# Mainly about Construction

BY "MEGOHM"

Radio, with all its wonders of the moment, is still in its infancy. The past twenty-odd years have seen wonderful developments, but what is to follow in the years to come makes it a thing of the future with a wealth of wonderful development in store to be gradually unfolded. Television, more wonderful than the wireless telephone, whereby we shall see distant scenes as we now hear distant music, will soon be a commercial proposition and an every-day delight. The youth of to-day will have seen many new and great inventions by the time he reaches the age of fifty, and those who make the effort to understand radio more or less thoroughly will have a life-long hobby of exceptional interest and continuous novelty.

The best adjunct to the reading of good text-books on the theory of radio, is practical construction. Theory alone cannot give the knowledge acquired by combining it with practical work, and those who develop their constructive abilities will derive far greater satisfaction from logging distant stations through the medium of a set of their own construction than by twisting the knobs of a bought set that they might never take the trouble to understand. Of course it is quite admitted that not everybody is constructively inclined, or can spare the time for it, and that those who buy a set with the one object of being provided with musical entertainment will reap unlimited pleasure from their investment. But those who feel that construction alone will satisfy their ambitions will gain in many ways by developing their craftsmanship. They will learn alongside the technicalities of radio, the general principles underlying all practical work—foresight, care and patience. Cabinet work, soldering, drilling, screwing and fitting together learnt in wireless work will often be turned to good account in other directions.

A constructor naturally becomes more or less of an experimenter, and as such his set is more frequently made up on a neat board rather than in a cabinet, so that alterations and improvements can be easily made at any time, and such a set being roomy, often gives better results than when components are closely huddled together in a cabinet without careful experiment or necessary shielding. There are certain accessories that an amateur cannot make, and valves, headphones, loudspeakers, low-tension accumulators and audio-transformers would so far as most people are concerned, come under this heading. But it is in the general design, lay-out, wiring-up, switching arrangements and operating convenience that the amateur has plenty of scope for ingenuity and inventiveness. And here it may be pointed out how very accommodating wireless construction is in suiting itself to the amateur's capabilities, as he is able to purchase ready-made any article that he does not feel disposed to make, though he may aim to eventually make everything possible.

The modest crystal set may be chosen as a first attempt at construction, and is not to be despised, at least as a beginning. To get really good crystal results is an achievement, and nothing will beat the solenoid coil wound with substantial wire on the low-loss plan, that is, with a space between each turn equal to half the thickness of the wire. Having erected a good outside aerial, and obtained good 'phone results with the crystal, the next step may be the addition of an audio-transformer and valve to amplify the output of the crystal, giving fair loud speaker volume if close to a main station, or two amplifying valves to give good loud speaker volume under the same conditions.

When a valve circuit has been tested and gives good results, the enthusiast may be pleased, but not satisfied—it will always be his aim to improve towards perfection. Then come the refining alterations, grid leak and fixed condenser values are altered and results noted, positions of adjacent wires adjusted, different valves may be tried, high tension voltages varied and variable condensers tested to prove that they cover the required range. There is constant interest in making alterations, and noting results, and from this experience sound knowledge is obtained. All this work develops the virtue of patience, enabling otherwise tedious problems to be coolly dealt with and finally solved.

Broadcast listening is now of such importance that every effort should be made by set owners to suppress any tendency for howling and oscillation to radiate from their aerials, and as already advised in a circular just issued by the Post and Telegraph Department, it will be well for purchasers or constructors of valve sets to consider nothing less than a two-valve outfit, the first valve to have a neutralised high-frequency arrangement to prevent radiation and consequent interference with nearby receivers. The second valve will of course be the detector, and one or two low-frequency amplifying valves can at any time be added to these. If it is desired to add a high-frequency stage, then it may be necessary to separately shield each of these stages and also the detector to prevent interaction.

It is as well to warn the beginner against wasting time on two and three-coil circuits, very much featured in certain imported radio journals. The two-coil circuit is illegal in New Zealand, and the three-coil, whilst more selective than the two-coil, can cause a great amount of interference in inexperienced hands and moreover, has been superseded in every way by circuits with an improved system of aerial tuning and reaction control. The superheterodyne is not a circuit to be recommended for home construction. It is complicated, and the same results can be obtained by newer circuits employing a less number of valves. It is illegal to use a super-het. on an outside aerial in New Zealand. The Browning-Drake and neutrodyne circuits are both suited to home construction, presenting no great difficulty. The Browning-Drake, though neutralised, is a particularly good circuit for searching out distant stations, a well-constructed set with four valves having a range of about ten thousand miles. Such a set, employing low-loss coils, is almost as selective as a super-het.

