sure good results. With such a combination not only must the tuning condenser be of small value but the distributed capacity of the loop must likewise be kept at a minimum. By using a large condenser and a small loop the change of capacity in the condenser between minimum and maximum settings is great enough to avoid trouble in tuning, but the signal will not be as strong.

The length of wire in a loop has no direct bearing on the wavelength to be tuned. The frequency depends entirely upon the inductance of the loop and its distributed capacity.

A loop, like any other coil, has an inductance which is desirable, and a distributed capacity which is undesirable. Inductance is increased by using more turns, greater length in each turn and greater spacing between each turn. Distributed capacity is reduced by using fewer turns and more spacing between the turns. It will be seen that these requirements oppose one another, and it is necessary to design a loop which will satisfy both. There is more or less a critical spacing beyond which additional spacing does not greatly reduce the distributed capacity. For a loop only 2ft. square the gain with spacing greater than 1-8in. becomes less noticeable. For a loop 4ft. square this critical spacing is somewhat less than ¼in. and so the spacing increases with the increase in size of the loop. The following table shows the number of turns required on box loops of various dimensions, when used with tuning condensers from .00025 to .0005 mfd. The loops are considered as being square. Rectangular loops having the same area as a given square will be identical. In the case of a spiral loop the dimensions apply to the average turn.

ON a frame 2ft. square 500 metres would tune in on 12 turns, which would require about 98 feet of wire; 300 metres on 9 turns, or about 74 feet; 180 metres on 6 turns or 50 feet. Lower wavelengths would require fewer turns. Many taps are not actually required, because the parallel tuning condenser in the aerial circuit of the receiver gives a wide range. Twelve turns will be ample for any broadcast reception, and it is a good idea to take a tap at the centre or sixth turn, and one at the ninth. One system of tapping is to merely scrape away the insulation at desired points, and make connection by means of a clip attached to the lead. Dead ends are not desirable in frame aerials, so if short-wave is to be worked it would be a good plan to bring out the ends of both halves separately at the sixth turn and connect together to put the whole in series, or use only one winding of six turns, further reducing it by clip connections as mentioned. Two laths one inch by half an inch will be required, 3 feet and 3 feet 6inches in length respectively. The shorter one is fixed by its centre at right angles to the longer at a distance of 18 inches from one end of the latter by "halving." Further security is obtained by fastening on a 4-inch square of 3-ply or 3-8in. thoroughly dry, and after cutting the slots, should be well shellaced, getting the shellac well into the cuts.

To obtain stability of the cross-piece, two short pieces of wood may be screwed to the upright as shown in diagram. Ends of wires may be secured by passing through a hole drilled in the strips, or may be connected to

Turns Required for Rectangular Loops.

Length of side in Inches—Square Loop.
or
Area of Rectangular Loop.

Condenser Capacity in Mfds.	Spacing ½-inch Between Turns								
	10x10 100	12x12 144	14x14 196	16x16 256	18x18 324	20x20 400	25x25 625	30x30 900	35x35 1225
.00025	—	—	—	25	23	21	17	15	13
.00035	—	—	22	20	18	17	14	12	11
.0005	—	21	18	16	15	13	11	10	9
.001	16	13	11	10	9	9	7	6	6

	Spacing ½-inch Between Turns.								
	10x10 100	12x12 144	14x14 196	16x16 256	18x18 324	20x20 400	25x25 625	30x30 900	35x35 1225
.00025	—	—	—	—	—	—	20	17	15
.00035	—	—	—	—	23	20	16	14	12
.0005	—	—	24	20	18	16	13	11	10
.001	22	17	14	12	11	10	8	7	6

wood, as shown in the diagram. 20, or 22 s.w.g. enamelled copper wire is the best to use.

Before putting the cross pieces together they must be slotted to take the wire. The slots are made with a saw, the slots, sloping diagonally, can be sawn in two strips at one operation, and if held in a vice with a waste strip outside each side, there will be no fear of breaking out the small pieces of wood between the slots, which are ¼in. apart. Just the same effect will be obtained by drilling holes 1-8in. apart and threading the wire through which is rather a tedious operation. Brass (not iron) tacks should be used on one edge of the strips as a makeshift idea. It is important that the wood used be of a good solid kind and terminals on a small square of ebonite as shown.

The lower extremity of the upright is rounded to fit the centre of an old wire spool, from which one flange may be removed. This is screwed to a baseboard and allows of the frame being rotated with ease. If a calibration scale is required for direction-finding, the top flange of the spool should be left intact, and upon it a cardboard scale marked in degrees can be fixed. A pointer of wire or a large needle is then attached to the upright.

No useful work can be done with loop aerials in connection with crystal sets, and an outside aerial will give better volume than a loop, but loses the advantages of the frame aerial's selectivity.

Tips and Jottings

Cutting Threaded Rod.

WHENEVER a length of threaded rod is to be cut, much trouble in trimming up the cut end will be saved if a die is first run on the rod. After the cut has been made, either with a hack-saw or a pair of wire-cutting pliers, the die is run off again over the cut end, leaving a clean thread for nuts to be put on. This eliminates the necessity for filing the end after cutting.

Topping-up Accumulators.

WHEN it becomes necessary to compensate for the evaporation of the electrolyte in an accumulator, care should be taken to add distilled water only. If ordinary tap-water is used, injury to the plates may be caused by the presence of metallic impurities introduced through this medium. Also, if the experimenter makes his own electrolyte from strong sulphuric acid and distilled water, the acid should always be added to the water and never vice versa. This will prevent the acid from "spitting" and perhaps causing injury by splashing on the hands or clothes. Should acid from an accumulator be spilt, however, it should be neutralised immediately by liberal applications of ammonia or of a strong soda solution.

Overhauling the Aerial System.

THE approach of the finer days inevitably heralds that much belied operation—spring cleaning. This, however, should serve to jog the memory of the keen wireless enthusiast that attention must be turned to the aerial system. During the winter months the insulators will have collected a considerable amount of dirt and grime, and it will well repay any expenditure of time if the whole aerial is lowered, the insulators thoroughly washed and the aerial wire itself examined for any signs of defects. If the wire is beginning to corrode it is better to replace it, while the lead-in wire should also be overhauled. The earth lead must not be forgotten, together with the actual connections between this wire, or wires and the particular type of earth in use. Due attention to these details will produce a sense of satisfaction that as far as this part of the receiving station is concerned doubts as to unreliability need not exist.