one step farther, we can supply direct current to the commutator end of the machine when it will act as a D.C. motor (for a machine which will supply D.C. when it is rotated mechanically will in turn revolve itself and do work, if it is supplied with current.) The D.C., therefore, drives the machine round and alternating voltage is then generated at the other end.

The Rotary Convertor

Such a device is known as a rotary convertor. It has many applications in radio work and will probably come to the fore considerably during the coming year. It has not hitherto been made in small sizes, but the increasing demand is bearing the necessary fruit. There is just one point which should be observed in connection with this class of machine, and that is that the ratio of the output voltage to the input voltage is always fixed and definite. This is perhaps the only disadvantage from which the rotary convertor suffers by comparison with the motor - generator arrangement, having two entirely separate machines.

In the case of the rotary convertor, however, since the D.C. and A.C. are both obtained from tappings on the same armature, there is a fixed relationship between the two voltages. From what has been said it will be realized that the D.C. voltage is the maximum value of the voltage induced in the circuit. The alternating voltage, however, varies between this maximum and the same value in the opposite direction, and in rating an alternating voltage or current it is necessary to adopt an average value; the particular value chosen is known as the root-mean-square or the R.M.S. value, which, with a pure alternating voltage has a value of 0.71 of the maximum.

Assuming that our machine, therefore, is reasonably pure in wave form, the A.C. output will be 0.71 times the D.C. input. If this particular value is not suitable, then a transformer must be employed on the output side to step the voltage up to what is required.

The Osaka Chamber of Commerce and Industry has decided to submit a recommendation to the Japanese Government for the establishment of radiophone facilities between Osaka and Shanghai.

A new aerodrome telephony station installed at Stroombeek (Belgium) may be heard carrying out tests almost daily between 6 and 9 p.m. G.M.T. on 900 metres. The call given is "*Ici station* 21,997"; on some evenings gramophone records are broadcast. As an opening signal, contrary to the custom of official transmitters, a record of the song of the nightingale is put over the ether.

1929—The YEAR'S BROADCASTING

NEW STATIONS

EARLY in the year, work was started on the new B.B.C. headquarters in Portland Place, London, on a site occupying an area of about 20,000 square feet. This building, which will cost between £400,000 and £500,000 to erect, will provide more than 100,000 square feet of floor space. The new home of broadcasting will be completed in 1931.

The new offices of the Northern region were opened at Broadcasting House, Piccadilly, Manchester, in April last; they include a studio which is regarded as the best in use at present by the B.B.C., together with the most up-to-date control-room equipment in Great Britain.

The advent of Brookmans Park has been a most important event in the radio calendar of the year, and has affected thousands of listeners, Brookmans Park is the first dual-wavelength transmitter of such a size to be built. The station started in October on a single-wave basis, making a single programme distribution in place of the Oxford Street transmitter. Tests on a two-programme basis were started on December 9.

In October constructional work was started on a similar station for the Northern region. The North regional transmitter will serve the industrial districts of Lancashire and Yorkshire with a similar service to that provided for London, except that its range may be rather greater.

TELEVISION

Experimental transmissions of television were started in October and are still in progress. They are given at a reasonably convenient hour during the mornings, and all experimenters who wish to do so, can now co-operate in the tests. This is a policy of which AMATEUR WIRELESS has always been in favour. It will be recalled that during the past year many discussions have been held between the B.B.C. and the Baird Television Development Co., with a view to the broadcasting of experimental television. Obviously television in this country would have been severely handicapped had regular broadcasting not been possible, so that amateurs might take part, and both parties concerned are to be congratulated on their mutual efforts during 1929, which have resulted in the broadcasting of television.

TECHNICAL PROGRESS

In September a new and more permanent station was opened at Tatsfield to replace the old temporary listening post at Keston. The main purpose for which Keston was originally intended was the relaying of distant programmes; but latterly it had become a wavelength, or frequency, checking laboratory, working in conjunction with that of the Union Internationale de Radiodiffusion at Brussels. The carrying out of accurate calibration work rendered it necessary to find a new site upon which a suitable building could be erected. Tatsfield has been designed and equipped for relaying European stations' programmes if and when a land line is not available, as well as for the important work of wave-checking.

The year has marked the gradual introduction of Continental broadcast programmes relayed by telephone cable as regular items in the B.B.C. programmes. These relays have been very successful owing to the development in Europe of a comprehensive system of telephone cables which comprise circuits specially designed for broadcasting.

During the second half of the year relays from America by short waves exceeded all previous efforts. A good U.S. relay was given on Christmas Day. Two of the best transmissions were a running commentary on the landing of the *Graf Zeppelin* at Lakehurst and the reception accorded to the Prime Minister in New York. Another notable attempt was the relaying of President Hoover's inaugural address.

OUTSIDE BROADCASTS

The chief outside broadcast of 1929 was the running commentary on the Schneider Trophy; of perhaps equal importance was the commentary from Cardington on the arrival of R.101 after her trial trip.

One hour after his arrival from America, where he had set up a speed record, a talk by Major Segrave was relayed from Southampton. Another broadcast from Southampton consisted of a talk by Capt. McNeil of the *Mauretania* after her fastest transatlantic crossing.

Relays of opera from Covent Garden and of several excerpts from theatrical shows were also among the activities of the O.B. department.

The Aldershot and Tidworth Tattoos were relayed in July, and in December a broadcast was given from a London newspaper office at night. In October a relay was made from a London telephone exchange.

Speeches broadcast included those of the Prince of Wales, the Duke of York, the Prime Minister, Mr. Arthur Henderson, the Earl of Derby, Lord Cecil, Mr. Philip Snowden, Sir James Barrie and the Archbishop of Canterbury. Speeches by General Smuts and General Von Lettow Vorbeck were broadcast from the East African Campaign Dinner.

BROADCAST MUSIC AND PLAYS

One of the outstanding musical events of the year was the B.B.C.'s participation in the Canterbury Festival. The Corporation provided the Wireless Symphony Orchestra for this great first festival in the Cathedral.

During 1929 the Queen's Hall concerts have been noticeable. British and foreign conductors took part—Sir Thomas Beecham, Sir Henry Wood, Sir Landon Ronald, Franz von Hoesslin, and Albert Wolff.

Turns from the Palladium, Alhambra, and Coliseum have been relayed regularly throughout the year. Among the variety artistes heard by listeners were Jackie Coogan, Odali Gareno, Jack Hylton, Fred Duprez, Marie Burke, Charles Hays, and Will Hay.

TALKS

You may not like talks, but 1929 has certainly seen—and "heard"—some good ones. There has been Mr. H. G. Wells' first broadcast talk—an address on world peace; Sir Hubert Wilkins on "The first Antarctic flight"; the Duchess of Bedford on "To India and back in a week"; Mr. Arthur Henderson on "Dr. Stresemann's death"; Sir Frederick Maurice on "Marshal Foch"; Lord Cecil on "M. Clemenceau," and many others.

Another important new departure has been the inauguration of the B.B.C. "National Lectures." Dr. Bridges, the Poet Laureate, Professor Eddington, and Professor G. M. Trevelyan have delivered the three lectures for 1929.

SPORT

Running commentaries on sporting events have during 1929 become a regular thing. This year descriptions have been broadcast of all the principal international Rugby football matches, the principal Association football matches, the Grand National, the Derby, the St. Leger, the Oxford and Cambridge boat-race, tennis at Wimbledon, the R.A.F. Display, the final shoot for the King's Prize at Bisley, the launch of H.M.S. *Exeter* at Devonport, the Scott *v.* Sandwina light-weight championship match, the Rydal sheep-dog trials, and dirt-track racing at Wembley. Eye-witness accounts have been given of the more important golf matches, of the South African Test Matches, of the King's Cup Air Race, of the International T.T. Motor Race in Ulster and of many other events.

Yes, 1929 has been a top-hole broadcast year, despite what the growlers say!

THE "RADIO WEEK" PROGRAMMES (*Continued from page* 48)

2 to 3.—Organ Recital.

6.40.—Military Band Concert.

7.30.—*As You Choose* (from Birmingham): A Seasonable Pantovue, by Robert Rutherford; Presented by Tommy Handley, Owen Lewis, Denham Charles, Eddie Robinson, Charles Herbert, Philip Brown's Dominoes Dance Band, and Jack Venables.

SATURDAY, JANUARY 18

2LO London and 5XX Daventry

1 to 2.—Light Music: Orchestra relayed from the Commodore Theatre.

2.10.—Wales *v.* England: A Running Commentary on the International Rugby Match, by Capt. H. B. T. Wakelam.

4.10.—Light Music: Ernest Hastings (entertainer), The J. H. Squire Celeste Octet.

4.45.—Organ Music: Played by Reginald New, relayed from the Beaufort Cinema, Washwood Heath, Birmingham.

7.30.—Excerpt from *Mother Goose.*

9.35.—Military Band Concert: Harold Williams (baritone); The Wireless Military Band, conducted by B. Walton O'Donnell.

10.35 to 12.—Dance Music.

5GB Daventry

3.30.—Ballad Concert: Gaby Valle (soprano), Silvio Sidelli (baritone), Betty Humby (pianoforte).

4.15.—Dance Music (from Birmingham): Billy Francis and his Band, relayed from The West End Dance Hall; Vernon Owens (entertainer).

6.45.—Francis Russell (tenor); The Gershom-Parkington Quintet.

7.30.—Orchestral Concert (from Birmingham): The Birmingham Studio Augmented Orchestra, Frank Cantell (leader), conducted by Joseph Lewis; Olive Goff (soprano).

9.10.—Symphony Concert: The Birmingham Studio Augmented Orchestra, Frank Cantell (leader), conducted by Joseph Lewis; Robert Maitland (baritone), George Bone (pianoforte).

A SPECIAL GIFT OFFER APPEARS ON PAGE 38

AT BOTH ENDS OF THE SCALE

Jottings from My Log, by JAY COOTE

THE recent spell of wet weather has provided us with a series of favourable nights for exploring the ether and an enforced rest at home has furnished an opportunity for taking full advantage of these suitable conditions. Result . a batch of new catches, some probably useless, others worthy of careful registration.

As a start, both Rome and Oslo, the latest high-power transmitters launched into the waveband, cannot be ignored. The Italian station after a formal inauguration on December 21 last, has been working steadily ever since and now provides a signal of considerable volume; Oslo, on the other hand would still appear to be in the test stage, and on some nights it is towards the end of the evening programme that it comes on the air. Both are welcome additions to our log, inasmuch as from Rome we may expect excellent operatic programmes and from Oslo, entertainments which up to the present have not been available to any but listeners dwelling in the north-eastern districts of England and Scotland.

As regards Trondjhem (Norway) which is to operate on 1,071 metres so soon as the old Oslo plant has been transferred to that city, its presence on that wavelength may compel Hilversum to seek a fresh position. It is not quite clear what will actually happen, for the Dutch broadcaster is doing all in its power to retain what it has held for so long a period. At time of writing the quarterly change-over between Hilversum and Huizen has not been advertised to take place.

Bucharest, which for a few days was clear of interference and could be separated from Frankfurt, seems to have disappeared in a background of mush and unpleasant noises, Frederiksstad had, I understand been moved, but appears to have returned to its original position.

In the lower band, a search will prove interesting, for Radio Wallonie (Liége) has revived its broadcasts on 280 metres and may be heard—faintly, it is true—on Tuesdays and Fridays at 7.30 p.m. G.M.T.

Luxembourg on 223 metres is now a regular transmission and although suffering from spasmodic distortion should be easily picked up on most nights. Below this station, and frequently colliding with Flensburg you will hear a call: Radio Chatelineau-Charleroy (Belgique), followed by a broadcast of peculiarly out of date dance tunes.

Finally, the latest arrival is that of Antwerp (ON4ED), on 206 metres, which three times weekly (Wednesdays, Thursdays and Sundays at 5.45 p.m. G.M.T.) puts out the call: *Radio Eglise du Christ*, with a special service on Sunday mornings; the station is run by the *Mission Methodique Evangeliste*.

OUR INFORMATION BUREAU

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

Separating the Two Regionals

Q.—*I have been anxiously awaiting the start of the two new London stations and I now know my fate! I am experiencing difficulty in separating the two transmissions and would like to know what steps I should take. As you will observe, I am living twenty miles from the new stations and yet no matter how I tune I cannot listen-in to one programme without a background of the other. My set is a manufacturer's kit-set consisting of a detector and two L.F. stages. I have plenty of H.T. current and voltage available from an eliminator.—W. R. (Hounslow).*

A.—There is just one little point you have omitted to mention and this may account for the whole of your trouble. If your aerial is erected directional for the reception of the new London stations, then you will certainly have difficulty in separating the two transmissions. To overcome such difficulty we suggest that you erect a new aerial of the single wire (7/22 copper) vertical type. The upper end of the aerial should extend as far as possible above the roof-top so as to avoid undue screening. At the same time a new earth wire should be run, also consisting of 7/22 copper wire. Two lengths of this wire twisted together for the earth will be an asset. If you still have any difficulty in separating the two transmissions, then we would advise you to connect a semi-variable type of fixed condenser, .0003 microfarad maximum capacity, in series between your aerial lead-in wire and the aerial terminal of your set. Suitable adjustment of this pre-set condenser should enable you to separate the two transmissions.—L. C.

When Asking Technical Queries

PLEASE write briefly

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

Reversed Reaction

Q.—*I have constructed the "Music Leader," using the "Arcadian Portable" coil, and whilst I am very satisfied with reception on the long waves I have had no success with short-wave stations. I cannot seem to get a proper reaction effect on the medium waves and feel that there is only some small fault which is spoiling an otherwise highly satisfactory set. Can you suggest where I may have gone wrong?—F. C (Whitchurch).*

A.—It seems to us that the winding of your special H.F. tuning coil is incorrect. We have learned that some samples of coils sent out from certain manufacturers had the medium-wave winding connections reversed, thus giving rise to a reverse reaction effect on the medium-waves only. This is possibly the cause of the trouble in your case and we advise you to try the effect of reversing the connections to the medium-wave winding. If you have any difficulty in following the windings or connections, then we would refer you to "Amateur Wireless," No. 367.—C. L.

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
261	1,148	London (2) tests	30.0
*288.5	1,040	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
356	842	Brookmans Park	30.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
206	1,460	Antwerp	0.4
217.1	1,383	Charleroy (PL)	0.25
244	1,229	Ghent	0.5
250.9	1,196	Schaerbeek-Brussels	0.25
280	1,071	Liége	0.1
339	887	Velthem	8.0
*500	590	Brussels	1.0
CZECHO-SLOVAKIA			
*263	1,139	Moravska-Ostrava	10.0
*279	1,076	Bratislava	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.5
ESTHONIA			
*296	1,013	Reval (Tallinn)	0.7
FINLAND			
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
FRANCE			
31.65	9,479	Radio Experimental (Paris)	1.0
175	1,714	S. Quentin	0.1
214	1,400	Fécamp (Radio Normande)	0.5
220	1,364	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
240	1,250	Nimes	0.25
248	1,411	Nice-Juan-les-Pins	0.5
*272	1,102	Rennes (PTT)	0.5
*286	1,049	Montpellier (PTT)	0.2
286	1,049	Radio Lyons	0.5
292	1,027.4	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
308	973	Radio Vitus	1.0
311	964.5	Agen	0.25
*316	950	Marseilles (PTT)	0.5
329	914	Grenoble (PTT)	0.5
329	914	Petit Parisien	0.5
363	828	Algiers	12.0
368	815	Radio LL (Paris)	0.5
375	803	Caen	0.5
*381	788	Radio Toulouse	8.0
410.7	730.4	Radio Maroc (Rabat)	2.0
447	671	Paris (Ecole Sup. PTT)	3.0
468	640	Lyons (PTT)	5.0
1,444	207.5	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
GERMANY			
*218	1,373	Flensburg	0.5
*227	1,319	Cologne	4.0
*234	1,283	Münster	3.0
*239	1,256	Nürnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Königsberg	2.5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*319	941	Bremen	0.35
*325	923	Breslau	1.5
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1.5
*560	536	Hanover	0.35
560	536	Augsburg	0.25
570	527	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100	142	Norddeich	10.0
2,290	131	Norddeich	10.0
GRAND DUCHY			
223	1,346	Luxembourg	3.0
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
*298	1,004	Hilversum (until 5.40 p.m. G.M.T.)	6.5
*1,071	280	Hilversum	6.5
*1,071	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T)	5.0
*1,875	160	Huizen (after 5.40 p.m. G.M.T.)	6.5
HUNGARY			
550	545	Budapest	20.0
ICELAND			
*1,200	250	Reykjavik	1.0
IRISH FREE STATE			
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
ITALY			
291	1,030	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (Genova)	1.0
*441	680	Rome (Roma)	50.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
308	973	Zagreb (Agram)	0.7
436	689	Belgrade	2.5
575.5	521	Ljubljana	2.5
LATVIA			
*525	572	Riga	3.0
LITHUANIA			
*1,935	155	Kovno	7.0
NORWAY			
241	1,243	Rjukan	0.18
*283	1,058	Notodden	.05
364	824	Bergen	1.0
393.7	762	Frederiksstad	0.7
453	662	Tromsö	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*493	608	Oslo (tests)	60.0
107.1	280	Trondjhem (tests)	
POLAND			
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
1,390	215.75	Warsaw	8.0
ROUMANIA			
*394	761	Bucharest	12.0
RUSSIA			
720	417	Moscow (PTT)	20.0
938	320	Moscow (C.C.S.P.)	75.0
1,000	300	Leningrad	20.0
1,075	279	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
*1,304	230	Kharkov	4.0
1,481	202.5	Moscow (Kom)	40.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EA1J9)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
424	707	Madrid (EAJ7)	2.0
4,532	662	San Sebastian (EAJ8)	0.5
SWEDEN			
231	1,301	Malmö	0.6
*257	1,160	Hörby	10.0
270	1,112	Trollhättan	0.45
*322	932	Göteborg	10.0
332	905	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
TURKEY			
*1,219	246	Stamboul	5.0

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

RADIOGRAMS

A Scottish Electrical, Wireless, Engineering, Musical and General Trades Exhibition is to be held in the Kelvin Hall, Glasgow, from January 29 to February 8. One of the outstanding features of the exhibition will be a small hall where visitors will witness, for the first time in Scotland, Baird television at work.

A new series of children's concerts for broadcasting has been arranged for Ulster. The series is being carried out by the B.B.C., in conjunction with the Ministry of Education for Northern Ireland, with the idea of laying the foundations of musical culture and musical appreciation in the audiences of the future.

WABC (New Jersey), the new 50-kilowatt key station of the Columbia Broadcasting network, is to be the most powerful and modern transmitter in the New York area. It will work on 860 kilocycles (349 metres).

Turin would appear to have altered its interval signal, instead of the song of the nightingale, the trilling of a canary may be heard between items.

On 1,350 metres (222.2 kc.) the Tunis (North Africa) broadcasting station transmits a concert nightly at 8.15 p.m. G.M.T. The call is "*Allo! Allo! ici le poste radio-telephonique de Tunis-Kasbah,*" announcements being made in both French and Arabic.

RADIOGRAMS

HIS MAJESTY'S first broadcast since his illness will be made at the International Conference on Naval Disarmament, which opens in the Royal Gallery of the House of Lords on January 21 next. The King will leave immediately after having spoken, and his place will be taken by Mr Ramsay MacDonald. The broadcast will continue from 11 a.m. to 1 p.m. Ten microphone extensions are being installed in the Royal Gallery, all connected to a central point, thence led to the private branch exchange of the House of Lords and so to the Savoy Hill control-room.

Captain H. B. T Wakelam, from Cardiff Arms Park, will give a running commentary on the International Football match which is taking place on January 18; it is to be relayed to London and Daventry 5XX.

Under the title "Helmet and Haversack," listeners to the 5GB programme on January 16 are to hear a sequence of army marching and camp songs from the days of the Waterloo campaign to the Great War.

On January 17 the Birmingham studio will produce *As You Choose*, a seasonable pantomime-revue, to be broadcast through Daventry 5GB.

Arrangements have been made to transmit through London and Daventry 5XX excerpts of a performance of Gilbert and Sullivan's *Mikado*, as presented at the Savoy Theatre, London, on January 24.

A particularly attractive vaudeville programme will be broadcast from London on January 16; it includes a number of wireless stars as well as some of the most prominent revue favourites. Ronald Frankau, Marie Burke, Jack Hulbert, and Cicely Courtneidge are taking part in the performance.

The conversion of the Eiffel Tower transmitter into a short-wave station for communication with the French Colonies is being seriously discussed in Paris. The Ministry of Posts and Telegraphs has already earmarked a sum of one and a half million francs for this work.

The telephone system in America is to be linked by radio with those in some of the South American republics. Arrangements for the service have been made and equipment installed, states a report from the Federal Radio Commission. The 19,000,000 telephones in the United States will be directly connected with any of the telephones in South America, which are equipped for the radio telephone service.

For the first time in nearly three years, the number of radio stations in the United States has dropped below 600. The most recent count taken by the Federal Radio Commission puts the number at 594.

LETTERS TO THE EDITOR

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

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

The Cost of Licensing

SIR,—I see that a question was recently asked in Parliament regarding the cost of issuing a wireless receiving licence. Mr. Lees-Smith, the Postmaster-General, said that the cost was about 1s. 1d. per licence. This seems to me to be an excessive proportion of the whole 10s. Personally, I would not mind the job of issuing licences at the cost of even a *farthing* each! Just work this out. There are over 3,000,000 licensed listeners. And in approximate arithmetic 3,000,000 farthings equal £3,000. Allowing for reasonable cost of printing and clerical work, this should show a fair profit. Surely the radio section of the Post Office has little at which to grumble if they charge fifty-two times the amount given in my example! P. D. (Towcester).

Request Programmes

SIR,—From what I hear from friends, the B.B.C. must get a large number of complaints regarding programmes. Is it not a fact that this is due to the choosing of programme matter by folk who, themselves, hardly ever listen to the programmes? I think it would be a good idea if more use could be made of the "Request" features—which, from personal experience, I know is done in America and Canada. Of course, many of the "Requests" would be the same, for a popular programme would be asked for again and again Nevertheless, it does seem that the B.B.C takes too little notice of the requests it receives, owing, I suppose, to the pre-arranged programme scheme. If programmes were regularly compiled from "Requests," they undoubtedly would be more popular with the average listener. M. B (London).

The Licence Position

SIR,—I know that 10s. a year is not excessive for the value one gets in programmes, but I do think that the licence fee and regulations should be more adaptable, as are car licences. What is going to happen to a man who wishes to try out a

(*Continued on next page*)

"LETTERS TO THE EDITOR"

(Continued from preceding page)

new set before definitely purchasing it, and, of course, before obtaining a licence? Or what would happen to him if, for instance, he lent the receiver to a friend for a few days? Who would be liable if the Post Office van should happen to pay a visit?

It is a pity that the licencing regulations cannot cover such simple cases as these.

B. F. (Walthamstow).

Separate Control for the Detector?

SIR,—A few years ago the majority of wireless receivers using two or more valves had a separate rheostat for each. The modern practice is to have only one, or an "on-and-off" switch. This certainly simplifies matters and reduces components, but owing to a recent experience of mine, I am inclined to doubt the wisdom of this method, in spite of its convenience. I have been led to the conclusion that when the detector valve is linked up on *both* its filament sides with the L.F valves, there is a certain loss of efficiency in the detector circuit. That the system works is granted, but the point I wish to emphasize is this: Would not results be even better with a separate control for the detector? I am inclined to think so for the following reason, based on practical experience.

I have a three-valve "straight" set of the Reinartz type (o-V-2), using two-pin coils. The tuning condenser was in the centre of the panel and the reaction condenser to the left of this as you faced the panel. I had a separate rheostat for each valve, and the set was very efficient so far as getting distant stations was concerned. The other day, in order to shorten the leads to the aerial coil from its condenser, I reversed the position of the two, i.e., the tuner and reaction. In doing so I had to remove the rheostat controlling the detector valve, and as I did not wish to drill a fresh hole in the panel for it, I dispensed with it and linked up the first two valves on the baseboard and controlled them from the rheostat which had done duty for the first L.F. valve only. On switching on again everything seemed pretty much as usual so far as the local station and the two Daventrys were concerned, but when it came to

(Continued on page 72)

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

CRYSTAL SETS (6d. each)

B.B.C. Brookmans Park Set AW206
Regional Crystal Set WM176

ONE-VALVE SETS (1s. each)

B.B.C. Official One AW208
Reinartz One WM127
A.1 .. .. WM153

TWO-VALVE SETS (1s. each)

Loud-speaker America Two AW190
Talisman Two (D, Trans) AW194
Hyper-selective Two (D, Pentode) AW198
Pentector Two (P. det, RC) AW213
British Broadcast Two (D, Trans) AW215
Clipper Two (D, Trans) WM135
Continental Two (D, Trans) WM143
Stay-put Two (All AC, D, Trans) WM155
Ether Ranger (D, Trans) WM156
ABC Two (D, Trans) with copy "WM"—1s. 3d. WM160
Brookmans Two (D, Trans) WM168
AC Two (D, Trans) WM175

THREE-VALVE SETS (1s. each)

All-Britain Three (H.F., D, Trans) AW158
The Binowave Three (D, RC, Trans) AW172
Clarion Three (SG, D, Trans) AW175
Broadcast Three (SG, D, Trans) AW192
James dual-range Three (HF, D, Trans) .. AW196
All-wave High-mag. Three (D, 2 Trans) .. AW199
Knife-edge Three (D, RC, Trans) AW201
Talisman Two-three (D, RC, Trans) AW203a
Wide World Short-wave Three (HF, D, Trans) AW207
Everybody's Three (SG, D, Trans) AW209
1930 Ether Searcher (SG, D, Trans) AW211
New All-Britain Three (HF, D, Trans) AW214
Standard Coil Three (HF, D, Trans) WM117
Wide-world Short-waver (SG, D, Trans) .. WM120
New Year Three (SG, D, Pentode) WM123
Lodestone Three (HF, D, Trans) WM129
Simple Screen Three (HF, D, Trans) WM131
Dynamic Three (AC—SG, D, Trans) WM136
At Home Three (D, 2RC) WM141
Short-Wave Link (D, RC, Trans) WM142
Binowave S.G. Three (SG, D, Trans) WM152
Fanfare (D, 2 Trans) WM157
Brookmans Three (SG, D, Trans) WM161
Community Three (D, RC, Trans) WM164
New Q3 (SG, D, Pentode) WM167
Brookmans Push-pull Three (HF, D, Trans) 1/6 WM170
Celerity Three (SG, D, Trans) WM173

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

Overseas Short-waver (HF, D, 2 Trans) .. AW133
Clarion All-electric Three (SG, D, Trans; AC Rectifier) AW200
*Music-lover's Gramo-radio (SG, D, RC, Trans—1s. 6d.) AW202a
*Music-lover's Gramo-radio (Loud-speaker—1s.) AW202b
*Music-lover's Gramo-radio (Motor-board—9d.) AW202c
Binowave Four (SG, D, RC Trans) WM119
Standard-coil Four (HF, D, 2RC) WM122
Dominions Four (2SG, D, Trans) WM134
Short-wave Adaptor for Dominions Four .. WM140
Music Player (HF, D, RC, Trans) WM144
Arrow (SG, HF, D, Trans) WM154
1930 Monodial (2SG, D, Trans) WM158
Electric Four (All AC—SG, D, RC, Trans) .. WM162
Outpost Four (SG, D, 2 Trans) WM165
Brookman's Four (2 SG, D, Trans) WM174

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

Fidelity Five (HF, D, 2RC) WM130
All-wave Lodestone Five (HF, D, RC, Push-pull) WM146
1930 Five (2HF, D, RC, Trans) WM171

AMPLIFIERS (1s. each)

A.W. Gramophone Amplifier AW205
Beginner's Amplifier (1v.) 9d. AW210
Brookman's Separator (HF Unit) AW212
Signal Booster (HF Unit) WM128
Auditrol Amplifier WM132
Concentrator (HF Unit) WM169

MISCELLANEOUS (1s. each)

Short-wave Adaptor (1 v.) AW183
High-tension Battery Charger AW191
Mains Unit for S.8 Valves AW193
Simplest H.T. Unit AW197
B.P. Wavetrap (6d.) AW204
H.T. Unit for A.C. Mains WM125
Lodestone Loud-speaker WM126
James H.T. Unit for D.C. Mains WM133
Two Ampere Low-tension Unit WM147
A.C. Mains Amplifier WM149
A.C. Mains Unit for All-wave Lodestone Five WM151
H.T. Unit for A.C. Mains WM159
"W.M." Linen-diaphragm WM172

PORTABLE SETS

Arcadian Portable (SG, D, 2 Trans) with linen-diaphragm loud-speaker (half scale) AW177 1/6
£5.5.0 Portable (D, Trans) AW181 1/6
Holiday Portable Three (D, RC, Trans) .. AW188 1/-
Music Leader (SG, D, RC, Trans) with copy "AW" .. .. AW203 -/4
Wayfarer Portable (Super-het) WM139 1/6
1929 Chummy (SG, D, Trans, RC) WM145 1/6
Enchanter Portable (2HF, D, RC, Trans) WM150 1/6

The three prints are obtainable for 2s. 6d. post free

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

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

"LETTERS TO THE EDITOR"

(*Continued from page 70*)

the foreigners there was a different tale to tell. With one exception, Langenberg, they were there all right, but not so good (loud and clear) as formerly. As for Langenberg, it had disappeared altogether. When I turned the dial to the spot where it usually came in, all I could get was a whistle not unlike a heterodyne, and no amount of juggling with the two condensers could alter this. I thought at first that perhaps 5GB was clashing with the German, as it sometimes does, but not to the extent of a heterodyne in my experience, though their programmes occasionally interfere with one another. However, I did not trouble overmuch at the moment, but on the second night of switching on and I met with the same conditions, I began to be suspicious, but decided to wait another night. When I then met with no improvement (and I was very much attached to Langenberg—always a good strong signal with me), I knew that something drastic must be done. Not wishing to reverse the variable condensers again, I decided to drill a fresh hole in the panel and replace the detector rheostat, having formed the opinion that the trouble arose at this point. It did not take many minutes to make the necessary alterations, and you may guess how eagerly I awaited results. I switched on with mixed feelings, turned the dial to the Langenberg position and, to my great satisfaction and delight, he was there as good as ever! Moreover, the other foreigners were much improved in reception.

It would appear (though I do not speak as an expert) that when the detector valve, perhaps the most important in the set, is linked up entirely with the L.F. valves, its full functioning is crippled in some way, probably by inter-electrode capacities.

A. J. W. (Chorlton-cum-Hardy).

[We suggest that the performance of the set when the detector rheostat was removed was impaired owing simply to a change of bias on the detector valve grid by the removal of the resistance in one filament leg of the detector. Alternatively, the re-arrangement of the wiring may have had an adverse effect. Our correspondent's suggestion seems highly improbable.—ED.]

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

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

PREPAID ADVERTISEMENTS

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

DEPOSIT SYSTEM

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

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

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS," ADVERTISEMENT DEPARTMENT, 58/61 FETTER LANE, LONDON, E.C.4.

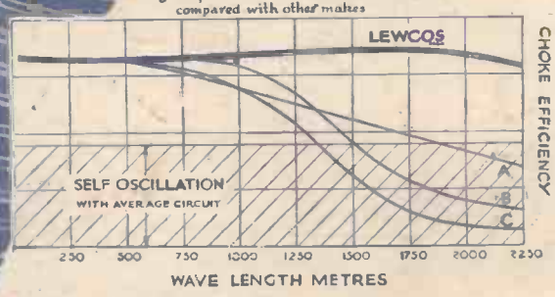
THE PROPRIETOR of Patents Nos. 263752 and 263753 "Variable Directional Electric Wave Generating Device" and "Directive Projecting and Receiving System for Use in Wireless Telegraphy or Telephony" is desirous of entering into arrangements by way of Licence or otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country. All communications should be addressed in the first instance to:—J. E. Evans-Jackson and Company, Registered Patent Agents, Bath House, 57 to 60, Holborn Viaduct, London, E.C.1; and 34, Dame Street, Dublin, Ireland.

ENGINEERS.—Can't we get together? All we ask is the chance to prove that you can earn £300, £400, £500 per year and more. Other men are doing it and you can do the same. We have an unrivalled and world-wide organisation waiting to help you, whether you be novice or expert. If you wish for something more than a "bread-and-butter" job, you owe it to yourself to investigate our service. Our handbook. "ENGINEERING OPPORTUNITIES," has pointed the way to better things to over 20,000 of your fellows. It contains details of A.M.I.Mech.E., A.M.I.C.E., A.I.E.E., A.M.I.A.E., A.M.I.Struct.E., C. and G., G.P.O., etc. Exams., and outlines Home-study Courses in all branches of Electrical, Mechanical, Motor, and Wireless Engineering. In a brilliant article, Professor A. M. Low shows clearly the chances you are missing. The book and our advice are quite free. We guarantee "NO PASS—NO FEE." Don't miss this opportunity; send a post card NOW (state Branch, Post, or Exam.).—British Institute of Engineering Technology, 109 Shakespeare House, 20 Oxford Street, London, W.1.

DECORATE YOUR LOUD-SPEAKER YOURSELF. Transfers giving painted effects on Fabric, Wood, Metal, etc. Sample and catalogue 1/-. A.W., Axon Ltd., Jersey, England.

"The Most Efficient Choke We Have Tested"

H F CHOKE CURVES
Showing the performance of the Lewcos HF Choke compared with other makes



H.F. CHOKE
Price 7/9

"We are pleased to report that the Lewcos H.F. Choke is, in our opinion, the most efficient Choke we have tested, there being no sign of instability even when using 150 volts H.T. on the Anode of the S.G. Valve. The construction is massive and well finished, and its design places it in the front rank of high-class components."

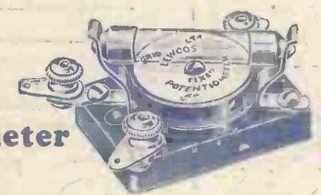
An appreciation from Industrial Progress (International), Ltd., Bristol

The above letter is a further appreciation of the unique qualities of the Lewcos H.F. Choke. The fine materials and the high-class workmanship used in its manufacture make it supreme. The terminals are arranged one at the top and the other at the base of the Coil, to eliminate the risk of additional self-capacity in the wiring of the receiver.

The H.F. Choke curves illustrated above show the astonishing performance and advantages of the Lewcos Choke over other makes.

A fully descriptive leaflet will be sent on request.

The Lewcos Fixed Potentiometer



Is designed to give smooth reaction control on all Radio Receivers.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
Church Road, Leyton
London, E.10

LEWCOS Regd.

Trade Counter and Cable Sales:
7, Playhouse Yard, Golden Lane, London. E.C.1

RADIO PRODUCTS FOR BETTER RECEPTION

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, January 11, 1930

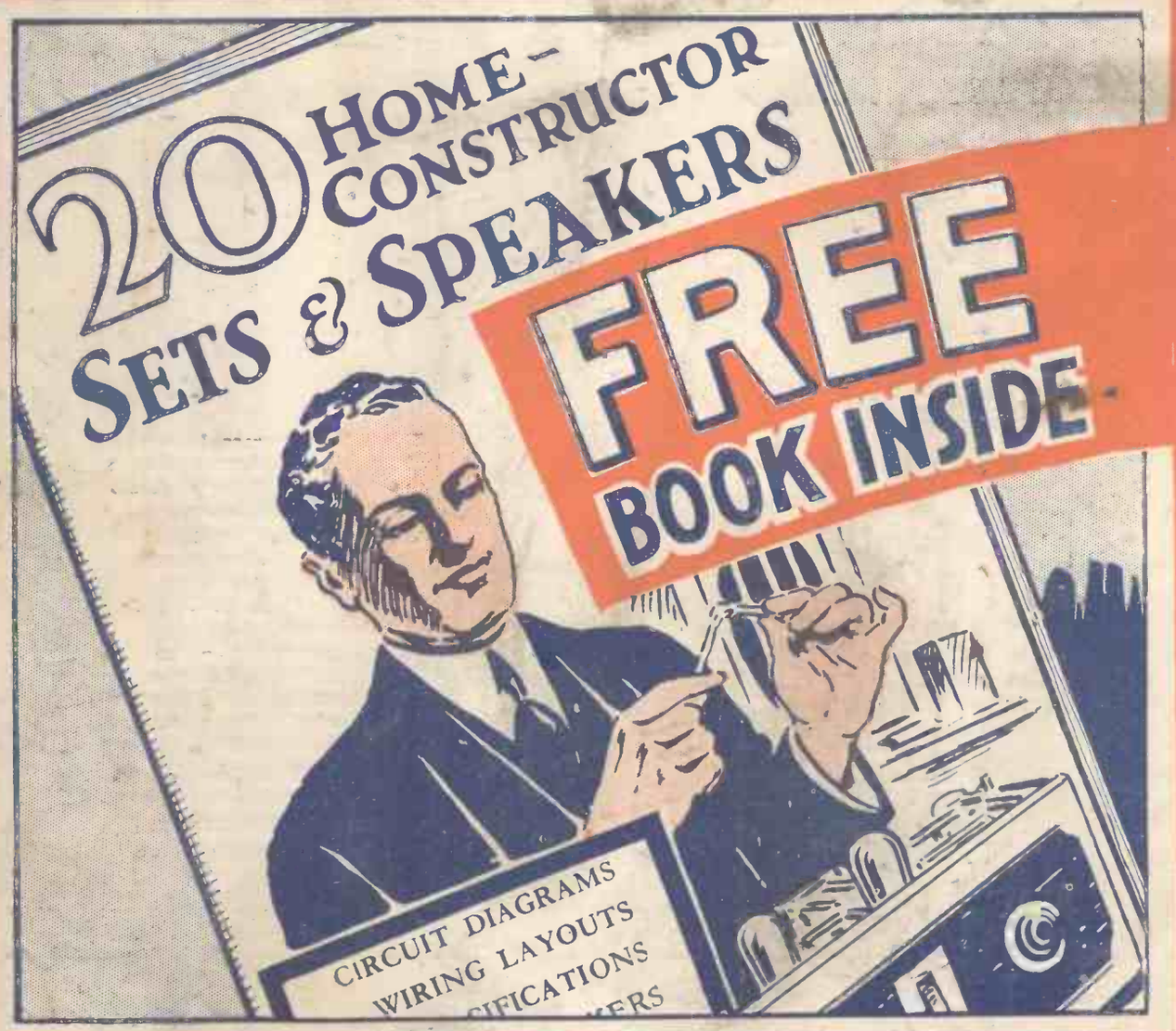
FREE BOOK— '20 SETS AND SPEAKERS' INSIDE

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVI. No. 397 Saturday, January 18, 1930



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

BECAUSE of its Interlocked Construction the *NEW* Cossor Screened Grid has a degree of strength never before attained in any valve. Unit by unit its elements are assembled — each joint electrically welded—each unit reinforcing and locking the previous one until the whole structure assumes a girder-like rigidity. Even the hardest blow cannot disturb its perfect alignment. For strength, for power and for long life use the *NEW* Cossor Screened Valve in your Receiver, no other make has Interlocked Construction.

2-volt type now available.

Cossor 220 S.G. (2 volts, ·2 amp.) Anode volts 120-150, Impedance 200,000 Amplification Factor 200. Price - - - **22/6**

Cossor 4 and 6 volt Screened Grid Valves are also available with similar characteristics at the same price.

