lighter, it was not until a little chalk was added that a filling was produced which matched the colour of the tables.

The method of making and using the filling is as follows: Heat 3 parts of linseed oil and stir in 24 parts of light amber resin, 8 parts of white beeswax, and 2 parts of chalk. It is best to powder the resin and cut up the beeswax before stirring it in. This mixture is then poured while hot into the joints of the tables until it overflows; as it is setting, a painter's scraper is run along the surface of the table and the surplus filling removed. This can be heated and used again, and any which cannot be removed by the scraper can be rubbed off with a little methylated spirits.

Hot water used in scrubbing the tables may momentarily soften the filling but this may be an advantage when the possibility of the wood shrinking or swelling is remembered.

The joints of the tables in the dining-room at the Army School of Hygiene have been treated in this way, some six months and others three months ago. The filling is still in good condition.

I do not think it would be of use in a hot climate as it has a low melting point.

A patent filling was also tried, but besides being expensive it was found to be difficult to work into the joints.

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THE RECEPTION OF WIRELESS BROADCAST.

By Lieutenant-Colonel F. A. H. CLARKE.

Royal Army Medical Corps.

ALTHOUGH wireless communication has been in use for some years, it is only of late that public interest has been stimulated by the adaptation of wireless telephony to the purposes of entertainment and instruction. The rapid development of the British Broadcasting Company, the improvement in scope and quality of programmes, and the arising of a very efficient wireless press, point to the fact that this interest is not ephemeral, but, on the contrary, gaining a stronger hold every day.

The reason is not far to seek. Not only is it, as an amusement, phenomenally cheap, but as a hobby it is unequalled by reason of the diversity of interest which can be aroused by the search for and trial of improved methods of reception.

It is thought that possibly some readers of the Journal, to whom the subject is at present a closed book, might be interested in a few notes on the methods by which these broadcast programmes are received:

A licence, cost 10s., can be had for the asking at any post office. The other essentials are: (a) An aerial; (b) an earth; (c) a receiver; (d) telephones or a loud speaker.
AERIAL.

The most efficient form is the outdoor aerial. There are various ways in which this may be constructed, but for our purpose a bare or enamelled stranded copper wire (7/22, i.e., composed of seven strands of twenty-two gauge wire) may be taken and suspended in such a way as to be free from contact with "earth"—trees, buildings, etc.—from its extremity to its termination at the aerial terminal of the set.

This insulation is obtained by means of porcelain insulators, preferably shell type, or of a special type of insulator, such as the featherweight insulators of the Silvertown Company, and by the use of either leading-in tubes or heavily insulated wire where the wire enters the house. The length of aerial is limited by the Postmaster-General to 100 feet, including the lead-in, and this is ample for the broadcasting wave length. A single wire is easily put up, offers little resistance to wind, and gives excellent results. Twin wires can be used, but these should be spaced six feet apart by spreaders of bamboo or other light strong wood, the same rigid precautions as to insulation being observed.

The shape of the aerial may be either inverted L or T. When the latter is used, it is important that the down lead should be taken from the exact centre of the horizontal portion. Bare wire should be used on account of the difficulty of making proper electrical connexion to the several strands of enamelled wire.

In erecting the aerial the following points are to be borne in mind:—
(a) The horizontal portion should be as high as possible. Every inch counts, and the greatest available height should be obtained.
(b) It should be "unscreened," i.e., clear of obstructions such as very adjacent buildings or trees.
(c) Insulation should be carefully attended to, at least, two insulators at the points where attachment has to be made to supporting wires or ropes.
(d) If rope be used as support, remember that wet causes considerable shrinkage, and make due provision for adjustment.
(e) The "free" end—i.e., end remote from receiving set—of the aerial should, if possible, point away from the station which it is desired to receive, in order to obtain the maximum benefit from its directional properties.

