THE TEREDO AND ITS WORK.

The *teredo navalis* is a mollusk belonging to the tubiferous bivalves. It has been from time immemorial, in all quarters of the globe, a subject of comment on account of its ravages in timber exposed to its attack. There are twenty-four species of the teredo, but the ship worm is the best known of these. Along the Gulf coast of the United States the worm has been carefully studied by the builders of railroads, and the students have been rewarded here more abundantly than those who have examined the subject elsewhere. In reality, the teredo is like the flexible-shaft boring machine. The *teredo navalis* is a natural reproduction of this instrument and is something more. Its long and flexible body terminates in cutting shells or bits, and is inclosed, for the sake of its protection, in a hoselike shell, which reaches from the inferior extremity to within a very short distance of what is known as the head. At that point the muscles come into play and work the cutters or bit edges and drive them into the timber, cutting as small and as round a hole as any boring machine yet devised. It can change its course at any point, and has this advantage over the flexible shaft auger.

The teredo first appears in the egg, which is round, like a mustard seed, which comes from a whitish looking mass, just below the stomach of the teredo, about a quarter of the distance from the head to the tail, and the eggs are in number from one to three millions.

These eggs are laid at the beginning of the warm season in the spring, and are deposited from time to time until cold weather sets in. The eggs hatch in the water, and give out worms about $\frac{1}{16}$ of an inch long, and so small as to be almost invisible to the inexperienced observer. They swim about for a day or so in the water, apparently enjoying their brief time of adolescence, and then search for timber. They enter the timber by boring and cutting with the shells or cutters with which they are provided, and the entrance they make is so small that it can scarcely be seen.

The worm grows at about the rate of two inches per month, under favorable circumstances, and bores a hole to accommodate its increasing size. The length of the hole is an indication of the length of the teredo, for it attaches its smaller end to the entrance of its burrow, and pushes forward with the growth of its body. As it progresses, it deposits a coating of lime upon the sides of its cell, the deposit being thinner as the animal advances. The deposit, which is thick at the entrance, is merely a film at the head, where is collected a whitish fluid, which contains the lime secreted for making the lining of the cell and perhaps, also, for repairing the wear of the cutters.

The worm continues its progress for one or one and a half years and propagates and dies. It is said it reaches the length of ten or twelve inches. The largest authentically observed specimen was twenty-three inches long and five-eighths of an inch thick at the large end. When grown, the teredo seems to be a gelatinous worm, attenuated in shape, extremely delicate to the touch and tapering to a very small point. The anterior or large end has two bifurcations provided with horny stiles which close up against each other like shells.

These cutters are attached to a pair of strong muscles which operate very much like forceps or scrapers. The edges of the shells carry away little chips or fibers of the wood. The continued scraping makes the walls of the cell regular, and, in time, with the action of the water, polishes them smooth. The bore hole made by the teredo is generally straight, as the inclination of the worm is in the line of the grain of the wood, and is changed only when the course will project the teredo into the tunnel of some other borer or when the path leads through some knots or twists in the wood. The teredo avoids the burrow of its neighbor with great accuracy. There may be hundreds of worms living in the same cubic foot of timber, but they never cut across or into the cavities of their neighbors. Coming in contact during its boring with wood having obnoxious qualities, the worm avoids it by going around it, or it will back about one-third of its length and begin a branch tunnel, previously building a calcareous dam across the abandoned path of its tunnel. It will get within the least possible distance of its fellows and within a hair's width of the outside of the timber without breaking the division wall.

