CHAPTER L.

Poles on the English and other European Lines—Baltic Squared Timber—Saplings of Larch, Pine, Spruce, &c.—Poles on the Hindostan Lines—Bamboo, Iron-Wood, Teak, Saul, and other Timbers—Their Preparation and Durability.

POLES ON THE ENGLISH TELEGRAPH LINES.

In Great Britain of the timber for telegraph poles, the most acceptable is the larch. In former years they were of Memel *squared* timber, chamfered down the sides. The following table shows the dimensions of the posts made from the Baltic timber:

LENGTH.	AT BASE.		AT TOP.	
	Drawing Posts.	Intermediate Posts.	Drawing Posts.	Intermediate Posts.
18 feet.	9 in. x 8 in.	6 in. x 6 in.	7 in. x 6½ in.	5⅜ in. x 4½ in.
22 "	10 " x 8 "	7 " x 6 "	7 " x 6½ "	5½ " x 4½ "
28 "	11 " x 10 "	8 " x 7 "	7 " x 6½ "	5½ " x 4½ "

These poles have been superseded by the round sapling wood, which is preferable to the Baltic cut or sawed timber. The saplings are cheaper, and more readily obtained, and if straight and well selected, stronger than the sawed pole. There has not been time sufficient since the adoption of the round poles, to test their relative durability. Gate-posts have been tried of the two, however, in wet and dry places, and the larch sapling has proved to be the most serviceable. The Baltic timber decays in about six years, so that they had to be cut off at the surface of the earth, and reset at a less length. This reduction would bring the pole to about ten feet above ground. This height might be considered as too low, and liable to interruption by mischievous persons; but in England the laws are rigid, and as the lines are placed within the railway fences, any interference would be a trespass on the railway, which, by act of parliament, is no small offence. On some lines where these poles have not been sufficiently long to admit of being reset, they have been cut off at the ground, and fixed in a cast-iron screw socket, similar to the dwarf screw pile used for breakwater fastenings.

The sapling poles of larch, now so generally used in England, on the telegraph lines, are eighteen feet long, nine inches in diameter, at the lower end, and five and a half to six inches in diameter at top, both ends measured after the bark is taken off. Crossing poles for railways and highways, and for villages, are from twenty to twenty-eight feet long, according to circumstances.

After the poles are neatly stripped of their bark, and allowed to dry a short time in the air and sun, carefully avoiding their warping, the butt ends are well charred to about a foot above the depth they are to be fixed in the earth. This charred part of the pole is then soaked in gas tar for about twelve hours, the poles are placed in a standing position in tanks filled with the gas-tar, arranged within a timber framework.

Poles thus preserved will last for many years, and although the expense is great at first, the economy in service will prove of tenfold gain. The cost of these poles varies, depending upon localities, as in some districts they are plentiful, while, on the other hand, in other districts they are very scarce, or not to be gotten at any price.

Poles of the dimensions mentioned above cost three, four, or six shillings each, barked, the knots planed off smooth, and the lower ends charred and tarred. Twenty-five are generally fixed per mile, unless there are other supports, as walls, buildings, bridges, or viaducts. In former times thirty to thirty-two were used, but a less number, of late, has been considered preferable. The poles have been increased in size, and set deeper in the earth, so as to have more strength, and few points of suspension for the wire, thereby improving the insulation.

POLES ON OTHER EUROPEAN LINES.

In Prussia the pine and spruce are generally used on the telegraph lines. The saplings of the wood are very abundant, and are found along most of the routes. The poles are neatly trimmed of bark and knots. The lower ends are well charred, and in many places they are painted. Much care is taken to season the wood before setting in the earth, and more recently the injection system of France has been adopted, and successfully applied.

In Russia, the poles are of pine. No country excels Russia in the universality of substantial telegraph poles. The pine saplings are felled in the forest, and neatly barked and planed. Then they are allowed to season in the air and sun. After this they are well charred at the butt end, for at least a foot above the earth's surface. Besides this preparation, they are mostly

coated with gas or coal tar, and many of them, even through the interior of Russia, are painted a lead color. They are well set in the earth from four to five feet, about twenty-five feet long, and at least five inches in diameter at the top. There are, on an average, twenty-five to the mile.

In Austria, the German States, Denmark, and Sweden, the poles are as those in Prussia. In Denmark, on the island of Zealand, a pole line has been erected to supersede the underground line from Copenhagen to Corsor, along the Royal Danish railway. I have lost the details of the expense of this line, but I well remember, on being consulted about the building of it, by the very able administrator-in-chief, Mr. Faber, the propositions received estimated the poles at from one to two dollars each.

POLES ON THE HINDOSTAN TELEGRAPH LINES.

