

Impregnation
of timber.

I now proceed to offer some suggestions regarding the study of the impregnation of timber. Of the numerous methods that have at various times been tried, there are, in my opinion, only two which are likely to meet our requirements in the Indian forests. The first is known as Boucherie's system. Timber, fresh felled, not dry, is impregnated with a solution of sulphate of copper, under a certain amount of hydrostatic pressure, the tanks being raised about thirty feet above the pieces to be impregnated. This method has been found to answer best for the impregnation of telegraph posts, and is largely used for that purpose in France and Austria. For various reasons, mainly because our forests are scattered over a large extent of country, and not sufficiently compact, this method does not appear to be as suitable in India as the following. The second is impregnation in air-tight cylinders. The wood, which is ready cut (sleepers, posts, planks, or other scantling), is dried completely, and then placed in the cylinders, which are first evacuated, so as to diminish the resistance which the air in the pores (tubes and vessels) would offer, after which the fluid is admitted, and forced into the wood under considerable pressure. The principal kinds of antiseptic fluids employed under this system are,—*creosote* (obtained by the distillation of coal tar), *chloride of zinc*, and *sulphate of copper*. Besides these substances, *corrosive sublimate* is used on some of the German railways (Nassau and Baden).

Antiseptic
substances used.

Boucherie's process must be learnt in France or Austria, but the pneumatic process for creosote may be studied quite as well in England. Pneumatic apparatus for the impregnation of beams, railway sleepers, and other scantling, with creosote, are numerous. On the Continent, I may mention the following establishments, which are well worth seeing:—

Creosote.—Rheinische Eisenbahn, Nippes, near Cologne. I visited this establishment last year, and found the arrangements excellent, and most instructive.

Chloride of Zinc.—Brunswic and Hildesheim, near Hanover. I do not know these establishments myself, but understand that they are well worth a visit.

Sulphate of copper is still used in pneumatic apparatus (cylinders of copper) on some of the North German lines, but I have not yet been able to ascertain particulars regarding existing establishments. In 1865 it was also in use on the North Italian lines, the impregnating apparatus being at Verona.

Corrosive sublimate is used at the impregnating establishment of the Nassau lines at Limburg, not far from Coblenz. I regret that I have not had an opportunity of visiting this establishment, and I am not acquainted with the apparatus employed, but I have lately seen a report regarding the duration of sleepers impregnated with that substance on the Nassau lines, which appeared to be favourable.

In 1871 the following antiseptic substances were used by the lines of the Association of German Railways:—

Chloride of zinc on	...	...	...	...	22 lines.
Sulphate of copper on	...	...	...	...	19 "
Creosote on	...	...	...	...	15 "
Corrosive sublimate on	...	...	...	...	14 "

In England, creosote is the substance mainly used for the impregnation of railway sleepers.

German forest
literature.

It may not be useless, in conclusion, to give a list of a few German books and periodicals on forestry, which will be found useful. Of the periodicals, which are numerous, I will only mention "Heyer, Allgemeine Forst und Jagdzeitung" (monthly); Tharander Forstliches Jahrbuch" (quarterly); "Baur, Monatschrift für das Forst und Jagdwesen" (monthly); "Danckelmann Jahrbuch der Preussischen Forst und Jagdgesetzgebung und Verwaltung" (annually). The proceedings at the periodical meetings of the general and local associations of foresters in Germany contain much that will be found instructive, and should officers find time to attend any of these meetings, they will not regret having done so.

As a general handbook I am inclined to name "Carl Fischbasch, Lehrbuch der Forstwissenschaft;" for forest culture, "Burekhardt Saen und Pflanzen;" for plans of operations, "Judeich Die Forsteinrichtung." For timber transport and working of forests, the following: "Gayer, Forstbenutzung," 2nd edition, Aschaffenburg, 1868. "Forstliche Mittheilungen des Königl." "Baierischen Ministerial Forst Bureau Band III." Heft 2, München, 1860. (Contains: "Artikel über Holz aufbereitung und Landtransport.") "Buresch, Darstellung der verschiedenen Verfährungsarten und Apparate welche zum "Imprägniren des Holzes Anwendung gefunden haben." Dresden, 1860. Regarding forest legislation, "Roth, Handbuch des Forstrechts" (with special reference to Bavaria). "Pfeil, Anleitung zur Ablösung der Wald-Servituten." Regarding forest statistics, "Leo, Forststatistik über Deutschland und Oesterreich-Ungarn." A small spirited book by August Bernhardt, on the general question of the maintenance of forests, "Die Waldwirthschaft und der Waldschutz," will be read with interest. "Die Forstverwaltung Bayerns" and "O. von Hagen, Die Forstlichen Verhältnisse Preussens" are works of permanent value, which may serve as a model for similar publications in India.

Forest ad-
ministration
in Italy.

In conclusion, I desire to draw attention to the recent development of forest matters in Italy. Shortly after the establishment of the present kingdom, a central forest school was organized in the vicinity of Florence. The director is A. di Béranger, formerly in the Austrian forest service of Venezia, and well known by his excellent work on the history of forest management in Italy ("Archeologia Forestale, ossia dell' antica Storia e Giurisprudenza Forestale in Italia." Venezia, 1863.) The district assigned to the institution is the splendid silver fir forest of Vallombrosa, below the crest of the Apennines, on their western slope, about twenty miles east of Florence. During winter the school is transferred to a lower situation at Paterno, in the region of the Olive, half-way between Vallombrosa and the railway station of Pontassieve, in the valley of the Arno. A visit to Vallombrosa will be found pleasant and instructive, and forest officers who may come home from, or return to, India *via* Italy, will be glad thus to see something of forestry in that country. For the use of the students a collection of excellent memoirs* is being published by the director, with the assistance of some of the professors, the first volume of which has just been completed, containing an

* "Raccolta di Memorie lette nel R. Istituto Forestale di Vallombrosa."