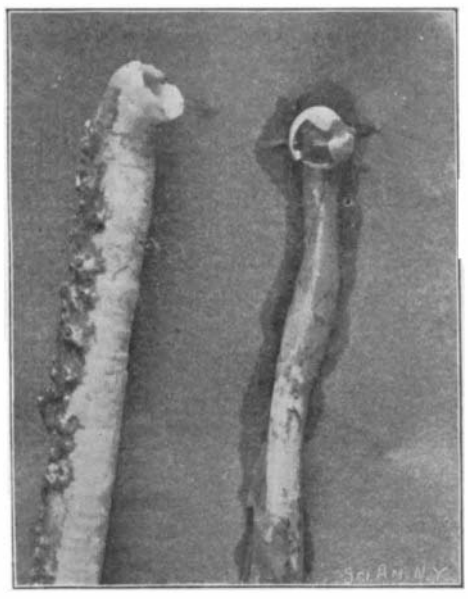
THE TEREDO AND ITS WORK.

BY J. G. M'CURDY.

Of the various forms of animal life that cause damage by their habits of boring into various substances, the Teredo navalis, or "ship-worm" as it is commonly called, easily heads the list for general destructiveness. It is found in every sea, and every piece of unprotected timber immersed in salt water is subject to its ravages. It works secretly, silently and effectually. A timber may appear perfectly sound upon the surface, but upon cutting into it, it will be found fairly honeycombed with the passages drilled by this indefatigable miner.

Teredos belong to an old and well-scattered family. They were well known to the ancients, who found



TEREDO AND CALCAREOUS LINING OF TUBE.

the problem of protecting their ships' bottoms from the ravages of the pest a most serious one. In 1731 Holland came near suffering an inundation through the agency of these creatures. The Zeeland dikes were found ready to collapse by reason of long-continued attacks on the part of teredos, and had not the situation been discovered most deplorable consequences must have resulted. The teredo is a cylindrical, worm-shaped creature, and as found in Pacific coast waters is usually about a foot in length and rarely exceeds half an inch in diameter. The head contains the boring apparatus, which consists of two peculiarly shaped shells. These working together have an action closely resembling an auger bit. The long, whip-like body is nearly transparent and so tender that it will hardly bear its own weight. The creature bores into the timber when it is very small and at once commences active labor. It invariably bores in the direction of the grain of the wood, unless turned aside by some obstacle in its path, such as a knot, spike or another burrow.

It lines its tube-like passage with a thin calcareous deposit, which serves as a protection to its crystalline body. No matter how many teredos may be operating in the same piece of timber, no excavation will be found breaking into another. How the artisans, working within the interior of the timber, can so unerringly avoid obstacles in their path is a puzzle to scientists. The section of a log pictured herewith measured but 18 inches in diameter, yet contained over 800 teredo holes by actual count.

To obtain a live teredo means a diligent and in many cases a disagreeable search. The writer made a number of visits to various wharves, but it was not until an extremely low tide that success attended his quest. Great care must be exercised in dislodging the creature if it is to be kept intact, while photographing the soft, watery mass will prove no easy task.

Many persons erroneously charge the teredo with the damage done by limnoriæ, minute insects that swarm upon the surface of immersed timbers and eat in toward the heart. Every piece of piling is beset with enemies within and without, and it is always a question which will cause the ultimate destruction of the timber.

The teredos bore into the lower end of the pile in such numbers that at length it breaks off and floats away; the limnoria makes its attacks at about half-tide mark, and if given sufficient time, will eat the timber completely in two. Where the bottom is foul and muddy, the teredo completes its work first; but on a firm, sandy bottom, the limnoriæ win the day. The teredo does not work with the same rapidity in all waters. They are worse in Alaska than in Southern California, and at various points upon Puget Sound but a few miles distant from each other they work with varying degrees of voraciousness, much depending upon the character of the bottom. A wharf left to itself soon becomes a tottering ruin. They are carefully watched, and as quickly as piles are destroyed they are replaced by a pile driver, which drives new timbers into the bottom with an immense hammer operated by steam power.