The NEW Cossor Screened Grid Valve

3127 CA

A. C. Cossor, Ltd., Highbury Grove, London, N.5.

Don't Forget to Say That You Saw it in "A.W."

JANUARY 18, 1930 No. 397. Vol. XVI

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

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

Our Gift—The New 5GB Times—"Hunting" the B.P.'s!—The "Hare" Found—Sweden's Radio "Scotland Yard"—A New Rating—School Broadcasts

OUR GIFT—In the centre pages this week you will find the first details of our latest set—the "Best-by-Ballot 3." It is *your* set, and is, of course, the outcome of the prize-winning ballot held in the Christmas issues to determine the most popular sets at the present time. To ensure that nobody has any trouble or difficulty in making up this set, we are next week presenting a free full-size blueprint with every copy of AMATEUR WIRELESS. Turn to page 79 for further details.

The New 5GB Times—We advise you to keep at hand this new schedule of 5GB, which came into operation last week. 5GB has hitherto broadcast the weekday programmes from 3 to 11.15 p.m. A programme is now radiated from 12 noon until 3 o'clock, when the station closes down. The evening programme starts at 5.15 and ends at 10.30. No transmission will take place between 12 and 3 on Saturdays, the programme hours on that day being 3.30 to 10.30 p.m. The first news bulletin continues to be broadcast at 6.15 p.m., and the second news bulletin is changed from 10 to 10.15 p.m. No late dance music will be given in future. The hours of transmission on Sundays are 4.30 to 10.30 p.m.

"Hunting" the B.P.'s!—In view of the discussion which has been aroused in amateur circles by the working of the dual transmitters at Brookmans Park, it is interesting to hear of a selectivity "hunt" by a prominent manufacturer and an official of the Radio Manufacturer's Association. Late one night last week important tests were carried out in order to investigate complaints respecting the twin programmes. That well-known pioneer, Mr. L. McMichael undertook the tests on a four-valve portable and he was accompanied by another radio authority and an official of the R.M.A.

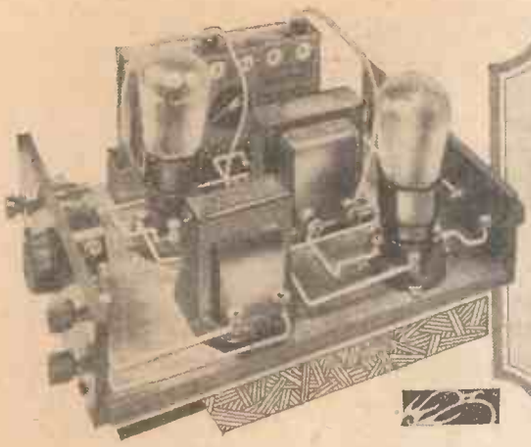
One licence for 200 families! A "communal" radio set has been fitted to a block of flats in the West of London. Here is a view of the installation and one of the 200 receiving points

The "Hare" Found—The party started testing by the roadside in various parts of North London and Hertfordshire at 11.40 p.m. and continued until midnight. The last halt was made at the gates of Brookmans Park when not only were the twin programmes separated and heard clearly, but several continental stations, including Berlin and the Eiffel Tower, were received! The moral? Well, just that selectivity is *not* yet a thing of the past, provided you use efficient tuning arrangements.

Sweden's Radio "Scotland Yard"—Many complaints from Swedish listeners have influenced the Swedish Government radio department to establish a unique kind of "Scotland Yard." This is a control station in the little town of Eskilstuna in central Sweden. The cause of the complaints of the listeners, who have been disturbed by insistent and powerful interferences, has now been traced by the radio police. It was found that a station in a certain capital of a Central European country had not respected the Prague Plan, but arbitrarily changed its wavelength with the result that it conflicted with that of Sweden.

A New Rating!—The engineers who built Huizen (the short-waver) have been digging into some funny statistics. Huizen has a power of 120 kw. The power used by an average person speaking has been calculated as being equal to .0001 watt. It would therefore take 12,000,000,000 people to produce a power equal to that of Huizen! Yet, when this station is received and heard at normal strength on a loud-speaker, the pressure on the ear-drum of a person standing 10 in. away is only .000001 of an atmosphere! There seems to be a snag somewhere.

School Broadcasts—Despite opposition in some quarters, the educational people at Savoy Hill are pushing forward with the 1930 programme of broadcast education for schools. Even the most severe critics must concede that the programme is extraordinarily complete. On Mondays the broadcasts to schools will consist of readings and dialogues in foreign languages for secondary schools, history and stories for younger pupils; on Tuesdays, of music, elementary and advanced, French, and special talks for secondary schools; on Wednesdays, of nature study and English literature; on Thursdays, of speech and language; and on Fridays, of rural survey and farming, geography, miscellaneous courses, concerts, and plays.

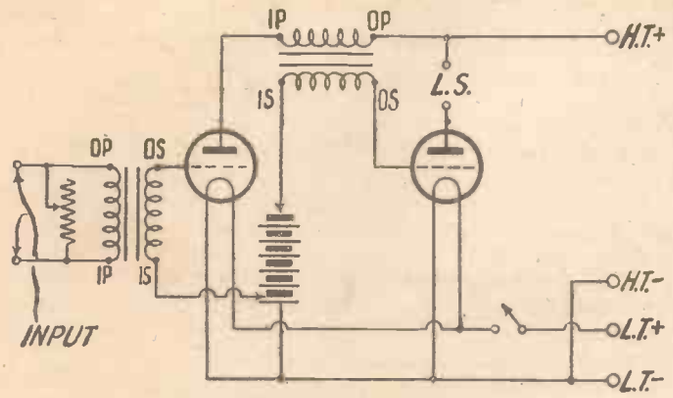


A USEFUL TWO-VALVE AMPLIFIER

A number of uses can be found for this amplifier. For instance, it is just the thing to bring crystal reception up to loud-speaker strength, or it is equally suitable for gramo-radio purposes.

NOWADAYS there are dozens of uses to which a simple two-stage low-frequency amplifier can be put. In a recent issue was described the "Beginner's One-valve L.F. amplifier," for addition to units such as the "B.B.C. Crystal Set," or the "B.B.C. One Valver."

Now here is an equally simple two-stage amplifier which, of course, gives greater amplification and which will find an even greater number of uses. It can be used in just the same way as the one-valve amplifier, with an existing receiver; or it can be used for gramo-radio work, and with most pick-ups will give good loud-speaker reproduction. For simplicity, transformer coupling is used, both in the input and between the two L.F. valves.



The circuit of the amplifier

But few parts are needed for the construction of this unit, and in their choice readers should be guided by the following list:—

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

Two ebonite strips, 6 in. by 2 in. (Trolitax, Lissen, Raymond, Becol).

Push-pull filament switch (Junit, Lissen, Bulgin, Keystone).

½-megohm volume control (Lissen, Igranic, Rotorohm).

Eight terminals, marked: Input+, Input−, L.T.+, L.T.−, H.T.−, H.T.+, L.S.+, L.S.− (Belling-Lee, Eelex).

Two valve holders (W.B., Benjamin, Lissen, Igranic)

Low-frequency transformer, ratio 3 to 1 (Lotus, Varley, Lissen, Igranic, Bulgin).

Low-frequency transformer, ratio 5 to 1 (Burton, Varley, Lissen, Igranic, G.E.C., British General).

Grid-bias battery clips (Bulgin)

Three wander-plugs, marked: G.B.+, G.B.−1, G.B.−2 (Belling-Lee, Eelex, Clix).

Connecting wire (Glazite).

Half a yard of thin flex (Lewcoflex).

A full-size blueprint has been prepared, and though the construction of the unit is essentially simple, this blueprint will be found useful, because it gives a wiring plan and shows all the components in their exact positions. The print can be obtained (price 1s., post free) from the Blueprint Dept., of AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4 No correspondence is needed. Just ask for print No. 216.

The unit is made up as simple as possible. Strictly speaking there is no panel. A terminal strip at one end of the baseboard carries the battery and output terminals, while a strip at the other end carries two input terminals, a volume control, and an on-off switch. Both these strips can be drilled, using the blueprint as a guide, and they are then screwed direct to the edge of the plywood baseboard.

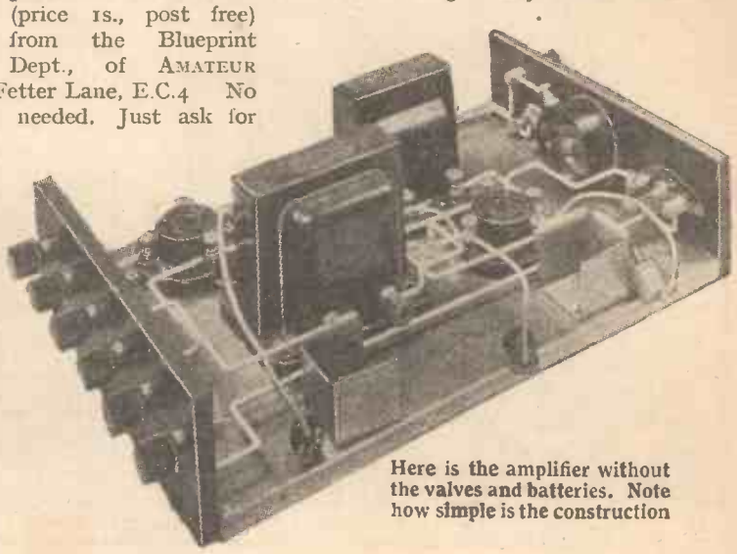
On the baseboard are mounted two low-frequency transformers, two valve-holders, and two clips supporting the grid-bias battery.

Wiring is straightforward. The connections of the volume control are so arranged that adjustment of the input strength does not have any adverse effect on quality

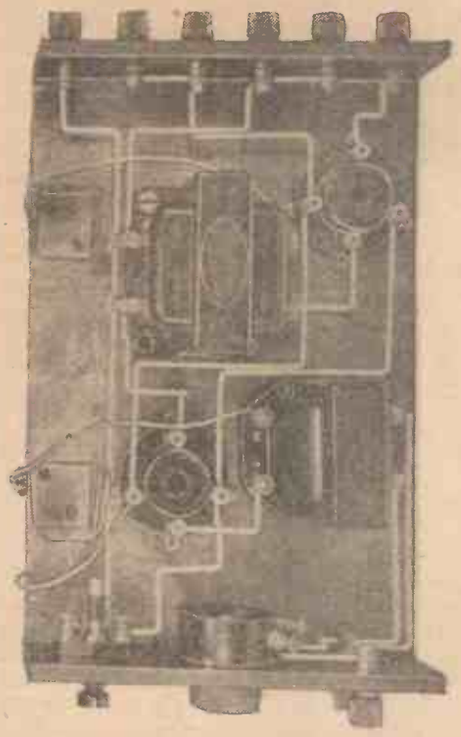
Constructional Points

The amplifier may be coupled direct to an existing valve set and in this case care should be taken to get the input terminals the right way round. With the Lotus L.F. transformer wired as in the original unit, the upper input terminal should be connected to positive high tension, and the lower input terminal to the anode side of the detector circuit. Rigid insulated wire is used for connections and it will be seen that the components are so arranged that all the wires are as short and direct as possible.

Make sure that you connect both transformers the right way round. If the



Here is the amplifier without the valves and batteries. Note how simple is the construction



Comparison of this plan view with the wiring diagram will facilitate the construction

windings are incorrectly connected, either indifferent results will be experienced, or motor-boating will be set up.

Short flex leads are used in order to make connections from the transformers and the L.T. negatives to the grid-bias battery. When you have completed all the wiring, check it over very carefully, using the blueprint as a guide, for wrong connections may mean a burnt-out valve.

So far as valves and batteries are concerned, these matters will depend entirely on the use to which the amplifier has to be put. For gramo-radio work about 120 volts should be applied to the H.T. terminal, the first valve should have an impedance of about 10,000 to 15,000 ohms (that is an ordinary L.F. or general-purpose valve), while the power valve should be a valve with an impedance of between 5,000 and 9,000 ohms.

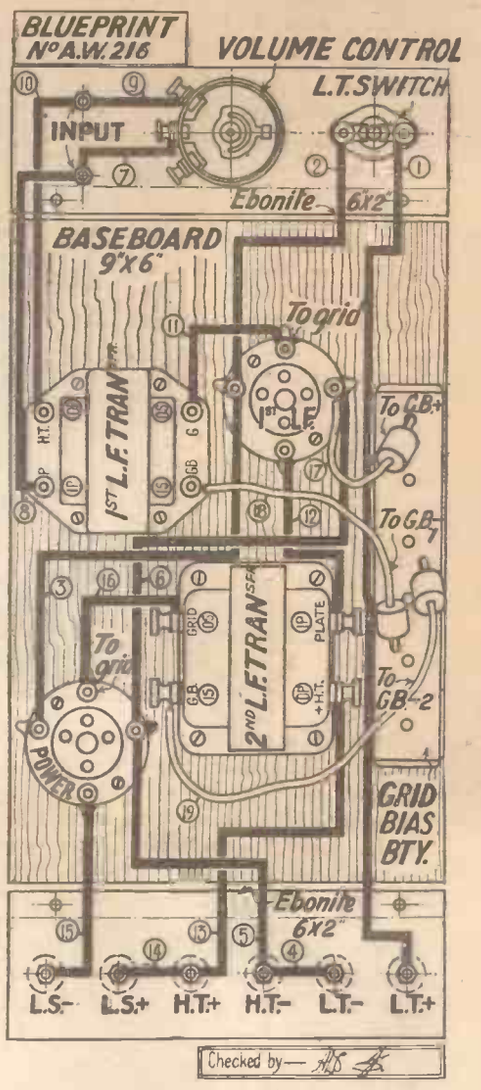
For somewhat heavier work, the H.T. voltage may be raised to 150 or even 180 volts, a small power valve having an impedance of about 9,000 ohms should be used in the first valve-holder, while the second stage should be a power valve of the super class having an impedance of perhaps only 2,000 ohms.

RESISTANCE OR IMPEDANCE

ALTHOUGH one is recommended to speak of the internal or A.C. resistance of a valve, in preference to using the term impedance, the distinction so drawn is not wholly correct. The capacities existing between the plate, grid, and filament inside the valve form an impedance factor which (unlike resistance) varies very considerably with the frequency being handled.

For instance, the input "resistance" of a negatively biased valve is not infinite, as one might imagine (since the circuit is broken between grid and filament), but may have an effective impedance varying from 50,000 to 200,000 ohms according to the frequency being handled. Further, owing to the inter-electrode capacity coupling, the value of the input resistance is to some extent affected by the impedance of the output or plate circuit.

B. A. R.



The wiring diagram. A full-size blueprint is available, price 1/-

FREE GIFT No. 2—NEXT WEEK

Large Blueprint of our Readers' Ideal Set, "Best-by-Ballot 3"

This week—a 32-page Booklet is presented with every copy of "A.W." Next week—A FULL-SIZE BLUEPRINT OF AN IDEAL SET will be given free to every reader!

There are blueprints *and* blueprints. This is a *large* Blueprint, approximately 22 in. by 18 in. An *absolutely full-size* Blueprint, so accurately prepared that it can be used as a template when setting out the panel and baseboard.

A REAL HOME-CONSTRUCTOR GUIDE BLUEPRINT, complete in every detail and ready for immediate application to the job. A full-size layout and wiring guide, so simple that with it at hand you cannot go wrong.

And what of the set—the "Best-by-Ballot 3"—which will be the subject of next week's free blueprint? Well, in a sense, readers of AMATEUR WIRELESS designed it. They said what sort of a set was their ideal; what systems and what details they would like it to incorporate. The set's a beauty, as good a "three" for British and Continental stations as anybody could reasonably want or could wish to build at the low price to which our Constructional Staff was instructed to work.

Control is easy and simple—no "lid-lifting"; battery consumption low; layout, intelligent, thoughtful, convenient. In a word, just the reader's ideal set "edited" and "revised" by the AMATEUR WIRELESS experts.

STILL ANOTHER FREE GIFT WILL BE ANNOUNCED NEXT WEEK

ALTHOUGH he does not always receive recognition, the announcer is entitled to a place among masters of the microphone. His work is an art often as difficult as any practised by those whom he introduces to the listening public.

I am not sure whether radio announcers of to-day receive much "fan mail" breathing adoration and requests for signed photographs. Probably persistent anonymity coupled with the fact that so much of their conversation is about the weather, spares them in this respect. At the same time, an announcer's task calls for qualities which are praiseworthy if not spectacular

The days when announcers were called "golden voiced" seem to be passing away The probability is that, through radio, listeners are coming to realise that ordinary good "King's English" is not beyond them; and the "golden voice" of the announcer is merely that of a practitioner of King's English crying in a wilderness of slang and slovenly talk.

The Impersonal Element

A factor, more important in announcing than is the ability to speak English well, is the ability to be impersonal. Most listeners will realise that an announcer is required to announce without recording his own feelings about the matter This restraint can prove a most difficult task at times, for announcers, like everyone else, are human, with their own axes to grind, and their own desires to give "points of view."

Yet the use of a "wooden voice" is based on sound principles. It has been urged in some quarters that if announcers were given more freedom of style—if, for instance, one of them adopted the "A. J Alan" method of delivery and another the "Sir Walford Davies"—their work would command even greater attention. On the face of it, this variety would seem to be the spice of broadcasting. But as one announcer put it to me, "such a method would be fatal at the end of a month! Don't forget that announcers, unlike other speakers in front of the microphone, are there constantly. A marked style would grow wearisome and the best style is no style at all."

Yet in demanding no style at all from its announcers the B.B.C. does not expect mediocrity. An announcer has to be able to rise to an occasion and, if necessary, charge his voice with just the right kind and right amount of emotion which that occasion demands.

A particularly good example of this was heard when radio was utilised for the spreading of news during the General Strike. The reports sent out were often such that, seen in cold print, would have made very worrying reading. In announcing them, however, listeners heard voices that were reassuring and steadying—and the presence of that reassurance was due neither to accident nor blind optimism. It was the art of announcing at its pinnacle.

Universal Criticism

The ease with which announcers speak is not always one which they feel. Perhaps they know that they are looked upon as natural targets for criticism, and no one likes to be shot at. I know at least one announcer who cloaks a severe "microphone fright" every time he speaks, while another has assured me that an announcement to "all stations" gives him a thrill of anxiety which long experience has not been able to allay. It is all the more to the credit of these two, therefore, and others like them, that from the "loud-speaker end" I have never detected anything other than an admirable coolness in their speaking.

It is, perhaps, not surprising, in view of the self-effacement generally expected of announcers, to find an occasional outcropping of personality. So long as it does not develop into a habit, inviting the demon of boredom, it is wisely allowed to pass. Thus the announcer who added "Good rest!" to his usual "Good night, every one!" received general acclamation. But he has been wise enough to use the addition only on rare occasions—for otherwise, as he is no doubt well aware, an unkind public would be only too ready to feel first bored and then skittish concerning this otherwise friendly phrase.

A Real Art

The art of the announcer is not one which can clearly be defined. Unlike the arts of, say, painting, dancing, music, and literature, it is not one where self-expression comes first. It is the art of being a back-ground, the art of setting a standard, both in speech and bearing, at which radio performers may aim without being outshone if they fail. It is the art of concealing art.

And while announcers are expected to know something about everything—so that they may correctly pronounce the names of Chinese generals and botanical specimens—it is also an advantage to them to know everything about something, that something being human nature. They are the captains of the studio, dealing, sometimes, with "artistic temperaments"; and from what I have seen of them they are required to exercise as much graciousness and kindliness inside the studio as out "on the air." It is true they may not give rise to a desire to chaff, but if the jokes about announcers are few and dignified, there none the less exists a feeling of goodwill between most of the announcers and those with whom they deal, which is again as much a part of the announcer's art as of his human nature.

Finally, by virtue of his particular share in broadcasting, the announcer is, on occasion, a man to whom all men will listen. It is one of the most creditable features of broadcast listening that, no matter what they are doing, 90 per cent. of listeners will pause to attend to an S O S. And if the work of assisting those in distress and of spreading the possibility of happiness and reunion for them were the only tasks of a radio announcer, they would surely constitute an art of which he might well be proud! ALFRED DUNNING.

A revival of "My Programme" broadcasts has been arranged for Scotland. In the first instance, the programmes will be constructed by people connected with broadcasting, though not officials of the corporation. The first of the new "My Programmes" has been prepared by T. P. Maley, whose work as dramatic producer and actor for the B.B.C. in Glasgow is well known.

A Simple Way of Locating Distant Stations

By N. W. McLachlan, D.Sc., M.I.E.E., F.Inst.P.

THE enthusiastic amateur has two great ambitions. One is to obtain perfect quality from the local station, the other is to log more distant stations than anyone else. We have one and all turned two or more condenser knobs for hours in the vain hope of hearing Finland laugh or China cough. Although buoyed with hope and full of expectancy, the tuning process lacks excitement, and a time comes when we tire of reaching out very far and content ourselves with reception of near-by stations.

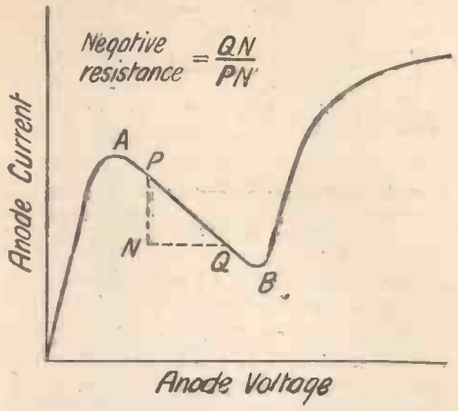
In winter it is common experience that one's harvest of distant stations exceeds that in the summer time. The influence of the summer sun on the atmosphere is such as to cause fading with consequent reduction in signal strength. Furthermore, electric disturbances are more prone to occur in the summer than in the winter months

A Station Finder

Everyone is familiar with the well-known heterodyne wavemeter, which consists of an oscillating valve and its associated circuits. When this is placed near a receiver tuned to a certain station, it is possible to secure a beat note of variable pitch by merely turning the condenser of the wavemeter. This instrument, however, is only useful *when we have found the distant station*. What we really desire is to know where to set the tuning controls of the receiver in order to find, say, Cologne.

A Simple Instrument

To make the process of locating distant stations simple, and to avoid needless searching by tuning for long periods in the pious hope of finding a station, I have devised a simple piece of apparatus called a *radio station finder*. In this apparatus use is made of a certain property of the screened-grid valve. A characteristic curve showing anode current and anode voltage for a definite value of grid bias is illustrated in the diagram. Over the portion AB, which slopes downwards to the right, the anode voltage increases as the anode current decreases. This is the reverse of the usual state of affairs. Under such circumstances the valve is said to have a *negative resistance* over the section AB. If the valve is arranged to operate over the portion AB, and if a suitable radio circuit consisting of a coil and condenser is connected in its anode circuit, persistent oscillations will be generated. Thus the arrangement will operate as an unmodulated transmitter and can be used in the same way as the heterodyne wavemeter mentioned previously. By adding a low-frequency circuit, having a frequency of, say, 800 cycles per second, to the above arrangement, the valve generates simultaneously two sets of oscillations (i.e., radio and audio) in its anode circuit. The



Curve showing anode current and anode voltage for a definite value of grid bias

result is that the apparatus radiates high-frequency waves modulated by an 800-cycle note. If now the apparatus is brought near a receiver, it is possible to tune to the high-frequency waves by observing when the 800-cycle note is loudest in the 'phones or loud-speaker. In other words, the apparatus is a miniature broadcast transmitter, whose wavelength can be varied by a condenser, and which is always modulated by a tuning note of 800 cycles. Such a piece of apparatus can be regarded as a *radio station finder* or modulated C.W. wavemeter. An instrument embodying these principles and calibrated to cover a range from 15 to 3,000 metres or more, is manufactured by Gambrell Radio and illustrated photographically above.

How the Finder is Used

The following examples will illustrate its use in finding distant stations, whether in Great Britain or abroad. To find Cologne proceed as follows:

1. Ascertain the frequency or the wavelength of the station desired. In this case the frequency is 1,319 kilocycles, corresponding to a wavelength of 227 metres.

2. Look up the charts and ascertain the correct coil and the reading of the condenser to give this wavelength.

3. Adjust the tuning condensers of the receiver until the musical note in the telephones or speaker is loudest.

4. With the receiver tuned as in (3), swing the wavemeter condenser five divisions on each side of its present setting. The receiver tuning should be quite sharp and the musical note should be at a maximum at only one setting of the wavemeter. If the note is loud on two or more settings of the wavemeter, or persists over several degrees of the condenser, some of the receiver circuits are not in tune and the condensers of the receiver must be re-adjusted.

5. Having tuned the receiver, switch off the wavemeter. The distant station will be heard if it is transmitting. A little tuning adjustment on the condensers or more reaction may be necessary to bring the signals up to full strength. Absence of signals means that either (*a*) the station is not working, (*b*) the signals are extremely weak, (*c*) the receiver is not operating properly.

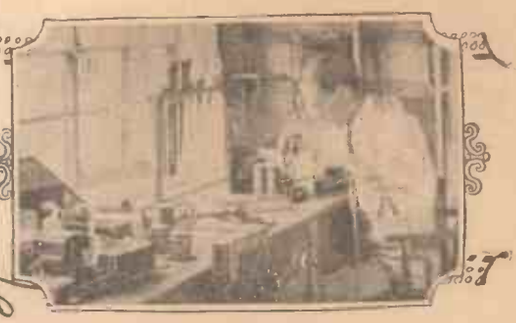
To ascertain the wavelength of a distant station which is being received, proceed as follows:

1. Set up the wavemeter as before and swing the condenser until a note is obtained whose pitch varies with the setting of the wavemeter condenser.

2. As the condenser is rotated, the pitch of this heterodyne note falls gradually until it becomes inaudible, and then rises again beyond audibility. The correct setting of

(*Continued in third column of next page*)

My Wireless Den



Weekly Tips—Constructional and Theoretical—by W. JAMES

A By-pass

HAVE you ever realised that the use of a detector by-pass condenser may improve not only the selectivity, but the volume as well?

I discovered the effect years ago whilst investigating detectors, especially those having negative grid bias. This form of rectifier, being so operated, as it is, that grid current does not flow, was generally supposed not to introduce damping into the circuit connected to it. But I found the detector did introduce damping.

It lowered the voltage of the signal in the tuned-grid circuit and broadened the tuning. By connecting a condenser between the anode and filament the damping was removed, signals being practically doubled in strength in certain instances.

This condenser is not always used, even to-day; but, needless to say, one should always be fitted. It may take the form of the reaction condenser, and in this connection the so-called differential type has its advantages. A condenser of fairly large capacity is usually best, about .0003 microfarad being the minimum. It depends, of course, upon the type of valve used and the rest of the circuit.

My Wander-plug Comments!

In looking over a box of odds and ends lately whilst tidying up, I discovered no less than a dozen different makes of wander plugs.

How I came to have so many is quite beyond me to explain; let's hope they were all bought and paid for! Not that all of them were good ones; far from it.

Indeed, many of them seemed quite unused. They looked perfectly good wander plugs, but they were either too fat or too thin for the sockets provided in my usual grid and high-tension batteries. The sockets themselves are not of uniform size. Some makes are larger than others, with the result that really good plugs of the correct size and having springy prongs are essential for providing really reliable contacts.

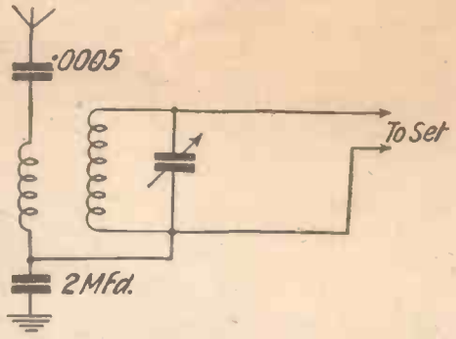
There are some wander plugs which are not a good job. Some patterns do not hold the connecting wire firmly. Others tend to cut through the wire. The best, of course, grip the wire tightly and no strands are broken when the plug is tightened.

Some plugs have ridiculous contact prongs. One type I noted was just a brass rod having a sawcut. It was fragile, a poor fit, and could not be adjusted to hold tightly in a socket for any length of time.

There were others which were little better in this respect. The satisfactory ones were really springy but firm. They were properly marked, too—a great advantage, particularly whilst experimenting.

Safety and Mains

Are you using a direct-current mains unit? If you have one fitted to your set, are you certain the outfit is properly protected and safe. Have you a fixed condenser in the aerial wire, for instance, as well as one in the earth lead?



A safety condenser arrangement which should be employed when direct-current mains are used to supply H.T. to a set

This aerial condenser is, I find, not always used and, as a matter of fact, may not always be essential. But it is the better plan always to connect one between the aerial wire and the aerial circuit inside the set.

Its capacity is of no great importance, provided it is not too little, when it would sharpen the tuning of the set. Anything above .0005 microfarad would be suitable.

In the earth circuit a larger condenser is more generally used. The capacity of the earth-circuit condenser is often 2 microfarads. If it is too small a hum may be heard, depending upon the mains.

The aerial condenser has nothing to do with hum. Its purpose is to isolate the aerial from the mains, and so to prevent one from obtaining a shock by touching the aerial should it so happen that the main connected to negative low-tension in the set is at considerable voltage from earth. The accompanying sketch makes the arrangement quite clear.

Bias—and Sharp Tuning

Many "local station" sets have an anode-bend detector because the signal to be handled amounts to several volts, and with this type the distortion is the minimum. The selectivity, too, is better than when a leaky-grid detector is used.

Listening to the two stations at Brookmans Park the other day on a simple set, I noticed there was slight interference, the speech from one being just audible during intervals in the musical programme from the other. Reaction was not provided in the set, and for a moment I wondered how best to remove the slight but annoying interference. But presently it occurred to me that I had purposely under-biased the detector for the purpose of making its working anode impedance as little as possible. This tends to improve both magnification and quality, but it was the reason for the interference, as by increasing the amount of the bias (making the grid of the detector more negative) the second station was completely removed. Those familiar with anode-bend detectors may have noticed that the apparent selectivity is dependent to an extent upon the grid bias and anode voltages, and may have had an experience similar to my own. Incidentally, the same result could have been achieved by reducing the H.T. of the detector by a small amount, and this would in a number of instances be the better method to adopt.

"A SIMPLE WAY OF LOCATING DISTANT STATIONS"

(*Continued from preceding page*)

the wavemeter is found when the pitch of the heterodyne note is zero and the musical note of the wavemeter is purest. When the condenser is rotated a few degrees on either side of the correct settings, the heterodyne note will reappear. It should be understood that although the heterodyne note is loud, no interference is experienced by neighbouring listeners.

3. Read the condenser and from the chart find the frequency or wavelength which corresponds to this condenser reading.

4. From a list of stations and their wavelengths the incoming signals can be identified.

On Your Wavelength!

Fine Work

THE B.B.C. has given us some excellent relays of late, both of European and of American programmes. We have not yet reached the time when, except in particularly favourable circumstances, American stations can be relayed over here with a complete absence of distortion or of loss of both very high and very low notes. One of the worst enemies of relaying with the short-wave link at great distances is quick fading, which causes the signal to wobble, as it were, and gives rather the effect of waves washing against the shore. Still, these American relays are jolly good in that they let us see something of the kind of programme fare that our transatlantic cousins have, and I hope that we shall have more of them. The relays from stations such as Brussels and Cologne are extraordinarily good from every point of view. Personally, I would like to see relaying—not, perhaps, of scraps from various stations, but of outstanding programmes from abroad—made a regular feature of our home broadcasting.

Funny, Isn't It?

The exchange of programmes at Christmas time between this country and the United States produced rather an amusing situation. We selected for transmission to America a Cockney programme, which made no very great appeal, since London's own particular dialect is even more of a foreign language to the Americans than are the accents of the innermost Bowery to us. The result was that the average listener could hardly understand a word of it, and, judging from the comments that I have seen, didn't think much of what he *did*. If the English programmes consist of tripe like that, etc. The Americans sent us a programme full of coal-black mammies, and the jazziest of jazz and negro spirituals, and one heard people freely express the opinion that if on the other side of the Atlantic the programmes consist of tripe like that, etc. And there you are, you see; or quite possibly there you aren't, and don't see. Anyhow, it is all rather complicated.

Wanted—A New Valve

The coming of the regional scheme has already had its effect upon receiving gear, and it is going to have an even greater effect still as the months roll by, and more and more big fellows come into operation, slinging out alternative programmes on different wavelengths in different parts of the country. One of the difficulties is this. With 1- or 2-kilowatt stations the number of listeners living within what I call the swamp area is quite limited. But the more you raise your power the bigger is the number of people whose aerials bring in terrific signals. Now, in the swamp area, this big signal strength means that the detector valve has to cope with something very much bigger in the way of grid swings than it ever dreamt of in the past. Unless one is very careful, distortion can be introduced by the overloading of the detector—a very undesirable form of distortion, since each note-magnifier makes it worser and worser.

Special Requirements

When using such valves as are general nowadays it is extraordinarily difficult, without a huge plate voltage, to prevent the anode-bend detector from being overloaded, and it is still more difficult to make a leaky-grid detector comfortable, since one of its little failings is that it does not like strong signals. What we need, I think, is a new valve especially designed for rectifying these big grid swings without being overloaded. It must not need too much in the way of plate voltage, nor must it consume a vast amount of H.T. current. It should, I think, be designed especially for the parallel-feed circuit that I have mentioned before in these columns. In this you combine resistance capacity and transformer coupling. From the plate of the detector there are two paths: the first via an ordinary coupling resistance to H.T. positive, the second by way of a coupling condenser and the primary of a transformer to earth. The secondary of the transformer is connected to the grid of the following valve and to the grid battery. The presence of the resistance cuts down the plate current considerably, and with this system you obtain all the advantages of resistance coupling together with all the advantages and none of the drawbacks of transformer coupling. Both the quality and the step-up effect are there.

Hooray!

For some little time past conditions for long-distance reception have been rather depressing, probably owing to those infernal sun spots. During the past ten days a tremendous improvement has taken place, and the set is now far more lively than it was at the beginning of the year. The position on the broadcast band is very curious at the moment. An examination of the monthly reports of the Brussels Laboratory would lead one to suppose that there was hardly a station that could be received without a heterodyne. Actually, as readers who take radio trips abroad will know, there are very few nights when a dozen or more stations cannot be picked up at good strength and perfectly clear of unwanted accompaniments. Whatever the croakers may say, DX listening is not dead yet by a very long chalk.

Sane or Insane?

There are, of course, two kinds of long-distance listener: the man who doesn't care two hoots what he hears provided that it comes from a distance of umpteen hundred miles, and the man who won't bother about any foreign station unless his loud-speaker will give him reproduction of its programmes that is genuinely worth listening to. The man who is interested only in stations that can be received at good strength and without whistles or sparks I call the sane DX man. I must admit, though, that there is a thrill to be obtained in picking up just occasionally a few stations, distorted though they may be, from very distant parts of the world. But, like most thrills, this one very soon palls if you overdo it. There is one other semi-sane long-distance merchant: the fellow who as soon as he has "got" Vienna switches over in the middle of a bar to Brussels, subsequently flitting from Brussels to Oslo, from Oslo to Rome, from Rome to Breslau, from Breslau to Toulouse, and from Toulouse to Cologne all in the space of half an hour. More happy homes have been broken up by this way of torturing musical wives than by any other that I know.

I Stand Accused . . .

My ears burnt when I read Baynham Honri's article in the current issue of *Wireless Magazine*. After alluding to me as "our mild-and-bitter friend," he next accuses me of "song-plugging" the virtues of "The Squeak"! Rather than say anything more that may turn out to be incriminating, I think you had better get a copy of the January number and read the article for yourself!

If you do, I may add, you will not be disappointed. I am certain you will be as interested as I am in the design of W. James' "Brookmans Four," a new set using two screen-grid valves in conjunction with the 1930 Binowave coils—a real "he-man" combination.

Those Sidebands

I came across a funny effect the other day which throws an interesting sidelight on the existence or otherwise of the much-discussed sidebands in radio transmission. I was using at the time a frame-aerial set having one stage of screen-grid amplification, a detector, and a fairly beefy-sized amplifier afterwards. The amplification was sufficiently good to give good moving-coil speaker strength on quite a number of foreign stations.

On Your Wavelength! (continued)

Now, I found that whenever London was not working, such as on Sunday evenings, I could obtain these distant stations without difficulty, but the advent of Brookmans Park on the scene promptly put a stop to all such reception. The distant stations simply faded out as soon as London came on the scene, and one obtained nothing else but London.

So far, there is nothing to startle the gentle reader. We have all experienced the same effect. The point is, however, that I happened to tune in idly the other day when London was not modulating. I found, to my surprise, that I could tune in several of the foreign stations which were normally blotted out, and that I could continue to do so until 2LO modulated. Then the wipe-out became evident at once.

There is food for thought here. If one can eliminate the sidebands from 2LO, apparently, reception on near-by wavelengths is quite practicable. But the energy in the sidebands is only one-quarter of the total, and therefore they should be comparatively easily obliterated. Now, all ye technical wallahs, what about it?

Play Technique

Slowly, but surely, the dramatic people at the B.B.C. are realising the artistic possibilities of various technical tricks. Some two or three years ago an elaborate dramatic control-board was installed for the benefit of the producer of radio plays. This "gadget" enabled him to mix up the outputs of any number of studios, introduce the right amount of background noises, or dissolve the sounds of one studio into the sounds of another. After a half-hearted "try out," the apparatus remained unused for several weeks, little importance being attached to the "freak" effects which it made possible. And then along came Messrs. Cecil Lewis and Sieveking, gentlemen who were afflicted with extraordinary ultra-modern ideas about the "rhythm and momentum" of sound plays.

A Fade-in

Suddenly the dramatic control-panel came into most extensive use. Hitherto, radio plays were nearly always produced in one studio, with "effects" located somewhere behind the players. Radio-play producers gradually revised their policy as they became more acquainted with the workings of the dramatic control-board. And now the effects the producers want in their plays have got beyond the scope of this control board. The scripts of the latest radio plays are calling for complicated combinations of sounds from two or three studios mixed up with gramophone records and an outside broadcast, the total number of "channels" of sound sometimes reaching ten.

Talking Film to Radio

The talking-film companies have taken a large number of ideas—and people—from the B.B.C., and one of the ideas which has been developed by the British companies is the original B.B.C. dramatic control-board. It is now the turn of the B.B.C. to borrow a few ideas from Islington and Elstree studios—rival institutions which are almost entirely "microphoned" by ex-B.B.C. engineers. In both of these studios the dramatic control-board idea has been much used, and at Islington, at the studio of Gainsborough Pictures, Baynham Honri, the chief recorder, has devised a dramatic control-board system employing trap valves for the prevention of interference between the various channels of sound and for ensuring that circuit impedances shall be constant, no matter how many microphones or pick-ups are used. And now a little friendly co-operation between the B.B.C. and the talking-picture people may result in a further exchange of ideas in this direction and the injection of a little talking-film technique into radio plays. As a result of these "conversations" it will not be long before some surprising new technical effects are heard by radio.

A Striking Television Claim

I see that some rather sweeping claims have been made by a Wolverhampton motor engineer, Mr. J. S. Shinton, in connection with a television patent he has just taken out. His apparatus appears to consist of revolving mirrors and a slot arrangement by which details of a transmitted picture are received and reproduced. This seems to suggest a combination of the Weiller drum used by Karolus and the Nipkow disc employed by Baird. Mr. Shinton states that his system gives a picture with greater detail and sharper reproduction.