When buying components it is good to have the assistance of an experienced radio amateur, but in any case the main factor should be "how good" and not "how cheap." This remark applies particularly to audio-transformers—only purchase large-sized ones, as they give good tone and do not distort: the small patterns are out-of-date and will only give tinny tone and distorted music, and speech if carrying any volume, and owing to their fine windings, easily fail through burning out.

No very imposing kit of tools is necessary for a beginner at construction, the main items comprising a hand-drill, cutting pliers, screwdriver, soldering gear, and a few ordinary carpenter's tools.

Do not be satisfied with untidy-looking work: aim to produce something good, well designed, easy to use, neatly laid-out and arranged even if it is only on a hook-up board. Quality of work will soon improve with practice, and this will often assist to get better quality of reception.

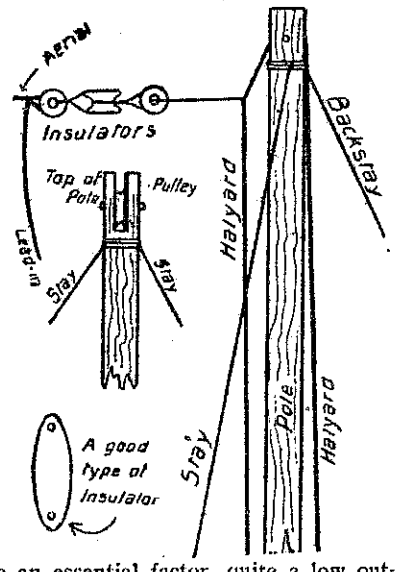
## ERECTING THE AERIAL

### SOME USEFUL HINTS

First of all the position of the aerial poles must be decided and in considering this it should be borne in mind that the direction of the aerial wire should be as much at right angles as possible to any power, lighting or tramway overhead wires or other aerial that may happen to be near. The lead-in picks up signals just as much as the horizontal portion of the wire, and is always included in reckoning the length. Seventy feet is a good length for an aerial, but it can be much longer without detriment. The shorter an aerial and the higher, the more selective it will be, but if the length is reduced to less than say fifty feet, it will be found that selectivity is being gained at the expense of volume. So the conclusion is that it pays to have a long aerial for bringing in distant stations, and this also applies to short-wave reception.

Turret and lattice-work masts of various designs, though they often look quite handsome and dignified, are not to be recommended in windy situations as they offer too much resistance to wind-pressure, and on that account require specially strong stays and anchors for the same.

It pays to put up a good strong aerial at the outset, and if proper attention is given to making a good firm job, very little further trouble will be experienced. Good poles can be made by bolting together a three-by-two and a two-by-two for each, to give thirty feet or more in height, but where this height is impracticable, twenty or twenty-five feet will give very good results. Where the local station is not far away and distance-getting is not to




be an essential factor, quite a low outside aerial will give all that is desired, though for crystal reception it is always a good maxim not to cut the aerial too fine and to pay special attention to the insulators, both on the aerial itself and on the lead-in if any should be required there. Neither valve nor crystal receiver can afford to allow aerial losses, and if the lead-in must have its direction changed, let the insulator to which it is attached be of the post office or "petticoat" pattern as these insulators are highly efficient.

**Stranded.**

Galvanised clothes-line makes good strong and cheap stays. Single wire stays are apt to break with the vibration caused by wind, and the loss of one stay may mean breakage and collapse of the pole. Stays should be attached to the very top of the pole and not a foot or two below, as the latter method causes the weight of the aerial wire to gradually bend the short length between it and the top of the stays, spoiling the appearance, and weakening the pole. Insulators are not necessary in the stays if the aerial is only for receiving. If the poles are higher than twenty feet a set of stays should be attached half-way up to steady the centre of the pole. An important matter with high poles is to allow for plenty of spread for the stays. The usual tendency is to place the poles too near fences to which the stays are attached, and thus not get sufficient angular pull to carry the strain properly. This usually happens at the bottom end of the garden: round the house there is usually more room for spreading the stays, so that it will in awkward cases where the section is short, pay to increase the height of the pole at the lead-in end and decrease the other in order to stay it more safely.

A single stranded wire is the correct thing for an aerial of ordinary length, and the lead-in should be a continuation of the same wire. In cases where it is impossible to erect an aerial of more than twenty or thirty feet, two or three wires separated at least two or three feet by wooden spreaders should be used, an insulator being placed wherever the wires are attached to the spreaders. The wires must only be joined together at the lead-in end.

