5. *The Boucherie system*, also first brought forward in the year 1840, consists in pressing a 10-per-cent. solution of copper-sulphate into the butts of poles and logs at a pressure of 10 lb. to 12 lb. per square inch, and immediately after the timber is felled. The process is continued until the solution runs out at the top end of the log, after which the bark is removed and the poles or logs left to season for some time before use. This system has been largely used for treating telegraph-poles, &c., but its application would be practically impossible with our hardwoods.

6. *Powellising.*—The essential part of the process consists in boiling wood in a saccharine solution, after which it is artificially dried. No mechanical force, either pressure or vacuum, is used throughout the process, nor is the timber at any time subjected to the action of steam at a temperature higher than a few degrees above the normal boiling-point of water at atmospheric pressure. The treatment is, therefore, of the simplest and cheapest description, and in this respect satisfies the first condition laid down for an ideal process. (*Vide* special article by Mr. F. W. T. Saunders, on page 80.)

The wood as it is received, and preferably as green as possible, is placed in the cold solution, and the temperature of the whole is then gradually raised to boiling-point, and maintained at that temperature for some hours, the length of time depending upon the size and nature of the timber being treated. In raising the temperature, the air in the wood expands, and a large proportion forces itself out, and escapes into the solution in a series of bubbles. The boiling-point of the saccharine solution is two or three degrees above that of water, and the moisture in the wood is thus converted into steam, which escapes with the air, carrying with it much of the colouring and other matter in the sap. When the evolution of air and steam ceases, as shown by the cessation of rising bubbles, the boiling is stopped and the solution allowed to cool slowly, and in this process it is absorbed into the wood, penetrating every portion of it, and thus replacing the previously expelled sap and air. The timber is removed when the solution is cold, and, if it is required to be seasoned, is placed in special drying-chambers, where its moisture-contents can be reduced if required to less than 1 per cent. of the dry weight of the wood-substance proper. First of all, with regard to the degree of penetration: Although soft woods and moderately hard woods that have been treated in England have shown on test that the solution penetrated to the very centre of the timbers, even in the case of such resinous woods as pitch-pine, balks of which, 24 in. square by many feet in length, have been treated, yet, to determine this point definitely with respect to our hardwoods, a number of large sections of our hardest and densest timbers were treated, some green and some dry, amongst them being 5 ft. lengths of 12 in. by 12 in. ironbark. Upon cutting sections from the centre of these timbers, after boiling, chemical tests showed the presence of the saccharine matter, and of the other chemicals carried in with it, at the very centre of these sections. Conclusive evidence was thus obtained as to the thorough permeation of the solution throughout the whole of the treated timber, thus satisfying the second of the conditions laid down for the ideal process.

The next consideration is the permanency and stability of the impregnated material. This point was thoroughly tested by Professor Boulger, of the City of London College. As a result of his examination and tests, extending over a period of two years, he reported that some of the sugar is indisputably so absorbed by the tissues as not to be readily parted from them. The sugar is not visible under the microscope, either as crystals or drops of syrup, and it is probably in some loose combination with the walls of the histological elements of the wood. The wood, in being subsequently seasoned, either naturally or artificially, parts with the water taken in with the saccharine matter, but retains the latter incorporated in the material of the cells themselves.

In experiments carried out in India, Western Australia, and elsewhere, treated samples were examined after being subjected to steaming, excessive temperature-conditions, saturation with water, &c., and in every case both the molasses and the chemicals with which the timber had been initially impregnated were still present.

With regard to the subsequent seasoning of the timber, it has been found in practice that within fourteen days the moisture-contents of our hardwoods, after treatment, can be and have been reduced from 60 per cent. to 3 per cent. of the dry weight of the wood itself; not that such a low moisture-percentage is either requisite or desirable.

[Note.—Professor Henry, of the French National School of Forestry, published in 1907 the results of his experiments with several timber-preservatives, and found that:—

(*a.*) Of the specimens left in the open *without any preservative*, the fir was the best preserved, and after it the Aleppo pine. Oak, beech, and poplar, not treated, were at the end of three years so decomposed that their replacement would be necessary in actual use.

(*b.*) The specimens of oak, Aleppo pine, beech, poplar, and fir, treated with either of the brands of *carbolineum*, with *coal-tar*, or with *microsol*, remained unaltered, and were as serviceable as at the outset of the experiment.

(*c.*) The value of the experiments emphasized the value of carbolineum and of microsol. The former imparts a persistent odour to the timber treated with it, which microsol does not.]

(2.) The Rueping Process.

[By H. Lightband.]

Necessity for preserving Wood.

This has now reached a point beyond the region of debate, and it only need be said that amongst the materials used for constructing purposes wood holds a very important position, from which it is not likely to be displaced for some considerable time, although the growing of timber for many years past has not kept pace with its consumption. It is therefore most important that wood used for construction should be rendered capable of resisting destruction from decay as long as possible, because this material contains the germs of a comparatively rapid decay in itself.