It compares favourably with the very early films, the intensity and length of the projected light beam being said to govern the ultimate size of the picture. Apparently the all-important question of synchronising is at the moment engaging the inventor's attention, for, after all, this is the crux of nearly all television problems. Since the claims for this invention embody points including no unduly high voltages and small power units, together with a relatively low first cost and subsequent moderate running costs, a more detailed explanation of the methods employed and the results achieved will be awaited with interest.

HAVE YOU SEEN THE GIFT ANNOUNCEMENT ON PAGE 79?

Night Television Transmissions Started

I see that the two extra half-hour transmissions allotted to the Baird Company for television tests through the Brookmans Park station have now been taken up. Tuesdays and Fridays from midnight to 12.30 a.m. are the chosen times at present, the first transmission having taken place on Friday, January 3. There was a rather remarkable circumstance arriving out of the first night transmission, for this was successfully picked up in Germany by an enthusiastic amateur. It so happened that one of the Baird engineers who was televised had been working in Germany on the Baird transmissions from the Witzleben station during last year and the German amateur voluntarily testified to having recognised the engineer in question. This surely is something of a record, and proves that there can be little doubt as to the quality of the transmissions given normal conditions.

Home-made Apparatus

Apparently there are several amateurs up and down the country who have constructed their own television receiving apparatus and report good reception of the daily tests. One enthusiast made up his disc from cardboard owing to lack of facilities for constructing one from sheet aluminium, and even with this is able to obtain quite good pictures. Undoubtedly still greater keenness will be displayed when the second wavelength is allotted, for both speech and picture will then be broadcast simultaneously from Brookmans Park and the real advantage of television will manifest itself. That is to say, it can be proved that complete intelligence may be conveyed by calling into operation the two human senses of sight and hearing. It is to be hoped that details of the intended television programme will soon be made public.

A Useful Hint

At this time of the year the permanent magnets of my loud-speakers (I use two at once) make their annual journey to the workshops of a firm which specialises in re-magnetising and kindred jobs. I find it well worth while to send them regularly for such treatment, for even the best of magnets are apt gradually to lose their pull. Though one scarcely notices it, since the process is so gradual, the loud-speaker, whether it be of horn or cone type, slowly becomes less and less able to tackle a strong signal. If it is left long enough it will eventually chatter on loud passages. Try sending your magnets up to be treated, and you will most likely be astonished at the improvement when they come back. The whole business costs only a shilling or two, and it is very well worth it.

THERMION.

HINTS FOR THE GRAMO-RADIO ENTHUSIAST

By A. G. McDONALD

This article will be particularly useful to readers who build the "Best-by-Ballot 3" described in the centre pages of this issue and make use of the gramo-radio feature incorporated. Among matters dealt with are:—Different Types of Needles and their Influence on Reproduction—Makers' Recommendations —Burmese Colour Needles and the Pentode—Scratch Control

THE satisfactory electrical reproduction of music or speech from gramophone records depends primarily upon whether or not the vibration of the needle in the pick-up armature generates a voltage, the wave form of which corresponds to the shape of the record track. If for some reason, such as armature resonance or, say, movement due to play at the armature bearing, the needle does not follow the track absolutely, distortion of the reproduction must necessarily take place. I have been assured by more than one manufacturer that the gramophone pick-up, with the possible exception of the balanced-armature loud-speaker drive, is the most difficult piece of apparatus they are called upon to make. Experimental models may have done all that is required of them, but the same models when put into production have given very different results. It is frequently found that although the individual components of the pick-up may be exactly the same and an identical process of assembly followed, individual pick-ups of the same batch may differ quite widely in output characteristics. It therefore follows that when purchasing a pick-up, even when the particular make has been decided upon, a test under working conditions is highly desirable. Further, having purchased and installed a pick-up, a trial of various grades and types of needle points will indicate how the reproduction of the radio gramophone is modified.

If for any reason you are dissatisfied with the reproduction of your pick-up try changing the grade of needle before altering the damping, or loading the armature with plasticene, or smothering the bearings with vaseline or whatever may be your pet method of trying to damp out the armature resonance.

Makers' Recommendations

Of course, in the first instance the makers' recommendation as regards the most suitable needle to employ should be followed. An authentic list of these may prove of interest.

Amplion.—Standard loud-tone needle. If soft-toned needles are used the top register may be lost.

Brown, S. G.—Entirely a matter of taste; either fibre or ordinary steel needles may be used.

Burndept.—Columbia or H.M.V. half-tone needles. H.M.V. extra loud-tone needle.

Edison Bell.—Electric Chromic or any medium steel needle of the fairly long variety.

Edison Swan (B.T.H. product).—Choice of a proper needle depends on one's own personal test as regards reproduction.

G.E.C.—Any type of needle, no single one specified for preference.

Harlie Bros.—Any grade of needle.

Hughes (Blue Spot).—H.M V. medium tone or Columbia de Luxe.

Examples of needles referred to in the text. From left to right they are : Spear-pointed, Columbia de Luxe, Ordinary, Burmese Colour, Tungstyle and Fibre

Igranic.—Any grade of needle.

Lissen.—Lissen or Columbia spear point.

Loewe.—Any grade of needle.

Marconiphone.—Loud tone Tungstyle.

Varley.—H.M.V. loud-tone needle.

While it is true that with many pick-ups any grade of needle, within fairly wide limits, may be used with success, it is also true that for any given pick-up one particular type of needle will in the long run prove most satisfactory. It must not be forgotten that the type of record being played also may influence the choice of needle.

My own personal recommendation for the average make of pick-up is the spear point. Also as in the case of an ordinary acoustic gramophone, the semi-permanent needle should be used. By semi-permanent I mean the make of needle which is reputed to play ten records. I need not say that since record wear with the present heavily cut records needs to be guarded against, more than one playing per needle point cannot be recommended. For trying different grades of needles without having to purchase a full box of each, the Columbia Company's glass tube container of assorted needles is certainly useful.

Burmese Colour Needles and the Pentode

It is very sound practice to compensate for the losses in one part of an electrical network by additional gains in another part of it. Probably the most familiar example of this is to be found in the type of low-frequency amplifier in which the falling high-note characteristic of a resistance-coupled stage is compensated for by a rise in the characteristic of a transformer-coupled stage. This system may be applied to pick-up practice. For instance, non-metallic needles such as fibre, and particularly the new Burmese Colour needles, owe their silent playing and diminished needle scratch to the fact that the higher audio frequencies are largely cut off. A pentode amplifier on the other hand tends to emphasize the high notes unduly. Messrs. Philips supply with their four-valve all-mains receiver, the output stage of which is a pentode, special filters for the purpose of cutting down the high notes.

"HINTS for THE GRAMO-RADIO ENTHUSIAST" (*Continued from preceding page*)

It follows that in practice a very effective compromise can be made by using Burmese Colour needles in conjunction with an amplifier, the last valve of which is a pentode.

Scratch Control

Although elimination of the scratch due to the abrasive action of the needle on the record track is very desirable, I am not at all certain that scratch filter circuits are the best methods of solving the problem. I feel that the problem is best tackled on the prevention, rather than the cure, basis. That is to say extreme care in use, rigorous cleaning before use, and sticking to one type of needle will ultimately give better results. There seems to be two types of surface noise. The first is a slight hiss produced by the needle gliding over the record material. The second is an actual scratch due to wear. The note frequency of the first type of noise is somewhere of the order of 4,500 cycles, and it is this type of noise which can be readily eliminated by a scratch filter. The other type of noise has more the nature of a transient rather than a continuous noise, and this type of scratch cannot be removed from the reproduction without some loss of quality. All scratch filter circuits are bound to have some effect on the quality of the reproduction. These effects curiously enough are most noticeable on speech, particularly in sounds of a sibilant nature.

There is one other aspect of the question which must receive consideration. The "attack" of many loud-speakers depends on the wave form of the currents in the windings. A filter circuit which is designed to suppress the higher frequencies in order to remove scratch will quite possibly change the phase of the higher frequencies close to those which are suppressed. This means that the wave form of the driving current is altered and consequently the "attack" is necessarily modified also

It is easy to attach a pick-up arm to an ordinary gramophone

Tone-arm Vibration

An annoying phenomenon frequently met with on several well-known makes of pick-ups is that of vibration of the whole of the tone arm as well as the pick-up armature on some particular note. Just as an organ when some particular note is played will make a church vibrate strongly, so a pick-up can make the supporting arm resonate in an unpleasant manner. It is frequently found, too, that not only does the pick-up arm vibrate, but also the whole of the gramophone itself. Apart from the fact that extraneous noise from the pick-up is undesirable, the reproduction itself will be found to be irregular.

As regards the cure for troubles of this character some experimenting may prove necessary, but the lines on which the problem should be tackled are fairly clear. Resonance of the gramophone cabinet is damped out by standing the fect on some vibration absorbing material such as rubber, cork, or felt. On ordinary acoustic gramophones this cabinet resonance used to be emphasized by standing the cabinet on glass insulators to produce a more robust tone. Pianos are also frequently placed on glass pedestals for the same purpose. Vibration of the tone arm is best cured by introducing some damping at the pivot. I have found that thick grease is particularly useful for this purpose. While it is necessary that the pick-up mounting should swing freely so that record wear should not be excessive, when resonance of the type described above is experienced some form of resistance at the pivot appears to be desirable.

H.M.V. Oil-damped Pick-up

The problem of minimizing record wear really boils down to a question of providing the pick-up needle with a load that is a pure resistance. If the reaction due to the displacement of the needle in following the record track is not absolutely coincident with the displacement itself, wear is bound to result. In practice it is extraordinarily difficult to make the load resistive only. The rubber damping usually employed is a good approximation but it is by no means perfect. The oil damping method used by the Gramophone Company is a good example of the practical application of the theory of the desirability of resistance loading.

Oil Creepage

I hear that in the new models of the products of the combined H.M.V. and Marconiphone Companies the oil-damped pick-up will be discontinued, the reason being that although this pick-up gave very good results both from a reproduction and record wear point of view, yet trouble was experienced because excessive maintenance was necessary. Creepage of oil was the principal trouble experienced.

If this is the case, it seems a pity that the oil-damped pick-up cannot be sold separately to amateurs who would not mind trouble with leakage of oil if long-playing life of records could be assured.

SMALL TRANSFORMERS

THERE is much to be said in favour of the new type of low-frequency transformer in which the ordinary iron core is replaced by a special alloy of iron, nickel, and cobalt. There are a series of such alloys—for instance, Permalloy and Mumetal, all of which are distinguished by their high permeability or extreme sensitiveness to magnetising force. Their use allows a considerable reduction to be made in the cross-section of the core stampings, with a corresponding reduction in size and weight.

If such transformers are inserted directly in the H.T. supply, so that the direct as well as the alternating-current component passes through the windings, there is a possibility that the former will saturate the core, and so lead to a slight loss of the highest and lowest audible notes. This can be avoided by feeding the plate direct through a suitable resistance of 25,000 ohms and connecting the transformer primary in shunt through a .5-mfd. condenser.

M. B.

PERMINVAR

PERMINVAR is an alloy containing nickel, cobalt, and iron, together with traces of a non-magnetic metal such as molybdedum. The alloy possesses high resistivity and an exceptionally constant permeability over a wide range of magnetising force. The new transatlantic telephony cable (intended to supplement the existing radio-telephony service) is to be continuously loaded with perminvar so as to enable heavier signalling currents to be used than have previously been possible.

M. A. L.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THE idea which I suggested exclusively in these columns, that a referendum of listeners should be taken as to the programmes they like, appears to have caught on. More about this later.

◆ ◆ ◆

Here is a friendly warning to the B.B.C.: Go slow with "Treasure Hunt" series. There are, of course, many true and financially disinterested talks to be given here; but some "Treasure Hunt" stories are used by financiers in order to obtain money from the public for hunting for the treasure. And I hereby warn listeners and others not to subscribe a penny to anybody who is sending out an expedition to locate treasures. I know of no instance where money was made, and I think the B.B.C should broadcast a warning in this connection.

◆ ◆ ◆

Mr Stobart's "Good night" was the best yet—yes, even including his first brilliant effort. I would suggest that this masterpiece of original literature should be reproduced and distributed

◆ ◆ ◆

A friend of mine "begs to disagree most profoundly" with me in regard to my complaint about the drowning of the announcer's voice by the band during variety hours. "I may say" (he writes) "that after hearing countless vaudeville broadcasts I have never heard the announcer's voice made indistinct by the *entr'acte* music on any occasion. As a matter of fact, I regard the few bars usually played by Jack Payne's band as highly essential. I heard, only this week, a variety hour during which—except for the announcer's voice—there was complete silence between turns. I give you my word that it was the dullest broadcast I have ever heard"

◆ ◆ ◆

I don't know whether my friend misunderstands what I wrote. I certainly did not refer to the intervals. I referred to the opening announcements, when we were invited to hear what the variety hour was to be composed of, when the band intervened and made the announcer inaudible.

◆ ◆ ◆

As far as I can remember I had not heard Ronald Frankau's Cabaret Kittens until a few evenings ago—at least, not as a variety turn. I must say that they are a bright little crowd—well drilled, jolly, and possessed of likeable voices. They brightened up the evening considerably. They have personality—none too plentiful among lighter turns.

◆ ◆ ◆

The concluding talk of the "While London Sleeps" series—that given by Mr. Maurice Dance entitled, "The Journalist"—was well up to the standard of a successful series. While Mr. Dance at times did not keep quite strictly to the nocturnal aspect, his talk was full of interest. In fact, many of my friends thought Mr. Dance's fifteen minutes' chat was one of the best given in the series.

◆ ◆ ◆

"I heard Codolban's Tzigane Orchestra with mixed feelings" (writes my low-brow correspondent). "One could not help admiring their clever artistry and nimble fingers, but as for the stuff they played and at times their style . . ! There was that breakneck one-step tune with which they opened—just a chaotic mixture of noises. And then a violin solo—slurred to such an extent that it reminded one, irresistibly, of molars slowly being drawn out."

◆ ◆ ◆

The "Foundations of Music" series persists and, although received with mixed feelings by listeners of varying tastes, has more than justified itself. Dorothy Moggridge, playing Schubert's Pianoforte Sonatas, was delightful. She plays with a wealth of expression and has a pleasing touch.

◆ ◆ ◆

Arnold Bennett's *Milestones* was another good reason why the names of wireless actors should be given. Seldom have I heard a cast interpret with such understanding and depth of feeling as these nameless players. Without exception, those who took part merited praise. Therefore it is invidious to single any one out for special mention. Yet I cannot resist saying that the actor who took the part of John Rhead came very near to my conception of the ideal radio actor. One criticism of "Rose Sibley"—about the only criticism I can level at any of the features of the play—is that her sobs were somewhat overdone through the ether.

◆ ◆ ◆

Leonard Henry—like most funny men—is not always at top notch. He has inclined to fall away lately; but he was a lot better in the last turn in which I heard him. There was more originality in his patter and for the greater part of the time he steered religiously clear of "chestnuts." His ballroom conversation was quite funny and I had a good laugh over his Scottish song with bagpipe accompaniment.

◆ ◆ ◆

The programme of marches and waltzes played by the Northern Wireless Orchestra and S.B. from Manchester was thoroughly enjoyable. Everything was sensibly selected and the orchestra must have made a good impression upon its southern listeners.

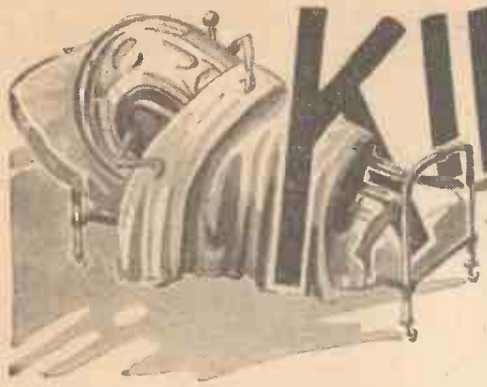
◆ ◆ ◆

"William," of Hammersmith, suggests that the lunch-hour music from the hotels should be continued until 2 30 for the benefit of late lunchers. The real point is this: Exactly how many people are able to listen to the midday programme, apart from housewives and invalids? Answer: Quite enough to justify the extension of the bright music till half-past two.

◆ ◆ ◆

There having been a bit of a re-shuffle of the dance bands, "Harold" comes forward with an amended opinion regarding their abilities. Leaving out Jack Payne's Orchestra, as it is an integral part of the B.B.C., he says that Jack Hylton's and Bert Ambrose's are the only dance bands worth listening to, or, rather, up to broadcasting standard as set by the bands of the earlier days. This is rather a sweeping statement. Any comments?

Our cartoonist's idea of Cecil Harrington



KILLING VALVES BY KINDNESS

By R. W. HALLOWS

SURPRISING as it may seem, there are many ways in which valves can be damaged, or even altogether ruined, by treatment which at first sight would appear to be of the most considerate kind. On the other hand, as we shall see in a moment, the advice to "treat 'em rough" may sometimes be applied successfully to valves suffering from senile decay.

Here is a way in which many a valve meets its end through its owner's earnest endeavour to enable it to do its best. We are told that no output valve has a fair chance unless its grid bias is adjusted to a nicety. Determined that its output shall have no cause for complaint, Muggs switches on the set, tunes in the local station, and proceeds to vary the grid bias until his ear tells him that neither grid-currenting nor bottom-bending are present. He does this by picking the negative wander plug out of one socket and trying it first in one and then in another. What is wrong with that?

The Correct Way to Adjust Grid Bias

Just this. Valves are made to stand up to a certain maximum emission from the filament. Every time that the wander plug is pulled out of the socket the grid loses its negative bias and the current passing through the valve leaps up to a figure far higher than is good for it. To give a concrete example, the Cossor 230XP, with 150 volts on the plate and properly grid-biased at 22½ volts negative, passes some 18 milliamperes of current. Flick out the grid-battery wander plug and current leaps straightaway to the neighbourhood of *sixty* milliamperes.

The proper way of adjusting grid bias is to try the plug in one socket and then to switch off before changing it to another. When a current much heavier than that for which the valve is designed passes, the coating of the filament is apt to be destroyed or damaged, with the result that emission goes down and the valve's whole characteristics are altered.

"Always use plenty of volts on the plate of the last valve" is another piece of advice that is excellent so long as one bears in mind the limit set by the makers. This for most valves nowadays is 150 volts. To exceed the maker's voltage, even though by doing so one seems to get slightly improved results for a time, is sheer folly, for any valve so treated must necessarily be very short lived.

One of the most curious ways in which a valve can be killed by kindness is by the use of an incorrect filament potential. Everyone knows that too high a voltage from the L.T. battery spells ruination to filaments, but how many realise that too low a voltage may be just as bad? In the old bright-valve days we were always told, and quite rightly, to advance the rheostats slowly from the zero setting, and not to go beyond the point at which good results were obtained. But with certain kinds of dull-emitters such counsel is eminently unsound. The thoriated filament consists of a blend of tungsten and of thoria. During the "age-ing" process at the factory the filament is run at such a temperature that a coating of thoria is deposited upon its surface. When the valve is in use this thoria is gradually dissipated, but if the temperature is exactly right fresh supplies arrive continually from within to replace what is lost. The filament thus continues in good condition until all the thoria contained in it has been used up.

HAVE YOU NOTICED

— the unconscious humour to be found in the pronunciation of English song-titles by some of the foreign station announcers, notably the French? Radiolo, the famous Radio-Paris announcer, who is not now with the Compagnie Francaise de Radiophonie, once gave out the fox-trot "Swinging Down the Lane" as (approximately) "Sveenjin-gg doh-vern ter lahner." His inimitable pronunciation of "Take, oh! take those lips away," almost always caused a ripple of laughter to pass among his unseen circle of listeners.

— in direct contrast to the preceding paragraph, the facile ability for excellent English pronunciation possessed by the announcers of Hilversum?

Filaments Too Dull

If we run the filament with too low a potential it is insufficiently heated. The result is that as the thoria on its surface is used up, replacements cannot come from inside. The emission slowly declines, and in time the valve becomes useless. The filament, in fact, is just in the same condition as one whose surface coating of thoria has been burnt off by the effects of an over-high temperature. Be careful, therefore, not to cut down the low-tension voltage too much. It is quite natural to feel that the lower you keep it, the longer will your filaments last, but this form of kindness is actually misplaced. Speaking generally, the voltage should not be allowed to fall more than about 10 per cent. below the maker's maximum figures. This means 1.8 volts for a 2-volt valve, 3.6 for a 4-volt, and 5.4 for a 6-volt.

Flashing

The rough treatment which was mentioned at the beginning of this article can sometimes be applied with success to valves which have lost their emission through the effects of too high or too low a filament potential. It is known as flashing, and this is the way in which it is done. Connect one of the filament pins to the negative of a high-tension battery. Place a wander plug with a piece of flex attached to it in, say, the 18-volt socket. With the bared end of this flex flick the other filament pin two or three times. Don't try to make a fixed connection or you will probably blow the filament up. The contacts must last only for a fraction of a second apiece. The effect of doing this is to drive a fresh supply of thoria from within to the surface of the filament. Obviously it can be successful only if the filament has not already been drained of its reserves. Another method which sometimes succeeds is to leave the valve in its holder with the high-tension wander plug disconnected. Current from the L.T. battery is then allowed to flow through the filament for several hours.

Pentode valves are expensive, and no one would willingly spoil their wonderful performances by any kind of ill-treatment. Yet many are ruined by users who have the best intentions in the world. All that

(*Continued on page* 111)

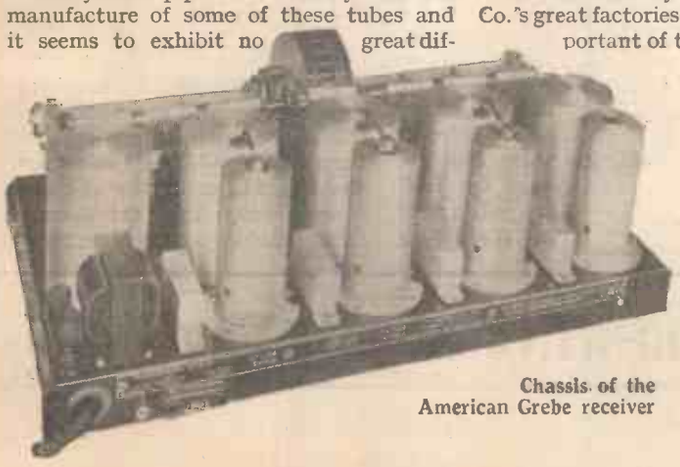
MY IMPRESSIONS OF AMERICAN BROADCASTING—BY CAPT. ROUND

TRANSMISSION :: RECEPTION

and Other Matters

DURING my visit to America, I had the great pleasure of going to WGY and KDKA, the two early birds of American broadcasting, where I saw the actual transmitters at work and I discussed various problems connected with transmission with the engineers. Both these stations are intimately connected with the two great manufacturing companies—the General Electric Corporation and the Westinghouse Company—and both are used as try-out stations for new ideas and for the initiation of new schemes in broadcasting. WGY has its own transmitter capable of giving 100-kilowatts to the antenna, and the transmitting panel with its six giant valves is very impressive. Each of these valves, by the way, when self oscillating, is capable of delivering 100 kilowatts to the antenna, but the six are used in the well-known way as high-frequency amplifiers delivering 100 kilowatts of modulated energy to the aerial.

These valves are about four feet in height and they seem to be handled in quite a casual way. I saw workmen strolling about the buildings at Schenectady with these 100-kilowatt tubes lying across their shoulders just as though they were carrying ordinary iron pipes. I actually saw the manufacture of some of these tubes and it seems to exhibit no great difficulties, so that one can quite conceive the next stage being still larger ones capable of 500-kilowatts to the antenna.



Chassis of the American Grebe receiver

American Short-wave Stations

Aside from the normal wave stations of WGY and KDKA, they have a multitude of short-wave stations. The transmitter building at KDKA is very interesting in that it seems like a giant switchboard lying on its back. All over the top of this switchboard, i.e. the main ground floor, are a number of high-frequency and low-frequency panels, the connections of all of which go through the floor. On the underneath side of the floor in the cellars are the bus bars with which all these high-frequency and low-frequency sets can be interconnected; and in addition, in the cellars also are the modulation chokes and other subsidiary apparatus which can all be joined up in this horizontal switchboard system.

There is nothing impressive about the aerial systems, which are quite small and normal.

Of these two big stations, WGY is not in either of the N.B.C. chains and seems to give its own programmes, but KDKA is in one of the N.B.C. chains.

At Schenectady the General Electric Co.'s great factories or at least the more important of their factories have been erected; in fact, it may be said that the town of Schenectady is merely the residential part of the General Electric factories. The town itself has about 100,000 inhabitants, and about 30,000 of these are directly employed by the G.E.C. As a sidelight on American living methods and at least their apparent prosperity, I saw in the car park at the factory over 2,000 cars belonging to the employees. The activities spread over almost all electrical fields, and in them are contained the great research laboratories with such well-known research men as Dr. Langmuir, Dr. Hull, Messrs. Alexanderson, Kellogg, and Rice, and many other research engineers.

A Wonderful Mercury Rectifier

Developments along every imaginable line are being carried out at a great rate and some novel product of these great laboratories is being brought out practically every month. One of the most recent developments is a hot-cathode mercury rectifier which Dr. Langmuir showed me in operation. A comparatively small bulb of glass, a mere seven or eight inches diameter, but it is capable of rectifying 100-kilowatts and not giving any sign whatever that such a vast quantity of energy is being transferred.

This new mercury rectifier is, I think, the most impressive practical development in the last year or so's work, and it is so extraordinarily simple when one sees it working that it is hard to conceive that there is any invention in it.

There is a small 5-kilowatt broadcasting station at the factory which is used in the daytime, I believe, but the big station is some few miles away, and at this big station new ideas, when they have arrived at the practical stage, are tried out. There I saw the 100-kilowatt oscillating valves being tried and I also saw the mercury rectifier in operation. Apparently WGY's main station is used primarily as an experimental one during the daytime, and at night time it goes over to broadcasting work.

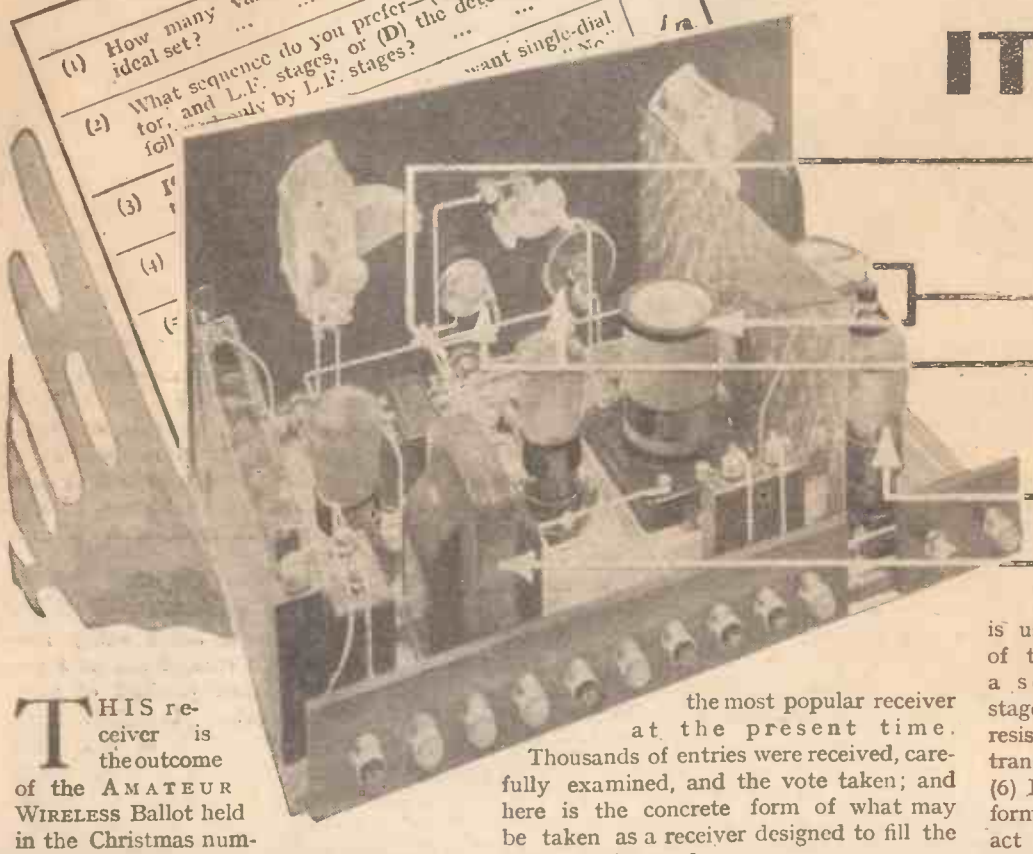
At WGY I saw some very good demonstrations in television; nothing very different from the methods being used over here,

(*Continued on page* 98)

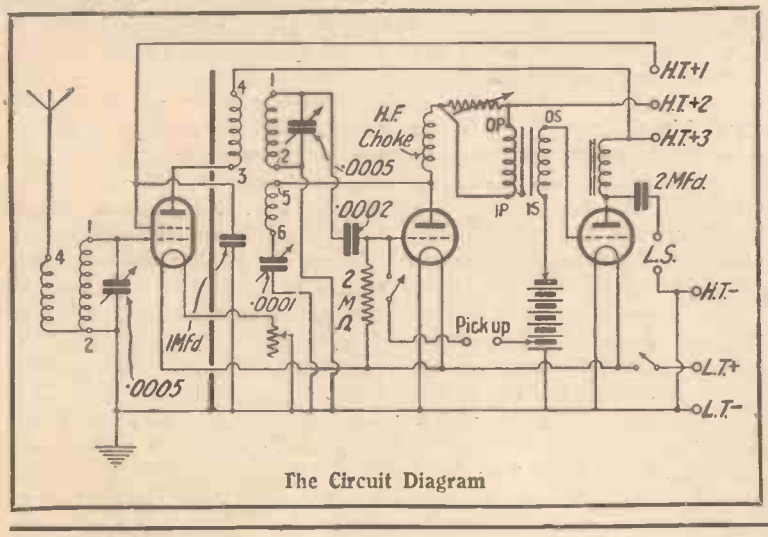
The BEST-b

IT EMBOD

GRAMO
CHANGE
DUAL-RA
SEPARA
VOLUM
SCREE
CHOKE



THIS receiver is the outcome of the AMATEUR WIRELESS Ballot held in the Christmas numbers in order to obtain readers' ideas of the most popular receiver at the present time. Thousands of entries were received, carefully examined, and the vote taken; and here is the concrete form of what may be taken as a receiver designed to fill the most popular needs.



The Circuit Diagram

In the ballot readers were asked the following questions: (1) How many valves would you have in your ideal set? (2) What sequence do you prefer—H.F., detector, and L.F. stages or the detector valve followed only by L.F. stages? (3) If an H.F. stage is used, do you want single-dial tuning of the whole set? (4) Do you prefer a screen-grid valve in the H.F. stage? (5) In L.F. stages, do you prefer resistance-capacity coupling, or push-pull transformer, or ordinary transformers? (6) Do you prefer output choke or transformer output? (7) Would your ideal set act also as an amplifier for gramophone records? (8) In wiring, do you prefer nut-and screw or soldered points? (9) For tuning-in both medium and long waves, do you prefer interchangeable coils or panel-switching? (10) Do you prefer ebonite panel with wooden baseboard or metal panel with metal baseboard? (11) Should the volume control be after the detector or before it? (12) Which suits your convenience, battery operation or mains operation?

An Effective Survey

These questions are searching ones, and each is a guide to an important feature of a set. The list was compiled in order that the result should show in analytical form the degree of popularity of the dozen features listed. This questionnaire, apart from forming a highly interesting prize

FREE FULL-SIZE BLUEPRINT of this Favourite Set

y-BALLOT 3

IES—

RADIO REPRODUCTION WITH
E-OVER SWITCH
ANGE TUNING
ATE RADIO & GRAMO-RADIO
IE CONTROLS
N-GRID H.F. STAGE
OUTPUT

competition, has enabled the AMATEUR WIRELESS Technical Staff to form an accurate idea of the types of receivers mostly in demand.

The Ideal Set

Rather than go here into the details of the results, it is sufficient to point to the outcome—the set illustrated by the accompanying photographs and of which full constructional details will be given next week. It is constructed as closely as practical considerations permit in accordance with the specifications given by the winners in the ballot.

The receiver is, of course, a three-valver. It has been known for some considerable time that a three-valve combination, in one form or another, suits the large majority of amateurs' needs at the present time. The title given to this set is the "Best-by-Ballot 3" and, in brief, it is a receiver which is just the kind of thing needed by listeners who do not necessarily want a set of the simplest type, but one which will give really good results and which can give every advantage possible with a modern outfit.

It is natural to expect that such a receiver, conceived by reason of a collection of readers' own views as to what is popular and desirable, will be made up by many new comers and novices. Efforts have therefore been made to result in the actual building of the receiver being as easy as possible for those who have not had great experience in set construction.

It is considered that the best way of helping beginners is to ensure that every one of them has in hand a copy of the full-size blueprint in the normal AMATEUR WIRELESS style. **A blueprint of the "Best-by-Ballot 3" is therefore being given Free with every copy of next week's "A.W.,"** in which also will be published an article giving full constructional details of the receiver. This print—the normal price of which, apart from the issue, is 1s.—is full size. It gives all the wiring, shows each component in its exact place, and can be used as a drilling guide and mounting template.

The theoretical circuit of the set is shown in the accompanying diagram, and this clearly shows the various salient points of the set. A screen-grid valve is used in the H.F stage, a leaky-grid detector is employed, with provision for adding a gramophone pick-up; the third valve is transformer-coupled to the detector, and a choke-and-condenser output arrangement is incorporated in the power-valve anode circuit

While no particular attempt has been made to condense the receiver into the smallest possible space or to reduce the number of controls to the minimum, the set is neither unwieldy nor difficult to

Here is a picture of the complete receiver

COMPONENTS REQUIRED

Ebonite panel, 16 in. by 8 in. (Lissen, Becol, Trolitax).
Two ebonite strips, 3 in. by 2 in. and 11 in. by 2 in.
Baseboard, 16 in. by 10 in. (Camco, Pickett, Raymond).
Panel brackets (Ready-Radio, Bulgin, Lissen, Keystone).
Two .0005-mfd. variable condensers (Lotus, Lissen, J.B., Dubilier, Ormond, Igranic, Burton, Polar, Formo).
.0001-mfd. reaction condenser (Lissen, Dubilier, T.C.C., Graham-Farish, Watmel, Ormond, Igranic).
15-ohm rheostat (Lissen, Varley, Sovereign, Ormond).
Volume control (Clarostat, Volustat, Regenstat).
Two push-pull on-off switches (Lissen, Bulgin, Keystone).
Two slow-motion dials (Brownie, Lissen, Igranic, Formo, Lotus).
Two dual-range coils, types Q.A.T. and Q.S.G. (Lewcos, Ready-Radio, Wearite).
Three valve holders (Benjamin, W. and B., Lissen, Lotus, Formo).
.0002-mfd. fixed condenser (Dubilier, T.C.C., Lissen, Graham-Farish, Ormond).
.0002-mfd. fixed condenser with series clip (Dubilier, T.C.C., Lissen, Graham-Farish, Ormond).
1-mfd. and 2-mfd. fixed condensers (T.C.C., Dubilier, Lissen).
3-megohm grid-leak (Dubilier, Ediswan, Lissen, Graham-Farish).
H.F. choke (Peto-Scott, Lissen, Ready-Radio, Bulgin, Lewcos, Tunewell, Sovereign, Watmel).
J-type L.F. transformer, ratio 6 to 1 (Igranic, Lissen, Lewcos, Varley, Lotus, Burton).
Output choke (Lissen, Varley, Bulgin, Formo, Wearite).
Three wander-plugs, marked G.B.+, G.B.—1, G.B.—2 (Belling-Lee, Eelex, Clix).
Twelve terminals, marked: Aerial, Earth, H.T.+1, Pick-up (2), L.T.—, L.T.+, H.T.—, H.T.+2, H.T.+3, L.S.+, L.S.— (Belling-Lee, Eelex, Clix, Burton, Raymond).
Partition screen, 10 in. by 6 in (Ready-Radio, Parex).
Connecting wire and thin flex (Lewcos).

"THE 'BEST-BY-BALLOT 3'" (Continued from preceding page)

operate. There are, it is true, nine controls on the face of the panel, but these are only to enable the most to be made of the set, and tuning is carried out with only three, and sometimes two, knobs.

As a matter of interest, it may be explained that two of the knobs on the panel (on the slow-motion dials) are the condenser controls; the three small knobs between these condenser controls are for reaction, volume, and H.F. valve control respectively; while the four knobs along the lower edge of the panel are for coil-switching, for bringing a pick-up into use, and for switching the whole set on and off. Nothing very difficult about that!

The receiver is made up in the conventional way with a wooden baseboard and ebonite panel. An aluminium screen separates the screen-grid stage from the rest of the receiver, but this can be purchased already drilled, and no metal work has to be undertaken in the construction of the set itself.

An accompanying table gives the components used in the original receiver. It is recommended that this list be adhered to and that if the parts specified are, for some reason or other, not obtainable, then the alternatives given should be used.

Simple Wiring

The wiring of the set is quite straightforward and, with the aid of the blueprint, no difficulty at all should be experienced in construction.

Two particular advantages of this receiver are the facts that the wave-changing does not necessitate any changing of coils or probing about inside the cabinet; the two wave-change knobs on the panel enable the set to be used either on the medium or the long waves.

In addition, a gramophone pick-up can be used. The pick-up can be permanently connected to two terminals at the back of the set, and the touch of another switch on the panel brings it in or out of circuit as required. This opportunity to use a gramophone pick-up without modifying the wiring of the receiver will be welcomed by amateurs who for this reason have previously refrained from benefiting by the advantages of electric gramophone reproduction. Those who have not gone into the question before are advised to read the article on this subject on page 89 of this issue.

The accompanying photographs give a very good idea of the appearance of the receiver and of the general arrangement of the components. Make sure of getting next week's issue in order to obtain your copy of the free blueprint and the explicit details of construction.

"TRANSMISSION—RECEPTION & OTHER MATTERS" (Continued from page 95)

but considerable care is being taken to obtain the finest results regardless of expense. Several people spoke to me over a wire transmission of television and voice, and as an interesting comparison between the transmissions of television and speech, I was able to recognize the faces before I recognised the voices. None of the television experiments which I saw, however, were really satisfactory in that with any decent size picture, projected up to a foot square, the amount of light was hardly sufficient to make vision easy. One had to be in a dark room and get used to the lack of illumination on the screen.

Experiments in television at Schenectady are being pushed forward as fast as possible, but no one so far has any hope of being able to give practical results within any reasonable time.

At East Pitsburgh where KDKA is situated, are the factories of the Westinghouse Company, almost as large as the General Electric Co. at Schenectady, and here, very similar work is going on, only carried out quite independently in all the possible fields of electrical development. Here again KDKA is maintained to some extent as an experimental try-out station for the productions of the company, and here again I saw experiments in television amongst other things. Mr. Conrad, who is, one might say, the father of the real broadcasting, was very busily engaged in these television experiments and they were being carried out along somewhat different lines from those at Schenectady, although similar methods have been employed using scanning discs. The method being developed is of very great interest, and in the whole of the receiver there were no mechanically moving parts. The picture producer consisted of a large cathode-ray oscillagraph and on the end of this oscillagraph was a fluorescent screen and a picture about four inches square appeared on this of quite remarkable definition and clarity. It was difficult to judge whether the intensity of light was as great as that for the scanning disc, because the picture was considerably smaller, but what interested me was the fact that the whole operation was merely that of placing a cathode-ray oscillagraph on to the end of receiver with no unwieldy disc revolving or any moving parts of any type except the light ray. The method certainly seems to have distinct possibilities, but all American engineers recognise that there does not seem to exist any wireless channel which can be used for television, and the only one they are attempting to use is the range between 100 and 200 metres, with no great hope of real success; they recognise that there will be great interference between television sets situated in different districts.

