The Canadian Engineer

VOL. VI.—No. 11. TORONTO AND MONTREAL, MARCH, 1899. PRICE, 10 CENTS $1.00 PER YEAR.

The Canadian Engineer.

ISSUED MONTHLY IN THE INTERESTS OF THE

CIVIL, MECHANICAL, ELECTRICAL, LOCOMOTIVE, STATIONARY MARINE, MINING AND SANITARY ENGINEER, THE SURVEYOR, THE MANUFACTURER, THE CONTRACTOR AND THE MERCHANT IN THE METAL TRADES.

SUBSCRIPTION—Canada and the United States, $1.00 per year, Great Britain and foreign, 6s. Advertising rates on application.

OFFICES—62 Church Street, Toronto; and Fraser Building, Montreal.

BIGGAR, SAMUEL & CO., Publishers,

E. B. BIGGAR, R. R. SAMUEL

Address—Fraser Building, MONTREAL, QUE.

Toronto Telephone, 1892. Montreal Telephone, 2589.

All business correspondence should be addressed to our Montreal office. Editorial matter, cuts, electros and drawings should be addressed to the Toronto Office, and should be sent whenever possible, by mail, not by express. The publishers do not undertake to pay duty on cuts from abroad. Changes of advertisements should be in our hands not later than the 1st of each month to ensure insertion.

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FOR THE CANADIAN ENGINEER.

RAILWAY ENGINEERING.*

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ARTICLE 3.—TIES.

Ultimately we may expect metal ties to take the place of wooden ones. In Europe, with dear wood and heavy traffic, substantial progress has already been made. In America experimental pieces of track have proven satisfactory in cheapening maintenance, and for many reasons, to be enumerated, we may expect progress to be considerable in the near future, but for many years wooden ties will continue, on this continent, to be the rule, and metal ones the exception, although their use constitutes a heavy drain on our forests, which probably amounts to six or seven million ties per year for Canada alone.

Wooden Ties.—Wooden ties are in general use because they are cheap, and simple in use or renewal, and by the use of preservatives their life may be increased considerably. In Belgium and adjacent countries where mild steel ties are in use, wooden ties are being abandoned in favor of steel ones on the following grounds:

(1) That their price will gradually rise owing to the devastation of forests.

(2) The quality of even the best varieties of wood is variable and an unknown factor, being affected by time of felling, place of growth, seasoning, etc.

(3) Preservative methods fail to produce a uniform material for use.

(4) No timber merchant will guarantee ties of wood, while two-year guarantees can be obtained for steel ties.

(5) There is a loss of interest, due to stacking wooden ties for seasoning, whereas steel ties may be in use, legitimately, even before being paid for.

(6) The difficulty of obtaining a good fastening of the rail to wooden ties, and the constant re-spiking necessary.

(7) The selling price of old wooden ties is less than metal ones even in proportion to their first cost. All of these objections are more or less valid, even in America, but the lasting and holding qualities are most important. Ties are ordinarily 8 ft. to 8 ft. 6 inches long, 6 to 7 inches thick, and 6 to 9 inches wide on top and bottom. They may be hewn or sawed, the former method producing a more durable tie if not hacked too deep before hewing. The top and bottom faces of a tie should be true and parallel planes, all bark being removed, and in sawed ties the removal of sapwood on the sides will add to their durability. They are usually laid 2 feet centres (2,640 per mile). The two ties at an ordinary angle-bar joint being selected as the widest ones near at hand and placed about 18 inches apart, centres, centrally about the joint, giving a suspended joint, but if the long six-bolted 44 inch angle-bars are used, then three ties are placed at a joint 18 inches apart, centres, one at each end and one in the middle; otherwise it is considered best to sort ties into groups of nearly the same width. It is believed that a random mixture of ties of various widths tends to cause poor track, as the narrow ones will sink more than the wider ones.

Ties are made from lignum vitæ, oaks, chestnut, locust, cedar, pine, maple, cherry, red elm, hemlock, tamarac, beech and spruce, being named, roughly, in order of durability in track, without treatment by preservatives. The life of a wooden tie in track, untreated, varies from 4 to 6 years for the poorer kinds, up to 10 or 15 years for the more durable ones, except lignum vitæ, which lasts 30 or 40 years. The length of life will depend on locality of growth, the kind and amount of ballast used, drainage, amount and speed of traffic, whether the tie is on a curve or tangent, and finally whether the rail rests directly on the tie or on a tie-plate or metal chair of some form. The wear on curves is greater than on tangents, due to the cutting into the ties of the rail base, which accelerates the rot; also, respiking is more frequent on the former; taking the life of a tie on a tangent as 9 years; one on a 2° curve will last about 8 years, 6° curve 7 years, 15° curve 5 years. Softwood ties can scarcely be used in America, owing to the poor hold of the ordinary dog-spike, which cuts and crushes the fibers of soft woods, while with hard woods the fibers are only squeezed back and are still elastic; but in England, with large metal chairs, soft-wood ties are in general use, and attempts have been made here to use cedar alternately with oak, as they both last well, and the latter will hold the spikes; also attempts have been made to nail oak planks on top of soft-wood ties, dove-tail oak bearing pieces just under the rails, and in other ways dodge the main issue, which is the poor holding power of