Reference will be made later to indoor and frame aerials, but every endeavour should be made to put up an outdoor aerial on the lines given above, on account of the better results obtainable with less apparatus.

EARTH.

The importance of a good "earth" cannot be over-estimated. It may make all the difference between excellent and merely passable results. Briefly, the wire consists of a rubber-insulated wire of at least as big a gauge as that of the aerial, connected, preferably by soldering firmly, to a
thin sheet of copper about five feet by one foot, buried say four feet in the

The size of the above earth-plate can be increased with advantage, but

Failing an earth-plate, the wire may be taken to a leaden main water-

Uninsulated wire can be used, but is not advised. A much longer wire

The range of a set of this description for telephony may be con-

Reception on a crystal set is by telephones only. This form of set is

There are many crystals on the market, usually with names ending in

THE RECEIVING SET.

(1) Crystal.—This is the simplest form of receiver, and gives the truest

its limited range, and the fact that it needs adjustment. The latter point has been

largely eliminated by the introduction of so-called “fixed” detectors, of

which there are two very good types on the market, priced at 3s. 6d. and

6s. respectively. The addition of one of these to a crystal set is worth

while.

The range of a set of this description for telephony may be con-

servatively stated at five miles from a relay station, fifteen from a main

station, and eighty from the high-power station at Daventry. Distances

much in excess of these have been and frequently are covered.

Reception on a crystal set is by telephones only. This form of set is

extremely simple, easy to make, or cheap to buy. It consists of a method

of tuning the incoming oscillations to the appropriate wave-length, and

of “rectifying” them by means of a crystal so as to make them audible

in the “phones.”

There are many crystals on the market, usually with names ending in

“-ite” and consisting of synthetic galena. These are very sensitive, and

readily give results when brought into light contact with the “cat's
whisker” until time, dust, oxidation, or strong currents impair their powers. The fixed detector noted above consists of two crystals of a different type, and is strongly recommended. The circuit of a simple form of crystal set is given here (fig. 1) in order to illustrate the principles on which reception is based.

Here A is the aerial, B the earth, C the tuning inductance, D the crystal, E the cat’s whisker of very fine wire, F the telephones, and G the variable condenser for tuning the inductance C.

This tuning is necessary in order to bring the receiving set into resonance with the station transmitting. Theoretically the sum of the wave-lengths of the aerial system and inductance should do that, but as it is obviously inconvenient to vary these within small limits, a variable condenser is introduced to do this by adding “capacity” to the circuit.

When we say that a receiver will tune to a given range of wave-lengths—say 200 to 3,000 metres—we mean that it can be so adjusted as to receive, at its appropriate range, signals sent out at wave-lengths within those limits. In practice, sets are commonly fitted with plug-in coils, by simply plugging in which we can vary the wave-length range within very large limits.

As has been stated, the crystal set has its limitations. It is, however, an excellent set to construct as a beginning, and can easily be put together in a couple of hours at very small cost.

(2) Valve Sets.—For more powerful or distant reception, and for loud speaker work, valves are necessary. These are small glass bulbs, roughly resembling small electric light bulbs, but on closer inspection it will be seen that there are material differences. It is beyond the scope of this brief note to go into the theory of wireless valves or the romance of their discovery. But one may note in passing that they act in a receiving set either as detectors or amplifiers, or both.

The range of a valve set depends on the number of valves used, the
type of circuit, and the skill with which the instrument is operated. While it is ridiculously easy to obtain results from a near-by station, the tuning-in of long-distance stations ("DX work") calls for both skill and patience if the best results are to be obtained. A single valve "reaction" set will normally cover a distance of about fifty miles on phones; with skilful handling it will cover hundreds on occasion. A two-valve set has a correspondingly bigger range—a three-valve set will cover the European stations, provided aerial, earth, and set be efficient and properly handled. On a near station two or three valves will work a loud speaker.