At WGY and at KDKA are maintained valve factories in which new types of valves are made, but the main production of valves occurs at Cleveland, and at Springfield, New Jersey.

At KDKA I saw being produced in small numbers some new transmitting valves larger than those produced at Schenectady. These valves have not only water-cooled anodes, but also water-cooled grids, and have been tested, so far, up to 180-kilowatts and 300 metres. As this amount of power is about equal to that given by the great Alexanderson alternators that we use on the long waves, and as the cost is probably less than one-hundredth of that of the alternator, it gives some idea of the development that has taken place in what a generation ago was quite a toy of doubtful value!

Valves by the Million

The great mass-production valve factories, one of which I saw at New Jersey, had not such vital interest to me as had the research laboratories, but it was extremely interesting to watch the enormous care being taken to reduce the cost of every single operation of valve manufacture. It almost seems as though glass and wire and valve sockets were fed into a machine at one end and at the other end came out boxes of a dozen valves neatly packed and labelled. But, of course, it is not quite so complete an operation as this.

Mass-production Testing

The construction of the valve stems is done to a great extent, as here, by hand; but from that point up to the final valve delivered for testing, is almost one continuous operation on great circular rotating tables handled by the minimum of labour. Completed valves are then delivered in bins to the testing machine which as far as I could make out was handled by one small girl. This girl plugs the valves one by one into a rotating turntable and as the valves go round on this table they are automatically tested for the possible defects; then they are automatically ejected on to moving belts, one belt representing perfect valves, another belt representing those with filament constants not quite within limits, and other belts for those valves with defective grids or plates, and so on; and these valves go down the belt into four separate bins where they are collected. Perfect specimens are about 70 per cent. of the total and these go off into the automatic packing machine where valves and cardboard are fed into the machine, and at the other end of this machine the valves are turned out packed in boxes.

Mr. Cyril E. Baron with his receiver in his home at Weybridge

AN 'A.W.' READER SAVES A SHIP

A Personal Account by Mr. C. E. Baron

Probably many AMATEUR WIRELESS *readers read of the recent thrilling experience of a fellow-reader, Mr. C. E. Baron, the well-known marketing consultant, who, while listening-in at his Surrey home, picked up an S.O.S. message from a Russian steamer He 'phoned the authorities and the distressed ship was saved Here is his own story*

I OFTEN listen to the "dots and dashes" during broadcasting intervals You see, being an ex-operator, I can read Morse and so find a great interest in deciphering some of the messages that flash about on the 600-metre shipping wavelength Well, I happened to rise early on the morning of Sunday, December 8. This was the time when the great gales were causing havoc all over the country A gale had caused my aerial to blow down over night, and it seems like the workings of Fate that, on this Sunday morning, I was so keen to listen to some of the ship traffic that I should be energetic enough to climb a 50-ft. fir tree, in a strong wind, just in order to re-fix the aerial!

There was much doing on 600 metres, and I spent several minutes picking up Morse, idly jotting down figures and messages. Perhaps I should add that the set I was using was a simple home-made three-valver, with a detector and two L.F. stages.

A Call for Help

Then I chanced on quite a strong signal, and it wasn't until I had recorded it that I realised what it was: *SOS SOS GNF GNF de RAEW RAEW SOS SOS. Please everybody come and help urgent.*

Translated from the lingo of operators, this meant that a ship with the call-sign RAEW was in distress, and wanted help from the post office station GNF at North Foreland. Well, I went on listening to this thrilling call for help, but no reply came from North Foreland Risking a reprimand from the authorities, I rushed to the telephone, explained matters to the exchange, and in three minutes I was speaking from my Surrey home to the officer in charge at GNF

Official Thanks

He just said, "Oh, thank you," when I said that I was only an ordinary amateur listening-in, but when I went back to my set I found that GNF was immediately calling out for the ship, and was giving the warning signal QRT so that the Channel might be cleared for the SOS call. In the meantime I looked up the call RAEW in the official list, and found that it belonged to a Russian boat of 1,812 tons—*Jakov Sverdlov*—it had been driven ashore Later I heard GNF tell the *Jakov* that three tugs were being sent to her assistance, and later still I picked up an *en route* message from one of the tugs. Then the aerial blew down again!

The *finis* to the story is that subsequently I wrote to North Foreland, giving full particulars, and received no reply. The Post Office was more polite, though!

I received one of those rigidly official letters (like one gets when a licence runs out), thanking me for acting so promptly, and explaining that, of course, the cost of the trunk call to GNF would not be debited to my account! The reason, so they said, that GNF did not pick up the SOS signals was that its directional aerial was not pointing in the right direction at the time!

Mr. Baron, it is interesting to note, is a very old reader of AMATEUR WIRELESS, *and, though now an amateur, was responsible for the erection of several Army W.T. stations in the East during the War—notably at Akaba, the headquarters of the famous Col. T. E. Lawrence.*—ED.

Mr. and Mrs. 2LO

IT is a curious fact that whilst many sets will cut out the short-wave "twin" completely, when tuned in to the original 2LO wavelength, much more difficulty is experienced in reversing the operation. In other words, although Mrs. 2LO can be silenced when Mr 2LO is performing, Mr. 2LO refuses to disappear entirely when his "wife" is on the ether.

This is certainly not in accordance with the traditional privilege of the gentler sex. Probably the rude persistence of the longer-wave station arises from the fact that the standard P.O aerial of 100 ft. is more suitable for the reception of medium than short wavelengths. One solution to the difficulty is to loosen the coupling between the aerial and input circuits. A better is to add one stage of screened-grid H.F amplification to the set.

M. L.

An impression of Miss Betty Hardy

Another Milestone

WHEN Crippen was traced by radio while on board ship, a radio milestone was passed. Another was reached recently when a radio transmitted photograph flashed across the Atlantic resulted in the detection of a criminal. The affair was taken up by the newspapers on account of the radio interest. What actually happened was that the transmission of the photograph was made from New York to London and it led to the detention of a man required in New York on a provisional warrant issued in America.

The photograph when received was at once distributed among detectives at the "Yard" and also circulated in the police papers. A man was in consequence detained within a day or so. He was remanded on a provisional extradition warrant charging him with embezzlement in the United States of America—thanks to radio! U.

"A.W." TESTS OF APPARATUS

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

Watmel Wavetrap

THERE are few devices more popular at the present time than the wavetrap, since it has afforded many solutions to the interference problem from Brookmans Park. The majority of valve receivers in this country employ a single-circuit tuner,

If "flat" tuning is experienced with your set, this Watmel wavetrap will be of assistance

which under optimum conditions cannot be sufficiently selective to cut out powerful near-by stations. Apart from re-designing the set and incorporating additional tuning devices, some simple selectivity device is almost essential.

The Watmel wavetrap which is tested this week is a particularly neat and well-made article. It consists of a tuned rejector circuit to be connected between the aerial and the aerial terminal on the set. The rejector effect can be varied by plugging the aerial into one of four sockets on the panel.

Both the base and the top of the coil are moulded in an attractively-grained brown material. A small knob and pointer moving over a semicircular scale, which forms part of the moulding, provides the tuning control.

Placing a lead from the aerial terminal of the set to the terminal 4 and the aerial on to terminal 3 provides a sharply-tuned rejector circuit having little effect on the strength of stations on near-by wavelengths to the trapped wavelength. Removing the aerial connection to terminal 2 increases the general trapping effect, although the tuning is not so sharp. At a distance of six miles from Brookmans Park either station could be cut out completely and 5GB received without interference

There is certainly no question about the efficiency of this trap, and it can be recommended to readers as a thoroughly serviceable article.

A Pioneer Switch

WE have received for test this week a neat Pioneer push-pull switch made by the Pioneer Mfg. Co., of Cromwell House, Fulwood Place, W.C.1 This is a useful article of the standard type for switching on and off the filament circuit of a valve set Connections are taken to two terminals or soldering tags in contact with strong and wide metal springs; these bear on a plunger consisting partly of insulating material and partly of metal. The contour of this plunger is so shaped that the action is definite, but quite smooth and good electrical contact is maintained in the "on" position.

Although this component is simple and inexpensive, it is supplied with a brightly-polished insulated knob and nickel-plated washer, presenting an attractive appearance on the exterior of the panel to which it is fitted.

This article should perform its duty with reliability, and can certainly be recommended to readers.

This Pioneer switch allows the spring leaves to be removed from tension when in the off position—a good feature

A Useful Gadget

THERE must be very few readers who have not at one time or other considered the attachment of a microphone to their amplifiers. By placing a microphone in one room and the loud-speaker in the other, one can obtain considerable amusement and even serve a useful purpose in the house Most receivers at the present time are fitted with jacks or terminals for connection to a pick-up, and it is, therefore, a simple matter to wire a microphone in circuit for use with the amplifier of the set.

We have received for test a small microphone and transformer made by Messrs. Fred Adolph, of 27 Fitzroy Street, London, W.1, costing 14s. 6d. The transformer, which has a step-up ratio of 100-1 is attached to the microphone on the primary side in series with batteries or accumulators of 1½ to 3 volts. The secondary is connected to the pick-up terminals or plug and when inserted in the amplifier forms a miniature public-address system.

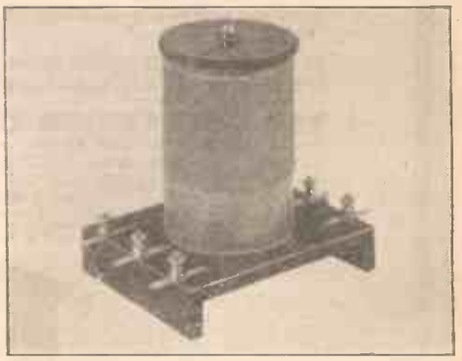
We tried this microphone in conjunction with a standard all-mains amplifier and obtained satisfactory results provided that it was separated from the loud-speaker. If they are both placed together in one room, trouble is experienced due to interference between the loud-speaker and the microphone which causes a form of howl; this disappears as soon as the sound waves from the loud-speaker are prevented from reaching the microphone. With a single A.C. valve amplifier, the volume obtainable was sufficient for a normal size room, whilst the speech was quite clear and improved by balancing the microphone at a certain angle.

Readers should obtain interesting results from this microphone and transformer

ANOTHER GIFT NEXT WEEK!
See page 79

Ready Radio "Q" Coil

"Q" COIL enthusiasts will be pleased to learn that these coils can now be obtained from Messrs Ready Radio, Ltd., of 159 Borough High Street, S.E. The Ready Radio "Q" coils, one of which is illustrated on this page, are produced in the well-known black and red finish which has become associated with this firm. The coil is, of course, of standard construction, being mounted on a six-terminal base with a self-contained push-pull switch. The size



A newcomer to the ranks of the "Q" coil—the Ready Radio

of the base, the disposition of the terminals and the connections thereto are also standard, thereby rendering the coils interchangeable with either of the other makes of "Q" coil, namely Lewcos and Wearite.

We have tested these coils against our standard coils and have found them satisfactory in every particular; they can be recommended to readers.

LISSEN ACCUMULATOR

Free CARRIER SUPPLIED

One more triumph of Lissen organisation—one more example of Lissen value for money—the Lissen L.T. accumulator. Here is a complete range of highly efficient accumulators, sturdily built to give absolute satisfaction in use and long life. These accumulators are designed to give absolutely trouble-free service. The plates are all very thick, the containers are strongly made, and the general appearance and finish of the Lissen accumulators is far in advance of usual standards.

All the Lissen accumulators listed below are supplied with strong carrier, free.

H.T. ELIMINATORS YOU CAN USE WITH YOUR SET LIKE A BATTERY

The current you get from Lissen Batteries is the purest power you can get for radio. But if you want to use an eliminator, use a Lissen Eliminator. You'll then get H.T current from your mains *smoother, steadier, better* than before.

There are 4 types of Lissen Eliminator: one of them will almost certainly be just right for your set. Tell your dealer what voltage your mains supply is and whether it is A.C, or D.C.; tell him what output you require, or what valves you are using, and he will show you the Lissen Eliminator to suit your needs.

Then you only have to take your battery out and put the Lissen Eliminator in its place. No need for special wiring. These Lissen Eliminators are cased in insulating material and the lead is heavily insulated cab-tyre flex.

TYPES AND PRICES

D.C. MODEL "A"

Employs 3 H.T.+ tappings: H.T.+1, giving 80 volts for S.G. valves; H.T.+2, giving 60 volts at approximately 2 m/A for detector valves; H.T.+3, giving 120/150 volts at 12 m/A.

PRICE .. 27/6

D.C. MODEL "B"

Employs 3 H.T.+ tappings: H.T.+1 and H.T.+2 are continuously variable by (means of two control knobs) and capable of giving any desired voltage up to 120/150 volts at approximately 2 m/A; H.T.+3, giving 120/150 volts at 12 m/A for power valves.

PRICE 39/6

Models working on 100/110 Mains Voltage give output voltages of approximately 60 per cent. of above values.

A.C. MODEL "A"

Tappings as in D.C. Model "A."

L.N. 576, for A.C. Mains voltage	..	..	..	..	..	..	200-210
,, 577 ,, ,, ,,	..	..	..	..	..	..	220-230
,, 578 ,, ,, ,,	..	..	..	..	..	..	240-250
,, 639 ,, ,, ,,	..	..	..	..	..	..	100-110
PRICE	..	..	..	..	..	..	£3:0:0

A.C. MODEL "B"

Tappings as in D.C. Model "B."

L.N. 579, for A.C. Mains voltage	..	..	..	..	..	..	200-210
,, 580 ,, ,, ,,	..	..	..	..	..	..	220-230
,, 581 ,, ,, ,,	..	..	..	..	..	..	240-250
,, 640 ,, ,, ,,	..	..	..	..	..	..	100-110
PRICE	..	..	..	..	..	..	£3:15:0

12/6 BUYS YOU The LISSEN FOUR-POLE ADJUSTABLE BALANCED ARMATURE UNIT

The Lissen 4-Pole Balanced Armature Unit brings something approaching loud-speaker perfection within the reach of everybody who owns a radio set. You can build any type of cone loud-speaker with it; you can use it with a big baffle board, or put it in a cabinet. You can build a linen diaphragm loud-speaker with it, or you can buy it completely assembled and ready to connect up to your set. It has a fine adjustment, and you therefore get the utmost volume from it without chatter.

In brown moulded case with attachment for fitting to any type of cone. PRICE 12/6

Cast aluminium Chassis, specially designed to give the best results from the Unit. PRICE 7/6

13-in. cone for use with the above, 2/6

PRICES

DULL EMITTER

(Type G.M.)

L.N.503 2-volt, 20 amp. hours 4/6

L.N.504 2-volt, 20 amp. hours ... 8/6

Multiple plate type, glass containers.

L.N.500 2-volt, 20 actual amp. hours 9/6
L.N.502 2-volt, 45 actual amp. hours 13/6
L.N.560 2-volt, 60 actual amp. hours 17/6

EXTRA CAPACITY

L.N.555 2-volt, 24 actual amp. hours 10/6
L.N.557 2-volt, 48 actual amp. hours 14/6
N.L.559 2-volt, 72 actual amp. hours 18/6

LISSEN ELIMINATORS

LISSEN LTD., Worple Road, ISLEWORTH, Middlesex. (Managing Director: T. N. COLE).

COMPLETE ASSEMBLY

with which you get the nearest possible approach to moving-coil tone and fine full volume without chatter.

Ready for use or to mount in a cabinet.
PRICE
22/6

RADIOGRAMS

THE new high-power Strasbourg transmitter, which is being erected by the French Posts and Telegraphs at Brumath, some eleven miles from the city, promises to be one of the most up-to-date stations in Europe. Its normal power is to be 15 kilowatts, with a possibility of considerably increasing the energy should it be found necessary to extend its sphere of action. A new studio, replete with the most modern equipment, is to be installed at Strasbourg and connected to the transmitter by a specially pupinised cable. It is expected that all announcements will be made in French, German and Alsatian dialect. The station is to be completed by June next.

Conscious that it possesses many listeners in the United Kingdom, Radio Toulouse has secured the services of an Englishman, Mr. Malcolm A. Frost, as announcer for special programmes destined to Great Britain.

Since the Petit Parisien broadcasting station was taken over by a limited liability company, the call of the studio has been altered. Between items you will now hear the announcer say, "*Ici Poste Parisien*," as the transmitter is no longer connected with the well-known French daily newspaper.

In Germany, purchasers of wireless receivers are granted eight days' test before being required to take out a licence.

On January 21, when His Majesty opens the International Conference on Naval Disarmament in the Royal Gallery of the House of Lords, the speech will be relayed to 5SW, for reception throughout the British Empire. Further, through the International Broadcasting Union at Geneva, facilities have been obtained for a transmission to be made to the interested broadcasting organisations in Europe. In spite of the fact that the hour is an inconvenient one, the N.B.C. (U.S.A.) is arranging to broadcast the ceremony through its large network of stations.

Mexico possesses seven broadcasting stations, all operated by private associations. Announcements are made in the Spanish and English languages.

A new broadcast demand is coming from Scotland. It calls for money for Scottish programmes to be spent mainly in Scotland, and for the publication by the B.B.C. of accounts showing how much is spent in Scotland, not only for programmes, but also for the building and upkeep of studios and broadcasting stations and for the improvement of outside broadcasts.

On the Paris-Havre main line several first-class carriages have been equipped with broadcast receiving apparatus. Passengers travelling on the 8.10 a.m. express from Paris and again at 5.15 p.m. from the Havre, may hire headphones. During the journey broadcasts from such stations as Eiffel Tower, Radio Paris, and 5XX are tuned in at regular intervals.

The French Government has inaugurated a wireless telegraphy service with Turkey. The charge per word is the same as for ordinary cabled telegrams.

Since January 1, Radio Toulouse has obtained authority to use the French telephone cable system, and as a result carries out daily relays from the principal cinemas and theatres in the city. On Fridays, at 9 p.m., on a wavelength of 311 metres, Radio Agen relays the Toulouse concert programme.

A French national programme will be broadcast by the majority of European studios on February 5.

On a wavelength of about 300 metres, a private transmitter at Arlon (Belgian Luxemburg) transmits a short concert programme every Thursday and Sunday afternoons between 4 and 6 p.m. G.M.T. The call is "*Radio Arlon.*"

A revival of the "Ceremony of the Keys," a nightly custom of the Tower of London, has been arranged as a late item of the 2LO programme fixed for January 21.

A new experimental radio-beacon is now in operation at North Foreland, Kent. This station has been allotted the call-sign MMF, and works in I.C.W. on the usual radio-beacon wave of 1,000 metres.

IS IT A CASE OF LEG-PULLING?—ATMOSPHERICS?—

—OR HIGH TENSION?— FLEX ONLY KNOWS.

Obtaining "Punch" with Low Voltage

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

THE possibility of obtaining high voltages when A.C. mains are available has led to the impression that high voltage is essential if any reasonable volume is to be obtained. By volume here, I mean an intensity of sound sufficient to enable, say, thirty couples to dance comfortably. An ordinary gramophone is inadequate on such occasions, and a somewhat larger output of sound is required to enable dancing to be conducted in comfort. Added to which, of course, there is the additional advantage of the improved quality.

I fitted up a small power amplifier for some friends only the other day. The whole job was carried out rather hurriedly and I was not by any means satisfied with the performance, there being several points which I subsequently cleared up after spending an hour or two matching impedances and such-like. Yet right from the start the difference between the quality obtained from the amplifier and that ordinarily reproduced by the gramophone was startling. The marked rhythm in the bass is, of course, of inestimable value for dancing, as it is just this which is lacking with the small table-model gramophone. Apart from this, the mellowness of the quality throughout was favourably commented upon.

This particular amplifier was not operating off a high voltage, and it occurred to me that the arrangement used may be of interest. The present article gives details of the amplifier arranged to operate off batteries. Two hundred volts H.T. is required, and as this will have to provide a current of some 80 milliamps, it is desirable to use H.T. accumulators for the purpose. Alternatively, super-capacity batteries may be used. I have, for example, run such amplifiers with Columbia Layerbilt batteries for long periods, but this rather overloads the battery, and an H.T. accumulator is preferable for supply.

Push-pull Output

The circuit used is shown by the diagram. It will be seen that only three valves are employed, there being one amplifying stage followed by a push-pull output stage. This is adequate to take the output from the average pick-up and to amplify it to sufficient volume to fill a small hall; suitable, as a matter of fact, for a hall of about 1,000 square feet area, full of people.

The voltage from the pick-up is applied through a step-up transformer. This is not usually done, but is a practice which I have often found convenient. It has the effect of acting as a scratch filter in that it tends to cut off the upper frequencies and it provides quite an appreciable step-up of the voltage applied to the first grid. The transformer should be suitably matched to the pick-up and an arrangement which I have found convenient is to use the R.I. multi-ratio transformer. This gives a number of ratios having varying primary impedances, and the arrangement best suited to the particular pick-up can readily be found by trial. A ratio of between 2 to 1 and 3 to 1 is most suitable.

Suitable Valves

The voltage from the secondary of this transformer is applied to the grid of the first valve, which is of the L.F. class. This valve should have an amplification factor in the neighbourhood of 15 and an A.C. resistance not exceeding 15,000 ohms. It should further be able to handle 4 or 5 volts grid swing and be provided, therefore, with 4½ volts grid bias. Such a valve as the Osram L610 is suitable in this position.

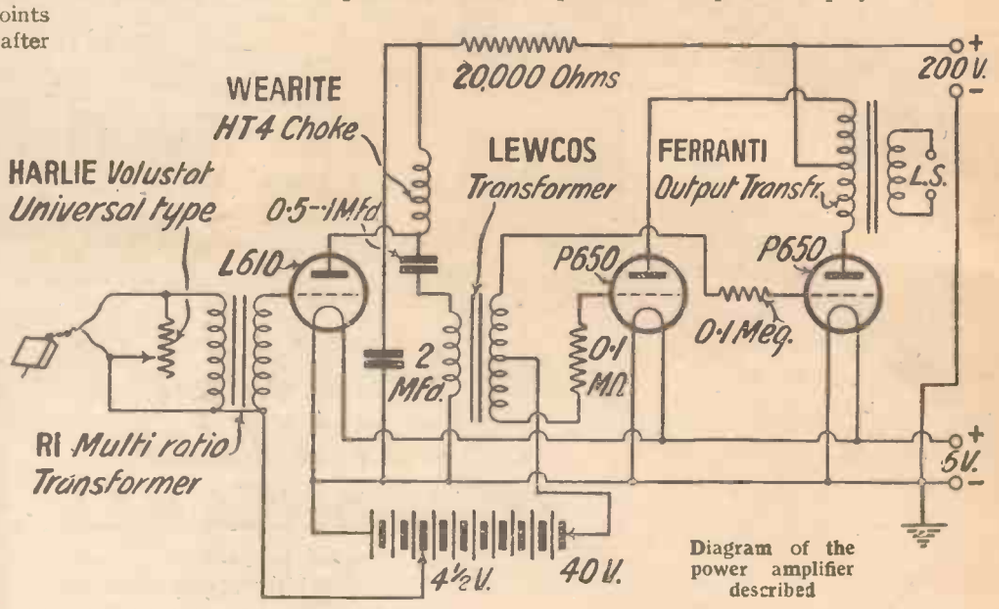


Diagram of the power amplifier described

The voltage is applied to this valve through a choke, the full H.T. voltage being broken down to about 150 with a suitable resistance. If the L610 is used, this resistance should be 20,000 ohms, which will cut the voltage down to 140. The resistance is by-passed with a 2-microfarad condenser in order to decouple the first stage, although with the circuit adopted this is not really necessary.

The choke should be a high-inductance one, and in order to maintain the greatest purity, it should be of the constant-inductance type. The Wearite H.T.4 choke is admirable for this purpose, as it will handle up to 25 milliamps without any appreciable change in inductance, and, as I have pointed out in a previous article, the importance of this in maintaining faithful reproduction cannot be over-emphasised.

The low-frequency currents are by-passed through a large condenser to the primary of a suitable step-up transformer. This should have a high ratio, and a component such as the Lewcos transformer is well adapted to the requirements. This has a total step-up ratio of 5 to 1 and is provided with a centre tap for the push-pull. The primary inductance of the Lewcos transformer is in the neighbourhood of 120 henries, and one can, therefore, arrange the feed condenser to resonate with this value in the bass if desired, thereby accentuating the amplification in these registers. Whether this is desirable or not depends upon the loud-speaker employed and the circumstances in which the amplifier is to be used. If one desires to produce a resonance, however, at about 70 cycles, this would be obtained by using a condenser with a capacity of 0.05 microfarad.

The output from this transformer is applied to the two push-pull valves in the customary manner, stoppers being placed in each grid lead, in order to avoid any parasitic oscillation being set up. In the anode circuit we have a suitable push-pull output transformer, and here one of the Ferranti range is probably the most suitable. Knowing the impedance of the loud-speaker to be used, it is possible to choose the correct ratio of transformer in order to obtain the maximum undistorted power output from the output valves. Messrs. Ferranti give a series of curves connecting the step-down ratio with the speaker-and-valve impedance, by means of which the correct transformer from the possible range of four may easily be determined. The series ranges from the OPM1c to the

OPM4c, and covers ratios of 1-to-1 down to 66-to-1.

Do not forget that the two push-pull valves are in series as regards the transformer primary. Thus, with the P650 valves the output-transformer ratio must be based on the assumption that the valve impedance is 2,600 ohms.

The output valves are two P650 valves, having an A.C. resistance of 1,300 ohms and an amplification factor of 3.5. These valves will handle a grid swing of 40 and are capable of giving approximately 1.1 watts undistorted power output. The total output from the amplifier, therefore, is just over 2 watts, which, as previously mentioned, is capable of filling a hall having an area of about 1,000 square feet full of people.

The amplifier is a fairly foolproof one, although with the average pick-up, allowed to run flat out, it is possible to overload the last stages, but the distortion is not serious. Provided a suitable volume control is placed across the pick-up, however, the volume output can always be kept within satisfactory limits, and good and pleasant quality will result.

The grid biases should be, as previously mentioned, namely, 4½ volts on the first stage and 40 volts on the output stage. The total milliampere consumption will be in the neighbourhood of 80, depending to some extent upon the particular valve used in the first stage. The amplifier is neither cheap nor expensive to construct, being of an average figure, but it serves to show that it is possible to obtain quite considerable volume in a relatively simple manner, even when not more than 200 volts H.T. is available.

The wireless transmitter recently installed at Heston "Air Park," is now in operation, and may be heard from time to time transmitting radio-telephony on a wavelength of 764 metres, in connection with the wireless-equipped light aeroplanes used for training pupils at that aerodrome. The station is also intended for working on approximately 1,500, 900 and 600 metres, the last wavelength being for emergency use. The transmitting power is 500 watts.

With the relaying for broadcast from London and Daventry, as well as Scottish stations, of an extract from a concert by the Scottish Orchestra in Glasgow, it is believed in some quarters that a new prominence will be given to the fact that orchestras of high standing do exist north of the Border. It is hoped that other relays of a similar character will be given in the future, with works by modern Scottish composers included in the programme.

Bitterly humorous critics of the B.B.C. are not unknown in Scotland. An international chess competition has just been held at Hastings, one points out, adding sadly, "By some oversight the B.B.C. did not arrange to broadcast such an ideal subject."

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
261	1,148	London (2) tests	30.0
*288.5	1,040	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
356	842	Brookmans Park	30.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
206	1,460	Antwerp	0.4
217.1	1,382	Charleroy (LL)	0.25
244	1,229	Ghent	0.5
250.9	1,196	Schaerbeek-Brussels	0.25
280	1,071	Liége	0.1
360	968	Arlon	0.3
339	887	Velthem	8.0
*509	590	Brussels	1.0
CZECHO-SLOVAKIA			
*263	1,139	Moravska-Ostrava	10.0
*279	1,076	Bratislava	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.5
ESTHONIA			
*296	1,013	Reval (Tallinn)	0.7
FINLAND			
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
FRANCE			
31.65	9,479	Radio Experimental (Paris)	1.0
175	1,714	S. Quentin	0.1
214	1,400	Fécamp (Radio Normande)	0.5
220	1,364	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
240	1,250	Nimes	0.25
248	1,411	Juan-les-Pins	0.5
*272	1,102	Rennes (PTT)	0.5
*286	1,049	Montpellier (PTT)	0.2
286	1,049	Radio Lyons	0.5
293	1,022	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
308	973	Radio Vitus	1.0
311	964.5	Agen	0.25
*316	950	Marseilles (PTT)	0.5
329	914	Grenoble (PTT)	0.5
331.4	*905	Poste Parisien	0.5
363	828	Algiers	12.0
368	815	Radio LL (Paris)	0.5
375	803	Caen	0.5
*381	788	Radio Toulouse	8.0
416	720	Radio Maroc (Rabat)	2.0
447	671	Paris (Ecole Sup. PTT)	3.0
468	640	Lyons (PTT)	5.0
1,444	207.5	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
GERMANY			
*218	1,373	Flensburg	0.5
*227	1,319	Cologne	4.0
*234	1,283	Münster	3.0
*239	1,256	Nürnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Königsberg	2.5
*283	1,058	Magdebnrg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*319	941	Bremen	0.35
*325	923	Breslau	1.5
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1.5
*560	536	Hanover	0.35
560	536	Augsburg	0.25
566	530	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
223	1,346	Luxembourg	3.0
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	30.0
*298	1,004	Hilversum (until 5.40 p.m. G.M.T.)	6.5
*1,071	280	Hilversum	6.5
*1,080	277.8	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T)	5.0
*1,875	160	Huizen (after)	
HUNGARY			
550	545	Budapest	20.0
ICELAND			
*1,200	250	Reykjavik (under construction)	16.0
IRISH FREE STATE			
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
ITALY			
291	1,030	Turin (Torino)	7.0
*332	905	Naples (Napoli)	1.5
*385	779	Genoa (Genova)	1.0
*441	680	Rome (Roma)	50.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
308	973	Zagreb (Agram)	0.7
433	693	Belgrade	2.5
570	527	Ljubljana	2.5
LATVIA			
*525	572	Riga	3.0
LITHUANIA			
*1,935	155	Kovno	7.0
NORWAY			
241	1,243	Rjukan	0.18
*283	1,058	Notodden	.05
364	824	Bergen	1.0
393.7	762	Frederiksstad	0.7
453	662	Tromsö	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*493	608	Oslo (tests)	60.0
1,071	280	Trondhjem (tests)	1.5
POLAND			
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
1,411	212	Warsaw	8.0
ROUMANIA			
*304	761	Bucharest	12.0
RUSSIA			
720	417	Moscow (PTT)	20.0
938	320	Moscow (C.C.S.P.)	100.0
1,000	300	Leningrad	20.0
1,075	279	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
*1,304	230	Kharkov	4.0
1,481	202.5	Moscow (Kom)	12.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EA1J9)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
426	703	Madrid (EAJ7)	2.0
453.2	662	San Sebastian (EAJ8)	0.5
SWEDEN			
231	1,301	Malmö	0.6
*257	1,160	Hörby	10.0
270	1,112	Trollhättan	0.45
*322	932	Göteborg	10.0
332	905	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
TURKEY			
*1,219	246	Stamboul	5.0

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

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Jan. 19 *The Temptation of Juniper*, by G. K. Chesterton, presented by the University College Dramatic Society.
,, 20 Vaudeville programme.
,, 21 The Ceremony of the Keys, relayed from the Tower of London.
,, 22 Symphony concert relayed from Queen's Hall.
,, 23 Concert relayed from People's Palace.
,, 24 Excerpts from *The Mikado*, relayed from the Savoy Theatre.

DAVENTRY EXPERIMENTAL (5GB)

Jan. 23 *The Marchioness*, a comedy operetta, being a chapter from Charles Dickens, arranged by B. W. Finden.
,, 24 "Aerbut and Gaertie's Party," written and arranged by Graham Squiers.

MANCHESTER

Jan. 21 *Legend*, by Philip Johnson, a play adapted for broadcasting, by Muriel Levy.
,, 25 *Leeds Symphony concert*, relayed from Town Hall, Leeds.

GLASGOW

Jan. 25 Celebration of the 171st anniversary of the birth of Robert Burns, relayed from Mossgiel, Mauchline.

BELFAST

Jan. 20 "Stop Press," the first of a new series of daily features, of which topicality will be the keynote.

The French P.T.T. station at Montpellier regularly relays a concert from Barcelona (EAJ1), once every fortnight.

Work on the reorganisation of the German broadcasting system is to be started without delay. The first of the new high-power transmitters will be erected in the neighbourhood of Stuttgart, the second of the series will be installed at Königsberg to replace the station now operating in East Prussia.

OUR INFORMATION BUREAU

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

Adding Volume Control.

Q.—*I have a three-valve set incorporating a detector coupled to the first L.F. valve with a Dubilier R.C. unit and followed by a transformer-coupled power stage. I find that on the new stations the volume is overpowering and yet distant stations come in sweetly. Is there a satisfactory and distortionless method of adding a volume control and if so, how should I proceed?—B. F. (Windsor).*

A.—A volume control can be fitted to your set in such a way as not to create distortion and the arrangement will be very effective. To incorporate this volume control take out the grid-leak from the R.C. unit and also disconnect the grid of the first L.F. valve from the grid terminal of the R.C. unit. Now fit a potentiometer, the total resistance of the windings of which is one megohm, on the panel in a convenient position and wire up one outside terminal to the grid terminal of the R.C. unit and the other extreme outside terminal to the grid-bias terminal of the R.C. unit. Connect the grid terminal of the first L.F. valve holder to the centre terminal or sliding-contact terminal of the volume control component. Suitable adjustment of this volume control will give effective variation in the volume, without distortion. It may be necessary to re-adjust the grid voltage to the first L.F. valve to rectify any difference in the resistance of the new leak—C.

When Asking Technical Queries

PLEASE write briefly

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

"All-electric Clarion Three"

Q.—*I have finished the construction of the above receiver, but in reading through the text matter relating to its construction I can find no reference to the valves used. Will you please tell me what actual valves were used in your original tests of this receiver?—L. M. (Manchester).*

A.—The valves we used in our original test of this receiver were Marconi and Osram MS4 for the H.F. stage, MH4 for the detector stage, and an ordinary P625 power valve in the L.F. (power) stage. If you use these valves or valves of other makes having similar characteristics, you will obtain satisfactory results.—C. L.

For the Newcomer to Wireless: SPARKS

WHY is it that, though my set is pretty selective, I simply can't get rid of certain spark signals? I can hear them over a big band of wavelengths.

Do you mean signals from near-by spark transmitting stations or those which come from some distance?

Well, there is first of all a station only a few miles away from my aerial which is a dreadful nuisance when he is working.

The interference that you have from him is due to much the same kind of shock excitation of your aerial as an atmospheric causes. You will remember that we discussed that not long ago.

Yes, I remember, but why should a spark signal cause shock excitation?

When a spark transmitter is working, trains of damped waves are sent out, or waves of the same sort that an atmospheric produces. At short range, therefore, the aerial has much the same wide response to them that it has to an atmospheric; and the worst of it is that the more efficient the aerial is, the more liable is it to shock excitation by damped waves.

Would you recommend making the aerial less efficient?

If you are troubled by a powerful spark station at short range, I certainly would. You might try lowering the aerial and even using an aerial coil of rather low efficiency.

What about distant spark signals? Often, for instance, I hear both ships and the French coastal stations over many degrees of the tuning dials.

Here the trouble is not due to shock excitation or to any fault in your receiving gear.

What is the cause then?

If a spark transmitter is very loosely coupled to its aerial, the tuning can be made reasonably sharp and no great amount of interference is caused on neighbouring wavelengths. But as you tighten the coupling the tuning becomes broader. And when it is very tight indeed, the signal may actually be heard very loudly twenty or thirty metres above and below its nominal wavelength, and not quite so loudly on that wavelength. This is known as double-humped tuning.

Then do some operators use too tight a coupling?

Unfortunately they do, since this makes it easier for their signals to be picked up by the station which they wish to call up. Not many operators offend in this way, but if just a few either on ships or at coastal stations do so, that is quite sufficient to cause a great amount of interference with broadcasting.

Is this practice allowed?

Strictly speaking, it isn't, for the regulations lay down quite definitely the maximum amount of coupling permissible. But until we have some kind of ether police to deal with commercial traffic as well as with broadcasting, I am afraid that there will always be offenders until——

Until when?

Until the spark transmitter disappears altogether, as by international agreement it will in a few years' time.

What will take its place?

Probably what is known as interrupted continuous-wave transmission. This has recently been adopted by the North Foreland and other stations and it has the further advantage that signals are receivable with either valve or crystal apparatus.

ANOTHER FREE GIFT NEXT WEEK, AND STILL ANOTHER TO FOLLOW THAT! (SEE PAGE 79)

"KILLING VALVES BY KINDNESS"

(*Continued from page 94*)

has been said about the right and the wrong methods of adjusting grid bias applies with especial force to the pentode, but there is another way in which it can be completely "done in" by an action which might seem to be perfectly innocuous—it would be so in the case of a triode.

The user who wishes to get the best out of his pentode often provides it with an output transformer with a tapped secondary. He knows that for reproduction of the finest quality the step-down ratio between primary and secondary must be suitable for his loud-speaker. He connects up the instrument to one pair of secondary terminals; then, with the valve still switched on, he undoes the connections and makes them to a second pair. He may even rig up a double-pole change-over switch so that he can change the loud-speaker instantly from one pair to another. What can be the harm in doing that?

It would not hurt a triode valve in the least, but the pentode is a strange valve with characteristics that differ from those of any other. One of the most surprising of its many little peculiarities is that a sudden removal of the load in its output circuit may send up the voltage across the valve to something very much greater than that furnished by the source of high-tension supply. With 150 volts on the plate and priming grid, for example, the disconnection of the loud-speaker from the secondary terminals of the transformer may produce *a momentary voltage in the neighbourhood of a thousand* across the valve. Little imagination is needed to realise the terrific strain set up by an electrical pressure of this kind. If you are a pentode user make it a firm rule to switch off the filament before you carry out any alteration.

A Point about Pentodes

There is one other rather interesting little point about pentodes. Makers often recommend that plate and priming-grid voltages should be similar; but many users, without realising that they are doing so, give the priming grid a positive potential considerably higher than that of the plate.

Take a concrete case. Suppose that when the potentials are really equal at 120 volts the valve passes 12 milliamperes in the plate circuit and 3 in the priming grid circuit. Then the D.C. resistance between the filament and plate is 10,000 ohms and that of the priming grid circuit 40,000 ohms. If the choke or transformer primary in the plate circuit has a resistance of only 500 ohms there is nearly a 6-volt drop across it, so that the plate is receiving only just over 114 volts, whilst the priming grid has the full 120 volts. The higher the resistance in the plate circuit, the greater is the difference between the two potentials. To set matters right, either connect the priming grid to a lower tapping of the H.T. battery or use a decoupling circuit with a series resistance of about 2,000 ohms.

