carried on since 1902. During the nine years up to and including 1910, there were set out 4,099,524 trees. This planting has been done on tracts of various sizes and under various conditions. Whenever a tract is turned over for forestry purposes a careful examination is made to determine how it can best be used. If it is already wooded the timber is inspected, and if the stand is sufficiently valuable the tract is carefully logged and conservatively managed. If it must be cut clean, or if it is already a clear area, the advisability of planting it is considered. If it is to be planted, the species which will grow best in that soil must also be decided on. The planting may be done either in the spring or fall, preferably in the spring. This work is done by squads of men who are employed locally. They work over the ground in two rows, the men in front cutting the sod and digging holes with mattocks, and the men behind, who carry the seedlings in buckets partly filled with water, planting them in the holes. The trees are set in rows, the location of each tree being determined by the planters by sighting stakes or by following stretched lines. Under favorable circumstances a squad should plant 400 trees per man per day. To grow tall and straight trees desirable for timber is is necessary that the seedlings be planted close together, the approved spacing in most cases being six feet in both directions. After several years this growth may require thinning if the stand is good, although the natural suppression of a considerable number of the seedlings must be expected. Along all such plantations which adjoin the right of way a fire line is kept plowed to guard against the spread of fire from locomotive sparks. Most of the older plantations are of black locust, and it is to be regretted that this species is being attacked by borers with considerable damage to the young trees. The borers attack both good and bad trees, and, although they do not kill the trees, the holes they make cause many of the trees to break and to a marked degree weaken the timber which can be made from the tree. The locust leaf miner is also attacking these plantations, with the result that the growth of the trees is retarded through lack of nourishment, since the leaves cannot perform their functions after they are attacked by the miner. Although the locust grows well in Pennsylvania and makes desirable trees, posts, etc., it does not seem practicable to continue its planting for these purposes until some method can be devised to prevent the damage by these insects.

Various lines of experimental planting are attempted from time to time. As an example of this class of work, two double rows of evergreen trees were planted near Glen Loch, Pa, in 1910, to serve as a snow fence. The wooden snow fences commonly used require considerable maintenance, and it is thought desirable to substitute growing evergreen trees where conditions are favorable. Their use, however, requires a wide space between the track and right of way line. In the planting made, the first row of trees is Scotch pine planted 100 ft. from the track, while the outer row, of Norway spruce, is planted along the property line. To save expense, small trees were used in this planting, but it is thought they will be large enough in a few years to drop the snow behind them successfully.

ELECTRIFICATION OF BRITISH RAILROAD.

The consulting engineers of the London, Brighton & South Coast Railway are preparing plans for the further electrification of the company's suburban services and the extension of the electrification schemes to the main line.

MANUFACTURING BUILDINGS.

The following data appeared in an address by Mr. E. H. Darling, assistant engineer of the Hamilton Bridge Works Company, Hamilton, given before the Engineering Society of the University of Toronto. The remainder of the address was printed in the November 9, 1911, issue of The Canadian Engineer under the title of Preliminary Problems in the Design of Manuafacturing Buildings.

1. Slow burning or mill construction.
2. Fireproof construction.
3. Steel frame construction or mill buildings.

Slow burning or mill construction is simply a special class of timber work. Such a building will have heavy brick walls with the interior columns, beams and floors of massive timbers so disposed as to present the least possible opportunity for the spread of fire. The columns are made of single timbers, usually square, capped with a corbel or short beam which forms a seat for the column of the next floor above, and supports the cross beams which carry the floor. This corbel may be replaced by a steel or cast iron cap which is more reliable when the loads are great. The cross-beams are also heavy single timbers, and on these are laid 2-in. by 4-in. or 2-in. by 6-in. pieces set on edge and spiked together, so as to form a floor 4 in. or 6 in. thick, as the case may be. A hardwood wearing floor 1 in. thick is usually laid on this. Note the absence of all joist and any thin projecting woodwork which might easily catch fire. In case a fire should start, the thick floors would tend to confine it to one story and the heavy beams and columns would burn slowly, thus giving the fire department a chance to put it out before it destroyed the whole building. This construction is only effective, however, when used intelligently, for unless all the many rules for preventing the spread of fire are carefully observed, the result may be disastrous.

The roof of such a building may be constructed like the floor, or, if the span between the rafters is not too great, matched sheeting may be used. This is covered with a felt and gravel roofing material or some one of a score of special roofings which will resist the attack of fire.

The cost of long timber of large cross-section practically limits the length of beams to somewhere between twelve and sixteen feet. This means that in a wide building there will have to be many columns, which take up room and interfere with the arrangement of machinery.

2. Fireproof Construction.—While there might be a difference of opinion as to how far it is expedient to go in making a particular manufacturing building fireproof, it is well understood that, if a building is to stand all the vicissitudes of a conflagration, it must be made entirely of brick, concrete, terra-cotta, and steel, the steel to be well protected from the direct heat of the fire.

It is in office buildings, hotels and tenament houses that fireproofing principles have been most extensively applied, and the manufacturer who requires a building of somewhat similar form will use similar methods of construction, adapting them to his special needs. Reinforced concrete may be used entirely for floors, beams and columns, or steel may be used for the beams and columns to form a framework to carry the floors. In this case the steel must be covered with at least 1½ in. to 2 in. of concrete.

Terra-cotta is being introduced for use in certain classes of manufacturing buildings, but, being more or less brittle and not suitable to withstand vibration and shocks, its use is limited. Its most extensive use is in the form of tile for roofs, where its lightness is an advantage.