Loggers are careful to construct their booms in places where streams mingle with the salt water in order that their logs may not be injured before reaching the sawmill. The Robertson Log-Raft Company recently removed its plant from Puget Sound to the Columbia River in order to escape the teredo, which rendered one-third of its timbers worthless before a raft of sufficient size could be got together for towing.

How to protect timbers from their insidious foes has been under consideration for years. In 1868 Dr. Avenarius, a German chemist of note, made a preparation from creosote which was fairly effective, but it did not meet with general favor on account of its inflammability, evaporation and destructiveness to wood fiber.

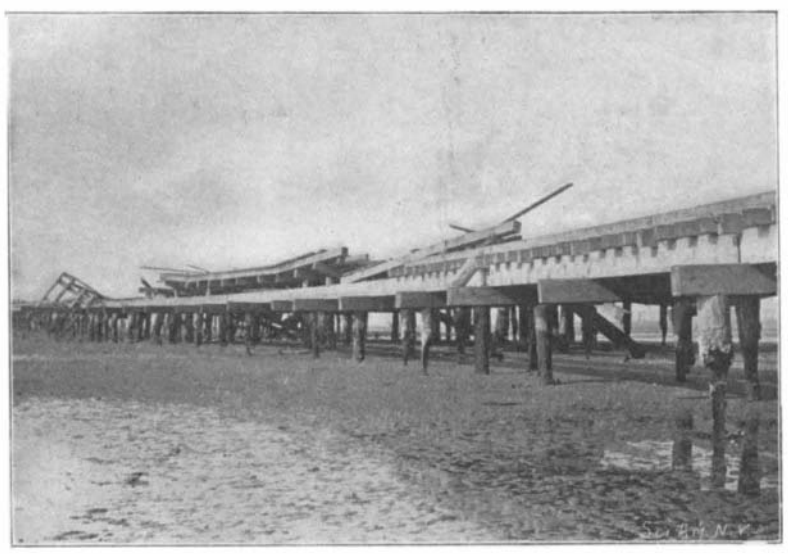
A few years later Dr. Avenarius invented a coal-tar distillation which proved of great merit, and most of the preservatives now in use are compounded largely in accordance with his formula. Copper or yellow metal sheathing is also efficacious.

The creosote process consists in a forcible injection into the fiber of the wood of dead oil of coal tar as obtained in the manufacture of gas.

Copper sheathing consists in a coating of copper or yellow metal (sometimes called Muntz metal) similar to sheathing on the bottoms of vessels.

It is well understood that there are numberless materials which will keep the teredo from destroying wood, provided they can be made to stay on the wood; but the solving action of salt water is so great that it will destroy the great percentage of them. In Southern California a considerable quantity of eucalyptus piling is used. This wood withstands the action of the teredo for from three to seven years, but the growth is limited in quantity and size, and is not of sufficient importance to cut any figure commercially.

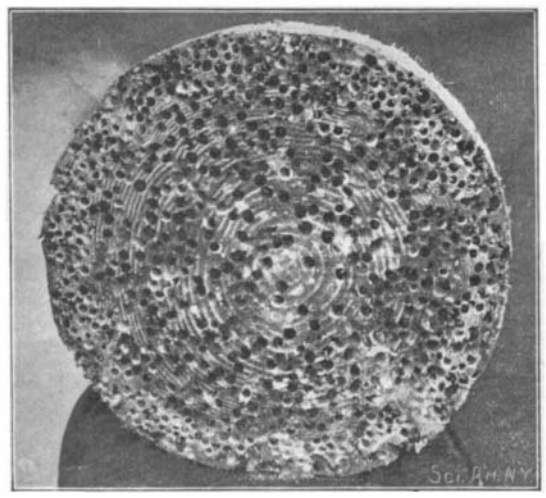
The government demands the use of pest-proof timber in all its wharves and harbor works, and railroads and other private enterprises are following the example. The writer recently made a careful examination of a dock built of prepared timber which had been built for several years, and could not find the trace of a teredo. In the fender-piles, however, which were unprotected, teredos and limnoriæ were holding high carnival.