LETTERS TO THE EDITOR

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

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

American Receivers

SIR,—I have, naturally, no wish to decry products of my own country, but I have recently had occasion to review the latest radio products of America. I have also operated American sets myself for some considerable time.

It is amazing to find the state to which radio has developed in that country as compared with this

I have before me a catalogue of a machine made by the Radio Corporation of America, in a cabinet of African mahogany, of most pleasing and graceful design nothing comparable to which is on the English market at all—seven valves, all electric, and complete with single-dial tuning, for $54

In this country for the same amount of money one gets a three-valve battery-driven set in either a tin box or a varnished wooden box—you cannot call it cabinet-work. If one turns to the more expensive models, one is able to obtain powerful, selective, sensitive, moving-coil receivers from such firms as Attwater Kent, Robert Bosch for $275. There is no comparative machine on the English or Continental markets.

A typical specification for a nine-valve machine, complete in first-class walnut cabinet, with built-in dynamic speaker, and priced at $175, is 3 screen-grid H.F., automatic tuning (i.e., push button), station selector, *double* push-pull audio amplification, 12-in. dynamic speaker, automatic volume control, and remote automatic tuning control and pick-up adaptor What can we do for the same amount of money?

J. W. (Upminster).

The "All-Britain Three"

SIR,—Just a few lines of appreciation of the "All-Britain Three." It is, without question, the finest "three" I have ever had.

Incidentally, I have built over fifty sets.

This set will bring in anything worth while listening to in the way of foreigners and the tone is superb.

Just one thing: I think a volume control should be included. I have put a rheostat in the same way as the "Chummy Four" (original)—that is, detune on the H.F. valve—but I feel that possibly a volume control on the transformer would be better.

H. (London, N.).

P.S.—No doubt other readers will disagree about valves, but my experience is that a pentode is not in the same class as a super-power for quality and a S.G valve has little or nothing on a properly neutralised H.F. stage I have had the "All-Britain Three" twelve months.

A Good Performance

SIR,—As a regular reader of AMATEUR WIRELESS, I have noticed lately in your columns quite a lot concerning Brookmans Park, selectivity, and swamping; so perhaps the following will be of interest to you, especially when on the topic of obsolete and old-fashioned sets.

Over a year ago I built your original "Clarion Three," detector and two transformer L.F. stages, with the old swinging coil reaction, which, according to present-day radio, I should consign to the junk box. Whilst fully appreciating the advantages of the screen-grid and pentode, also the synchronised tuning of your recent "Ether Searcher," the following log of stations speaks well for your original "Clarion Three." The only alteration that I made is that I have dispensed with the switching-out of one valve and run the set as a three-valver.

The following have all been tuned in on the loud-speaker (I do not use phones): Cologne, Münster, Nürnberg, Belfast, Hörby, Radio Catalana, Königsberg, Turin, Göteborg, Aberdeen, Barcelona, 2LO (261 metres), Stuttgart, Hamburg, Radio Toulouse, Lyons, Langenberg, Daventry 5GB, Milan, Vienna. All were free of interference with the exception of Barcelona and Stuttgart, which are only a few degrees from London.

I use a No. 60 centre-tapped aerial coil and No. 25 reaction coil. My aerial is about 20 ft. long and runs parallel with the gutter of the roof.

I consider these results speak very highly of your designs and of AMATEUR WIRELESS itself. I have no desire to replace the old "Clarion Three."

A. (London, S.E.).

Wireless for the Blind

SIR,—AMATEUR WIRELESS is to be praised for its interesting article by Captain Ian Fraser on "Wireless for the Blind." There is a great need for any and every form of education and amusement for the blind, and wireless opens up new fields.

The School for the Blind at Swiss Cottage has already given its blind wireless and, knowing what a benefit it is, thanks you

(*Continued on next page*)

for helping to obtain it for other less fortunate blind people and children.

H. B. REYNELL (Organising Secretary, School for the Blind, Swiss Cottage, London, N.W.).

Sound-recording Progress

SIR,—I read with great interest the notes setting forth some of the work which I did for the B.B.C under the heading "On Your Wavelength," published on December 7.

It is quite correct that I am now with the British International Pictures, the company which made *Blackmail*, and would like to state that many of my ideas have been successfully incorporated in sound-recording apparatus.

I think I can claim that this company has made more progress than any other film studios which have taken up sound pictures, and I quote as an example that fine picture *Atlantic*, which has just been released. This picture taxed the resources of the sound department to the utmost, and even included sounds recorded by landline from Tilbury Docks.

The idea of making transmissions generally automatic, with the exception of the microphone end, is being developed in connection with sound studios to the extent that one can ultimately imagine microphones being placed on a "set" by a trained expert and the remainder of the work of getting the sound on to the film being entirely automatic. It is a far cry from the crude methods employed in the early talking-picture work to this ideal, but Elstree has already commenced a portion of the final idea.

A. STANLEY ATTKINS (Chief Sound Engineer, British International Pictures, Ltd.).

Another Interference Problem

SIR,—I have just been reading Thermion's paragraph entitled, "A Problem in Interference." I thought that perhaps it would interest you to hear about my experiences.

I have a three-valve pick-up amplifier, which I run off an all-mains D.C. eliminator. Several times I have heard Daventry 5XX coming through the loud-speaker. The amplifier is not in any way connected to a wireless set or an aerial.

I also found that if I put my finger on the grid terminal of the first valve it made the music louder.

All I can think is that the mains are acting as the aerial. E. S. C. (Bentham).

A microphone version of *Huntingtower*, the popular novel by John Buchan, has been prepared, and this broadcast adaptation will be relayed from Glasgow to London on January 30. It was given in October last to the Scottish group under the title of *The Holiday Adventure of Mr. Dickson McCunn*.

HUMMING IN SHORT-WAVE RECEIVERS

A SHORT-WAVE receiver is liable to hum badly when used under the same conditions as a broadcast receiver. A hum in a short-wave receiver can be very pronounced and will cause the set to appear to be insensitive when tuning in a faint signal. This hum in practically every case comes from the electric-light circuit in the house. Occasionally it is provided by the automatic telephone. If there is no electric lighting in your house you are not likely to be troubled by humming in your short-wave set, although in some cases this hum can be produced by an electric-lighting system in a neighbouring house, or even by electric trams or trains passing near the house.

Besides humming, there are several other sources of interference which show themselves up in a short-wave receiver, although they may not appear on a broadcast set. Many tramway companies are installing automatic points now, and these produce a loud click on a short-wave set when operated. Even if the points are at the other end of the road, the interference will probably be bad.

And now a few words about getting rid of, or at least lessening, the effect of some of these troubles. The writer recently built a one-valve short-wave adaptor, which gave excellent results, but the hum was hopeless and made distant listening impossible. The set was enclosed in a metal case—four sides and a top. The baseboard formed the bottom of the home-made "cabinet." The screening did not make the slightest difference to the hum. The receiver was operated in an upstairs room, and it was noticed that when the receiver was placed nearer the centre of the room, i.e., with an electric-light pendant above it and one in the room below, the hum became very much worse. When the metal screening was completed, a screen of metal under the baseboard, the hum, as far as ordinary listening was concerned, disappeared completely.

Many commercial receivers are built on this plan nowadays—i.e., they have a wooden baseboard as one side of the cabinet, and so leave the screening incomplete. A piece of thin zinc or similar non-magnetic metal, screwed to the underside of the base and earthed, should be effective.

In the instance given above the mains are mercury-arc rectified A.C., which are notoriously bad for humming; and yet with this set now one has to put one's head in the loud-speaker to find any trace of hum at all. Remember, though, that in cases where a very thin baseboard is used the proximity of a sheet of metal near the tuning coils and condensers is going to make a considerable difference to the tuning and, if the amount of trouble involved is not objected to, it is best to

(*Continued on page* 116)

"HUMMING IN SHORT-WAVE RECEIVERS"

(*Continued from page* 114)

make a "false" base by raising the baseboard about an inch from the metal.

In many cases the hum can be got rid of without any metal screening at all. There is the loud hum which sometimes comes when the receiver just approaches the edge of oscillation. There are several possible cures for this. One is to place a fixed grid leak of about ¼ megohm across the secondary of the first L.F. transformer. Another is to change the value of the grid leak in the detector circuit. Yet another is to try another H.F. choke in the detector-plate lead. An aerial too tightly coupled to the grid coil will cause it. Even too much grid bias will sometimes cause it. This hum will become so bad at times that it reminds one of threshold howling. Indeed, the cure in many cases is the same.

When humming occurs in a short-wave set it is practically sure to originate in the detector circuit, where it is passed on to the L.F. valves and gets amplified along with the signal. If all hum can be got out of the detector circuit the background will not be amplified by the L.F. valves and the signal will stand out loud and clear.

MANDER BARNETT.

In 1925 the number of British ships on which wireless direction-finding apparatus was fitted was 225. The number has now risen to over 800.

The U.S. Department of Commerce announce that 24 radio beacons are in operation, 15 are being built, and some 40 more are being planned for completion in the near future.

That operating costs do not necessarily vary with the rise in power is shown in the following tabulation of expenses for broadcasting stations in America, prepared recently by the Federal Radio Commission. For 100-watt stations and under, £1,823 a year; 200-watt stations, £1,586; 250-watt stations, £5,340; 350-watt stations, £38,000; 500-watt stations, £5,581; 750-watt stations, £19,838; more than 1,000 watts and less than 2,000 watts, £10,780; 5,000-watt stations, £23,053; 7,500-watt stations, £40,000; 10,000-watt stations, £23,535; 20,000-watt stations, £35,800; 25,000-watt stations, £93,653; and 50,000-watt stations, £53,141.

Direction-finding installations or wireless beacons have been erected and are in operation round the coast at the following points: Kinnaird Head in Scotland, the *Spurn* light-vessel on the Humber, Cromer, Dungeness, Start Point, the Casquets in the Channel Islands, Round Island in the Scillies, Lundi Island, the South Bishop off Pembrokeshire, the *Coningbeg* light-vessel off the south-east of Ireland, the Skerries off Anglesey, the *Bar* light-vessel in Liverpool Bay, and Sule Skerry off the north-east coast of Scotland.

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

CRYSTAL SETS (6d. each)

B.B.C. Brookmans Park Set AW206
Regional Crystal Set WM176

ONE-VALVE SETS (1s. each)

B.B.C. Official One AW208
Reinartz One WM127
A.1 .. .. WM153

TWO-VALVE SETS (1s. each)

Loud-speaker America Two AW190
Talisman Two (D. Trans) AW194
Hyper-selective Two (D, Pentode) AW198
Pentector Two (P. det, RC) AW213
British Broadcast Two (D, Trans) AW215
Clipper Two (D, Trans) WM135
Continental Two (D, Trans) WM143
Stay-put Two (All AC, D, Trans) WM155
Ether Ranger (D, Trans) WM156
ABC Two (D, Trans) with copy "WM"—1s. 3d. WM160
Brookmans Two (D, Trans) WM168
AC Two (D, Trans) WM175

THREE-VALVE SETS (1s. each)

All-Britain Three (H.F., D, Trans) AW158
The Binowave Three (D, RC, Trans) AW172
Clarion Three (SG, D, Trans) AW175
Broadcast Three (SG, D, Trans) AW192
James dual-range Three (HF, D, Trans) .. AW196
All-wave High-mag. Three (D, 2 Trans) .. AW199
Knife-edge Three (D, RC, Trans) AW201
Talisman Two-three (D, RC, Trans) AW203a
Wide World Short-wave Three (HF, D, Trans) AW207
Everybody's Three (SG, D, Trans) AW209
1930 Ether Searcher (SG, D, Trans) AW211
New All-Britain Three (HF, D, Trans) AW214
Standard Coil Three (HF, D, Trans) WM117
Wide-world Short-waver (SG, D, Trans) .. WM120
New Year Three (SG, D, Pentode) WM123
Lodestone Three (HF, D, Trans) WM129
Simple Screen Three (HF, D, Trans) WM131
Dynamic Three (AC—SG, D, Trans) WM136
At Home Three (D, 2RC) WM141
Short-Wave Link (D, RC, Trans) WM142
Binowave S.G. Three (SG, D, Trans) .. WM152
Fanfare (D, 2 Trans) WM157
Brookmans Three (SG, D, Trans) WM161
Community Three (D, RC, Trans) WM164
New Q3 (SG, D, Pentode) WM167
Brookmans Push-pull Three (HF, D, Trans) 1/6 WM170
Celerity Three (SG, D, Trans) WM173

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

Overseas Short-waver (HF, D, 2 Trans) .. AW133
Clarion All-electric Three (SG, D, Trans, AC Rectifier) AW200
*Music-lover's Gramo-radio (SG, D, RC, Trans—1s. 6d.) AW202a
*Music-lover's Gramo-radio (Loud-speaker—1s.) AW202b
*Music-lover's Gramo-radio (Motor-board—9d.) AW202c
Binowave Four (SG, D, RC Trans) WM119
Standard-coil Four (HF, D, 2RC) WM122
Dominions Four (2SG, D, Trans) WM134
Short-wave Adaptor for Dominions Four .. WM140
Music Player (HF, D, RC, Trans) WM144
Arrow (SG, HF, D, Trans) WM154
1930 Monodial (2SG, D, Trans) WM158
Electric Four (All AC—SG, D, RC, Trans) .. WM162
Outpost Four (SG, D, 2 Trans) WM165
Brookman's Four (2 SG, D, Trans) WM174

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

Fidelity Five (HF, D, 2RC) WM130
All-wave Lodestone Five (HF, D, RC, Push-pull) WM146
1930 Five (2HF, D, RC, Trans) WM171

AMPLIFIERS (1s. each)

A.W. Gramophone Amplifier AW205
Beginner's Amplifier (1v.) 9d. AW210
Brookman's Separator (HF Unit) AW212
Two-valve Amplifier AW216
Signal Booster (HF Unit) WM128
Auditrol Amplifier WM132
Concentrator (HF Unit) WM169

MISCELLANEOUS (1s. each)

Short-wave Adaptor (1 v.) AW183
High-tension Battery Charger AW191
Mains Unit for S.8 Valves AW193
Simplest H.T. Unit AW197
B.P. Wavetrap (6d.) AW204
H.T. Unit for A.C. Mains WM125
Lodestone Loud-speaker WM126
James H.T. Unit for D.C. Mains WM133
Two Ampere Low-tension Unit WM147
A.C. Mains Amplifier WM149
A.C. Mains Unit for All-wave Lodestone Five WM151
H.T. Unit for A.C. Mains WM159
"W.M." Linen-diaphragm WM172

PORTABLE SETS

Arcadian Portable (SG, D, 2 Trans) with linen-diaphragm loud-speaker (half scale) AW177 1/6
£5.5.0 Portable (D, Trans) AW181 1/6
Holiday Portable Three (D, RC, Trans) .. AW188 1/-
Music Leader (SG, D, RC, Trans) with copy "AW" .. .. AW203 -/4
Wayfarer Portable (Super-het) WM139 1/6
1929 Chummy (SG, D, Trans, RC) .. WM145 1/6
Enchanter Portable (2HF, D, RC, Trans) WM150 1/6

The three prints are obtainable for 2s. 6d. post free

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

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

"MORE RADIOGRAMS"

THE thrill of listening to the striking of Big Ben from London in Australia is no longer a novelty, because it is heard with such consistent regularity.

An analysis made by the Federal Radio Commission was submitted to the American Senate of 340 broadcasting stations, which showed that 172 lost money in amounts up to £2,000 over a period of a year; the remaining 168 stations realised monetary gains up to about the same figure. The greatest losses were reported by the highest-powered stations. All the five 50,000-watt stations were in this class.

The American Radio Commission has reserved the frequencies from 14,100 to 14,300 kilocycles for amateur telephony work. They are particularly adapted for long-distance communication, and should therefore be heard throughout the world.

One company has been given a broadcasting monopoly for Turkey in Europe and Turkey in Asia. Two high-power stations have been built, one at Angora, the other at Stamboul. Turkish interest in radio, however, is not great, and its growth has been small.

London County Council Education Committee proposes to give permission for wireless apparatus to be connected to electric lighting installations in schools, provided that the Chief Engineer is satisfied as to the suitability of the apparatus.

It is reported that the first man to make a proposal of marriage by transatlantic wireless telephony has just been married in London as a result of his enterprise.

Station WTMJ (Milwaukee) has established an artistes' bureau. This bureau acts like an employment agency for its studio entertainers during their time off the air. Under this system two hundred station artistes and twenty orchestral units are available for personal engagements.

Broadcasting station WTAM has a mechanical clock which goes on the air at five-minute intervals between 7.30 and 8.30 every morning. It is linked with a mechanical voice and is intended to help the reluctant to get out of bed.

Seven broadcasting stations in New England, WBZ, WBZA, WEEI, WNAC, WSSH, WHDH, and WLEX, have adopted standards to govern broadcast advertising so that objectionable matter will be eliminated.

WBBM, Chicago's super-power broadcasting station reports that talent costs more than £1,200 a week. The studio orchestra receives an average of £31 a week per man.

The *Leviathan's* two-way radio telephone communication to subscribers ashore can be maintained up to a distance of 1,500 miles—about two and a half days from port. The charge for a one-minute call ranges from twenty-five shillings to forty-five shillings.

RADIO AND THE WHALE HUNTERS

IN the North Polar regions and the Southern Atlantic Ocean, radio is daily becoming of greater use. Its latest sphere of utility has been in the assistance given to the whale fishing industry. Gone are the days of the sailing ships and man-propelled boats, now replaced by high-power steam or petrol launches, fully equipped with harpoon guns, hand grenades, compressed-air cylinders, wireless transmitting and receiving plant, and direction-finding apparatus.

The modern whale "chaser" to-day may be one of a small fleet attached to a ten or twelve thousand ton mother ship carrying a crew of some two hundred and fifty men. This steamer, directing the individual operations by wireless, may also be in direct touch with its home port. By this means, full information in regard to catches may be given at regular intervals, and in exchange the mother ship receives news bulletins, instructions, personal messages for the crew, and any news which may be of assistance to its work.

Telephony and telegraphy also play an important part in the communications between the ship and its motor fleet, as the former, in the event of snow storms, fog or other adverse weather conditions, by the aid of the direction finders, can help the smaller boats in their return to the depot vessel.

CLIFTON HILL.

A series of exclusively Scottish health talks has been arranged for broadcast from Scottish stations during 1930. These have been arranged with the co-operation of the Department of Health for Scotland, and will be broadcast monthly in periods formerly reserved for Government Departmental talks from London. The first four talks are being given by officials of the department, opening with Mr. Tom Johnston, the Under Secretary for Scotland, on "Public Health and the Private Citizen." Subsequent talks will deal with such subjects as the new Pensions Act, Scottish Hospitals, and the Scottish housing problem.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: Central News Agency, Limited. Sole Agents for Australasia: Gordon & Gotch, Limited. Saturday, January 18, 1930

Amateur Wireless,
January 25, 1930

WITH FREE FULL-SIZE BLUEPRINT

THE SET VOTED FIRST AND BEST

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVI. No. 398 Saturday, January 25, 1930

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

JANUARY 25, 1930 No. 398. Vol. XVI

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

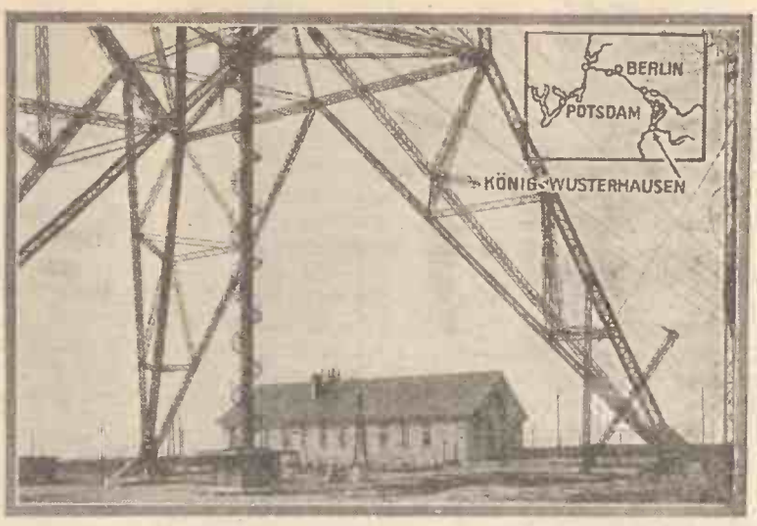
Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

Still Another Gift!—This Year's "G.N."—The New "London"—These "Human Wireless Sets"—"DX" on the High Seas!

Still Another Gift!—Inside this issue you will find our second great Free Gift—a Full-size Blueprint of the "Best-by-Ballot" three-valver described in the centre pages. Next week's issue will contain yet *another* free gift—a full-size blueprint of a little unit which will cure all your interference problems, appropriately termed the "Brookman's By-pass." Turn to page 136 to find out full details of this new way of getting knife-edge tuning.

This Year's "G.N."—Not long now till the Grand National—one of the most important, and difficult B.B.C. outside broadcasts. This year's broadcast will be more complicated than in any previous year. The commentator's task has been hitherto an almost impossible one, as he has had to identify the horses over the whole course from his post in the grand stand. This year two commentators will take part, one in the grand stand and one at the canal turn. The two accounts will be dovetailed to form a continuous narrative and to ensure a definitely accurate account of the steeplechase. Tricky work ahead for the men at the "fader" controls!

The New "London"—While in Portland Place one night recently (writes an AMATEUR WIRELESS correspondent), I made a point of seeing what progress was being made with the new London B.B.C. headquarters. Workmen were busy completing the retaining walls and foundations under the glare of huge electric "spot-lights," giant conveyors swung tons of earth and gravel over their heads, and the general scene was one of intense business. It won't be long now before the erection of the superstructure is started. An interesting feature has been the encasing of a large brick sewer over a century old, at a depth of 50 ft. below the ground level. As this sewer is liable to a surcharge of 25 ft., the task of carrying out the necessary operations with safety has provided an interesting engineering problem.



Here is that "station with the long name"—Königswusterhausen—which is heard so well in this country just now. (Inset) a map showing the station's location.

These "Human Wireless Sets"—What do you think of the idea put forward recently by a national daily paper, that some people can "hear" wireless music going on in the air? "Is it possible that there are people who, owing to some special conformation of the brain, are natural wireless receivers? Is it possible, too, that there are people confined in asylums merely because they have this power and continually 'hear noises'?" These questions were suggested to the paper in question by Major Leonard Avery, a physician who, impressed by the case of a patient he saw in an asylum, believes that here is a problem for scientific inquiry. It does sound just a *little* far-fetched, eh? If it's true, the P.M.G. should do something about special licences!

"DX" on the High Seas!—A short time ago, an ocean-going tug sailed from Glasgow, bound for Victoria, Brazil, with a heavy tow-load. A short-waver was carried, and throughout the entire voyage of some 6,000 miles, the PCJ programme was regularly received. A log was kept, from which much valuable data was collected. For the first few weeks of the voyage, PCJ was heard regularly and without fading. When the vessel was in the equatorial zone, reception was interfered with by atmospherics, but when these ceased, even daytime reception was extraordinarily good. As time went on, the American short-wavers, WGY and KDKA, were tuned in. Then it was noticed that transmissions came through with much greater power after the moon had set, although during the day-time signals were quite satisfactory. Sometimes the rolling of the boat made reception a little difficult, but even while in Victoria Harbour, PCJ still came roaring through. A good short-wave test!

PRINCIPAL CONTENTS

DO NOT MISS THE GIFT ANNOUNCEMENT ON PAGE 136

RAIDING A RUM-RUNNERS' RADIO STATION!

By KENNETH ULLYETT

Prohibition Officials examining the bootleggers' radio station

"I DON'T know why you folk trouble to read American fiction. Stories from real life are just as 'peppy'—especially the doings of bootleggers." So said an American friend to me in London last week, visiting this country to learn of the quieter happenings in radio over here. Then he went on to tell me of the radio exploits of rum-runners and bootleggers, following recent sensational arrests in New York.

I admit that I have seen many Hollywood films in which rum-runners and radio have played a part. To an English audience they seem strange, but here is a story which I know is true.

A Clever Capture

It appears that the Prohibition officials had been for some long time watching a certain section of the Atlantic seaboard from Long Island to Atlantic City—a distance, I suppose, of about 200 miles. This is a "hot" centre for rum-runners. You will doubtless be aware that crime of this description is carried out on quite an organised basis, but it is surprising to learn that when certain bootleggers' premises on this strip of the coast were raided by one hundred and thirty Federal agents it was discovered that at one spot was a powerful radio transmitter from which a fleet of six armed rum-runners was directed!

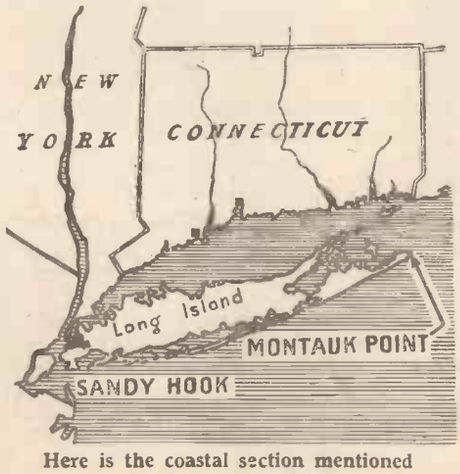
My American visitor had been in close touch with the Federal agents in this particular raid. "It was a bit of a surprise," he said, "although it was known that there were some means of communication through which the runners could be directed as to when to land the liquor.

"However, the bulls (the police) made investigations, and one fine day they had the opportunity to drop across the transmitter itself a mile or two from Sandy Hook (a well-known point in New Jersey); the operator at the station was surprised, too, when they paid their visit. They held him up with gats (revolvers) and one of the agents who knew how to handle a key, carried on transmitting the messages. Meanwhile the code was got from the operator and they found that the messages were going out to a fleet off Montauk Point—each boat carrying 3,000 cases of liquor!

"This was the real stuff, better than you see on the films. The Federal man slipped into the code and after the scheduled stuff was through he transmitted instructions to the fleet which would lead the bootlegger boats into arresting reach of coastguard cutters. But the receiving operator at the fleet end must have winded something, for the boats did not float into the trap, though they were had later.

"What does a bootleg radio outfit look like? Well you might be surprised at the business-like way in which everything is done.

"The wavelength generally is between 60 and 100 metres, but I have known an outfit in which the wavelength was 6,000 metres, and in this way they make the radio traffic look like pucka commercial long-wave stuff. The short waves get farther, but are more likely to be suspected, because there is very strict supervision at present in the States on all short and medium waves. The bootleggers use code and not phone (telephony) for obvious reasons.



Here is the coastal section mentioned

The Amateur in Business

"One bootleg radio outfit raided, and where the accompanying photograph was taken, was the home of a keen radio fan. During the night he handled short-wave code messages for the rum-runners; and during the day he experimented to get better results! Most of the transmitters work on low power, and get it from the ordinary lighting mains.

"Once a Federal-agent raid disclosed a rum-runners' headquarters in a sumptuous office suite in West Forty-third Street, New York City. Here the director of 1,000,000-dollar syndicate gave orders over the 'phone lines to a radio set in a private house near the coast. Afterwards the operator broadcast the messages to boats standing off the coast, and then speed boats set out from the Hook to unload the cargo. This isn't fiction, though I reckon it sounds like it, but is hard fact. It seems expensive, and of course, radio transmitters do cost a lot, but bootleg liquor is 50 per cent. diluted and about 80 per cent. profit!

Good Equipment

"I guess some of the big men in bootlegging make big money. The two folk responsible for the radio plant which was raided at Sandy Hook are Mannie Kessler and Morris Sweetwood, former bootleg 'kings,' and both of them have been in the Atlanta Federal can (prison). They neither of them know any more about radio than how to listen to the Kiddies' Hour from WGY., but they know the utility of radio in directing a bootleg fleet!

"One of the best bootleg radio stations raided by the Federal men disclosed some good radio gear—two short-wave transmitters, one using phone (telephony) strangely enough, a two-tube short-wave receiver, a commercial broadcast set, and last but not least half a dozen good rifles and a specimen selection of liquor—which latter I suppose the operator sampled after long sittings at the key!"

How the radio bootleggers get away with it in a country where all the wavebands are so closely watched I can't imagine; but judging from this story and from current American Press cuttings which prove its truth, radio is playing an important part in an illegal but nevertheless large industry.

Some of the leading authorities on Ulster folk lore and history are being approached by the B.B.C. Belfast officials with a view to a new dramatic series on Northern Ireland.

ANOTHER FREE GIFT NEXT WEEK!
A Special Announcement is made on page 136

NEXT WEEK

OUR THIRD FREE GIFT

Introducing The BROOKMAN'S BY-PASS

ANOTHER FULL-SIZE BLUEPRINT

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

A simple and cheaply constructed device which will solve the selectivity problem at all ranges from five to fifty miles from Brookman's Park. Complete constructional details of the new "Brookman's By-pass" together with a Free Full-size Blueprint will be given next week

THE ordinary tuning circuit consisting of a coil with a condenser in parallel is capable of selecting one station from among a number of other stations by virtue of its magnification. The voltages picked up on the aerial are normally very small, and it is only when we adjust the tuned circuit to resonance with the particular station to be received that the voltages become sufficiently large to operate a valve.

Consequently, we can usually turn from one station to another by the simple expedient of re-tuning the circuit.

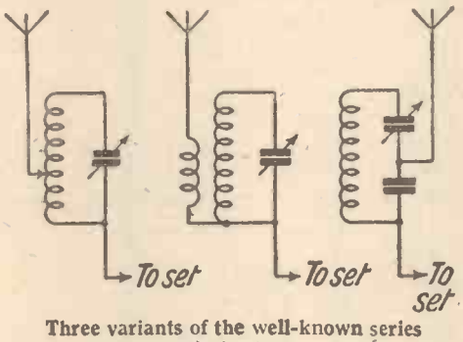
This simple device breaks down when one is situated in close proximity to a powerful transmitting station. The voltage induced is then so large that appreciable voltage is applied to the valve even when the circuit is not correctly tuned. We say that this makes the tuning broad or flat, as the particular station can be heard for many degrees on either side of the actual tuning point.

Methods of Obtaining Selectivity

In extreme cases, the actual tuning point is difficult to define, and where one is really close to such a station as Brookman's Park, the tuning extends over the greater part of the dial and interferes with the reception of such powerful stations as 5GB or the second Brookman's Park transmission. Clearly, our simple tuning system has entirely broken down, and it is necessary to devise methods of restoring the balance of affairs to something comparable with the normal condition.

Fortunately, this does not mean a considerable alteration to one's receiver. An additional tuned circuit can be made to provide the necessary results. One method is to arrange this to tune to the required station, thereby obtaining a double-selecting process. This arrangement is known as a coupled circuit, but has the disadvantage that *both* circuits need to be tuned all the time. The alternative is to adjust the additional tuned circuit to absorb or cut out the interfering station, either totally or partially, and this method has the important advantage that it only needs to be adjusted once. The tuning of the receiver proper is then carried out in exactly the same manner as usual, but, due to the presence of the additional tuned circuit, the interference from London (or whatever the local station may be) is greatly minimised.

We have really devised a complex circuit which not only has a tuning point, but also



Three variants of the well-known series rejector trap

a rejecting point; the reception at this latter point being, as far as possible, nil, irrespective of the strength of the signal applied to the system. This is the principle underlying the use of additional tuning circuits, known variously as wave-traps, filters, rejectors, etc.

From what has been said, however, it will be clear that there are certain requirements which must be fulfilled by any satisfactory device of this character. These may be set forth briefly as follows :—

(1) The trapping action should be independent of the tuning of the detector circuit itself.

(2) The trapping should be discriminative. It should eliminate the undesired stations as completely as possible without causing a reduction of the signal strength of near-by stations.

(3) If possible, some means of varying the by-passing action should be provided so that the circuit may be adjusted to give optimum results under all conditions.

A number of tests have been carried out at the Furzehill Laboratories, and also at greater distances from Brookman's Park, with various devices of this character. A study was made of the series-rejector type of trap as shown by the diagram. The circuit is tuned to the frequency which is to be rejected and the aerial is coupled either by direct tapping, by a coupled winding, or by a capacity tap, so that the extent to which the circuit absorbs may be controlled.

The Best System

It was found difficult, however, with this form of trap to attain the desired standard, and attention was directed in other directions. The series-rejector type of trap just mentioned works by introducing into the aerial circuit a very high resistance at the actual tuning point. A certain amount of energy, however, will force its way through, and there is always the pick-up on the earth lead to be considered. Using a full-size aerial at Elstree, it was not found possible with a trap of this type to eliminate Brookman's Park unless the coupling to the aerial was such that 5GB was seriously reduced in strength.

Attention was turned, therefore, to other methods, and it was found that a very satisfactory by-pass trap could be produced with proper precautions. This consists of a tuned circuit arranged to by-pass the greater portion of the energy received without allowing it to affect the receiver. This, of course, only applies to the frequency to which the circuit is tuned.

A by-pass of this nature proved eminently satisfactory, for it was possible to eliminate Brookman's Park, even with a full-size aerial, with only the slightest

(*Continued in third column of next page*)

FREE! FULL-SIZE BLUEPRINT OF THE "BROOKMAN'S BY-PASS" NEXT WEEK

My Wireless Den

Weekly Tips—Constructional and Theoretical—by W. JAMES

Is A.C. or D.C. Better?

THOSE having a mains supply of alternating current are usually considered to be more fortunately placed as regards the ease with which suitable high-tension for reception is to be obtained, but those whose supply is of direct current need not despair.

The amateur having only 100 volts or thereabouts is apt to feel the supply is of no great value for wireless purposes. Some, however, use the mains for charging high-tension accumulators, and are therefore able, with a little trouble, to maintain an adequate battery. But this method does not recommend itself to all amateurs who want to use a reasonably high voltage, such as 400 with a current approaching 100 milliamperes.

To those who can bear the expense, I would suggest a rotating machine of the motor-generator or rotary transformer class. A motor-generator is, of course, a double machine comprising a motor wound to suit the voltage of the supply which drives a generator designed to provide the necessary high voltage. It may have two windings, one being for the filaments and the other for the high-tension circuits, and there is no reason why a third winding should not be employed for the grid circuits.

Such a machine having three commutators would be somewhat expensive, but I remember using one seven or eight years ago, with every satisfaction.

A rotary transformer is usually a simple double-wound machine, the mains being connected to one commutator and the output being taken from the other. Suitable machines are readily to be obtained. Smoothing normally presents no difficulties at all and running costs are relatively low.

The question of noise naturally arises. There need be no fear of difficulties in this respect, according to tests I have carried out from time to time. Good machines suitably fitted are quiet in operation. They are reliable, too, and do not cost very much to run, considering the output obtained.

Those Switches!

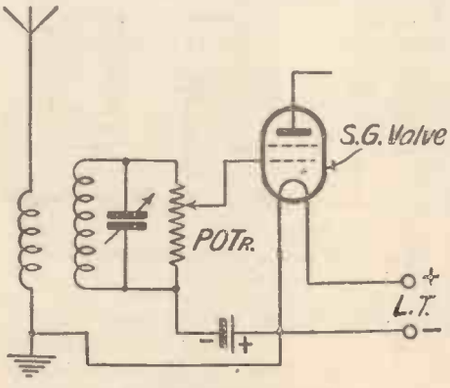
It seems that switches must be used in modern circuits for wave-range changing and the filament circuit.

Not all switches are good ones, however. Some are poor, flimsy things that fail after a little service. This ought to make us very careful of the design that we use in our sets, for surely nothing is more annoying than a faulty contact, particularly when it cannot be reached for adjustment.

I have been fortunate with the switches used in the new Binowave coils as employed in "Everybody's 3" and other sets. Not a single instance of switch failure has been brought to my notice! The switches used are particularly robust. They are mounted in an easily reached position where the contacts may be seen, and therefore no trouble of any description should be experienced.

A New Volume Control

Every modern set has its volume control. Sometimes it is fitted after the detector, but when there is a high-frequency stage a control of some sort ought to be provided in the high-frequency circuit, or how is one to reduce the strength of the more powerful stations?



A novel volume control

I have described several types at various times, but there is one which, I think, may be of great value in certain circumstances. It comprises a potentiometer connected across the grid coil (see accompanying figure). The sliding contact is taken to the grid of the H.F. amplifying valve; therefore, the actual voltage applied between the grid and filament may be adjusted.

A useful value is 200,000 ohms—non-inductive, of course. I have used a Centralab with good results. This type is free from noise in my experience, and has a nice smooth movement.

You will notice that grid bias is included for the H.F. valve. This is quite essential in one form or other, although to my surprise, it is sometimes omitted from sets. As I have said before, the time will arrive when an H.F. stage will always be biased, as is an L.F. stage.

Back to the Phones

I suppose that relatively few amateurs make a practice of listening with phones.

Someone once asked me, in all seriousness, "What are headphones?" which goes to show that in some quarters loud-speakers only are used.

But many of us have a pair of phones. I came across mine the other day. They had not been used for a long time. The diaphragms were rusty and when, out of curiosity, I tried them, I was rather surprised to hear at all. Actually, I wanted to learn how far I had succeeded in removing a hum from a mains set. This had a filter output, but, being doubtful of the insulation of the phones, I put in a transformer to make doubly sure. A shock through the head is not very pleasant, and it is best to be on the safe side.

"INTRODUCING THE 'BROOKMAN'S BY-PASS'"

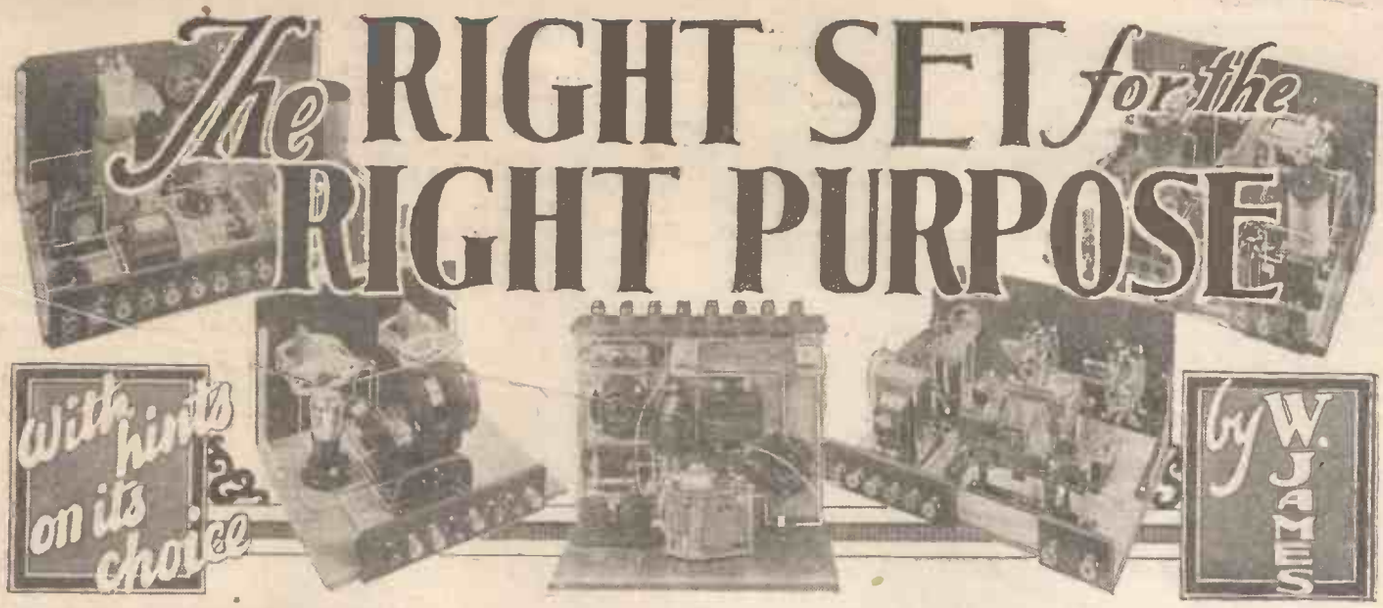
(*Continued from preceding page*)

trace of reduction of 5GB. It was realised, however, that for readers living farther afield the trapping would be too severe, and it was necessary to find some means of varying the by-passing action.