At the base of its cutters is the esophagus, or orifice leading into the stomach, in which can be traced the fine sawdust and chips, showing that the worm feeds upon such matter. This is more likely to be food for the worm than the debris of stone which the shell fish of the same group as the teredo have to swallow in the course of their operations. Whether the worm has a rudimentary brain does not appear to be known. It is almost transparent and its interior arrangements can be plainly seen when it is suspended in glycerine or alcohol. The smaller end of the teredo is attached to the cell lining by a membrane in the shape of a sleeve, which closes the entrance hole and prevents water from coming into the cell This sleeve is provided with two long pointed filelike edges which protrude,

LOG EATEN BY THE TEREDO.

by muscular action, out of the aperture. This instrument is to aid in removing the rough parts of the wood by the worm and partly to protect it against other animals. Without some such protection, a rival of the teredo or some parasite would enter the tunnel and devour the inmate. The teredo having lived its life and having given birth to millions of young ones, closes the outer aperture with a coating of lime and dies. Very often death comes before the allotted time, for so many worms will enter a piece of timber as to eat it up. The whole community, having no further means of subsistence, dies of starvation. Logs have been found cut all to pieces and filled with worms, all dead. As may be judged from our engraving, which is a half tone of a piece of wood which has been eaten by the teredo, it is a very destructive animal to timber and many series of experiments have been tried to find a remedy for this voracious little monster.

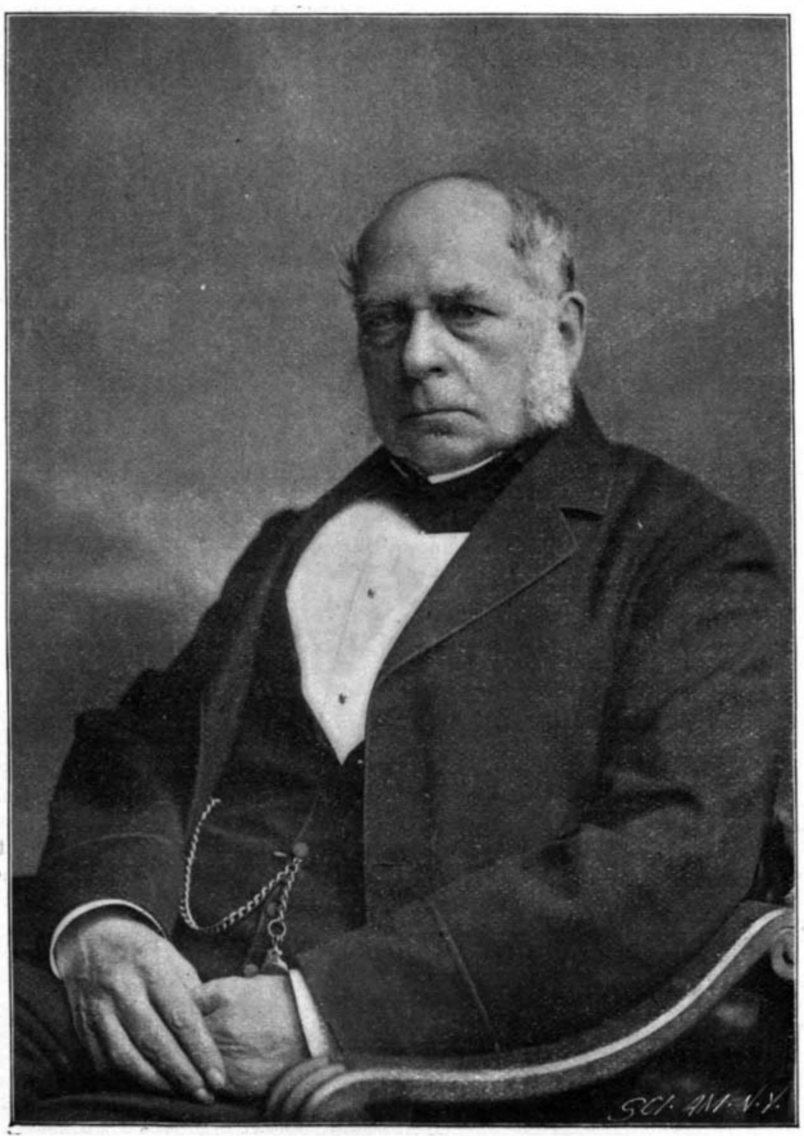
DEATH OF SIR HENRY BESSEMER.

