

north, longitude  $32^{\circ} 19'$  east. This point was selected for the reason, that just here the line of deep water is nearer to the beach than anywhere else along the coast. In the bay of Pelusium, it was found that the line of 33 feet soundings was nearly 4 miles from the shore, while at Port Said, the distance is only about half as great. The beach in all this region, is merely a narrow strip of sand one hundred or two hundred yards in width, inside this are a number of shallow lakes, or mere salt marshes, some of them of great extent.

(To be continued.)

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### ANCHOR ICE.

In this *Journal*, Vol. 51, p. 327, was published an account of the formation of ice on a strainer connected with the inlet pipe of the Detroit Water Works, and at a depth of 25 feet, together with the opinion of Professor S. H. Douglass of the University of Michigan. In the following volume 52, p. 101, appeared, with editorial endorsement, the reply of Professor Douglass to objections which had been urged by Professor Henry, against his explanation. On page 236, of the same volume, we find an excellent paper, by J. B. Francis, C. E., confirming the views of Professor Henry. Having thus referred to the history of the subject, as far as this *Journal* is concerned, we will briefly record the results of sundry experiments, which have been made at the Detroit Water Works, upon the strainer in question, and fully establish the true theory and explanation of the action. This record we take from the Report of the Board of Water Commissioners of the above place. After a description of the strainer, which is of so simple a description that it need not be here repeated, we find as follows:

"Under certain circumstances, during extreme cold weather, it is with difficulty a supply of water can be obtained, in consequence of the accumulation of ice on the strainer, frequently requiring the speed of the engine to be reduced, and at times to stop it for several hours together, no water passing through the pipe into the well, notwithstanding the bottom of the well is twelve feet below the surface of the river. The size of the well is about forty feet long, eighteen feet wide, and twelve feet deep. The circumstances under which the difficulty occurs are, when the weather is cold, and ice is

forming in the lake above, and on the shores of the river, and the river is free from ice over the strainer. But when the river is covered with ice over the strainer, the difficulty does not occur at any degree of cold.

This fact induced us to suspend a line of booms from the wharf some distance above and outside the strainer, so as to retain a covering of ice over it when the rest of the river was not covered. This boom was successfully kept in position until the ice firmly formed inside of it, but failed to accomplish the object. The theory that the covering of the entire surface of the river by ice prevented radiation, and by that means the ice did not form on the strainer, was strongly urged; and, if so, any covering over the strainer would answer the same purpose. To test it, we, last summer, employed the submarine divers, Messrs. Harrington and Philips, to build a submerged platform of planks immediately over the strainer, which they successfully accomplished, but which, however, proved of no avail, for the stoppages occurred at a higher temperature than before.

On the 29th of December last, while but a small supply of water could be produced, we induced Mr. Harrington to go down to the strainer and make an examination of its condition. Owing to the extreme coldness of the water and atmosphere (the thermometer on the wharf marking twenty-six degrees), it was impossible for him to remain down beyond a short time, but this was long enough to discover the fact that the strainer, with its surrounding spiles, was one mass of ice, particles collected into a mound some ten feet high, and about fifteen feet in diameter, and that large quantities of minute crystals of ice were rapidly passing and adding to the mass already collected. Specimens of the ice were brought to the surface in a bag. It was in sheets and particles thin as paper, translucent, with sharp, pointed edges. A further examination developed the fact that the small amount of water the pump was then receiving came through the lower or down-stream side of the strainer, this being the only point where he could approach it, and which was found but slightly covered with ice. When these facts were ascertained, we thought we were about to solve the problem and provide a remedy for the difficulty, especially as a similar experiment to the one we then proposed to adopt had been successful at the Buffalo Water Works. It was to inclose the strainer, except a part of the down-stream side, so as to prevent these floating particles from col-

lecting on and around it. To do this, a large piece of canvas was prepared of suitable size, and firmly fastened by the diver around the spiles, which, with the platform, completely covered and encircled the strainer, except on the down-stream side. This was but just completed when the weather became colder, and during the night the thermometer indicated several degrees below the freezing point, and before daylight the engine stopped for want of water. Preparations were made as speedily as possible, for another descent to the strainer. At 11½ o'clock, A. M., the diver went down, and this very important fact was ascertained, that, with the temperature of the atmosphere at twenty-nine degrees, the water at the surface was thirty-three degrees, whilst at the bottom of the river it was thirty-five degrees. At this descent much less ice was found on the strainer and its surroundings, than the first time. The lower side was clear, but on the upper side the action of the current had worn the ice into elongated cones, pointing up stream. At this time the pump was receiving a full supply of water. About three hours later, the diver again descended (thermometer thirty-three degrees); he found the ice had entirely disappeared. The wooden platform was removed, since which time no trouble was experienced up to the evening of the 24th inst., when the surface ice of the river was in motion. From 1 o'clock, A. M., of the 25th inst. (thermometer sixteen degrees), no water could be obtained until daylight, when the engine was again started, and no further delays have since occurred.

Your committee, by the aid of the submarine diver, have ascertained the fact that at certain temperatures these ice particles are ever present in the river, and are continually passing down by the action of the current, and whatever obstructions they meet with in their passage they collect upon. This being the case, we recommend, the coming summer, the entire removal of all spiles and other substances adjacent to the strainer, believing that with nothing but the smooth dome of the strainer for these particles to lodge upon, the quantity that will accumulate cannot very seriously prevent the flow of water to the inlet pipe."

The report from which the above extracts are made, is signed

S. G. WIGHT,

J. OWEN,

*Committee on Supply of Water.*