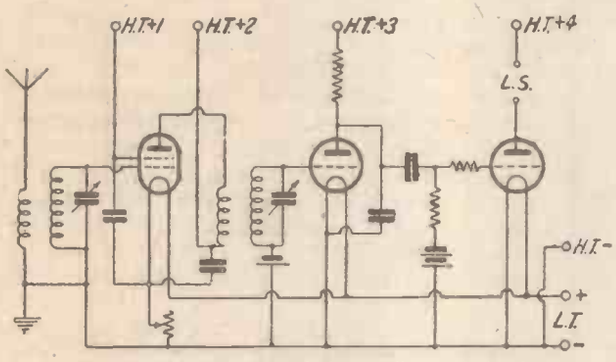
Hitherto this had never been done with this type of circuit, which is essentially different in its operation from that shown and it was only after a careful examination of the theory had been made that a possible method suggested itself.

This method, which is ludicrously simple, proved very satisfactory on trial. The result is a simple and cheaply constructed device which will prove effective on all ranges from five to fifty miles from Brookmans Park. Complete constructional details of the new "Brookman's By-pass" and a FREE BLUEPRINT will be given next week.

The RIGHT SET for the RIGHT PURPOSE



THE dangers of indicating a certain type of set as being the most suitable for an individual's own particular requirements are probably fully appreciated only by those who receive numerous requests for advice upon this matter.



A good three-valve circuit for quality reproduction

Personally, I realise, through experience, some of the snags. As a result, I am careful to point out the limitations of various designs.

Neither do I attempt to indicate the sets which some people want, as they have, as yet, not been built. This is quite a serious statement. In the future we shall have sets with four or five tuned circuits worked by one knob, a decent detector, and a really good power stage and reproducer.

I know of no such sets in production at the present time in this country, and certainly no satisfactory design has been published.

Many people fancy a three-valve set having one high-frequency stage. Sets of this type are popular just now. But they probably represent no more than a step in the right direction, as compared with the older detector and two low-frequency type. How much better the selectivity when further high-frequency stages are added; how much more easily the distant stations are received and what an improvement there is in the tone!

For many purposes a simple two-valve set is perfectly satisfactory. A listener living within a few miles of the London Regional station, for instance, would be able to receive clearly and with fair volume the alternative programmes to be transmitted. The set would have to be fitted with a decent coil and a reasonable power valve. Run from the mains, a two-valve set for listening to the local stations only, is an attractive proposition because of its results, reliability and low costs.

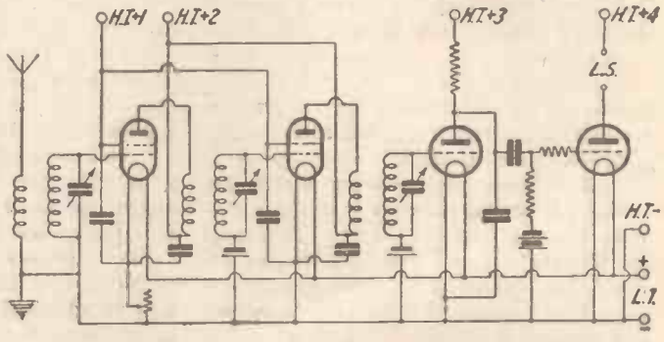
My own little two-valve set has an anode-bend detector and a power valve with 160 volts of high-tension. The quality is good—anybody can use it, and I don't expect to be called upon to bring in foreign stations with it, because, frankly, it is made for the local stations only. We want good quality and not squeals from a lot of Continental stations.

A nice little two-valve set used with an outdoor aerial has a resistance-coupled stage, but if a good transformer were used, the quality would be practically as good. A two-valve set, of good design, and where possible mains operated, is a really first-class receiving equipment for short distances, and suitsnumerous listeners. The loud-speaker would, of course, be of the reed-driven cone type. No one would normally expect to drive a moving-coil pattern reproducer from so small a set, although a particularly sensitive speaker might provide enough power.

Gramophone records are sometimes played through the medium of a pick-up and two-valve set. Given a sensitive pick-up of reasonably good design, and a volume control, fair results may be expected. Naturally, much depends upon the last valve—its size and the amount of the high-tension applied to it. Some two-valvers have a pentode output valve. Used without a tone corrector, the quality of the reproduction is considered by many to be too hard and of too metallic a nature.

Personally, I do not care for the tone, unless a filter is fitted. This must be of suitable design, however, or speech will sound drummy. I am no lover of pentodes, myself, being too acutely aware of their shortcomings as compared with ordinary valves, and there is, of course, the question of their price. However, some people like pentodes because they are supposed to provide more power and greater magnification.

Strictly speaking, a three-valve set should be used when a few distant stations are required. Used in towns, a good three-valve set will easily bring in a few foreign stations worth listening to, even when the aerial is not a good one.



A "four" with two H.F. valves—also recommended for quality

A typical set, designed for good quality of reproduction would have an H.F. stage with a shielded or ordinary valve, an anode

Send detector, and a resistance-coupled Power stage. With a set of this pattern, the quality would be good, and if it had one-dial tuning, anybody could use it. Run from the mains, it would, in many respects, be ideal for an ordinary listener.

Getting Selectivity

By fitting a leaky-grid detector and reaction, the sensitivity would be improved and a further increase in strength would follow the inclusion of a transformer in place of the resistance coupling. This brings us to the popular three-valve set, made to bring in a number of distant stations and to provide fair quality from the local station.

There are several patterns, all of which are good all-round sets, although not appealing so much to the music lover as the three-valve set described above. Some have one-knob tuning and others two tuning controls with the addition of one for reaction.

Wavechanging

Coil changing being practically a thing of the past, excepting when the short wavelengths are included, the sets have switches. Some are attached to the coils themselves and others to the bases of the coils. They may be ganged, but here the reader is warned to be on the lookout for poor mechanical arrangements. Apparent simplicity in particular must be regarded with care. A simple switch may be satisfactory, or its springs may be so weak that poor contacts result. However, there are numerous good switches that will last indefinitely.

Probably the shielded valve is more easily and cheaply used for high-frequency work than the ordinary type. It needs no balancing condenser and is easily arranged to provide good magnification. Its price is relatively high, of course, but the total cost of a high-frequency stage is no greater than when a three-electrode valve is used.

The coils fitted should not be too small. No method has as yet been discovered of making a compact coil as effective as a larger one. Litz wire is hardly necessary, nor great bulk, but too compact a design is to be avoided on the score both of magnification and selectivity.

Suiting the Locality

One make of three-valve set may be much more suited to the needs of a district than another make; it all depends upon what the designer had in mind. I know of a set, for example, which was primarily designed to magnify, and it is, therefore, well suited to places far from broadcast stations. It would hardly suit those living near a station as it tunes very broadly. Other sets are much more selective and not quite so powerful and are as a consequence better suited to the needs of listeners who normally have no difficulty in hearing a few strong stations.

The importance of realising the wide differences between sets of the same general type should be noted. One may be specially designed for quality of reproduction and will receive only a few stations, whilst another will bring in a number and receive the local one with fair quality.

The factor of safety is, naturally, much greater in a four-valve set. With two high-frequency stages its selectivity is almost certain to be good, or there may be only one H.F. stage and two low-frequency, when the volume may be greater.

Two good low-frequency stages at one time used to be considered essential for loud-speaker work, but I doubt whether they are really needed in these days. The playing of gramophone records is easy when there are two L.F. stages with plenty of high-tension, but the mistake of expecting more volume from a four-valve set than from a three, provided with identical power valves and high-tension supplies, should not be made.

Distant stations will naturally be heard at greater strength, owing to the higher magnification. But the volume is restricted to that which can be dealt with by the last valve and therefore is the same for local signals.

Transportables

Self-contained, as distinct from portable sets, are very popular with listeners, particularly those working from the mains. They are ideal, being reliable and needing little or no maintenance. The number of stations to be received is dependent purely upon where the set is used, but one may usually rely upon having good quality of reproduction.

This feature is, in my opinion, of the first importance, as it is the local station that is received for the greater part of the time. When sensitivity is obtained at the expense of quality, the average results are bound to be poor, and is therefore to be avoided.

Some self-contained sets are so arranged that an outside aerial and earth may be fitted and will then bring in a large number of stations clearly and well. This is, perhaps, the most desirable type of set—plenty of stations, easily tuned, run from the mains, and good quality of reproduction.

How Thrilling!

By J. CRICHTON

IF I called once up the stairs, I called a dozen times, and always the same response :—

"I'm coming!"

The concert was due to begin at 7.30, and twenty minutes walk lay before us.

Seven o'clock chimed.

Still Marion kept moving about her room. Upstairs, drawers and cupboards were being banged hurriedly. Evidently she was making sure that nothing was left lying about during her absence. The burglar scare in the Avenue a few days previously had put her on her guard.

Feeling my patience departing, I hauled it back with an effort and called again :

"Hang it; it's twelve minutes past seven! Marion, you know we shall never get there in time!"

"I shan't be a minute, dear; we've left later than this before Don't you remember the London Symphony concert?"

"I should think I do; you'd never have run like you did then if you hadn't thought it would keep you slim. We only got there in time to hear the end of the overture, and had all the audience gazing at us with annoyance for disturbing them."

"Well, my new dress will do their hearts good when they see it to-night!"

Another pause; then a door banged, and she appeared.

"Oh! wait a minute, dear, I've forgotten those pink roses I was to wear; they're upstairs!" She quickly disappeared again.

"It's raining," I called back.

"How unfortunate; hold this fur till I get my chubby."

"Well, that's a bit tall!"

"Don't be silly; chubbies are short."

"For goodness sake, hurry!"

"You've got the worst temper of any man I ever met."

"None of the others have had to put up with——"

◆ ◆ ◆

At the door we stopped and listened. Marion was shivering with fear. I could have sworn I heard voices in the drawing room. Imagination! Nonsense!

Yet someone *was* speaking; a rough, harsh voice said : "You're afraid, are you? You start out to do a job and then funk it!"

"Hold your tongue—unless you want the weight of this." Then followed a shriek.

Picking up my heaviest stick, I rushed in; Marion leaned against the stairs rail. It was quite dark, but the shriek continued. I switched on the electric light.

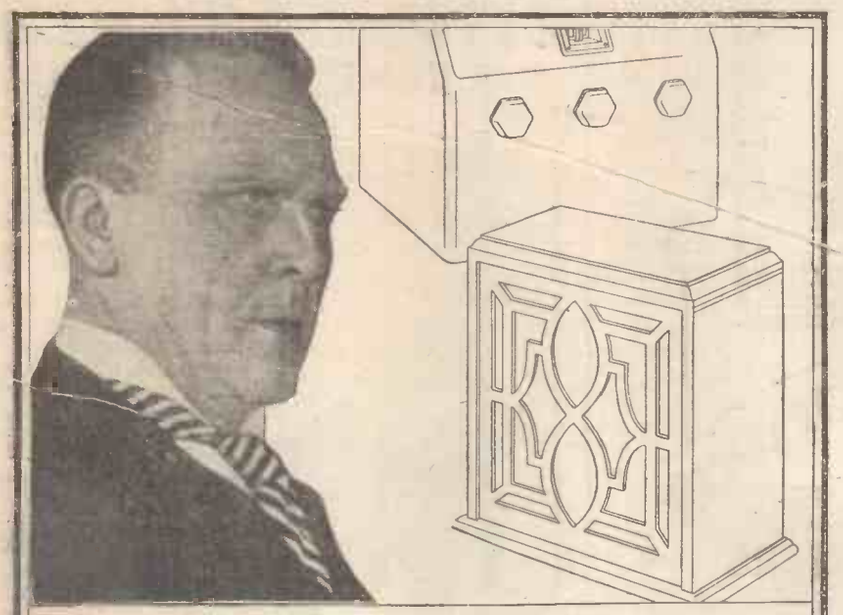
No sign of life, but a gentle voice announced to us that dance music would now be relayed from 2LO until midnight.

Marion looked at me and smiled :

"Forgive me, Jack, I forgot to switch that thing off this afternoon!"

CHALIAPINE

believes his ears!



Theodor Chaliapine, the great singer, says: *"They tell me there is no orchestra inside a Marconiphone. But my ears contradict! They say where there is such music, there are musicians. So I believe my ears, too; for the music from a Marconiphone is real to me."*

To hear every smallest detail of the programme, every note in the musical scale, every inflexion of the voice — radio as it really *should* be — a *Marconiphone* loud speaker!

Marconiphone engineers make these speakers. All the skill of thirty years' leadership in wireless is in their construction. Sir Edward Elgar, Albert Coates, Mischa Levitski, Peter Dawson, many other famous musicians delight in their clear tone, their unfailingly accurate reproduction. Any dealer will willingly demonstrate the Marconiphone speakers to you. If there is no dealer near you, write to The Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

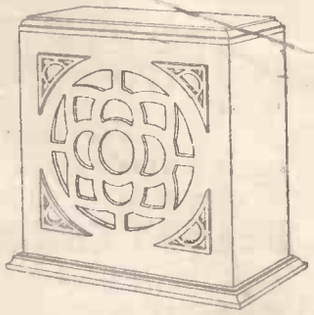
THE FIRST AND GREATEST NAME IN WIRELESS

Listen with a

MARCONIPHONE LOUD SPEAKER

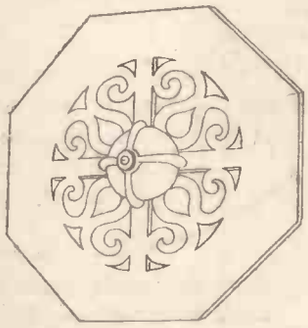
MARCONIPHONE MOVING COIL SPEAKER
(shown on left)

The most sensitive speaker you can buy, the Marconiphone Moving Coil. Responding fully, evenly to all tone frequencies, it gives perfect results equally from a two- or a multi-valve receiver. Units from £4.10.0. Cabinet models: for 6-volt accumulator, £7; for D.C. mains, £7.10.0; for A.C. mains, £12.12.0.



MODEL 60 CABINET CONE

Obtainable at the very moderate price of £3, the Model 60 is an extremely efficient "all-purpose" speaker. Made on the latest lines and embodying the Marconiphone reed-system, its tone is outstandingly good.



A FIRST-CLASS CONE SPEAKER . . . FOR 30/-!

The Octagon Cone is a well-established favourite, giving excellent reproduction from a 2- or a 5-valve receiver. Made in two different and pleasing designs, it can be placed on the table or hung from the wall.

TEAM WORK—

A PERFECT COMBINATION!

Team work—every part pulling its weight—is the foundation of success in a wireless set—just as much as in a tug-of-war. The colossal success of BurTon's "Empire 3" is due to team work. Every part a BurTon part—every part doing its job to perfection—all pulling together—that's team work!

£5 10 *Valves, Batteries and Royalties extra.*

ALL MAINS MODEL
(self-contained)

Price of Set - - - - **£11 : 5 : 0**
Price of valves (Mullard A.C.) **£3 : 10 : 0**
(Royalties extra)

Identical in appearance to the Battery Model

THE BURTON EMPIRE 3

EVERY PART A BURTON PART

C. F. & H. BURTON, Progress Works, Walsall, Eng.

T.C.C. acquire Sole Selling Rights in MICROFU

REGISTERED TRADE MARK

THE Telegraph Condenser Co., Ltd.—the Makers of the world-famous T.C.C. Condensers have pleasure in announcing that they have acquired sole selling rights in "Microfu," product of Microfuses, Ltd.

The "Microfu" is made in various ratings, from 5 milliamperes to 1,000 milliamperes, and is suitable for the protection of valves, wireless sets, eliminators and all instruments taking small currents. It remains constant and will carry a load within 80% of its blowing point. It blows to within 10% of its rated value and operates with the extreme rapidity of 1/1,000 second.

The "Microfu" will now have behind it the backing of the whole T.C.C. organization with its unrivalled and world-wide reputation.

PRICES:

Cartridge: 2/-

Complete with Holder: 2/9.

The "Microfu" is made in a wide range of types to blow at from 5 m/a. to 1,000 m/a. Obtainable from all dealers.

POLICY

The T.C.C. will continue as heretofore their policy of manufacturing Condensers only.

TELEGRAPH CONDENSER Co., Ltd., Wales Farm Road, NORTH ACTON, W.3.

CA 3488

On Your Wavelength!

Anxious Moments

MY abode is so situated that it meets the full force of most of the gales that we are having just now. Twice I have had bits of my roof removed, but—I touch wood firmly as I write it—so far my aerial mast has remained in position. I must say that I had some anxious moments on Sunday, January 12, when it bent so much at times that it seemed as if it really could not stand up any longer. I am beginning to regard the outdoor aerial as an anachronism, and I find that I am making less and less use of mine. Probably the regional scheme will do as much as anything to oust the outdoor wire in favour of the indoor. Actually, if your high-frequency amplification is up to the mark, you can get all that you want in most places with an indoor collector, and it certainly saves trouble and anxiety during gales and thunderstorms.

A Queer Point

There is one very queer point about the indoor aerial that I have never seen brought up by anyone. Suppose that you decide to try an indoor aerial and rig one up in the room which houses your set, you will probably not discard the outdoor arrangement before making tests. In this case it is quite possible that you will be grievously disappointed with the increase in the selectivity produced by the indoor collector. Tests that I have made show that so long as the outdoor aerial is standing it may have a very big effect upon the doings of an indoor aerial, whether of the ordinary or of the frame type. The outdoor system still acts as a collector and is still shock-excited by powerful transmissions at short range. It thus oscillates, and these oscillations may be picked up by induction by any indoor arrangement.

Worth Trying

Experiments show that when there is a good-size outdoor aerial in the immediate neighbourhood a frame may fail to exhibit its well-known directional properties and that a wire stretched round a room near the ceiling can fail to give the selectivity necessary for cutting out a powerful station or for separating two high-power transmissions at short range. Anyone who wishes to make the experiment can very easily do so by putting up an indoor collector and seeing over how many degrees of the condenser dials the local station comes in, first, with the outdoor aerial in position and, secondly, with its wires lowered right down to the ground. In the majority of cases it will be found that there is a very great deal of difference between the results when the big aerial is up and when it is down.

That Explains

And, when you come to think of it, this quite possibly shows why it is that one sometimes comes across astonishing cases of crystal reception at enormous strength. I have definitely authenticated instances of crystal reception in this country of stations such as Radio-Paris, Toulouse, Turin, and Nürnberg. Also, I know of one man who has quite frequently obtained weak loud-speaker reception of his local station (and he does not live on its doorstep) with nothing but a crystal set. Such cases are usually explained by saying that someone in the neighbourhood is tuning by finding the silent point with his set in oscillation. Radiation thus takes place from the oscillating aerial, and crystal sets in the neighbourhood can pick up the station to which it is tuned. But since, as we have seen, even the presence of a large outdoor aerial, which need not be tuned, can cause an increase in signal strength in another by induction, it seems that these phenomenal cases of crystal reception are quite easily understandable. In a thickly populated area where there are many aerials close to one another it is quite possible that a crystal set may give a surprisingly good account of itself.

What is the Reason?

Like a good many others, I expect, I have been very much puzzled over the doings of my short-wave receiving set for the last month or two. I used to yoke it up and sit down to the controls with the certainty of picking up heaps of European telephonic transmissions and a good many from countries such as Africa, Java, Australia, and the United States. I used to ask my friends airily whether they would like to hear some American broadcasting, and when they said "Yes" I promptly tuned in 2XAF or 2XAD on the loud-speaker, subsequently trying to look modest, though I did not feel it. Now I turn to the wavelengths of stations that were once a certainty and pick up weak carrier waves that cannot be resolved; on the short waves, finding stations in this way is permissible, though no one but an idiot fails to get the set subsequently just short of oscillation. Idiots tune to the silent point (between squeals) or hear nothing at all. I began to wonder whether something had gone wrong with the set, only to discover, by hearing powerful C.W. signals, that it is in thorough working order. Sometimes I strike a fairly good patch when I can hear something of stations that used to be good, but even then they are far from being up to the mark. Rapid fading is the great trouble.

Reports Wanted

Some time ago I asked whether readers were hearing anything of the American stations on the medium waves, and at once received quite a crop of reports of success. I want to ask now whether anyone is having better luck than I am with America, Java, and Kenya. Does anybody find that even the nearer stations, such as PCJ, Doerberitz, and Lyngby, are coming in as they should? I don't think that many of you will send me triumphant reports, for I am afraid that those infernal sun spots are still playing havoc with our short-wave work.

Can You Beat This?

Believe me or not, what I write now is the absolute cold, hard truth. A neighbour of mine who possesses a set made some years ago was electrified—no, perhaps I had better say was astonished—to see the other night a thin wisp of smoke curling up from his receiving set. Leaping up, he saw a small firework display going on between two terminals. The set, I should explain, was one of those old-fashioned affairs with a vertical row of terminals near the right-hand edge of the panel. These terminals are for aerial, earth, H.T.+1, H.T.+2, H.T.−, etc. The pyrotechnics were occurring between earth and H.T.+1. He hastily pulled every plug out of its socket in the H.T. battery, disconnected the accumulator, earthed the aerial, and did everything else that one would do in such circumstances.

The Explanation

Then, having calmed down, he began to investigate. The earth wire comes in through an ebonite tube let into the window frame. Wishing to avoid joints as far as possible, he had not made use of a metal rod with terminals at the ends passing through the tube, but had brought the earth wire itself straight in. It was pelting with rain outside and little drops of water were trickling down the wire on to the earth terminal of the set. Arrived there, they continued their trickling until they had made a nice wet path between this terminal and that connected to H.T.+. With a modern set, whose terminals are arranged in a horizontal row, such a thing could hardly happen. Still, water is not the kind of thing that we want to introduce into the receiving set. If you bring your wires straight through tubes it is advisable to plug the ends with Chatterton's

On Your Wavelength! (continued)

compound or some similar messy stuff; though, personally, I find it better to use threaded rod with terminals at either end running through the tube. The second moral of the tale is that fuses should always be used in the high-tension battery leads.

The Magic Valve

Quite apart from its applications to wireless, no one yet has any idea of what the valve will eventually enable us to do. It has been used already for many other purposes. For example, a weighing machine has been made with its aid, which will register the distance that a half-inch steel rod bends (it does, really) when a fly settles upon it. It has also enabled us to hear sounds, such as those made by insects, which would ordinarily have been completely beyond the powers of the human ear. I believe that the valve, though possibly not in its present form, may have still wider and more important applications. Take, for instance, the problems of the telescope. The human eye has an aperture of but a fraction of an inch; therefore, it can collect comparatively few light waves from a distant object, such as a planet or a star. By means either of lenses or of parabolic mirrors, apertures up to 100 in. have been made, as in the great Mount Wilson telescope. A new giant telescope with a 200-in. mirror will be completed in the near future. But can we not apply to light waves the methods of amplification that we now use for wireless waves? In other words, can't we use tuned circuits and valves in place of lenses or parabolic mirrors? I believe that in time to come something of this kind will be accomplished. At present we could not possibly tune to frequencies such as those of light waves nor, owing mainly to parasitic capacities, could we amplify these waves by means of valves. But that we shall eventually do so I am certain, and when that day comes we shall begin to know something about the universe in which we live.

Transmission Vagaries

The B.B.C. has had a perfect orgy lately of playing about with the transmission. Why on earth it does this I cannot tell, but it is really most annoying, not only for those who use the programmes to listen to, but for those whose only use for broadcast is to test their receivers.

I have cursed many a time when I have been making some test or other to find that the modulation has suddenly been altered in the middle of a test and I have had to repeat the various experiments in order to free myself from the bewilderment occasioned by this change. It really is most inconsiderate after one has spent, say, an hour taking a series of readings to find the whole results upset because the modulation has suddenly been altered near the most interesting point. However, the B.B.C., if asked kindly, will reply with equal kindness that their principal object is to provide amusement for the listeners, and not a source of high-frequency energy for experimenters.

A Practical Test

This being so, I determined to put the matter to the test the other day and to discover just how much extra amusement was provided by the continual alteration of the modulation. I must be an awful dud at listening, because I obtained no pleasure whatever, but rather the reverse.

I even went to the length of listening to a talk; several talks, in fact, because, much to my surprise, I found one or two of them rather interesting. Now, from my point of view, it causes me intense annoyance to find that a speaker, when just getting warmed up to his subject, suddenly bellows forth at me some quite unimportant fact. The engineers apparently decided that the speaker in question was getting tired and therefore shot up the transmission another stage, with the result that, by contrast, the man simply appeared to bellow in my ear. It creates quite an unnecessary emphasis on the wrong portion of the speech, and I really find it quite disturbing and annoying.

Spoilt Broadcasts

Exactly the same thing happens in musical transmissions. I don't really know what is happening, but the engineer in charge apparently feels that the pianissimo of the orchestra is sounding too soft. Consequently he shoves up the strength just a bit, thereby spoiling the effect. What is even more objectionable is to find that a really rousing climax in a piece of good orchestral music is cut down mercilessly because the engineer has gauged the transmission incorrectly in the first place and consequently all his needles are flickering violently. As a matter of fact, I don't suppose it would do any harm if they continued to flicker for the duration of the climax. At any rate, it would be preferable to this continual changing about.

The trouble has been very much worse since Brookmans Park started up, and I am wondering whether that has anything to do with it. I wonder if anyone can enlighten me as to the reason for this absurd interference. Of course, what we should like to see would be a real explanation from the engineer in charge as to why he cannot refrain from knob-twiddling.

YOUR "WIPE OUT" TROUBLES WIPED OUT! (See page 136)

When Experts Disagree

It is comforting for ordinary folk like you and me to know that even acknowledged experts often fail to agree on what seem to be fundamental points in radio. Personally, I feel grateful to W. James for remarking, in the *Wireless Magazine* (a new issue has just been published), that detectors are not properly understood.

He believes that quite a fair proportion of amateurs have only the vaguest of notions concerning the essential points of leaky-grid and anode-bend rectification. His lucid and well-argued comments on this matter are worth reading—especially if you are an old hand at the game and have your own pet theories on the subject!

By means of a little judicious wangling, your Thermion managed to "win" a copy of the February *Wireless Magazine* several days before its official publication. I do not think that I shall be letting the juice out of the battery if I mention also that Captain H. J. Round makes some pertinent comments on the crop of high-power broadcasting stations promised for 1930.

A Television Sceptic

Youth and age combined to make a very happy gathering at the recent Schoolboys' Exhibition, and, as usual, some of the questions asked and remarks passed were full of unconscious humour. The Baird Company were running television demonstrations continuously from 10 a.m. until 9 p.m., and thousands of people availed themselves of the opportunity to see the results of this new science for the first time. In addition, many were actually televised themselves. Apparently there was a need for proving that the transmissions were nothing in the nature of a conjuring trick, for in the course of conversation with one of the engineers I learnt that one lady vowed it was spiritualism!

On another occasion a party of youths passed round with the queue and had their look into the Baird "Televisor" receiver. One of them was asked what he thought of it and said: "It's no good, Mister, you cannot kid me. That's the face of a real man you have got there, I saw his boots poking out under the table!" Although it was pointed out that this was an assistant making an adjustment in the rear, the youth was still sceptical. He was therefore asked to accept a ticket which would enable him to visit the transmitting apparatus, and actually be televised himself. His friends could then say whether they recognised him at the receiving end. He thought for a moment and then replied: "No, thank you. You have fooled me once, so I am not going to give you a second chance to do the same thing."

THERMION.

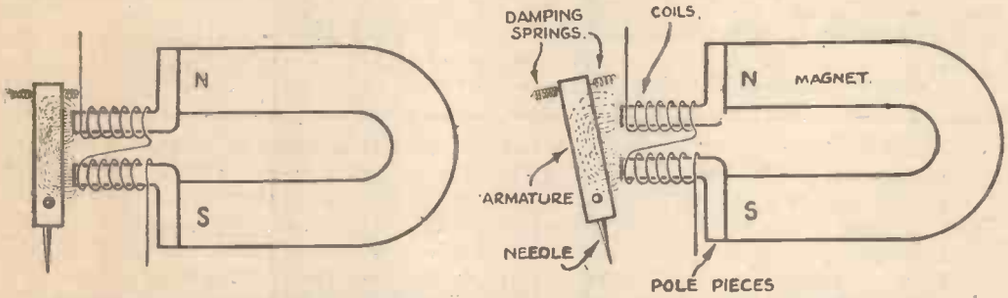
HOW PICK-UPS WORK

by A.G. McDONALD

Fundamental Principles :: Special Points of Design

Main Principles

IN the design of a gramophone pick-up the problem to be faced is to produce a device which will transform, by some means or other, the side-to-side movement of a needle in following the sound track of a gramophone record into audio-frequency-current pulsations which are capable—after suitable amplification—of driving a loud-speaker. This sounds rather a long and involved definition, but briefly what we have to do is to design a piece of apparatus which, instead of giving out ripples in a column of air, i.e., sound waves, as an ordinary gramophone sound-box does, gives out ripples in a current of electricity.



Schematic diagram of moving-iron armature pick-up. Note the change in the number of lines of force when the armature is moved

Actually, at the moment, only one type of pick-up is in common use. That is the moving-iron armature pick-up. Many ingenious systems have been devised and even patented, but none of them has been very successful and, with the exception of relatively minor modifications, all the well-known makes of pick-ups have the same fundamental operating principle. Other possible types of pick-ups which have been proposed from time to time are carbon microphone, moving-coil, condenser and condenser-operated local oscillator, piezo-crystal and hot wire. In the gramophone pick-up as we know it to-day the principle employed is electro-magnetic, the vibration of a mass of iron in the field of a magnet which has coils of wire wound on its pole pieces, producing electric currents in these coils. It is interesting to note that this action is the reverse of that taking place in a telephone receiver. In this piece of apparatus low-frequency currents flowing in a coil wound on soft-iron pole pieces of a magnet cause an iron diaphragm placed near the magnet to be displaced by variations in these currents. The movements of a diaphragm thus set up start pulsations in the air which by vibrating the drum of your ear are heard as ordinary sounds.

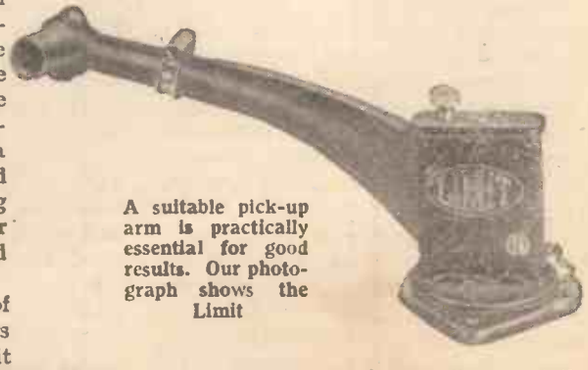
Component Parts of a Pick-up

A pick-up consists essentially of a magnet, an iron armature which takes a gramophone needle, coils wound on pole pieces of the magnet, and a spring to act as a restoring force to bring the armature back to its initial position. In at least two well-known makes of pick-up the armature is the gramophone needle itself, but the principle remains the same. In following the sound track of a record, the needle is deflected from side to side and in changing its position also changes the air gap between the armature and the pick-up pole pieces.

Although the majority of amateur radio experimenters know what an electric circuit is and have a working knowledge of its most important features and limitations, few seem to be as familiar with magnetic circuits. Magnetic lines of force have circuits as well defined and almost as definite as those of electric currents. In magnetism leakage of lines of force nearly always takes place, and calculations are not quite so exact as those of current electricity. The various effects which are brought into play in magnetic phenomena are explained most readily by Faraday's conception that imaginary lines start from one pole of a magnet and finish on the other. These lines stretch through air and their approximate directions can readily be traced by observing how a small compass needle sets itself when placed near the magnet. If a piece of iron, particularly soft iron or even better, the special alloy called stalloy, is placed near the magnet, all the lines of force in the neighbourhood of this piece of iron try to crowd into it and the actual number of lines of force is increased many thousand times.

Concentration of Field

Soft iron is a good conductor of these hypothetical lines of force. It will be understood that since there is such an enormous difference between the behaviour of these lines in air and their behaviour in iron, the slightest change in position of the armature will materially affect the number of lines of force in the magnetic circuit, formed by North pole of



A suitable pick-up arm is practically essential for good results. Our photograph shows the Limit

(*Continued at foot of next page*)

STILL ANOTHER FREE BLUEPRINT NEXT WEEK!

"THE BROOKMAN'S BY-PASS"

THE IDEA.—Radio development is ripe for a new word—the By-Pass. Ether conditions and road conditions are not dissimilar at the present time—there is too much traffic in each case. We build by-pass roads to relieve a town of unwanted traffic and to facilitate the circulation of the local traffic. In a word, we by-pass the unwanted and welcome the wanted. That is the idea, applied to ether conditions, of the "Brookman's By-pass." Powerful transmissions, unwanted at the moment, are by-passed to earth, while a weaker transmission from a station working on a near-by wavelength is received and welcomed. "By-pass," as far as radio is concerned, is an invented word, but it is obviously wanted.

WHAT THE "BY-PASS" IS.—The "By-pass" comprises a special arrangement of tuning condenser and tapped coil, and has been especially developed by our Technical Editor, Mr. J. H. Reyner. It has just two external connections: one to aerial and one to earth. It is small, cheap, and can be built in from one to two hours.

WHAT THE "BY-PASS" DOES.—In a word, as we have said, it by-passes unwanted radio traffic. More accurately, it simply reduces the width of waveband of, say, the two Brookmans Park transmissions, thereby considerably sharpening the tuning. Various wavetraps and rejectors do that also, but have the disadvantage that in weakening the unwanted stations they also reduce the strength of many of the wanted stations also. There are, for example, between the two Brookmans a number of Continental stations—mostly French and German—which every listener reaches out for occasionally, and the ordinary wavetrap and rejector rather tends to blot them out at the same time as it wipes out the Brookmans. This is where Mr. Reyner's device proves a real friend. It blots out Brookmans, but *allows the stations on near-by wavelengths to come in at their usual strength.* The by-passing action is from 200 to 550 metres and can be varied so that either a wide or a narrow band is effected.

THE FREE BLUEPRINT.—This is "A.W.'s" third consecutive FREE GIFT in three weeks. It measures nearly 20 in. by 5½ in. and shows, full-size, every detail of the "Brookmans By-pass." It illustrates the tapped coil, which can be wound on a cardboard tube by anybody, whether skilled or otherwise, and every detail of the whole device is perfectly clearly and intelligently conveyed to the home constructor.

Now, this is next week's Free Gift—Blueprint of the "Brookman's By-pass"

A GADGET THAT IS REALLY WANTED!

Order "A.W." Now for Next Week

"HOW PICK-UPS WORK"

(*Continued from preceding page*)

magnet, iron pole-piece, air gap, armature, air gap iron pole-piece, South pole of magnet (see diagram o). The lines of force thread also the turns of wire of the coils wound on the pole-pieces. In the changes in the air-gap brought about by movements of the armature the number of lines of force change and in so doing cut the turns of the coil. The fundamental principle, upon which it may be observed all dynamos work, is that whenever magnetic lines of force cut a coil a voltage is developed across the ends of the coil and a current of electricity will flow through the coil if its ends are joined by a conductor.

It will be noted that the armature does not work directly against the poles of the horse-shoe magnet, but is placed near two extra pieces of iron, called pole-pieces, which are screwed on to the poles. The purpose of these pieces of iron is to concentrate the field of the magnet on the armature so that small changes in its position will produce relatively large changes in field strength across the air-gap.

Since every movement of the armature changes the size of the air-gap and consequently the number of lines of force in the iron circuit, a voltage will be developed in the pick-up coils proportional to the speed at which the armature moves.

The force needed to move the armature is relatively very small and the reaction on the needle, which of course determines the amount of record wear, should also be very small. In addition, however, to the load set up in moving the armature there is a certain amount of work to be done in order to overcome the resistance of the damping springs.

Pick-up Damping

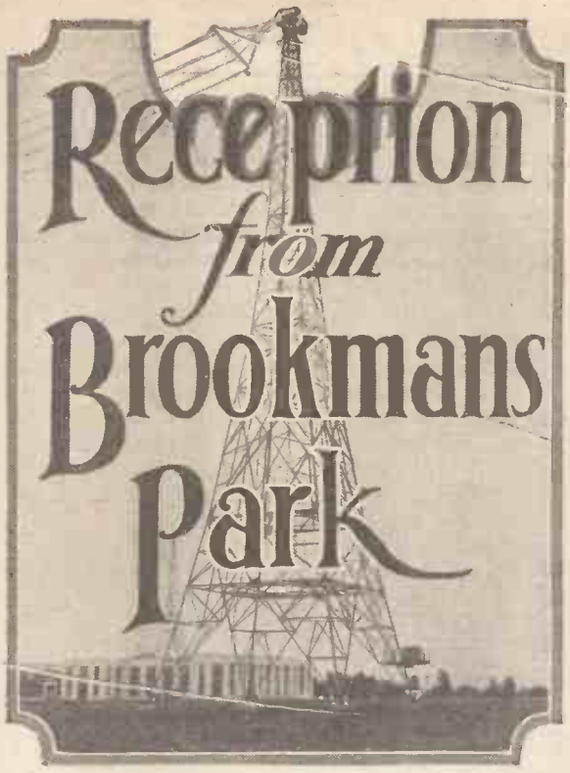
The armature cannot be left free to rotate about its pivot for two reasons. First, the magnet exerts quite a strong pull on the armature, just in the same way that an ordinary horse-shoe magnet exerts a pull on its keeper. Secondly, if the armature is deflected from its normal position by the sound track it needs some restoring force to bring it back again to its mid position. Hence some form of springy constraint called damping is necessary. Usually it takes the form of rubber buffers. These make quite a good form of damping, but are not absolutely ideal. The output voltage is dependent on the strength of the magnet and if a powerful magnet is used, the magnetic pull to be overcome is fairly large, with the result that the damping required is proportionately heavy.

Damping is also made necessary in order that the resonance (or rattle) frequency shall be as high as possible. It is desirable that the armature resonance should occur outside the normal audio frequencies. In practice it is usual by severe damping to drive it up high—say to 4,500 cycles per second. It would be equally satisfactory if it could be arranged to take place below, say, 50 cycles, except possibly that supporting arm or cabinet resonance may be more likely to occur.

In order that the voltage developed at the output terminals of the pick-up should be a true electrical representation of the sound-track of the record there are several important points to be considered. First, the needle itself must tend to follow the track. If as a result of, say, a very large displacement it overshoots the mark, or it develops an independent motion due to resonance, the output voltage, since it is a copy of the motion of the armature, is therefore not a copy of the track and evidently distortion results. Also the armature and the needle together must be sufficiently rigid so that the movements of the armature follow those of the needle point. It is also important that the strength of the magnet, the size of air-gap and the cross-section of the armature be proportioned so that there is no possibility of magnetic saturation of the armature taking place.