It is very difficult, however, to lay down any definite data as regards the distance over which a given set will operate, and a possible purchaser of a manufactured receiver is advised to have a demonstration, on his own aerial and earth if possible, of the capabilities of the set before completing the purchase.

For those with a little—a very little—constructional ability, it is quite easy to make a really good set at much less cost than to buy a similar article ready-made. The parts for many different types of sets of proven worth are available in complete kits, including even the ebonite panel ready drilled. But it is preferable to select components from among the many types available. It is satisfactory to be able to note that, at very reasonable price, the British component parts are unexcelled by any others. It is invidious to specify where so many are good, and the constructor is advised to refer to the excellent wireless papers published every week, and if, in any doubt to avail themselves of the advisory services of those papers. Constructional articles often specify components by name—these will act as a guide. The truest economy will be found in the use of parts of the best quality only—the difference in price is trivial.

When buying or building a valve set, the method of lighting the filaments of the valve or valves should be considered. Valves are now made either as "bright" or "dull" emitters—that is, they give off electrons at a high or low temperature. They also vary in the voltage they require, and the current or amperage they consume. For the man with accumulator-charging facilities, bright emitters are satisfactory and cheaper to buy. Dull emitters are more economical in the long run, as they consume so much less current, and can be worked from dry batteries or accumulators. The choice of valves and their lighting should be made with care and consideration.

The high-tension battery is a factor which has given much trouble in the past. Consisting of a collection of tiny dry cells joined in series to give, say, sixty to seventy-two volts, and held in place by pitch or paraffin wax, this battery had a bad habit of adding extraneous noises. Also, if wrongly connected to the set, of burning out the filament of a valve in a flash. Now, larger batteries have much improved this component, and care in connecting up will save accidents to valves. For those who disregard expense, high tension accumulators are made. They cost about four times
as much as the high tension dry batteries, but are more reliable and probably not as expensive in the end.

There is a type of set now on the market, either ready-made or in parts, called the "Unidyne." This uses no high-tension battery. Very numerous correspondents in the wireless press have testified to the satisfactory nature of the results obtained.

The purchase of a loud speaker may well be deferred until experience has been gained in the manipulation of the set. Here, again, an actual trial should, if possible, be arranged. There are many excellent types on the market. The one you buy must be a clear speaker also. Quality and not noise is the hallmark of the loud speaker. The disc or cone-shaped pattern has lately become fashionable.

**Reception on Frame and Indoor Aerials.**

An indoor aerial merely consists of one in which as much as possible of about 100 feet of wire is erected within the house, as under the roof or in a room, on the same general principles as an outdoor pattern.

Many methods of doing this will occur to the mind of the experimenter. Perhaps one of the easiest is to run about six lengths of insulated wire from side to side or end to end of a room, parallel to and about a foot from each other and from the ceiling, gathering these together into a single lead at one end.

The earth connexion will probably have to be made to a water-pipe, by clip and insulated wire.

The frame aerial consists of about 100 feet of wire bound on a framework usually consisting of arms in the form of an X, the wires being supported on ebonite insulation at the ends of the arms.

The frame is turned so that its edge points at the station it is desired to receive. It is strongly directional, and if turned at right angles nothing may be heard.

Frame or indoor aerials are, generally speaking, useless for crystal sets, and if used with valve sets, more valves are necessary to attain the same results as a smaller set on an outside aerial.

There is an area—as a rule about one to two miles radius of a main broadcasting station—called a "swamping" area. Within this, very good results can be obtained on the simplest crystal set, using a wire spring mattress or frame of bedstead as aerial, and a connection to a bath tap as earth. Such results must not be taken as a measure of those likely to be obtained with indoor aerials at greater distances.

No attempt has been made to explain the theories underlying wireless reception. The above has been written merely in the hopes of interesting those who are unacquainted with broadcasting, and of inducing them to take up a most fascinating pastime, which has the additional advantage of being best experimented with after darkness has fallen and the day's work is completed.