THE ELECTROPLATING OF THE HULLS OF IRON SHIPS.

Paints and compositions innumerable have been tried to prevent marine growths from forming upon iron and steel vessels below the water line. Mr. Theodore D. Wilson, late chief naval constructor, says, "Thousands of dollars have been expended in the testing of protective and anti-fouling paints and compounds with very little encouragement to further experiments." The process of Mr. Thomas S. Crane, of East Orange, N. J., patented May 30, 1893, controlled by the Ship Copper Plating Company, of New York, has just been put to a practical test in coating the iron hull of an ocean tug 98 feet long with copper to the thickness of one-twentieth of an inch. The tug is being treated in a dry dock in Jersey City, but it is expected to coat new ships before they are launched, to save the expense of docking and loss of time.

The destructive effect of barnacles on the hulls of the ocean liners and war vessels is well known. Some idea of the saving in cost by using the new process may be gained from the statement of Philip Hichborn, the U. S. naval constructor, in his report to Congress, in which he says that to dry dock, clean, and paint the cruiser Chicago in any port would cost about $12,000, and that on the average it would be necessary to do this three times a year, making $100,000 for a three years' cruise. Only a short time ago one of our war ships burned 1,000 tons more of coal on her homeward trip from Rio than on her journey there, and her speed was two or three knots less per hour because of a foul bottom. From the hulls of the Alert and Atlanta twenty-five tons of barnacles and incrustations were removed. Some of the foreign navies resort to the cumbersome method of covering the vessels with planking, which is in turn sheathed with copper. A coating of copper will keep barnacles off the hulls, and will also prevent the pitting and corrosion to which iron and steel vessels are now subjected.

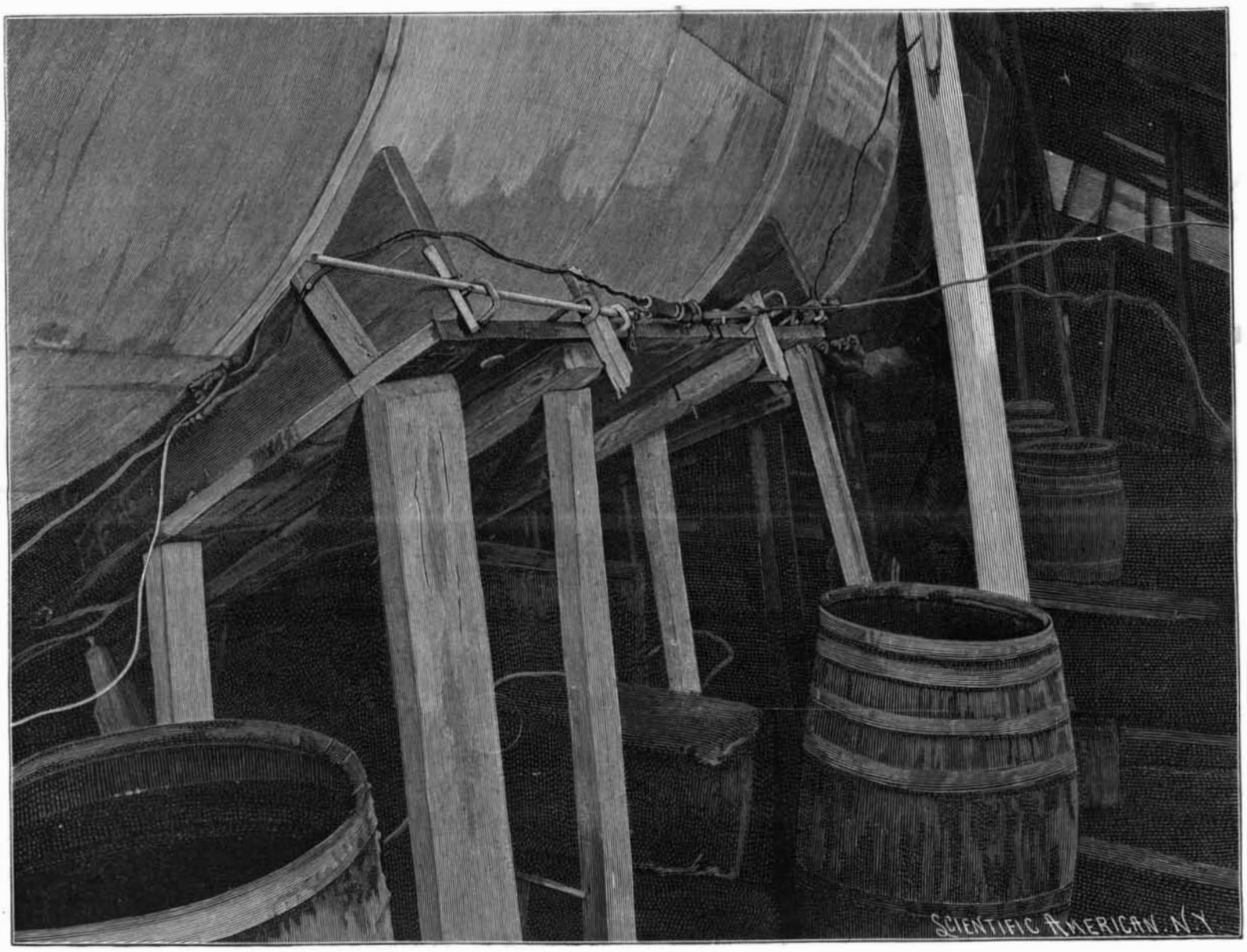
By the new process, which we illustrate, the copper is electrically deposited in sections upon the surface of the vessel in successive rows, and the joints of the sections are overlapped during the electro-deposition in such a manner as to perfectly unite the whole coating of the vessel. The entire surface below the water line, including the riveted laps of the steel sheets, the keel, the stern and rudder post, are thus protected by an unbroken metallic sheet of copper. The baths are open upon one side, which is applied to the hull of the vessel, and our illustration shows the bath actually applied to the hull of the tug Assistance while supported upon blocks in the dry dock.