In India the telegraphs have been constructed under the direction of the distinguished telegraph pioneer, Dr. O'Shaughnessy. In this country there are two kinds of lines; the first are those put up speedily, as temporary or flying lines, in order to establish correspondence between any two or more places, in cases of emergency, for the government. On these lines single iron rods, five sixteenths of an inch, galvanized, 1,120 lbs. per mile, have been run across the country, supported on bamboos, palm-trees, guran posts, and other *light* and *cheap* timbers available in the districts, painted with coal tar, and planted fifty feet apart. No insulators are used, the rod being laid in the notches cut in the posts. The other, or second kind of lines, are more substantial than the first or temporary lines. On the substantial lines, sixty lofty posts of the best timber procurable, each shod with an iron screw-pile, penetrating three feet into the ground, are erected to each mile. On these posts insulating brackets of great strength are fastened, and the iron wire or rods, No 1 Birmingham gauge, are keyed or braced so as to allow, at the lowest point, sixteen feet above the level of the ground, to permit laden elephants to pass under the lowest part of the line.

These lines are built of poles of the iron-wood from Arracan, which are known to be almost indestructible by damp, fungus, or insects. This wood is so hard that it is cut with difficulty by the axe. It is very heavy, and the transportation expensive. It is used in its sapling form, and the posts are, on an average, twenty-four feet high, and five to six inches diameter at the base. The butt end is tapered by the adze and plane, so as to fit closely into the hollow iron screw-pile, in which they are to

be inserted into the ground. When iron-wood is not procurable, teak, saul, or any other good timber, is used. In the mountains oak and pine are used. Deep-rooted trees, occurring on the line, are used freely, as in America, but in India the tops of the trees and their limbs are cut off, and the bark is wholly removed. The toddy palm-tree is used where convenient. Each post is branded with a letter or a number, in some conspicuous place. Before placing the posts in the iron screw-pile, the insulating cap and the bracket are securely attached to the post. When thus arranged, the pole is ready to be fitted into the screw-pile. The screw-piles are used for the double purpose of protecting the timber from decay and insects, and for the great strength they afford in resisting displacement, by shocks and strains of every kind. While two men can readily pull down or displace a post of equal size, planted in the earth without a pile, ten men cannot accomplish this when the screw is used, without the aid of shears and tackle. The screw-pile also greatly facilitates the erection of the posts.

The screw-pile to be employed, is three feet one and a quarter inches long, and seven and a half inches in diameter at top, hollow and conical. Its head is six-sided externally, and round internally—thickness of the iron three fifteenths of an inch. It tapers to a point below. The screw-flange commences close to the point, and making three turns, terminates ten inches above the point. The diameter of the screw-flange, at its greatest width, is twelve inches.

The post and the iron screw-pile united, constitute the telegraphic post. The pile is screwed into the ground by a wrought iron bar, with a four-sided opening at one end, in which the neck of the screw is received. This is called a "spanner." It is nine feet long, and fits closely to four sides of the hexagon head of the screw. The "spanner" is worked like a capstan bar, and gives leverage for setting the pile in the earth.

To screw down a pile, a party of nine men is required. One of the men commences by making a hole in the earth with a crowbar. This hole need not be very deep, but if the ground is hard and pebbly, it must be two to two and a half feet deep. The screw-pile is then placed quite upright, with its end in this hole, and the lever or spanner fixed on the pile to screw it down. Four men are required at each end of the lever, and one man should carefully attend to the screw, watching whether it goes down straight. Everything being ready, the men now go round steadily and slowly; there must be no hurry, and care

must be taken to work the lever as horizontally as possible. If the men press downward at one time more than another, the pressure will make the screw go crooked. It is also a great object not to let the pile "wabble," as it loosens the earth. If the ground is very stiff, and the screw bites imperfectly, it may be taken up, and the hole made somewhat deeper with the crowbar, or a pailful of water may be thrown into the hole, and one or more men should stand on the head of the pile, the penetration of which is much accelerated by their weight. The pile having been screwed into the ground within six inches of the top, the posts are now to be erected, the intervals being exactly three hundred and thirty feet, or sixteen to the mile. At that distance the iron rod employed can be braced up with ease by the straining machine, so that the deflection from the horizontal line, is no more than eighteen inches, being scarcely perceptible to the naked eye. At this span, three men, of four hundred and twenty pounds weight, have been supported on the rod in the centre of the span, without causing it any injury. After about one hundred posts are erected, the iron rod is lifted from the nearest bamboo, and placed on the centre of the permanent post. This is the process of removing the iron rods from the temporary posts to the permanent line. Each end of the section being removed, the iron conducting rod is fastened to a tree by a large chain or to a log of timber some eight or ten feet long, placed transversely in a trench four feet deep, and the earth well rammed in the trench, to hold fast the log. The temporary posts may now be removed, except intermediate posts between the permanent poles, which are retained until the straightening of the line is perfected, and in fact some are kept all the time on some lines, or until the transmission of the current is interrupted by them. On such as are retained, the iron rod is insulated as follows, viz.: a strip of strong and cheap silk from Assam, Bagulpore, &c., one and a half inches wide, and thirty-six inches long, is saturated with a solution of shellac in wood naphtha. This strip of silk is wound round twenty-four inches of the rod, smoothly, and spirally, overlapping one half in each turn. This is repeated until a double layer is formed. When this dries, it constitutes a flexible non-conducting coating, which does not soften by the sun's heat, and is not affected by rain. The silk and lac coating is also given to the rod where it touches the permanent pole. When the silk and lac are not procurable, Madras cloth, or any strong and porous fabric, is used, saturated with pitch. From these facts it will be seen that the India lines are the most substantial in the world.