Types of Pick-ups in Use

Although, as stated earlier on, practically all the well-known makes of pick-ups work on the principle outlined in this article, yet in practice they all have special points of design. As may be imagined with many considerations to affect the design and with the necessity of making compromises between conflicting requirements, wide variations are possible.



By MORTON BARR

MOST listeners in the London area have now settled down to the new conditions caused by the move of 2LO from the neighbourhood of Oxford Circus to Brookmans Park in the northern suburbs.

Whilst it cannot be denied that the new station has won the approval of the majority of those affected by the change, there are still undercurrents of hostile criticism. The objections come principally from two particular quarters.

In the first place there are the listeners who live so close to the transmitter that they cannot tune it out, and so find themselves shut off from any kind of alternative programme. In the second place many listeners living in the more central London area, especially those who depend upon crystal sets, find that they get weaker signals from the new 2LO than they did from the old.

Gainers and Losers

Listeners who for either reason find themselves worse off under the new regime, are not greatly consoled by the fact that the normal range for crystal reception is now double what it used to be. They rightly point out that the advantages of high-powered transmission are all in favour of the rural districts, whilst the disadvantages fall heavily upon the densely populated London area.

On the other hand, if the transmitting

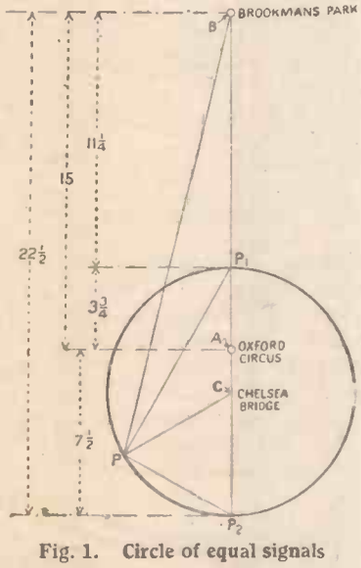


Fig. 1. Circle of equal signals

aerial had been left where it was near Oxford Circus, and the power output increased to its present value, the net result would have been much more troublesome to all concerned.

Under present conditions, it is only crystal listeners inside a comparatively small area who are permanently worse off. In every case it is possible to restore the *status quo* either by installing a better aerial or by changing over to a simple valve set. What cannot be done inside this area is to pick up the same signal strength as before from any old kind of aerial such as a piano frame or bedstead, or from bits of wire strung up here and there. With a decent aerial, in fact, it is possible to get good crystal strength anywhere within a radius of forty miles from Brookmans Park.

Alternative Programmes

In the case of the second class of sufferers—those who find themselves shut off from an alternative programme—their grievance will to some extent be automatically remedied as soon as the twin transmitter "Mrs. 2LO" comes on the ether with a separate programme. Should they still yearn after Continental or other distant transmissions (and there are times when most reasonable folk do) they will have to install a really selective valve set, with at least one stage of screen-grid H.F. amplification or add some efficient type of wavetrap.

The first may seem an expensive remedy, but it is the best at present in sight. Meanwhile it is some consolation to reflect that it would have been forced upon practically all London listeners had the high-powered transmitter been left where it was, instead of being moved to Brookmans Park.

Future "Regional" Changes

It must be borne in mind that the opening of the new 2LO station is merely one more stage in the full development of the new Regional Scheme. The opening of Daventry 5XX and 5GB was the first step. The second will be completed when the twin transmitter at Brookmans Park is brought into play. Meanwhile the Northern transmitter at Moorside Edge near Huddersfield, together with the Scottish and West Country stations, are still on the horizon.

The situation now being faced by our London readers is, therefore, only typical of what broadcast listeners in other parts of the country must expect to meet when their turn comes to change over from the local or relay station to a more or less distant high-powered twin transmitter under the regional scheme.

It may therefore be helpful to see exactly how it is that the change-over to Brookmans Park has led to a poorer service over a certain definite area.

Effect of Increased Power at Same Distance

In the first place the new transmitter is rated at 30-kilowatts as compared with 2-kilowatts from the old 2LO aerial. Now, a fifteen-fold increase in power means an aerial current increased by the square root of that number. In other words, the aerial current is practically quadrupled.

It is known that the field strength (measured in milli-volts per metre height of

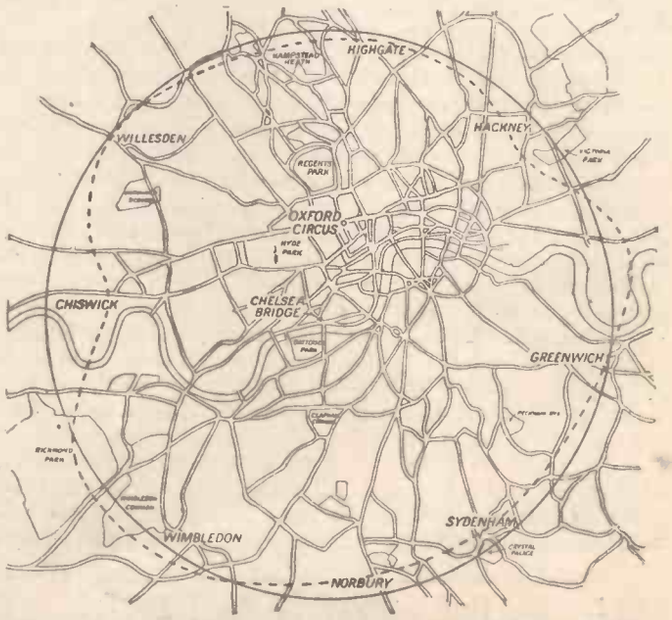


Fig. 2. Map of London showing area of decreased signal strength

"RECEPTION FROM BROOKMANS PARK"

(Continued from preceding page)

aerial) at a distant point is directly proportional to the aerial current. So that if the higher power had been applied directly to the Oxford Street aerial, a listener at any given point would have had his signal strength increased four-fold.

But the transmitting aerial at Brookmans Park is greatly superior in many ways to the original 2LO aerial. It is of greater effective height, and is located in open country instead of being in a neighbourhood crowded with high buildings. On this account it is reasonable to take the effective field strength of the new aerial, at a given distance, to be about five times instead of four times that received at the same distance from the old aerial.

Effect of the Same Power at Different Distances

This comparison of field strengths only

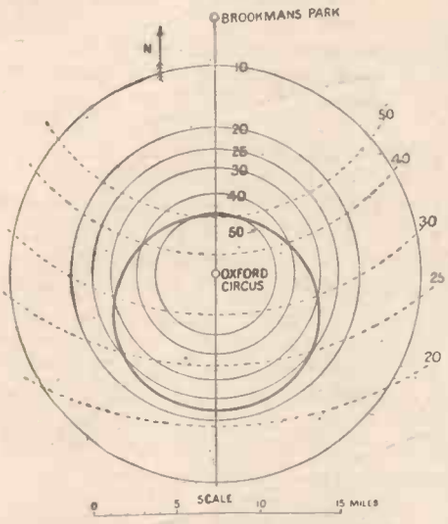


Fig. 3. Circle of equal signals based on field strength

applies to a given range. In order to estimate how the field strength falls off as the range increases, it is necessary to apply another rule, which has been found to hold good for distances up to about 50 miles. This rule states that the field strength falls off according to the $\frac{1}{3}$th power of the distance. Taking the ratio between the field strengths of the new and old transmitters to be five to one, and applying this rule, we find that the new transmitter gives the same field strength as the old at a point three times as far distant.

In order to make this clear, consider the diagram of Fig. 1. At a point P1 on the straight line between Brookmans Park (B) and Oxford Circus (A), a listener would be equally well off (whether he was listening to the old 2LO or the new) providing the distance P1B is three times P1A. Similarly, there will be another point P2 on the far side of Oxford Circus, along the same straight line, such that the distance P2B is three times the distance P2A. Here again a listener would neither lose nor gain in signal strength as the result of the change-over.

Now, if the distance between points P1 and P2 is bisected at C and a circle drawn from this centre with P1 P2 as diameter, it can be shown geometrically that at every point (such as P) on the circumference of that circle, the distance PB will always be equal to three times the distance PA.

In other words, the circle defines the position of all listeners who should receive exactly the same signal strength from Brookmans Park as they did from Oxford Circus. Outside the circle, the field strength from Brookmans Park is greater than that formerly supplied from Oxford Circus. Inside the circle the present field strength is less than it used to be.

Not Well Defined

In actual practice, the borderline of signal strength is not clear-cut—the shading-off is too gradual to be appreciated at once; but at distances varying from a quarter to half a mile on each side of the circumference of the circle, the change will make itself felt.

Now, if the distance from Oxford Circus to Brookmans Park—*i.e.* from A to B—is taken as 15 miles, the distance from A to P1 will be $3\frac{3}{4}$ miles and from P1 to B three times this, or $11\frac{1}{4}$ miles, making up the total distance of 15 miles. Similarly P2A is $7\frac{1}{2}$ and P2B is three times this distance or $22\frac{1}{2}$ miles. The diameter of the circle is obviously P1A + AP2 or $(3\frac{3}{4} + 7\frac{1}{2}) = 11\frac{1}{4}$ miles, so that its radius is roughly $5\frac{1}{2}$ miles, and its centre is situated at a point C almost two miles (one and seven-eighths to be exact) south of Oxford Circus. *i.e.*, just north of Chelsea Bridge.

If this circle is superposed on a map of London as shown in Fig. 2 it will seem that the area of decreased signal strength consequent upon the change-over to Brookmans Park is bounded by Highgate in the north, by Willesden and Chiswick eastwards, by Wimbledon, Norbury, and Sydenham southwards, and then through Greenwich and Hackney on the east, back to Highgate.

In Fig. 3 the same result has been arrived at by a graphical method. The full-size circles centred at Oxford Circus indicate the field-strength of the old transmitter at various distances, the actual value of the field in millivolts per metre being marked on each circle. The dotted line circles centred at Brookmans Park indicate similarly the positions at which the field strength from the new transmtter has the values marked on these circles.

The points at which reception from both stations should be the same are evidently those where the two series of circles intersect. These points have been joined up, giving a circle which agrees very closely with that previously arrived at by calculation.

The original 2LO transmitter at Oxford Circus had certain directional properties, owing to the presence of adjacent buildings, which had the effect of minimising radiation along a line slightly north of east and south of west. The result was that the distribution of field strength was slightly irregular instead of circular.

On the other hand the transmission from Brookmans Park is free from this defect, so that the lines of equal field strength are practically true circles.

In Fig. 4 the two fields have been superposed as in Fig. 3, but in this case the field

Fig. 4. Correction for directional effect of original 2LO aerial

from the original 2LO transmitter has been corrected for directional effect, so that the thick-line circle corresponds more accurately with the actual area of diminished signal strength than either of the theoretical circles shown in Figs. 1 and 3. This corrected circle is also shown in dotted lines in Fig. 2.

In the heart of New Guinea, three hundred miles from the nearest white man, an explorer is forcing his way through the bush. He is taking with him a special short-wave receiver with which he tunes in the principal short-wavers. At night-time natives cautiously creep within hearing distance to listen with wonderment to the "magic" music! At Merauki, in New Guinea, is another short-waver.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

ANYTHING by an author with so forbidding a name as Tchekov is usually a warning to many listeners. If, however, they switched off when *The Proposal* was put on they missed something. It proved to be excellent entertainment. The nameless players entered into it with zest and brought out the wit and subtleties of the famous author. I felt sorry for the nameless players. Do they like or approve this anonymity, I wonder? Leaders of tinpot dance bands are able to publicise themselves every five minutes—but perhaps the radio actor is above all this.

◆ ◆ ◆

After a short period it seems that we are back to the fashion of so-called revues, with high-falutin' titles which turn out to be mediocre or worse. *The Rush Hour*, described officially as "A Tonic for the Tired Business Man," was more a sleep-inducer for everybody. There was a good cast, and I wondered why they spend their time on such poor stuff. The music was trite and the chatter mostly inane. I detected one good voice, which I had to admire, although it was rendering a silly song. I believe the possessor of the voice was Foster Richardson—although it was difficult to distinguish one person from another in that mess of rottage.

◆ ◆ ◆

Here's a pretty picture for you: A darkened room; a cosy fire; arm-chair occupied by attentive listener; from a loud-speaker comes an appealing rendering of Tchaikovsky's "Pathetique Symphony." It is the Scottish Orchestra relayed from Glasgow. What a picture of a music-lover's content! Then, above the soft strains of the orchestra, there come with startling suddenness—*the beastly little pips from Greenwich*. Shades of Tchaikovsky!

◆ ◆ ◆

I was one of the first to render homage to a certain comedian named Stephen, who emphasises his character or reputation by the adjective "Stainless." Well, Stephen-Stainless is certainly not letting us down. His review of 1929 had a good laugh in every line. And, although I'm still against studio audiences, one may sometimes distinguish genuine applause from the dud stuff. Studio audiences *always* clap—no matter what the turn is like—but if you make a study of their noises you realise that there are five kinds: the polite, the friendly, the hysterical, the awe-struck, and the genuine.

◆ ◆ ◆

Well, during and after this particular turn of S.S.'s I heard applause, the like of which is seldom heard—from the studio, at any rate. It was spontaneous, vociferous, and assuredly sincere. Stainless had done nobly. The concluding song, which dealt with the deeds of the B.B.C. during 1929, was clever and original. Stainless averred that the announcers made ninepence in tips! Alas, he was merely raising their hopes!

◆ ◆ ◆

Mischa Mottę is clever, even though he has a relatively small repertoire. I continue to find him amusing and mystifying. His vocal conjuring beats the band. In an operatic "duet" he changed rapidly and effectively from baritone to soprano in quite an astonishing fashion.

◆ ◆ ◆

Harley and Barker can give sound entertainment if they so wish. Their light songs and patter pass the time away in an agreeable manner. But when they start to sing their trashy syncopated jingles—then I have no patience with them. At once they slither away to the level of certain miaowing people of whom I have written so often.

◆ ◆ ◆

I hear murmurings of "too much Germany" in recent transmissions. One listener, a well-known general, wants me to criticise the recent Seiveking transmission. Another writes: "Why so many German songs? I have nothing against German music, but we seem to get such a lot of mournful stuff these days. For a whole week Sumner Austin regaled us with Brahms' songs, and day by day they grew more dirge-like. Mr. Austin sang rather mechanically, too. He didn't seem to take much interest in what he was singing. Who could, anyway, so early in the evening? Such dirges should be reserved for 'the morning after.'"

◆ ◆ ◆

The fact is, however, you must have a "soul" to appreciate the true inner beauty of German music and art. Those who listen against their will to the German *lieder*, for instance, are neither doing themselves nor the composers justice. You simply must be in the mood.

◆ ◆ ◆

The Children's Request Week was an inspiration and a success. I took the trouble to get a co-census of kiddies' views about it, and they were all thoroughly charmed.

◆ ◆ ◆

Oh, about a certain talk delivered by your own critic! At the time of writing I have received a number of letters from various parts, and the talk seems to have got over. It is extremely difficult, I find, to get what I call helpful views from one's friends. All they say is: "We heard every word," "It was wonderful," and so on.

I shall still be glad to hear from readers of AMATEUR WIRELESS who will perhaps enable me to judge my effort as I judge others.

◆ ◆ ◆

The Choral and Orchestral Union of Glasgow concert, which was relayed from St. Andrew's Hall, was a splendid success. I have already paid a tribute to the Scottish Orchestra, but must add that their playing of the "Leonora" overture was first-rate. This and the next number, the "Pathetique Symphony" are, to my mind, two wonderful compositions which any highbrow can learn to love, even as I have.

◆ ◆ ◆

That happy annual, *Hansel and Gretel*, becomes more popular each year. Congratulations and thanks!

An impression of Thornley-Dodge

FREE SUPPLEMENT—Presented with No. 398 of "AMATEUR WIRELESS," January 25, 1930

BLUEPRINT N°A.W.217

BEST-BY-BALLOT

3

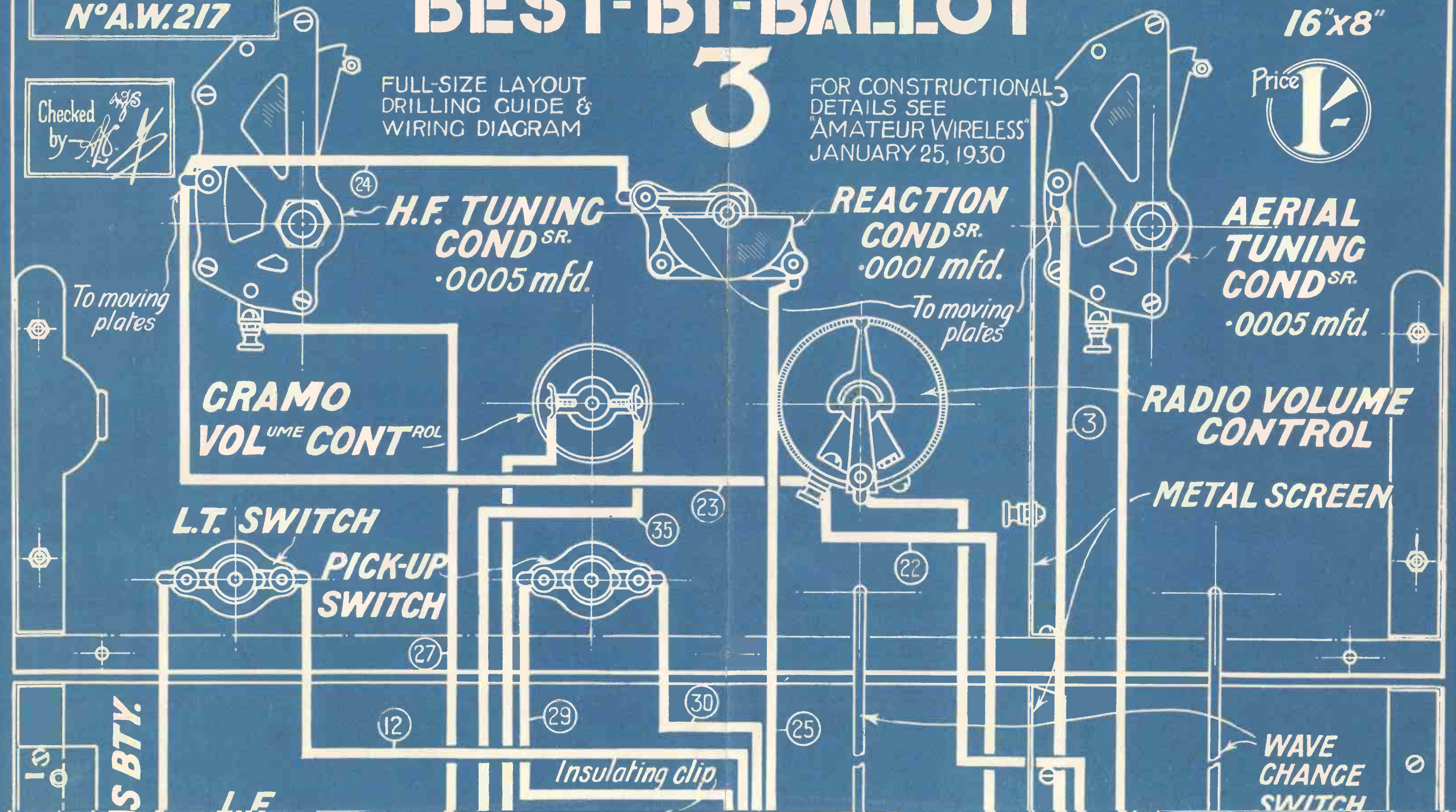
FULL-SIZE LAYOUT
DRILLING GUIDE &
WIRING DIAGRAM

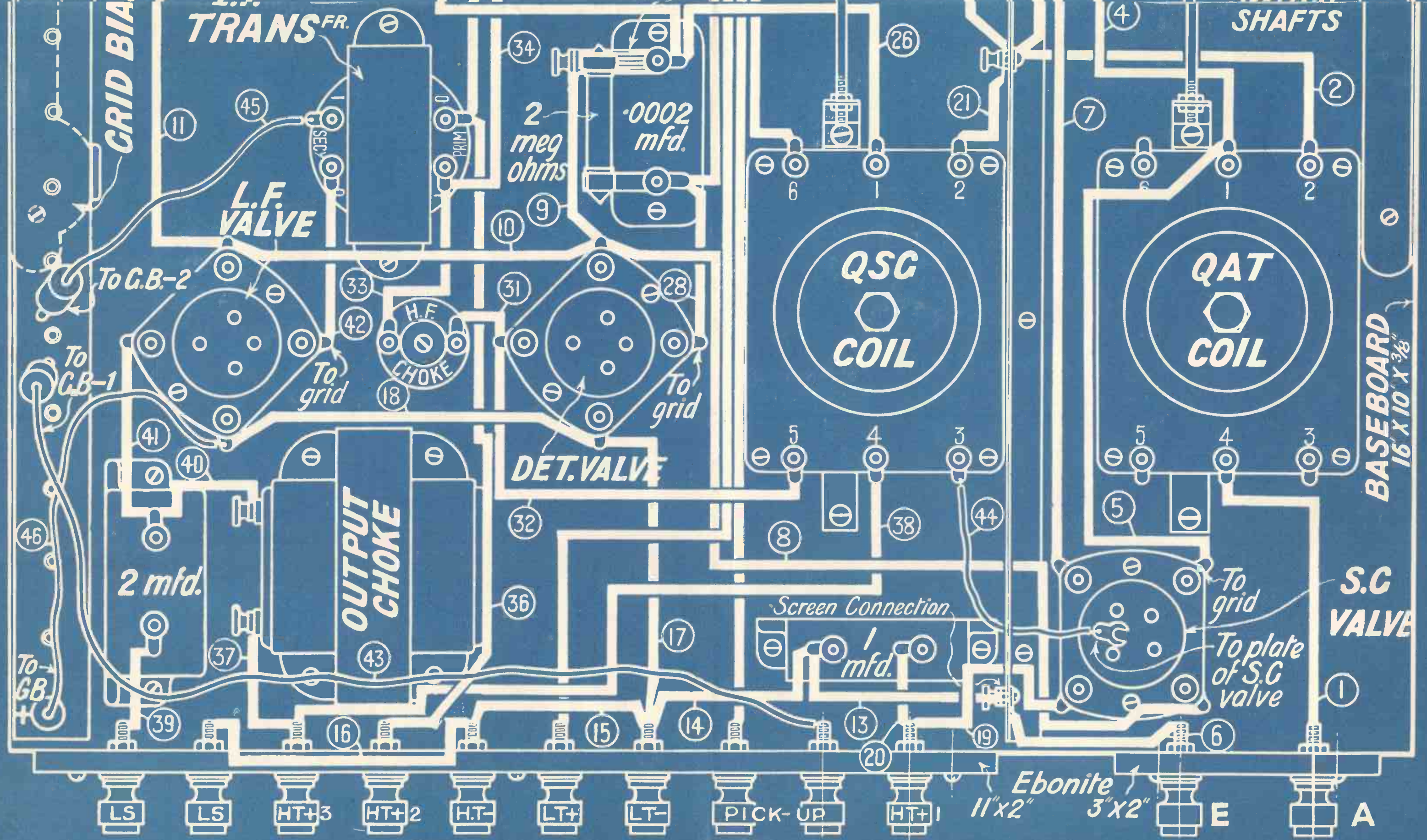
FOR CONSTRUCTIONAL
DETAILS SEE
"AMATEUR WIRELESS"
JANUARY 25, 1930

PANEL 16"x8"

Price 1/-

Checked by A.J.S.





PUBLISHED BY BERNARD JONES PUBLICATIONS, LTD., 58-61 FETTER LANE, LONDON, E.C.4

YOUR IDEAL SET

BEST-by-B

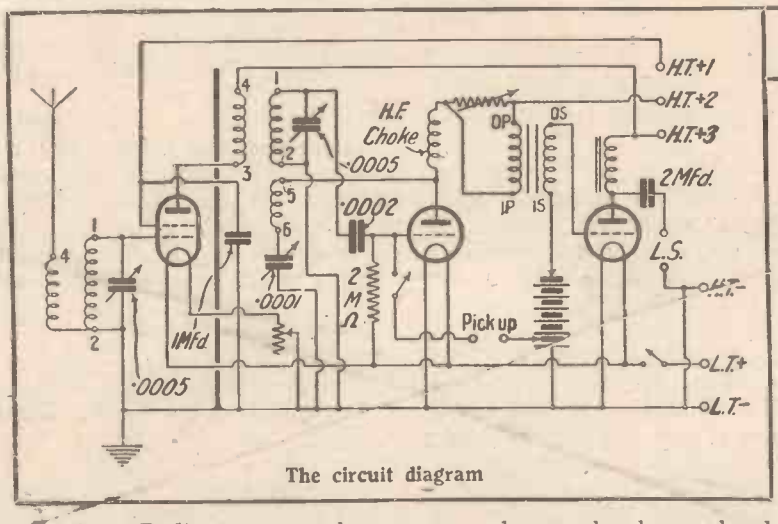
FULL CONSTRUCTIONAL DETAILS OF THE PRACTIC

HERE are constructional details of the "Best-by-Ballot 3," the receiver which forms the subject of our Free Gift this week.

As you will know, if you read the preliminary details given last week, this "Best-by-Ballot 3" is *your* receiver. It is a receiver the specification of which is based as nearly as practical considerations permit, upon the result of a ballot run in the Christmas Numbers. This ballot served the dual purpose of being a simple and enjoyable prize competition, and also of being a valuable indication regarding readers' requirements as to the best and most popular type of set in use at present.

Thousands of entries were received, carefully examined and the vote taken. And here is the receiver based on readers' suggestions.

The salient points of this set are the following: Radio or gramophone reproduction, with the change-over switch on the panel and no necessity to alter any connections or battery values; separate radio and gramo-radio volume controls; dual-range tuning, obviating the need for any "lid-lifting" or probing about inside the cabinet in order to change from the medium waves to the long, and *vice versa*; a screen-grid valve in the H.F. unit, combined with most efficient tuning arrangements, results in the tuning being really knife-edge, and with simple operation; finally, a choke-output arrangement in the anode circuit of the power valve, which improves reproduction, and, at the same time, insulates the windings of the speaker from the steady D.C. current flowing into the anode circuit.



The circuit diagram

Output Arrangements

The choke output arrangement is such that one side of the loud-speaker is connected to earth and the other through the large fixed condenser to the power valve anode. This is a great convenience when it is desired to have extension leads for the loud-speaker. With this arrangement only one extension lead is really necessary, for the second connection can be made to any convenient earth point; but more of this in the operating notes.

The set is fairly large and, of course, its specification being comprehensive, there is a good deal of constructional work to do; but it is all quite straightforward. As explained last week, it was decided to make this receiver the subject of the Free Gift of a Full-size Blueprint, in order that no reader shall have difficulty in construction.

As readers will know who have already taken advantage of the "A.W." Blueprint Service, the preparation of these prints, in conjunction with the constructional material published, forms a valuable part of the service which AMATEUR WIRELESS offers to its readers. These prints are, of course, expensive to prepare, and one is made of every receiver published, no matter how large or small.

They are always full-size, show all components in their exact positions, and give all the wiring. The charge made for them (they can always be obtained, post free) is reasonable and barely covers the cost of production: **but in this instance we are giving with this issue a Full-size Blueprint of the "Best-by-Ballot 3," so that you can start constructional work right away**

An accompanying panel gives the components required. In accordance with our usual practice, the name of the maker of the actual component used in the original receiver is given first in each case. Following this are, usually, one or two alternatives, which we know from experience to have approximately the same electrical values.

Starting Construction

Readers are quite safe in using these alternatives, but, of course, a little modification of the component spacing and drilling centres may be needed, for all the alternatives given do not, of course, have the same fixings. It is particularly important that constructors should not attempt to experiment with substitutes of their own, or to use some old component, just because it happens to be at hand. A good set can only be made by using the best components and the components here given "balance" properly—an important feature

BY BALLOT—BRITAIN'S MO

The "Best-by-Ballot 3" has the BEST number of valv for a m

BALLOT 3

FREE BLUE-PRINT

AL RECEIVER BASED UPON OUR READERS' VOTES

in the design of any high-class receiver.

The first constructional step is to drill the panel, and here is the first opportunity to use your free blueprint. The blueprint being full-size, it can be used as a drilling template. Attach it to the panel with a spot of adhesive at each corner, keeping the print perfectly flat, and then mark off the drilling centres with a punch. Do not pencil lines on the panel or you will get high-resistance leaks.

job. Again, do not forget the holes at the lower edges of the strips for the wood screws. All the terminals can be mounted on the strips with their lettered heads the right way up: the terminals can be screwed up tightly, for soldered connections should be made to the shanks.

Mounting the Components

All the components may be mounted on the panel—the three variable condensers,

The other components mounted also on this side of the screen include the 1-mfd. fixed condenser, the two valve-holders, H.F. choke, grid condenser and leak, Igranic L.F. transformer, Lissen output choke, and the 2-mfd. condenser in the output choke circuit. There is just one small point to watch, and this is that when mounting the H.F. choke, if this is of the Peto-Scott type recommended, take care to see that when screwing it into place, the blade of the screw-driver does not damage the two fine wires connected to the terminals at the top.

See that all the parts are mounted exactly in the positions indicated. The set is fairly large, and there is the ample spacing necessary between components in order to prevent interaction—or, at least, there will be the proper spacing if you adhere rigidly to the scheme of things here given.

ST POPULAR RECEIVER

Do not forget, also, that if you are not using a component specified, but one or other of the alternatives, the drilling centres may be entirely different. All the holes may be drilled, including those for the panel-bracket holders, and those for the wood screws at the bottom edge of the panel. When drilling, you must of course take the usual precautions to keep the bit at right-angles to the surface to be drilled.

Next, you can drill the terminal strips and mount all the terminals This is an easy

the Clarostat, the 15-ohm rheostat, and the two push-pull switches. The panel can then be attached to the baseboard and the panel brackets should be fixed in place. Next, you can, with the aid of the blueprint, screw the remainder of the components to the baseboard. Screw first of all the aluminium screen in place, for this will serve as a guide to the positions of the rest of the components.

On the smaller side of the screen is placed one valve holder (make sure that you mount it the correct way round, as shown on the blueprint), and the Q.A.T. aerial coil. This should be mounted with the row of terminals 3, 4, and 5 facing the rear edge of the baseboard. The wave-change switch arrangement with the shaft and knob can then be assembled, and the rod should slide freely backwards and forwards. The same directions apply to the mounting of the Q.S.G. H F. coil on the other side of the screen.

In past years there was a craze for very wide spacing of parts, but this was before components, such as transformers and coils, which are always liable to interact, were so efficiently designed as they are to-day.

Nevertheless, there is still a danger that if one part be placed too close to another, then some interaction or mutual reaction effect will be set up which will manifest itself in continual howling, or, at the least, imperfect reproduction due to the threshold effect of low-frequency oscillation.

The same applies to the wires, as you will find later on, when you come to the wiring-up stage. Interaction between badly spaced leads is just as likely to cause trouble as the incorrect spacing of components, and you should bear this in mind.

Make sure, too, that the components are placed the right way round, as shown on the blueprint. The valve-holders, for instance, are components which it is easy to mount facing the wrong way. The anode and grid pins of the detector and power valves

COMPONENTS REQUIRED

Ebonite panel, 16 in. by 8 in. (Lissen, Becol, Trolitax, Trelleborg).
One ebonite strip, 3 in. by 2 in.
One terminal strip (Junit).
Baseboard, 16 in. by 10 in. (Camco, Pickett, Raymond).
Panel brackets (Ready-Radio, Bulgin, Lissen, Keystone).
Two .0005-mfd. variable condensers (Lotus, Lissen, J.B., Dubilier, Ormond, Igranic, Burton, Polar, Formo).
.0001-mfd. reaction condenser (Lissen, Dubilier, Ormond, Igranic).
15-ohm rheostat (Lissen, Varley, Sovereign, Ormond).
Volume control (Clarostat, Volustat, Regenstat).
Two push-pull on-off switches (Lissen, Junit, Bulgin, Keystone).
Two slow-motion dials (Brownie Lissen, Igranic, Formo, Lotus).
Two dual-range coils, type Q.A.T. and Q.S.G. (Lewcos, Ready-Radio, Wearite).
Three valve holders (Benjamin, W.B., Lissen, Lotus, Formo).
.0002-mfd. fixed condenser with series clip (Dubilier, T.C.C., Lissen, Graham-Farish, Ormond).
1-mfd. and 2-mfd. fixed condensers (T.C.C., Dubilier, Lissen).
2-megohm grid-leak (Dubilier, Edi-swan, Lissen, Graham-Farish).
H.F. choke (Peto-Scott, Lissen, Ready-Radio, Bulgin, Lewcos, Tunewell, Sovereign, Watmel).
J-type L.F. transformer, ratio 6 to 1 (Igranic, Lissen, Lewcos, Varley, Lotus, Burton).
Output choke (Lissen, Varley, Bulgin, Formo, Wearite).
Three wander-plugs, marked G.B.+, G.B.—1, G.B.—2 (Belling-Lee, Eelex, Clix).
Twelve terminals, marked: Aerial, Earth, H.T.+1, Pick-up (2), L.T.—, L.T.+, H.T.—, H.T.+2, H.T.+3, L.S.+, L.S.— (Belling-Lee, Eelex, Clix, Burton, Raymond).
Partition screen, 10 in. by 6 in. (Ready-Radio, Parex).
Connecting wire and thin flex (Lewcos).

AMO-RADIO REPRODUCTION
ITH CHANGE-OVER SWITCH

DUAL-RANGE TUNING

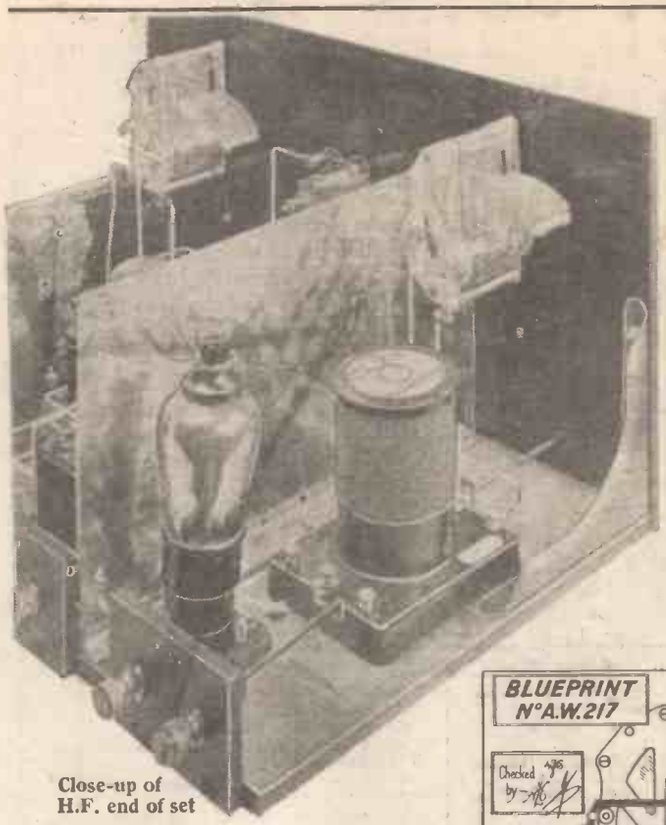
SEPARATE RADIO & GRAMO-RADIO VOLUME CONTROLS

SCREEN-GRID H.F. STAGE

CHOKE OUTPUT

es, the BEST circuit and all the BEST features required odern set

"THE 'BEST-BY-BALLOT 3'" (*Continued from preceding page*)



Close-up of H.F. end of set

should be in line, and the anode pins should face to the left, looking at the set from the back.

If you accidentally mount a holder the wrong way round then reverse it before you attempt to wire up. For one thing, you will find it difficult to trace the connections in conjunction with the blueprint, and for another you are almost certain to find it difficult to space the leads properly. Such small points lead to inefficiency.

The H.F. valve holder is mounted with the axis across the anode and grid pins at an angle to the screen. But follow the blueprint as far as mounting is concerned, and you can't go wrong.

There is one point regarding the coils which it is opportune to mention at this stage. Lewcos Q.S.G. and Q.A.T. coils are specified for use in this set, and as there is a certain amount of difference in the internal construction of the "Q" coil of this make and in other makes of "Q" coil, readers may wish to know whether other makes are interchangeable.

Actually this is so, and any "Q" coil can be used in the aerial and H.F. stages. It is the Lewcos coil, however, which is used in the original set, and the mounting of which is given in the blueprint.

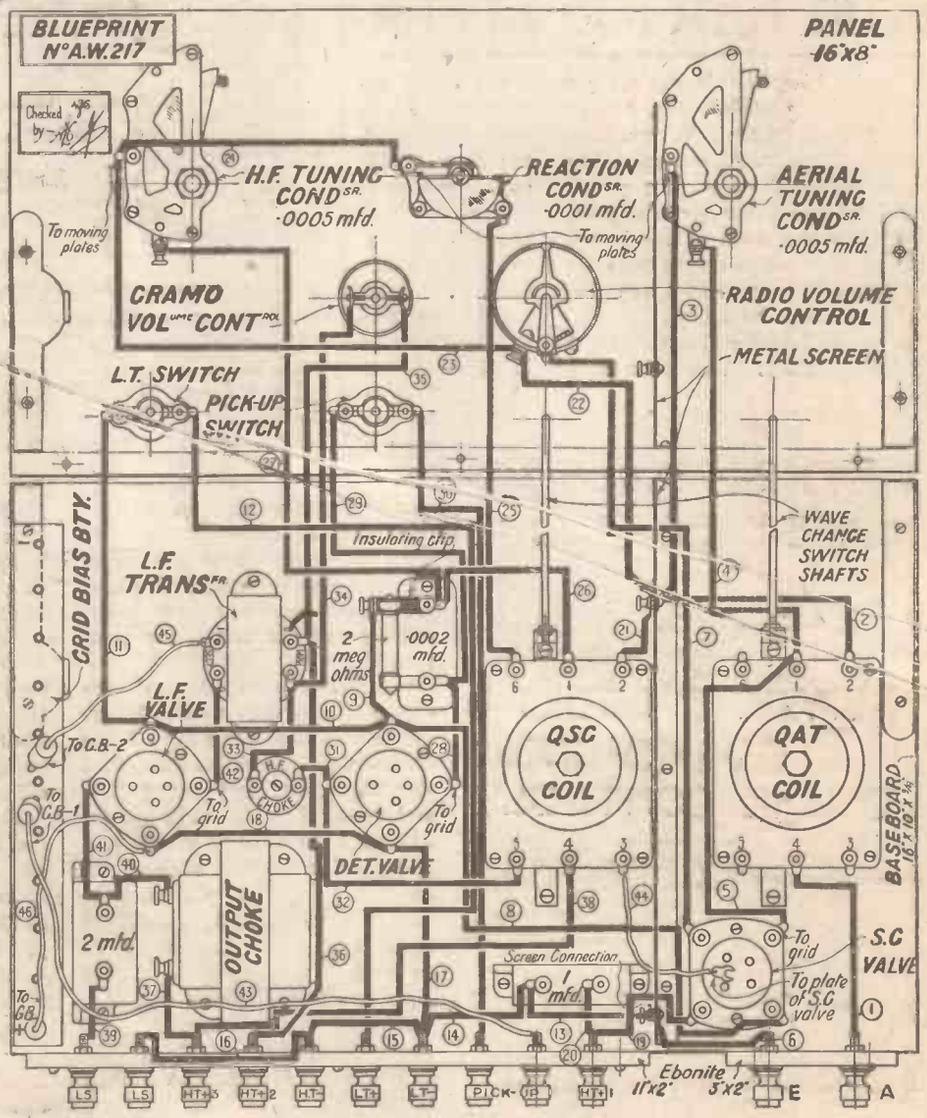
And now that all the components are mounted, the wiring may be started. We recommend that this receiver be wired up with rigid insulated wire, such as Glazite. The extra trouble involved in baring the ends of insulated wire of this type is well repaid by the freedom from the possibility of short-circuits in the wire. An important point is, that when making the earth connection to the screen, the lacquer covering the aluminium is first scraped away so that a good connection results.

