Art. XII. *On Charring Timber as a Protection from* Teredo.

By John Buchanan.

[*Read before the Wellington Philosophical Society, 25th November, 1876.*]

The purpose of the following notes is to call attention to some portions of charred piles presented to the Colonial Museum by the Hon. G. M. Waterhouse. They were taken from a wharf in Tasmania by Mr. Watson, and forwarded by him to Wellington with an accompanying letter, which contains matter of much importance at the present time in New Zealand, regarding the advantages of charring piles for wharves or other constructive marine works. As explained by Mr. Watson, and also as shown by the specimens, charred piles thoroughly resist the boring of sea-worms, thereby ensuring durability to the works concerned. Specimens are also sent, showing the destructive action of the worms on uncharred piles of the same species of *Eucalyptus*.

The protection of timber by charring from marine worms appears to have been a very ancient practice, and sometimes with complete success. As an instance of this, charred piles have been found in a sound state in the Thames, below London, the driving of which is accredited to the Romans. It is strange therefore that this well-known method of protecting timber has not been more frequently adopted.

Charring fence posts to ensure durability is also a common practice, but is often brought into disrepute through ignorance of its particular use in this case, which is only to prevent beetles boring the post at the surface of the ground, or, as it is called, between wind and water. Charring must be well done in this case. So much is the necessity for thorough charring that an intelligent idea of the use of the process is essential to success in the practise of it.

In charring timber as a protection against marine worms or land beetles, it should always be borne in mind that the charring offers only a mechanical obstruction to the boring apparatus of the worm or beetle; hence the necessity of deep charring, and not merely blackening the timber. The opposition offered to the hard mandibles of the worm is exactly similar to that which would be found if an attempt were made to bore with an auger into thick fibrous bark; and, indeed, if the bark be left on and charred, the obstruction would be more efficient.

It has been proved in Australia that the bark alone, without charring, is a sufficient protection against marine worms, but not, as stated by some, in virtue of its juices. There is always, however, a tendency in driving piles with the bark on that it strips off; but as the process of charring would make it cling close to the wood, or even become semi-united, the advantage of charring with the bark on is obvious.

On the whole the method has much to recommend it—both simplicity and cheapness, with a guarantee of success based not only on the present Tasmanian experience but on the experience of ages, charring timber as a means to durability dating back to the highest antiquity.

An opinion has been imported from Western Australia, in connection with the reported appearance of worm-borings in the Jarrah piles of a recently constructed work at Onehunga, "that the action of the worm will be confined to the sap-wood." The experience gained by the Auckland wharf confirms the correctness of this opinion in the case of totara piles, but in this case, before the mature timber was reached and the ravages of the worm checked, the totara piles were reduced to six inches diameter, when the wharf had to be renewed. A most important question is thus introduced. Would it be safe to trust to the amount of mature timber in any of the Jarrah piles imported. Certainly many of those now in Wellington are young trees. I am of opinion that no Jarrah piles fifty feet in length should be less than two feet diameter at the top, and it would increase their value here if the additional weight was squared or rounded off in Western Australia.

I have also to draw your attention to a portion of a pile from a Maori pah, presented by the Hon. Mokena Kohere to the Colonial Museum. The interest attached to this specimen of timber, the yellow pine or Manoao of the natives, *Dacrydium colensoi*, Hook., is its great age. The history attached states that this pile was taken from an old native pah at Tapuaeharuru, on the Omapere Lake, Bay of Islands district. This pah, according to native history, was built about fourteen or fifteen generations ago, by an old Maori warrior named Hua, so that it must be several hundred years old.

This species of *Dacrydium* is found throughout the colony, from the north of Auckland to Otago, but never in great quantity, the average size being two and a half to three feet in diameter, and occasionally five to six feet in diameter.

The specimen is perfectly sound, close grained and heavy, the chief feature of interest attached to it being the complete destruction of the sap-wood by weathering, and the small amount of heart-wood or mature timber remaining being only five inches diameter. It may be concluded that this specimen has either formed part of a very young tree, or the sap-wood of this species of *Dacrydium* forms a large portion of the timber. At the same time it proves that the sap-wood of even the most durable New Zealand timber trees is of little value, and should either be removed or protected in some manner by charring or otherwise.

Letter from Mr. Watson to the Hon. Mr. Waterhouse relative to the charring of timber:—

"Hobart Town, June, 1876.

"Sir,—Believing that you take an interest in all matters connected with the prosperity of New Zealand, I take the liberty of addressing you on a subject of considerable importance to the colony—namely, the construction and maintenance of her harbour works.