Sir Henry Bessemer, the inventor and metallurgist, died in London, March 14. The death of this great man brings a realizing sense of the importance of his contribution to the world, revolutionizing, as it did, many vast industries. The remarks of the Hon. Abram S. Hewitt on Bessemer steel and its effect on the world will be found on another page.

Sir Henry was born in Hertfordshire, England, in 1813. From his earliest youth he was fond of modeling and designing, and at the age of twenty he was an exhibitor in the Royal Academy. He had always a leaning toward mechanical pursuits, and when he was demonstrating to the French military authorities at Vincennes the results of his system of firing elongated projectiles from high smoothbore cast iron guns, Commander Minie said: "Such projectiles will be of little use if you cannot get stronger metal for your guns." This led Sir Henry to consider the possibility of extending his researches to the kinds of metal most suitable for artillery purposes. At first he did not have the least idea of how he was going to do it, as the science of metallurgy was not familiar to him; but he was not daunted, as he worked on the theory, which is sometimes a good one, which he formulated as follows: "I find that persons wholly unconnected with any particular business have their minds so free and untrammeled to view things as they are, and as they would present themselves to an independent observer, that they are the men who eventually produce the greatest changes."

He studied all the literature on the subject and visited large manufacturing concerns to judge of the defects of the methods then employed. He then began experimenting in London, and after a year he produced a cast iron almost as white as steel. He made a small gun from this metal, which he took to Paris and presented to the Emperor Napoleon III., who encouraged him to keep up his experiments.

Sir Henry continued his labors, taking out patents for each improvement, and at the end of eighteen months the idea struck him of rendering cast iron malleable by the introduction of atmospheric air into the fluid metal. His first experiment was made in a crucible in the laboratory. The samples produced were so satisfactory that facilities were offered him at the Woolwich Arsenal, and the first sample of "Bessemer" steel rolled was preserved by Sir Henry as a memento. He took out a patent embodying his idea in October, 1855. His experiments brought on a severe illness, and after his recovery he built a large experimental plant at Saint Pancras, London, with a converter three feet in diameter and five feet high. The classic trial rendered famous the premises once the home of Richard Baxter. The engine forced streams of air under high pressure through the bottom of the converter and the workmen were told to pour in the melted iron. Instantly came a dazzling shower of sparks and the dangling lid melted in the fierce heat. The air cock was beside the converter and no one dared to go near it. Finally the process of decarburization was completed and the new metal was tried, the problem was solved, and "Bessemer" steel had become a reality. In the next number of the SUPPLEMENT a full biography of Sir Henry Bessemer will be published.



SIR HENRY BESSEMER.

At the time the fiftieth anniversary number of the SCIENTIFIC AMERICAN was published, the readers of our journal wisely put themselves on record as considering that the Bessemer process was the greatest invention of the last fifty years. Sir Henry Bessemer made about $10,000,000 out of his discovery, and he was the recipient of scores of marks of distinction from the crowned heads of Europe and from the scientific and learned societies of the world. He received the honor of knighthood in 1879. He took out 120 patents, and the specifications fill two volumes and the drawings seven volumes. He is one of the greatest examples we have of an inventor whose labors were rewarded by every honor and whose material success was owing to the patent systems of all countries.

Cement for India Rubber on Metal or Wood.

The following is recommended by the Allgemeine Tischler Zeitung as a strong and lasting cement for rubber either on metal or wood, and hence will serve for cementing bicycle tires: Put 1 part of shellac, broken into small pieces, into 10 parts of ammonia water (strongest), and set aside for three or four weeks, or until the mass becomes entirely fluid. In use the liquid is applied to the India rubber surface, and the latter is applied to the metal or wood, and firmly wired or corded thereto. On the evaporation of the ammonia a most complete joint is formed between the two surfaces.