The method is a triple one. The bath, which in size is about five feet square, is securely placed in position, and after being shored up against the vessel's bottom, is calked around the edges with cotton and oakum till it is water-tight. Then it is filled with strong acid solution for twenty-four hours, which cleans the plates. The acid bath is removed, the spot washed thoroughly, then the wooden bath is filled with a solution of copper cyanide, and a current of six volts and 900 amperes is applied. The action of the cyanide solution is two-fold—it assists in cleansing the plates and also causes a firm film of copper to adhere in the next stage of the process. The cyanide bath is removed after having been allowed to act for twenty-four hours, and a solution of copper sulphate is substituted. Large copper plates are used as anodes; the current is reduced to three volts and the amperage remains the same.

The deposition of copper takes place immediately, and the process continues until copper has been deposited to the thickness of $\frac{1}{25}$ to $\frac{1}{16}$ of an inch; the current is then stopped, and the bath removed. The deposition of the copper usually requires about four days. The coating is closely adherent, and cannot be removed except by chipping with a cold chisel, in which case a portion of the iron usually comes away with it. The lapping of the coatings has been already described. There is no chance for galvanic action to set in except by a blow or grinding upon a rock which might cut through the film. But after such a blow the vessel would undoubtedly have to be docked for repairs and a small bath could be applied to recopper the defective spot. The plating of propellers will be of particular value, as the least bit of corrosion interferes seriously with their efficiency. Of course in practice a large number of tanks or baths would be in use, and it is expected that an ocean steamer of the largest size (600 feet long) could be completely plated in four weeks.

Experiments have been made on the copper coating, using sea water which has been brought from ten miles out at sea; it is found that this water has no effect on the coating. To Mr. Henry Bergfels, the plater of the tug, much credit is due in the way of overcoming difficulties, which naturally arise in a new undertaking of this description. It is now expected that an elaborate plant will be built to accommodate vessels of large size if the Assistance proves to be all right in actual sea trials. The success of the plating stage of the process is assured, and all that is now needed to demonstrate the success of the process as a whole is a test in actual service to see if the coating has the permanency which there is every reason to believe it possesses.

Our engraving is from a photograph showing one of the electro-plating baths in operation, as applied to the bottom of the tug Assistance as above described.



THE ELECTROPLATING OF THE HULLS OF IRON SHIPS.

The Cost of Electric Transmission of Power.

At a recent meeting of the North of England Institute of Mining and Mechanical Engineers, at Newcastle, Mr. Alex. Siemens, president of the Institute of Electrical Engineers, read a paper on "The Cost of Electric Transmission of Power." He said that some time had elapsed since Lord Armstrong and Sir William Siemens installed electricity for this purpose, as well as for lighting, at their respective residences at Cragside and Tunbridge Wells. Those applications of electric transmission were perfectly successful, though it was only lately that the transmission of electric power had been taken up in earnest. First of all electric tramways were developed, and their rapid extension was sufficient proof that reliable electric motors could be erected and would work reliably and without trouble. There was a belief in the minds of some people that an electric motor cost about as much for repairs as a steam locomotive did for coal. His firm had electric motors on tramways which had run 60,000 miles without any repairs whatever. If they made a motor sufficiently strong, so that it could do its work comfortably, it would not use up the brushes. Mr. Siemens then described the system of electric transmission in use in the works of Messrs. Siemens Brothers & Company, at Woolwich, which has been put in to succeed steam power. He said the works were lighted from the same currents. If engineers introduced electric power for pumping or hauling in mines, they could use the same mains for lighting purposes, and they would find it worked perfectly well. Having given the result of careful experiments as between steam and electricity, he said there could be little doubt about it that for new works electric transmission was the cheaper. Whether a change from the old system to electric transmission could be recommended could only be decided by the local circumstances. As a rule, electric transmission was most valuable where power was required to be transmitted to various and distant portions of the works, and especially in such places as mines, etc. By the conversion the colliery owner would save sufficient to repay the outlay in ten years. In other words, the cost of erecting the plant for the year would be less than the present cost by an amount equal to 20 per cent of the outlay.

LORD KELVIN holds that the internal heat of the earth has nothing to do with climates. The earth, he says, might be of the temperature of white hot iron 2,000 feet below the surface, or at the freezing point 50 feet below, without at all affecting a climate.