"For some years past I have continually heard of the destructiveness of the ship-worm to the piles forming the wharves and piers; but I was rather surprised on reading a small publication compiled in New Zealand in 1875, and containing reports of several gentlemen on the durability of New Zealand timber, to find the immense expenditure to which the Government have been subjected in consequence of the damage done to the piles by these worms. For the last seventeen years the Hobart Town Marine Board, at my suggestion and under my superintendence, have had the piles used in the construction of their works put through a process of charring, and have found it to answer admirably. Some seventeen years ago I was employed by the Government here to superintend the building of what is called the New Wharf, in this harbour (the old one, which had been erected about fourteen years before, having been quite destroyed by the ravages of the worms on the piles). The plans, etc., for its erection were all prepared in the Public Works office, and it was intended to have all the piles to be used in the construction of the wharf coppered; but on an estimate of cost being made the intention was abandoned. I then proposed a plan which, from my experience, I considered would answer the purpose of stopping the ravages of the worm—namely to char the piles, the expense of which is not more than ten shillings a pile. This being a new process, and apparently so simple a remedy, it was not at first entertained by our engineering department, and the contractor had orders to proceed with the construction of the wharf. They had driven about six of the new piles well coated with coal tar, when on my examining one of the old piles when drawn out, I found it was charred, but on one side only. It had evidently been a fallen tree, and a bush fire had passed over the upper side of it, the other side being most likely embedded in wet scrub, or in the ground. The charred side was quite perfect, but the worm had completely eaten away the other side of the pile. On this being brought before the department, instructions were at once given to the contractor to char all the remaining piles to be used in the work. I am forwarding you two samples of portions of piles taken from that wharf, on which I will note particulars. One is a piece of the first pile that was driven without charring, the other from a pile which was charred and driven a week or so

afterwards. I also forward a third piece taken from an old pile which had been driven uncharred about eighteen years ago. This, I think, will show that the worm is equally destructive in the Derwent as elsewhere.

"If it is not taxing your time too much, I will give you a short account of how I gained my experience with reference to the benefits of charring piles, and will make a few general remarks. (I may remark, in passing, that my experience was rather dearly bought, as the vessel alluded to was uninsured.) About twelve years before the New Wharf was built, I had bought an old whaler of about 300 tons, intending to make a sheer hulk of her. The necessary alterations were in course of being made, when by some means she took fire in the night, and was burnt to the water's edge. The mainmast had been burnt to less than twelve inches in diameter, when after being burnt through at the deck it fell overboard. In making up a raft of old masts for the men to work upon at ships when hove down, this was put in with others. After being about four years in use they became so eaten away that the raft was broken up, and, to my surprise, the old masts, which had been fully twice its diameter, were eaten away to a less size than it, although they had been well coated with hot tar before being put together. The charred spar came out as fresh as the day it was put in, so that on my undertaking to superintend the building of the wharf I considered the process of charring would answer better than the coppering, the expense being so trivial. Since that time I have had the sole charge of the planning and building of all the piers and wharves here. A new pier that was built for the steam-boats about ten years since, the piles of which were all charred, are as perfect, to all appearance, as the day they were driven—a standing proof of the utility of this process. I will send a sample from one of its piles with the others. The top of this pier is watertight without caulking, and is subject to the continual traffic of horses, drays, etc. Some of the main planking was removed lately for inspection, and the beams and main planking were found to be as sound as on the day they were laid. The top is formed with a double thickness of planking, and well coated with chunam between.

"We are just now about completing another new pier about 310 feet in length by 52 feet in breadth, with a curved top nearly the same as a ship's deck. It will be watertight, and have scupper-holes to let the water off. It is formed on about 300 piles, the outer ones of 75 feet in length. It goes into 40 feet of water, and the cost will be about £5,500. By the top being made watertight, the top planking beams and pile-heads will last many years; otherwise no wood in the world would stand the weather above ten or twelve years.

I have no doubt but that your New Zealand timber would, from the

accounts I have read of it in the publication referred to, answer every purpose. I notice it complains of our Blue Gum not lasting. At this I do not wonder, and much question if the timber alluded to is Blue Gum at all. I have seen timber shipped from here as such that was utterly worthless for exposed works.

"We have made many changes from the old plan of wharf-building, saving a considerable expense, and ensuring a greater stability and more durability in the upper portion above the water, the particulars of which would occupy too much space in this letter. But should your Government be inclined to try the experiment, I shall be most happy to furnish them with further particulars.

"His Excellency Mr. Weld has paid a visit to the new pier and witnessed the process of charring, and, I believe was very favourably impressed with its utility. At the same time he inspected the specimens taken from piles charred and not charred, and which are the same pieces as those I am forwarding to you.—I am, etc.,

"John Watson, late Shipbuilder.

"The Hon. G. M. Waterhouse, Esq."

Art. XIII.—*State Forestry: Its Aim and Object.*

By Captain Campbell Walker.

[*Read before the Otago Philosophical Society, December 21, 1876.*]

Since I became connected with the Indian Forest Department, twelve years ago, the question has very frequently been asked me, "What do you do? What *is* State Forestry? Do you plant trees, or cut them down?" And one fair correspondent, writing since I came to New Zealand, asked tersely, "Have you planted a tree yet?" Now, it is not easy in a few words to give an exact definition of what Forestry, and especially State Forestry, really is, and what are the duties in which the forest employés should be engaged; and I have generally replied that I could not reveal the secrets of my craft. I propose pursuing a contrary course this evening, and hope, ere I finish, to initiate you, even though it be only in the first degree.

The "Gardeners' Chronicle" of 5th August last, defined *practical* forestry as distinct from fanciful or ornamental, as "the art and practice of growing the largest quantity of the most valuable wood or timber upon the smallest area of ground in the shortest period of time." And this is doubtless a sufficiently accurate definition of the art as applicable to private