

is consumed in treating one cylinder full of timber. The great objection to this process, and to all others depending on enclosing timber in a huge cylinder, is that the pressure must take place on all sides and both ends of each stick; there is no washing out of the timber, and there can be no benefit except what results from a chemical reaction that takes place in the timber when the creosote oil or other chemical comes in contact with the albumen, and combines with or in some way neutralizes the elements of decay in it.

The Hayford Patent.

Ira Hayford, of Boston, a few years since, patented an improvement on Bethell's creosote process. It was originally intended to creosote by the Bethell process none but seasoned timber. Railway companies and contractors could not get seasoned timber, so they sent green timber, fresh from the saw-mills, and had it returned with but little creosote oil in it. Hayford's process was designed to obviate this difficulty, and provide a way by which green timber could be creosoted. The old system of subjecting the green timber to a cold vacuum would not draw out the sap in the wood, and, until the sap came out, the creosote could not go in by the system of pressure on all sides and ends. The new system of Hayford (he also using a huge and costly cylinder and apparatus similar to Bethell's) is to first subject the timber to a steaming process, by which the water in the sap of the wood is partially vaporized and carried off by a current of hot air. This adds to expense and consumes time; for it takes ten to twelve hours to make certain that, with heavy timber, all parts have been reached by a temperature above 212° , and the water in it brought to the vaporizing point. This steaming being thoroughly effected, the next step is to drive from the cylinder, by pressure and the use of air-pumps, all the steam and condensed water; this occupies an hour, during which time the heat is kept up by the coil of steam-pipes in the cylinder. The next step is to create a vacuum, the same pumps used for forcing air are now used for exhausting, by reversing the valves; this process is maintained for five or six hours, until the gauge shows 25 or 26 inches of vacuum, and during this time much of the water still remaining in the wood runs out, bringing with it much of the elements of decay that it held in solution, all of which are thrown out through the nozzles of the exhaust pump. This is the chief and valuable part of the Hayford process; by the old process little or no sap is rendered by the wood in a cold vacuum, and, of course, little or no creosote can go in until the sap comes out, or the water is dried out. The next and last step in this process is similar to Bethell's—namely, to open the valves in the pipes leading to the creosote reservoir and let it flow into the big cylinder until it is full, and then to pump a pressure on to the timber; the creosote oil, being previously heated and made limpid, readily enters the pores or tubes of the timber and fills them. For pine or fir, and other similar timbers having large pores, a pressure of 75 lb. per square inch maintained for three or four hours has been found sufficient; but, for timber that is more dense and having minute pores, 150 lb. or more per square inch is maintained for a much longer period. The surplus oil being drawn off, the process is complete; the timber is drawn out, and the cylinder again filled. This process will most undoubtedly render timber durable, and protect it against the ravages of the teredo, white ants, and other animals. The creosote oil is insoluble in water and will not readily come out of the timber, it resinifies in the outer pores, or ends of the tubes, and holds the main body of the oil in the timber; in such condition fermentation cannot take place, and lead to decay and disintegration.

The objections to creosoting under this process are as regards apparatus, the same as mentioned for the old Bethell process. Also that the process as described above is costly and occupies much time. It leaves the timber flammable; and the creosote oil cannot be obtained in large quantities—at least, in some parts of the world—unless specially manufactured, and then it becomes expensive.

The Kyan Patent.

The Kyan process, invented some thirty-five or more years ago, called for the use of chloride of mercury (corrosive sublimate), a poison, and dangerous to handle. It was not a success, and has gone out of use.

The Margary Patent.

The Margary process called for the use of sulphate of copper (blue vitriol) It also was not a success, and is not now used.

The Burnett Patent.

Sir William Burnett, a medical director in the Royal Navy, invented a process which called for the use of chloride of zinc. He was after the teredo, and thought to poison him, but it did not answer the purpose. The teredo ate timber saturated with it; grew fat, and thrived on it. The process failed.

The Payne Patent.

The Payne process was the first that called for the use of two chemicals. He used the sulphate of iron and the chloride of calcium (the metallic base of lime). These two chemicals coming in contact with each other form an insoluble salt.

Payne produced some good results, for he preserved timber so that it was almost incombustible. A factory for Payneizing timber, at Rochester, was burnt, but some prepared railway sleepers in it at the time were not burnt, and the edges hardly injured. This process, like all those before mentioned, called for a costly and cumbersome apparatus. The expense in money and time were too great to insure success to any of them. They all left the albumen in the wood, and none of them were found to have the antiseptic properties of creosote. Other patents were taken out since the commencement of the railway era, all depending on similar and costly apparatus as before named; all depending on some chemical in solution; and all fell to the ground except creosoting, which is still extensively used, and is likely to be more generally used in connection with Hayford's improvements.

The Thilmany Patent.

The Thilmany process was a German invention of twenty years ago. This process, like Payne's, calls for the use of two chemicals; the sulphate of copper (blue vitriol), and the chloride of barium