Aerials appear to be almost immune from being struck by lightning, even in countries where thunderstorms are more frequent and much more severe than in New Zealand. Insurance companies do not make any extra charge on the premium when an aerial is erected, provided that it is installed in accordance with the fire underwriter's regulations which stipulate that not less than 14's copper wire shall be used for the lead-in, and earth connection, and that an efficient lightning arrester and switch to earth the aerial shall be included in the aerial circuit. Recent practice is to place the lightning-arrester outside the house near the lead-in, and this should be done if possible, the earth connection also running to ground outside the building. An ebonite lead-in tube purchased ready-made, if inserted through a hole drilled through the wall of the house, forms a good method of getting the aerial connection through. The inside portion from the lead-in to the set, whether covered wire or not, should be attached to a small fixed porcelain insulator where it is necessary to turn a corner, but the wire should be kept several inches from walls and partitions.

It is important to see that neither the poles nor aerial wire can swing, as that tends towards jerky and uncertain reception, more especially on short-wave work. Keep the wire reasonably tight. Continuous rope halyards are best, and may run over a pulley-wheel running in an upright slot cut in the top of the pole, the spindle being a portion of a large nail pushed through a hole drilled in the side of the pole across the slot. The lead-in must come out from the aerial at the very end of the wire at the first insulator, and not a foot or two from the end. This is important for technical reasons that need not be explained here.

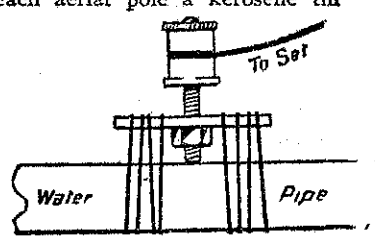
Trees growing near the aerial will be inclined to screen waves coming from their direction, and the only way to overcome this, short of cutting down the trees is to make the aerial higher than the screening trees. People living next to each other sometimes get an idea that they can join at an aerial, or erect two aerials on one pair of poles. It is not feasible for two sets to use the same aerial at the same time, and with two aerials on the same pair of poles, results would not be very satisfactory if either of the sets happened to be a radiator or howler.

**"MEGOHM" WILL BE PLEASED TO ANSWER THE REQUESTS OF ENTHUSIASTS FOR CONSTRUCTIONAL DETAILS IN RELATION TO HOME-MADE SETS AND OTHER DATA. SHOULD ANY LISTENER OR ENTHUSIAST DESIRE A CONSTRUCTIONAL ARTICLE UPON ANY PARTICULAR ASPECT, EVERY EFFORT WILL BE MADE TO COMPLY WITH HIS REQUEST. ADDRESS "MEGOHM," BOX 1032, WELLINGTON.**

## THE EARTH CONNECTION

### AN IMPORTANT LINK.

An important link in the chain of wireless reception is the earth connection, yet in many cases once contact has been made to a water-pipe it is decided that the earth is all right and little further consideration is given to the matter. Yet although a water-pipe connection may give excellent results in damp weather, in a dry season it may give poor results on account of the nearness to the surface of the ground in dry earth or even dry sand. It is worth while to get a good earth for all seasons by running a 14's copper wire from the set the whole distance under the aerial, buried where possible. Near each aerial pole a kerosene tin



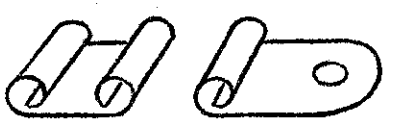

should be soldered to the wire and sunk several feet to where the earth is always damp. If coke or cinders can be put round or inside the tin it will help to improve matters.

In cases where there is no alternative but to use a water-pipe, do not waste time trying to solder a wire to the pipe, as it is too difficult a process for the average amateur. A simple method of getting a good connection is shown in the accompanying sketch. All that is required is a brass terminal of the pattern shown and a piece of metal drilled to slip loosely over the screw. Then screw the nut on a short way, hold in position as shown, and with a length of clean 18's wire bind the metal strip to the pipe. Turning the terminal will then tighten the binding wires to give good contact. The pipe must be well cleaned beforehand, especially where the terminal contacts it. The earth lead to the set is then attached to the terminal in the usual way.

A bad earth has a very detrimental effect upon reception, yet it is very easy to suspect any other part of the circuit when the earth is to blame. Gaspipes should never be used to earth a set, the chief reason being that red-leaded joints prevent continuous metallic contact. The water-pipe used should be the one entering the house from the street mains.

## A HANDY IDEA

Here is a handy idea for connecting several pairs of 'phones in series. Thin brass such as shaving stick containers are made of will do for the material.



Cut a few pieces about one and a half inch by five-eighths, and roll up each end over a thick nail or other article slightly less in diameter than the thick part of 'phone tags. These will connect any two pairs of 'phones by slipping a tag of each into the curled-up ends. To attach the end 'phones to the set you may require two pieces with a curl at one end only and a hole at the other, which can be slipped over terminals on the set, or a small bolt passed through to which a wire can be attached.