A short flex lead is used from terminal 3 of the Q.S.G. coil to the anode of the screen-grid valve; for convenience, a spade tag should be soldered to the end of this lead. Flex leads are also used for making grid bias connections. The short lead connected to one filament terminal of the power-valve holder should have a red wander plug attached to it; flex leads from the "sec. 1" terminal of the Igranic transformer and from one pick-up terminal on the main terminal strip should have black wander plugs attached to their ends.

The wiring should be done in the order shown on the blueprint and, indeed, you should rely entirely on the scheme given. As each wire is put in place in the set, it should be ticked off on the blueprint. This will obviate the possibility of any wire being left out. When the whole job is finished, make a thorough check. Five minutes spent in this way may save the life of three perfectly good valves burnt out through an accidental short in the H.T. circuit!

In next week's issue full operating details will be given, so that the veriest tyro will have no difficulty in getting good results, both with radio and gramophone reproduction.

In the meantime, it may be noted that (*Continued on page 144*)



The wiring diagr am of which a full-size Blueprint is presented free with every copy of this issue

"THE 'BEST-BY-BALLOT 3'" (Continued from page 142)

The "Best-by-Ballot 3" ready for testing

two-, four- or six-volt valves may be used. An ordinary screen-grid valve is suitable in the H.F. stage; a general purpose medium impedance valve is suited to the detector position, while the final power valve should have an impedance of between 3,000 and 5,000 ohms. Further valve details will be given next week.

The H.T. demands of the set are moderate. It can be operated from an H.T. battery if desired, and those who wish to purchase their battery equipment right away should note that the following H.T. batteries are recommended: Selfridge "Key," Lissen, Ever-Ready, Siemens, G.E.C. Magnet, Dubilier, Hellesen, Nesper, Pertrix, Carlton, Pifco, Columbia, Ecco, Ripaults, etc.

As is the case with all AMATEUR WIRELESS receivers, the "Best-by-Ballot 3" is being shown this week in the Somerset Street windows of Messrs. Selfridge & Co. Somerset Street is parallel with Oxford Street. London readers who can conveniently do so, should make a special point of seeing this receiver, which is built up according to what AMATEUR WIRELESS readers themselves think a set should be like for 1930.

DEBIT AND CREDIT

THE drastic alterations made in the time schedules of the broadcasts carried out by the B.B.C. on 261, 356, and 479 metres may affect listeners in various ways. In some instances, possibly, it will mean a decided loss in wireless entertainment; in others, no doubt, it will give opportunities for picking up more distant transmissions which up to the present have been blanketed by the local station. In particular will this be the case with possessors of wireless sets who dwell within the swamping area of 5GB, and the closing down of this station at 10.30 p.m., although curtailing the home entertainment, should give to many greater facilities for hearing such stations as PTT Lyons, Langenberg, Prague, and Oslo. It is possible that on all nights after 5GB has signed off, the Continentals may not be enjoying late programmes, but generally speaking it will be found that at least half an hour will be vouchsafed to the searcher for an exploration of—to him—an hitherto undiscovered portion of the waveband.

With care, in London, by means of a frame aerial, I can clearly separate Langenberg from 5GB; this is a matter of direction only, for I experience much more difficulty in securing good reception of Prague. As to Oslo, its strength greatly facilitates matters, but there are days when, in view of my geographical position in relation to the Norwegian capital and Daventry, if the latter station is at its best, my reception of the North European entertainment is uncomfortably fitful.

DX Difficulties

There is little doubt that the placing of two or three high-power stations in a comparatively narrow section of the band hampers the listener to a great extent in holding a broadcast for a reasonable period of time. It would seem that the set critically tuned to cut out neighbouring transmissions reacts at once to any wavering on the part of one of the broadcasters. The slightest deviation from the narrow but virtuous wavelength causes trouble. That in practice this is the case is proved by the fact that on Sundays, for instance, when 5GB regularly signs off at an early hour, Zurich can be heard excellently.

JOTTINGS FROM MY LOG
By JAY COOTE

As regards London No. 2, on 261 metres, the future is not so hopeful. For the present, from all I gather when visiting friends, the majority of them possess portable receivers which do not allow of any reception whatever of the programme on the lower wavelength. On the other hand, those listeners who possess outdoor aerial sets find that Moravska-Ostrava, Leipzig, and even Hörby, in some cases, have disappeared in the background.

From January 21, the 5GB programme is heard on 479 metres and 356 metres; the London or National on 261 and 1,554 metres. This should ensure the home entertainments, as a certainty in every household blessed with wireless apparatus.

The question of an addition or reduction in the foreign programmes heard will now entirely depend on the situation of the listener in respect to the transmitter, but the early closing down of 5GB should prove a boon to some. Were this to be practised on alternate nights with the alternate programmes, I am of opinion that it would meet with general approval. Why not try it?

AERIAL "HISSES"

A FAIRLY common, though not particularly obnoxious, form of atmospheric disturbance is that heard as a low "hiss" in the headphones. The effect, which may last for a second or two, is usually attributed to a silent discharge through the receiving circuits caused by the aerial "tapping" or draining regions of high atmospheric potential.

As a result of recent investigations carried out at a high altitude, it has been observed that similar intermittent disturbances occur regularly during any kind of "precipitation" from the atmosphere, e.g. rain, hail, or snow. It is supposed that they are caused by adjacent masses of air at different temperatures. Strange to say, the hisses were heard at the same relative intensity, whether reception took place on an indoor frame or on an outside aerial.

M. B.

SHORT-WAVE RESULTS

ALTHOUGH signals transmitted on wavelengths below 10 metres are subject to very heavy fading—due, it is supposed, to the waves passing completely at times through the Heaviside layer—successful results have recently been obtained on the transatlantic beam service using waves as low as 8.5 metres.

The generation of these very high-frequencies presents many points of difficulty. The ordinary metal-glass high-powered valves are liable to be punctured in operation. Water-cooled silica tubes have, however, been successfully used to generate high-voltage oscillations at frequencies up to 30,000 kilocycles, corresponding to a wavelength of 6 metres.

B. A. R.

The inaugural meeting of the Scottish Sub-Council for School Broadcasting marks a further advance in this new form of education. The sub-council, which is to work in close touch with the Central Council in London, is intended to provide machinery for ensuring contact between the B.B.C. on the one hand, and, on the other, the Scottish Education Department, Education Authorities, and the whole body of teachers.

BROADCAST ARTISTES IN PICTURE

JACK HYLTON.—Mr. Hylton made up his first and principal band from ex-Service musicians. He made the Kit-Kat Club famous for its music.

MARGARET PITCHER.—This charming young soprano, heard at Daventry recently, was one of the earliest of broadcasters. She has a wide repertoire for both ballad and classical music.

TOMMY HANDLEY.—As an entertainer of first rank, Mr. Handley is known throughout the country. He has also compered so many broadcast programmes that few are reckoned complete without him.

GLADYS PALMER.—As a singer it would be difficult to know whether Miss Palmer is best in concert, oratorio, or musical operatic excerpts. She excels in all three.

SONIA MOLDAWSKY. — The well-known Russian violinist has given many recitals from 2LO and is famous for her interpretation of the great classical concertos. Her tone is particularly rich and vivid.

LEILA MEGANE.—Few singers have had wider experience than Miss Megane in many lands and in many types of songs. As a broadcaster she is particularly good owing to her clarity of diction.

HAROLD WILLIAMS.—Another of the late B.N.O.C. artistes, Mr. Williams, like many other of his fellow members, hails from Australia. He has played many roles.

ALBERT DANIELS.—A well-known Birmingham entertainer, Mr. Daniels has figured prominently in many broadcast programmes. His work is clear-cut, and he possesses the gift for pleasing audiences.

KENNETH ELLIS. — Another early broadcaster, Mr. Ellis has figured also in many a Children's Hour. He has a fine voice and has the knack of getting it over either footlights or ether.

"A.W." TESTS OF APPARATUS

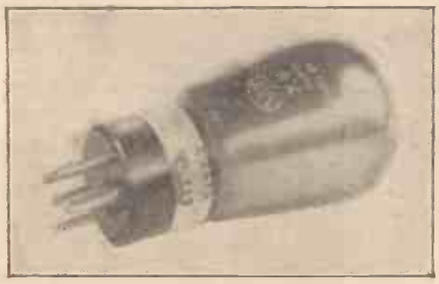
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Six-Sixty A.C. Valves

SAMPLES of the Six-Sixty five-pin A.C. valves and the five-pin pentode have been submitted to us for test, and these have been put through their paces on the laboratory valve bridge. In the case of the A.C. valve the separate heater works at 4 volts and consumes 1 amp. The cathode, which is taken to the central pin, completely surrounds the heater, whilst the grid is placed very near the cathode in order to provide the most efficient control over the electron flow to the grid. All the electrodes are mounted horizontally and supported firmly to prevent internal vibration.

One of the samples tested is known as SS4-G.P.A.C. and, as its nomenclature implies, is a general-purpose valve, which may be utilised in high-frequency neutralised circuits or as a detector and a weak-signal amplifier. Some idea of the efficiency of this valve may be gauged by the fact that the A.C. resistance is 14,800 ohms with an amplification factor of 34. The mutual conductance in this case is 2.3 milliamps per volt. These results were obtained with a negative bias of 1.5 volts and an H.T. potential of 120 volts. This valve is fully up to the highest standard associated with A.C. valves.

The second sample tested, although not actually an A.C. valve, is closely linked with the series, since it is a five-pin pentode whose filament will operate quite effectively off 4-volt raw A.C. Under such conditions one may obtain full amplification from the valve with hardly a trace of hum. These pentodes differ from the earlier types in that the structure of the electrodes has been generally stiffened up in order to overcome the original fault of unreliability.



One of the range of Six-Sixty A.C. valves

The advantage of a pentode is such that its subsequent development is well worth the time and expense spent on improving the reliability.

For the A.C. resistance of this valve we obtained a figure of 67,000 ohms with an amplification factor of 114. The mutual conductance of 1.7 milliamps per volt is commendably high. These figures were taken with a negative grid bias of 7 volts and a positive H.T. potential of 120 on both anode and extra grid; the latter is connected to the central valve pin.

These two valves make an excellent combination when used together, and will give surprisingly good results both as regards quality and volume of reproduction in an all-mains receiver.

New Wates Cabinet Speaker

DUE to the popularity of cone loud-speakers, considerable ingenuity has been expended on the design of suitable actuating units. It has been found that some types of balanced-armature unit are excellent for giving good-quality reproduction, but it has been somewhat of a problem to obtain the requisite sensitivity from such a unit.

Messrs. Wates have recently developed a four-pole balanced-armature unit with double adjustment for the reed mechanism, and this has proved not only sensitive, but capable of giving good reproduction with a suitably designed cone.

New Wates cabinet speaker

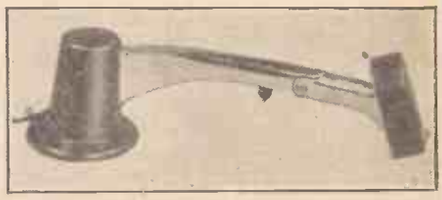
We recently tested one of the new Wates loud-speakers which includes the four-pole unit and a double diaphragm assembly. These are housed in an attractive-looking cabinet having overall dimensions of 15¾ in. by 10¼ in. by 15½ in. high. The cones are mounted with their apexes touching, the outer of these having a diameter of 13½ in., whilst the other has a diameter of 7 in.

A fairly supple material is employed for the diaphragm, and it is intended that the reproduction on the larger cone should accentuate the bass frequencies, whilst the smaller cone accentuates the treble, thus providing a fairly uniform balance over the audible register.

We tested the quality of this speaker on both speech and music, and found a volume output which compared very favourably with our standard horn-type speaker. The cone is slightly lower pitched than our standard cone speaker, but this did not appear to detract from the quality of reproduction which was pleasant on both speech and music. Tested out on a variable-frequency constant-output oscillator, there were no particular frequencies on the audible range which were unduly accentuated; both the treble and the bass were well reproduced to a practical frequency limit.

Harlie Pick-up

A GRAMOPHONE pick-up which has recently made its appearance on the market and which appears to be in the front rank is the Harlie, marketed by Harlie Bros., of Balham Road, Lower Edmonton.



A combined pick-up and tone-arm—the Harlie

Mechanically this pick-up is of more or less conventional form. The armature actuated by the needle moves in between specially shaped pole-pieces, as a result of which the field in the gap is highly concentrated.

The coil surrounds the armature and as a result of the particular shape of the field system a relatively large gap is permissible without serious loss of sensitivity.

This means that the needle itself has free play, in a lateral direction, to a considerable extent and can thus traverse heavy passages on a record without serious wear or any tendency to jump track.

From the point of view of performance the results are equally pleasing.

There is a sharp peak at 4,000 cycles, followed by a cut-off. This makes for brilliant tone, but we are inclined to think that this peak might be reduced in intensity with advantage. Otherwise the pick-up is very close to the ideal.

An actual test on records bore out the promise of the preliminary inspection, for the reproduction was clear-cut and was free from the jumbling of the instruments which is often found in a pick-up which otherwise has a good response.

The Harlie pick-up is obtainable either by itself or complete with tone-arm either with or without built-in volume control. The price is 27s. 6d., the tone-arm being 7s. 6d. extra, or 9s. 6d. with volume control.

RADIOGRAMS

ON January 31, listeners to 5GB will hear Mr. G. Bernard Shaw's speech at a public meeting held by the British Drama League at Kingsway Hall. His subject will be the National Theatre.

The next relay from the Continent, to be undertaken by the B.B.C. on February 3, will consist of a concert directed by the well-known German conductor, Dr. Felix Weingartner.

From the Manchester station on January 26, George Robey will outline the work of the Salford Royal Hospital for which he will make a charity appeal.

The Roosters' Concert Party will present a new programme on January 28 through 2LO and 5XX; it is a series of army snapshots entitled "Tommy's Little Day." The evening's vaudeville entertainment also includes Billy Mayerl, Florence Marks, Mischa Motte, Winnie Melville, and Derek Oldham, with a relay from the Coliseum.

Two new "thrillers" are to be broadcast from the Birmingham studio on February 8, namely, *The Witch Wife*, by Michael Hogan and Mabel Constanduros, and *The Crossing*, an original play by Holt Marvell and Cyril Lister.

Albert Whelan, the Australian entertainer, will broadcast from 2LO, 5XX, and other stations on February 1.

Further visits to the Parlophone studios are to be made by the B.B.C. artistes on January 27 and 29, when Puccini's opera, *La Boheme*, is to be broadcast on the former date to 5GB, and on the latter to 2LO, 5XX, and other stations taking the London programme.

According to information which has reached Scotland from a Californian source, a broadcast programme from Britain has lately been received in New York, and successfully relayed to San Francisco, where it was clearly heard.

One shilling a year is the rent to be paid for the fixing of aerials to trees in Enfield Town Park, London.

At the beginning of October last there were 2,843,569 receiving licences in Germany.

The Catholic Radio Society and the Netherlands Christian Radio Society in Holland have applied for permission to erect a number of local stations for relaying the Huizen programmes.

Of the French provincial cities, Lille being the one which numbers most listeners, it has been proposed to erect in its neighbourhood a 20-kilowatt transmitter.

(*More Radiograms on page 155*)

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*243.9	1,230	Belfast (2BE)	1.0
261	1,148	London (2) tests	30.0
*288.5	1,040	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
356	842	Brookmans Park	30.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
206	1,460	Antwerp	0.4
217.1	1,382	Charleroy (LL)	0.25
244	1,229	Ghent	0.5
250.9	1,196	Schaerbeek-Brussels	0.25
280	1,071	Liége	0.1
360	968	Arlon	0.3
339	887	Velthem	8.0
*509	590	Brussels	1.0
CZECHO-SLOVAKIA			
*263	1,139	Moravska-Ostrava	10.0
*279	1,076	Bratislava	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.5
ESTHONIA			
*296	1,013	Reval (Tallinn)	0.7
FINLAND			
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
FRANCE			
31.65	9,479	Radio Experimental (Paris)	1.0
175	1,714	S. Quentin	0.1
214	1,400	Fécamp (Radio Normande)	0.5
220	1,364	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
240	1,250	Nimes	0.25
248	1,411	Juan-les-Pins	0.5
255	1,175	Toulouse (PTT)	1.5
265	1,132.2	Lille (PTT)	0.7
268	1,121	Strasbourg	0.5
*272	1,102	Rennes (PTT)	0.5
*286	1,049	Montpellier (PTT)	0.2
286	1,049	Radio Lyons	0.5
293	1,022	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
308	973	Radio Vitus	1.0
311	964.5	Agen	0.25
*316	950	Marseilles (PTT)	0.5
329	914	Grenoble (PTT)	0.5
331.4	905	Poste Parisien	0.5
363	828	Algiers	12.0
368	815	Radio LL (Paris)	0.5
375	803	Caen	0.5
*381	788	Radio Toulouse	8.0
416	720.3	Radio Maroc (Rabat)	2.0
447	671	Paris (Ecole Sup. PTT)	3.0
468	640	Lyons (PTT)	5.0
1,444	207.5	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
GERMANY			
*218	1,373	Flensburg	0.5
*227	1,319	Cologne	4.0
*234	1,283	Münster	3.0
*239	1,256	Nürnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Königsberg	2.5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*319	941	Bremen	0.35
*325	923	Breslau	1.5
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1.5
*560	536	Hanover	0.35
560	536	Augsburg	0.25
566	530	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
GRAND DUCHY			
223	1,346	Luxembourg	3.0
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	30.0
*298	1,004	Hilversum (until 5.40 p.m. G.M.T.)	6.5
*1,071	280	Hilversum	6.5
*1,080	277.8	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. G.M.T.)	5.0
*1,875	160	Huizen	6.5
HUNGARY			
550	545	Budapest	20.0
ICELAND			
*1,200	250	Reykjavik (under construction)	16.0
IRISH FREE STATE			
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
ITALY			
291	1,030	Turin (Torino)	7.0
*330.5	907.7	Naples (Napoli)	1.5
*385	779	Genoa (Genova)	1.0
*441	680	Rome (Roma)	50.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
YUGOSLAVIA			
308	973	Zagreb (Agram)	0.7
433	693	Belgrade	2.5
570	527	Ljubljana	2.5
LATVIA			
*525	572	Riga	3.0
LITHUANIA			
*1,935	155	Kovno	7.0
NORWAY			
241	1,243	Rjukan	0.18
*283	1,058	Notodden	.05
364	824	Bergen	1.0
387	775.2	Frederiksstad	0.7
453	662	Tromsö	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*493	608	Oslo (tests)	60.0
1,071	280	Trondhjem (tests)	1.5
POLAND			
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
1,411	212.5	Warsaw	8.0
ROUMANIA			
*304	761	Bucharest	12.0
RUSSIA			
720	417	Moscow (PTT)	20.0
938	320	Moscow (C.C.S.P.)	100.0
1,000	300	Leningrad	20.0
1,075	279	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
*1,304	230	Kharkov	4.0
1,481	202.5	Moscow (Kom)	12.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EA1J9)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
403	743	San Sebastian (EAJ8)	0.5
426	703	Madrid (EAJ7)	2.0
SWEDEN			
231	1,301	Malmö	0.6
*257	1,160	Hörby	10.0
270	1,112	Trollhättan	0.45
*322	932	Göteborg	10.0
332	905	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
TURKEY			
*1,219	246	Stamboul	5.0

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

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Jan. 28 Vaudeville programme.
" 29 *La Bohéme*, an opera by Puccini.
" 30 *Huntingtower, or The Adventurous Holiday of Mr. Dickson McCunn*, John Buchan's novel, adapted for broadcasting by T. P. Maley, S.B. from Glasgow.
" 31 Symphony concert relayed from the Queen's Hall.
Feb. 1 Running commentary on the International Rugby football match, Scotland v. Wales, relayed from Murrayfield, Edinburgh.

DAVENTRY EXPERIMENTAL (5GB)

Jan. 27 *La Bohéme*, an opera by Puccini.
" 28 Liverpool Philharmonic Society concert, relayed from the Philharmonic Hall, Liverpool.
" 29 Vaudeville programme.
" 30 Royal Philharmonic Society concert.
" 31 Speech by Mr. Geroge Bernard Shaw, from the British Drama League.

LETTERS TO THE EDITOR

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

A Request

SIR,—Being a reader of your excellent journal for some considerable time, I wish to convey to you my thanks and my appreciation for the knowledge I have obtained from AMATEUR WIRELESS. Also, dear sir, allow me to comment on the wonderful "sets" and other "radio" apparatus you have published. Looking at your paper from all angles, I should say you cater for all and my only regret is I have failed to get a certain AMATEUR WIRELESS which I should very much like. Perhaps you will ask if any reader can supply me with the copy of AMATEUR WIRELESS which gave a description of how to make a morse inker and recorder. I am willing to pay postage, etc.

H. NEWBY, 37 Hibbert Road,
Barrow-in-Furness.

"Everybody's 3"

SIR,—I have recently put together the "Everybody's 3," and am so pleased with it that I feel I must write and thank you for giving us such an excellent design. I have made up for a number of years your principal sets, but have no hesitation in

saying that this is by far the best three-valver you have issued to date and I am keeping it for permanent use in place of a four-valver. The coils are of particularly happy design, and although rather expensive, are worth every bit of the money and will be a revelation to anyone who is interested in the apparently simple problem of switching from the medium to the high waves and vice versa.

Stations can be brought in on this set which will never be heard on the best of straight three-valvers, owing to the highly efficient H.F. amplification. To anyone who wishes to build a really tip-top set for keeps, I can recommend the "Everybody's 3."

It has range, quality, and is a delight to handle, besides being simple to construct, and I shall be interested to hear what readers from other districts have to say on its merits. B. (Aughton).

American Reception

SIR,—Further to my letter which you published in the issue of AMATEUR WIRELESS dated December 28, the set and circuit with which I have heard American stations on several occasions on the *medium-wave band* (always on the loud-speaker) is a 1929 Cossor Melody Maker.

The high performance attained has, I think, been assisted by much experimenting and many trials.

The deviations from standard were the substitution of a pentode valve in place of power valve, and the use of a Pentamu output transformer. I found some instability on the American reception, but effected a great improvement by earthing the case of the Cossor transformer and the case of the Pentamu output transformer and also the metal cabinet of the set.

Another factor concerned, I believe, is the use of large-size Oldham accumulators for the high tension. I have fourteen sections of 10 volts, which, with trickle charger in constant use, gives me a total of 150 volts.

Of course, I think the loud-speaker plays an important part. The one I have in use seems to be ultra sensitive, and was home-constructed from the article in AMATEUR WIRELESS of June 8 issue last year; it is a Mono-cone linen diaphragm, and is the object of great admiration by everyone who hears it.

Lastly, my aerial has an overall length of 50 ft., and incidentally runs east to west; whether this last has any beneficial effect on American reception I do not know.

P. (Reigate).

Detector Control

SIR,—With reference to your correspondent who favours a rheostat in the detector filament, I entirely agree with him and I think that in the near future your paper will advocate this, as you do with the S.G. valve.

(*Continued on next page*)

(*Continued from preceding page*)

With the varying efficiency of coils, aerials, and earths, also the position of wires, surely the extra little cost of the control in the detector is worth while, and after not a few years' test, I have proved this, especially with 4- and 6-volt valves. On two occasions lately, when I have changed from 2- to 4-volt valves I have been unable to control the reaction without the resistance. Perhaps I, along with other of your readers, am wrong, but the proof of the pudding, etc., has worked out right in our case.

Just another point. Would it not be better to use a good rheostat as an L.T. switch, and so heat and cool the valves gradually?

A. C. F. (Wellingboro).

"Q" Coils

SIR,—I must congratulate AMATEUR WIRELESS and Mr. J. H. Reyner for good coils and sets: the "Q" series. I use an indoor aerial, situated about one mile from the 5NO aerial. As I write this letter, Vienna is being reproduced from the loud-speaker very clearly. I am at present using the old type "Q.A." and "Q.S.P." coils in a "Q4" combination, with 50,000-ohms resistance, and 2-microfarad condenser across the H.T. The third valve is in a Dubilier combined resistance-capacity unit, with valve holder. Valves are Mullard 2-volters. I have logged about fifty stations at reasonable strength, both medium and long bands, and, after the local has closed down, they come rolling in one after the other. Being so close to Newcastle's aerial, he occupies a good portion of the dial, but, from about 90 degrees onwards to 180 degrees, the other transmissions are easily separated. Brookmans Park on 356 metres is easily picked up separate from Graz and Stuttgart, as are Hamburg from Manchester, and Langenberg, Daventry 5GB, and Prague. So you will see there is something to "crack" about. I think we up here must thank the B.B.C. for its regional scheme, *at present*, as it gives us some of the plums that have hitherto been mainly for the southerners.

B. (Newcastle-on-Tyne).

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

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

MORE RADIOGRAMS

Rio de Janeiro states that the work on the installation of radio-telegraph stations is commencing at Fernando-de-Noronha (destined to become the most important air-port in Brazil), Natal, Recife (Pernambuco), Maceao, Bahia, Caracellas, Victoria, Rio de Janeiro, Santos, Florianopolis, Pelotas, and Puerto Alegre.

The American Department of Commerce figures reveal that there is one receiving set for every twelve and a half persons in the United States; one for every fifty-three in Europe; and one for every eighty-eight in the world.

A new service of picture transmissions has been opened between Leningrad and Moscow. According to a Russian report, no extra charge is made for the transmission of a photograph provided the latter is accompanied by a paid telegram of, at least, two hundred words.

The Casablanca (North Africa) broadcasting station has closed down, but in order that radio programmes, including news bulletins, should still be available to listeners in the distant parts of Morocco, the Rabat (Radio Maroc) entertainments are re-broadcast on 43.60 metres on Sundays, Tuesdays, Wednesdays, and Saturdays. The call is: "*Poste de Casablanca, station experimentale* 8MC."

Listeners to Radio Toulouse will be interested to learn that this station relays nightly from 9 p.m. onwards concerts from local cinemas. On Fridays gala concerts are broadcast from the Theatre de la Capitole.

With the transfer of the P.T.T. Grenoble transmitter to a site outside city limits, the authorities have decided to increase the power of the broadcasts to over 2 kilowatts.

During the last few days British listeners to Radio Luxembourg may have noticed that the transmissions are not subject to the same amount of fading as was hitherto the case; this is due to the fact that the direction of the aerial has been altered and is now more favourably situated for broadcasts to Western Europe.

Every Saturday evening at 10.30 p.m., 8KO, an experimental station at Asnieres, near Paris, broadcasts a concert on 531 metres.

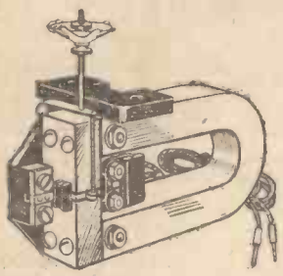
Nine transmitters are to be erected in Greece, according to the proposed broadcasting scheme; they will be situated at Athens, Zavel, Vari, Sitta, Chios, and Heraclion.

On Mondays, Wednesdays, and Thursdays, Huizen broadcasts an early transmission of gramophone records; the station call is put out at 7.55 a.m. G.M.T.

PERFECTION!

The "GRAWOR"

4-POLE BALANCED ARMATURE UNIT



Every atom of energy fed to this Grawor Unit is handled in a masterly manner.

21/-

From all Dealers.

GRAWOR

Sound - in Every Sense

HENRY JOSEPH

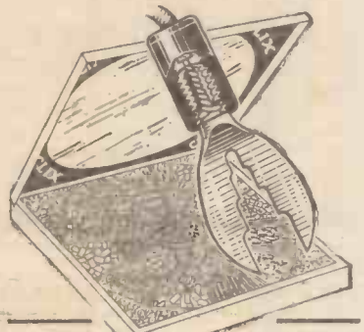
11 RED LION SQ.
HOLBORN
LONDON, W.C.1

Telephone: CHANCERY 8770

SEND POSTCARD FOR THE GRAWOR ILLUSTRATED PRICE LIST.

CLIX

21 VARIETIES



No. 3. FIT-ALL SPADE TERMINAL. Fits all sizes of screw terminals. Lead coated for L.T., Nickel plated for H.T. Red and Black ... ... **2d.**

The above is one of the many useful lines displayed in the Clix Showcase.

Supplied with engraved insulators

for ½d. extra.
Full range of markings

Look for the Clix Showcase on your dealer's counter. Write for descriptive leaflet "A Matter of Connection."

LECTRO LINX LTD.,
254 Vauxhall Bridge Road, S.W.1

RAYMOND'S

27 & 28a, LISLE ST., LONDON, W.C.2
Come to LEICESTER SQUARE TUBE.
This address is at the back of Daly's Theatre. Phones: Gerrard 4637 and 2121

WE ARE OPEN

ALL DAY SATURDAY	Hours 9 a.m. to 8 p.m.
ALL DAY THURSDAY	Sat. 9 a.m. to 9 p.m.
ALL DAY EVERY DAY	Sunday Morning 11-1

KITS OF PARTS of your own selection
Quoted for at a special cash price where possible on receipt of detailed list. OVER **25/-** In value

SPECIAL OFFER. Ready to Use.
Assembled in a nice cabinet with Power & D Valves. Best components and specified Coil. Tested. Ready to use.
→ BRITAIN'S FAV. 2 OR BROADCAST 2 OR TALISMAN 2
→ Either of above
70/- CASH
EASY TERMS
12 MONTHLY PAYMENTS of 7/11. CARR. 2/6

VARIOUS
A.W. RECEIVERS
ON SHOW IN WINDOW

EASY TERMS ON KITS OF PARTS ETC., OVER **£3**

SPECIAL PRICES *ON MANY OF* **OUR OWN LINES** *IF YOU* **SHOW THIS ADVT.** *AVAILABLE AT RAYMOND'S ONLY*

BEST-BY-BALLOT 3
Please select parts required. Lowest Quotation by return for CASH or EASY TERMS

WEARITE COILS
Talisman 7/6
1930 Binowave "A" or "B" [each 17/6
QAT or QSP ... 15/-

BRITISH VALVES
Marconi, Cossor, Osram, 10/6. Power, 12/6. S.P., 15/-. S.G., 22/6. Pentode, 25/-. Sets of valves for all Cossor, Osram, and Mullard Kits of parts, etc.

SOVEREIGN Special Dual Coil 200/2000 Panel Mounting, 8/6; H.F. Choke 10/ 2000, 4/6; Compression Type "F" .0001, "G" .001, "J" .0003, 2/-. Post 3d.

WE STOCK
L.B. Condensers, R.I. Chokes, Transformers, and all usual products, Lewcos Coils, Chokes, etc., Ekco Mains Units, Amplion Speakers, Brown Speakers, and all components, 'phones, etc., Ferranti L.F. Transformers, Chokes, Anode Resistances, Cossor, Mullard, Osram, Ediswan, Marconi Valves, Varley Chokes and Transformers, Ormond Condensers, Dials, etc.

OAK SPEAKER CABINET
12 x 12 x 6
GOOD QUALITY **10/-**
CARR. 1/3

TRIOTRON VALVES
New Dark Emitters.
Power, 7/6; R.C., H.F., L.F., each 5/6. 2-volt. Post 3d. Later TRIOTRON 4-pole Bal. Arm. Loud Speaker Unit, 15/6.

DARIO VALVES

Universal, R.C., Super H.F.	5/6
Super Power	7/6
Hyper Power	9/6
2 or 4 volts	Post 3d.

FOR ETHER SEARCHER
Pair Dual-range Colvern Coils, 17/- Lissen Super, 19/-. Lotus .00015 Differential, 7/-. Lewcos H.F. Choke, 7/9. Lissen, 5/6, etc. Two 1-mfd. Fixed, 5/-, etc.

TUNEWELL

CLARION COILS, each	10/6
DUAL 6-PIN, each	7/6
BROADCAST 2	8/3

CLARION S.G. 3
Approved SET OF PARTS
2 Polar .0005, No. 3, at 5/6. .0001 Reaction, 4/-. 2 Dual range C.I Coils, with Reaction (Tunewell) Anode, 10/6; Aerial, 10/6. 3-Sprung V.H. at 1/3. Preset, "J," 2/-. 1-mfd., 2/6. .01 Fixed T.C.C. 1/9. 3-meg., 1/-. S.G. H.F. Choke, 5/-. H.F. Choke, 5/6. L.F., Lotus or Telsen Radiogrand, 12/6. .0002 and series Clip. 14 by 7 Ebonite Panel. Screen, 8½ by 6. 8 Terminals, Push-pull Switch. Flex. Plugs, Wire. 2 S.M. Dials.
CASH 70/-. Carr. paid
EASY TERMS
KITS OF PARTS, with 2 Tunewell Clarion Coils, panel, strip, all screws, wire and sundries, 14 by 7 Cabinet (hinged lid), baseboard, S.G. Mullard Valve, 2 D.E. Valves, Blueprint.
12 monthly payments of 12/9

WAVE TRAPS

WATMEL	8/6
I.D.S.	10/6
GECOPHONE ...	18/6
BROCKMAN'S REJECTOR	8/6

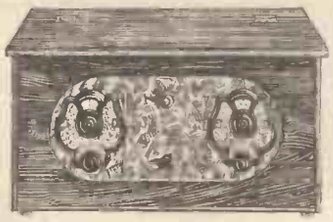
LISSEN PARTS ALWAYS IN STOCK.

SPEAKERS, etc.
Blue Spot Unit 66K, 25/-; Chassis, 12/6; Do., Major, 15/-; B.T.H. Chassis, 12/-; Unit, 15/-; Brown's Vee Unit, 25/-; Chassis, 15/-; Amplion Cone, 21/-; A.C.40, £3; A.R.9 Horn, 27/6; Celestion C10, 75/-; Marconi Octagon, 30/-; B.T.H. C.2, 45/-.

MARVELLOUS CASH BARGAIN!

AMAZING OFFER IN LOUD-SPEAKER RECEIVERS

DE LUXE MODEL READY TO USE



For Local, Brookmans Park, 5GB, and new alternative programmes. Many Continental Stations. NO COILS TO CHANGE

READY TO FIX TO AERIAL.
The Most Wonderful Set for Distance, Speech and Music; and THE WORLD'S BEST SELLER

Complete Receiver READY TO USE
as shown above
Assembled in AMERICAN CABINET (hinged lid) all parts enclosed; DUAL WAVE COIL is incorporated (200/ 2000); GRID BIAS BATTERY; 4 WAY LEADS; 3 DULL EMITTER VALVES; 2 SLOW MOTION DIALS, TRANSFORMER COUPLED.
69/6
Packing & Carr 5s. U.K. NOT C.O.D.

BATTERIES AND SPEAKER EXTRA.

Complete Receiver The Lot. Nett
AS ABOVE
100-v. H.T., 2-v. 40 Exide, Aerial and **AMPLION GUINEA CONE** **£5.12.6**
CARRIAGE and PACKING 7/6

EASY TERMS
Receiver in Cabinet, with valves, etc. Assembled ready to use
12 MONTHLY PAYMENTS OF **7/9** CARR. EXTRA

OR

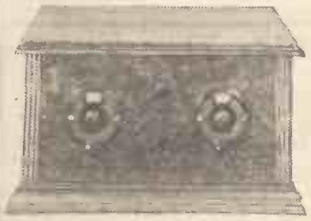
Receiver, Batteries, SPEAKER and AERIAL. The LOT
12 MONTHLY PAYMENTS OF **13/11** CARR. EXTRA

FLAT OR HOUSEHOLDER'S FORM FREE

WHY PAY MORE?

OUR LATEST DE LUXE "SUPER" 3-VALVE LOUD-SPEAKER RECEIVER IS JUST WHAT YOU WANT

EVERY STATION ON THE MAP NOT GUARANTEED, BUT IT GETS THOSE THAT MATTER.



READY TO FIX TO YOUR AERIAL. ASSEMBLED IN CABINET.

CASH PRICE **95/-** Carr. extra 5/-. Or 12 monthly Payments of **9/11**

Built for Tone, Power and Selectivity. Extremely efficient. COSSOR NEW PROCESS VALVES supplied (Power, H.F. & L.F.) giving marvellous results. New type of dual wave panel mounting coil incorporated with switch, 2 fine Tuning Dials. Super L.F. Transformers. Grid Bias, Coloured Battery Leads. Range 200 to 2,000 metres.

Batteries and Speakers NOT included.

FLAT or HOUSEHOLDER'S E.P. FORM FREE

UNSOLICITED TESTIMONIALS.
£50 to any Charity if not Genuine.

7/11/29
Spark-hill, Birmingham.
Thank you for set, etc., of which I am very proud: it is all it claims. I was extremely astonished; its merits are unequalled.
Wishing your sets every future success, and thanking you again, I remain,
Yours sincerely,
(Signed) A. Wall.

3/10/29.
Hartley Wintley.
Have received wireless set, etc. I am more than pleased with same. It has surpasssed my expectations, and you can be sure I shall recommend your firm in future to my friends.
Yours truly,
(Signed) A. C. Morton.

H.M. THE KING BROADCASTS

An historical occasion was the broadcasting of H.M. the King's speech at the opening of the great Naval Conference. Details of the elaborate simultaneous-broadcast arrangements made all over the world were given last week in AMATEUR WIRELESS, and it is a fact that His Majesty had the largest audience of any speaker in the world.

The short-wave station at 5SW enabled British listeners in many parts of the country to hear the address, and many official relays were conducted.

France, Germany, Norway, Denmark, Sweden, Hungary, Austria, and Czecho-Slovakia were connected by means of a land-line from Savoy Hill via Berlin. Holland and Belgium rebroadcast the B.B.C transmissions. Canada used the Canadian beam transmission, and the Columbia chain of stations in the United States picked up the G.P.O. Rugby station. The N.B.C. chain in the States, on the other hand, relayed 5SW, as did Australia, New Zealand, Japan, and Finland. In Canada and the United States, chains of stations from the Atlantic to the Pacific rebroadcast the speech.

The occasion was one of which all radio enthusiasts may well be proud, and a world-wide relay such as this is distinctly calculated to raise British radio prestige.

U.

PREPAID ADVERTISEMENTS

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

DEPOSIT SYSTEM

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

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

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to
"AMATEUR WIRELESS," ADVERTISEMENT DEPARTMENT, 58/61 FETTER LANE, LONDON, E.C.4.

EVER READY

Special EVER READY Units for Portable Sets

Careful attention has been given to modern practice in portable set construction, and the following three batteries are specially designed for use with them. These units should cover the range of replacements required for most standard models.

63 VOLTS.	PORTABLE ONE	6 x 5 x 3 in.	**8/6**
99 VOLTS.	PORTABLE TWO	9 x 5 x 3 in.	**13/6**
108 VOLTS.	PORTABLE THREE	10 x 5 x 3 in.	**15/-**

THE BATTERY FOR YOUR PORTABLE SET

—with a great name behind it!

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, January 25, 1930