WHARF DESTROYED BY TEREDOS.

Glass for Scientific Purposes.

In the course of a paper by Dr. Glazebrook, read before the British Association, the author said that the theory of an ordinary achromatic object-glass was well known. In consequence of the fact that in a prismatic spectrum the ratio of the dispersion of the extreme rays to the deviation of the mean ray was different for different materials, it was possible to construct two prisms so as to produce a resulting deviation, but not separation of two given rays. The image formed when the two extreme rays were combined was not white, but exhibited prismatic color. If an ordinary lens of crown and flint glass were achromatized for the rays C and F, then, for the flint glass, the dispersion of the blue end was greater than that of the red end, less for the crown. A more completely achromatic result would be obtained by using two glasses, for which, for given equal total dispersion, the distribution of the rays in the two spectra was more nearly the same. After referring to the work of Abbe, Stokes, Harcourt, and others, Dr. Glazebrook said that among the glasses manufactured at Jena it was possible to find various pairs which could be combined into better achromatic lenses than the old crown and flint. It was necessary for this purpose that the ratio of the total dispersion to the refractive index should be different for the two glasses but that the ratio of the partial dispersion to the total should be the same. He then showed how three colors might be combined in the image instead of two, as in the older manufacture. In such an object glass the advantages were numerous. It was more nearly white than that formed by a lens of two ordinary glasses, and as a consequence would stand a higher magnification in the eyepiece. As a result the whole instrument might be made more powerful, or, for the same resultant magnifying power, we might use a less powerful object-glass, and thus secure other advantages in illumination. There would be with such a lens some outstanding chromatic aberration, the violet image being rather greater than the red. This was corrected in the eye-



CROSS-SECTION OF PILING, SHOWING 800 TEREDO HOLES, NO TWO HOLES BREAKING INTO ONE ANOTHER.

piece itself. Attempts had been made either to use fluorspar in the object-glasses, or to make glass containing fluorine. With such a glass it would be possible to obtain almost perfect conditions.

Plans for the Moscow-Kasan-Kyschtymsk Railroad Approved.

According to German newspapers, the standing Russian railroad-building commission has just approved the plans for the Moscow-Kasan-Kyschtymsk Railroad. The present outlet of the great Trans-Siberian Railroad —the Ssamara-Slatonster Railroad—is so overburdened with freight that it can no longer handle the amount of goods delivered. It has become necessary to find other means to relieve trans-Siberian traffic, and the so-called North Railroad, which connects Viatka, via Vologda, with St. Petersburg, and the Moscow-Kasan-Kyschtymsk line, which has been projected by the Moscow-Kasan Railroad, will be made to serve the purpose. The former line is already laid out and contracts are being made with foreign firms for its construction. The building, equipping, and running of the latter road has been turned over to the Moscow-Kasan Railroad Company by the commission, under condition that it be completed at once and that the necessary rails and cars be ordered from Russian factories.

The Current Supplement.

The current SUPPLEMENT, No. 1350, has a number of unusually interesting articles. "M. Santos-Dumont Wins the Deutsch Prize" is accompanied by a large engraving showing the descent after the successful journey. "A Military Bakery Automobile" describes an interesting flour mill and bakery which transports itself. "Modern German Fire Engines" illustrates some modern types. The second important series of "Enameling" is published in this issue. "The Berlin-Zossen High-Speed Electric Railway" gives full details of this remarkable experimental line. "Anthropology" is an address by Prof. D. J. Cunningham, M.D. "Reflex Action and Instinct" is by W. Benthall, M.D.

Contents.

(Illustrated articles are marked with an asterisk.)