

The operations at this pier have been suspended for the last three days, owing to extreme cold weather and the river being gorged with ice. The front of the pier stands out in the river about 100 feet from the Illinois shore, and the derrick pontoon or barge about 40 feet further. On this barge are 6 large steam boilers, 4 or 5 flues each, about 26 feet long and 44 inches in diameter, 2 steam engines driving air pumps, 2 ditto driving traveling purchases, 3 driving hydraulic rams, 8 hydraulic lifting jacks for hoisting stone, 5 large Cameron steam pumps to drive sand pumps, besides smaller ones for each battery of boilers (four in all). In fact this barge, *G. B. Allen*, is loaded down with a precious freight of most valuable machinery, and should she sink it would cause great trouble. To prevent this she is thoroughly bulkheaded into eight water-tight compartments, and a strong ice apron has been established above her to deflect and break up the ice as it comes down. This is now running so heavily as to thoroughly prove the apron to be a success, the ice being turned off from it like turf from the plow.

The river is so nearly blocked this morning that the ferry-boat can scarcely cross, even below the channel piers, and the ice is so heavy and moving so slowly that a close of the river is confidently expected if the cold continues many hours more.

The river is very low now, but I think it quite likely that 20 feet more will have to be worked through before getting down to the rock; this would give about 120 feet of water. Thirty working days will suffice to put the pier to the rock. St. Louis, Mo. A. B. C.

Special Correspondence of the Scientific American.

**EASTERN LONG ISLAND—MENHADEN OIL AND THE FISHERIES.**

SAG HARBOR, Dec. 9, 1870.

This is by no means the most pleasant season of the year to visit this end of Long Island, but business and pleasure do not always go together. This place, once one of the largest and most important of the whaling towns, now does almost no business in that line. Once they fitted out more than twenty good-sized ships every year, now two or three constitute the whole number.

The town has lately received some impetus from an extension of the Long Island Railroad to it, but it is hard for a seafaring population to learn new tricks. It contains one good-sized cotton factory, run by steam, and a large steam flour mill. Through the politeness of Mr. R. S. French I had an opportunity of seeing the place in its best aspect. It is much resorted to in summer, and its hotels are always crowded during the warm season. I could easily see the good one might derive from the sea breezes and recreation under the shade of the great elms around the Fordham House, or lolling lazily on a yacht floating down the bay.

The history of the cotton factory is that of too many similar institutions. As a corporation two distinct capitals were sunk; now it is in the hands of one man, and he makes it pay.

South of this place is the ancient town of East Hampton. With its venerable church, its cemeteries with their quaint old tombstones, its old-style houses, and good, honest old-fashioned people, not to speak of its excellent boating and fishing, and superb bathing beach, it has become not only a curiosity, but a favorite resort for hundreds of New Yorkers. A change is what the wearied city man wants, and in East Hampton he finds most emphatically the opposite of New York.

The Old Church is built chiefly of oak and juniper. There are timbers in it, perfectly sound, yet it is over 220 years since they were cut and hewed. The original church was built in 1649; this one was built partly of the old materials in 1717, and, unfortunately, somewhat remodeled in 1824. The frame is so strong that I think it would be possible to roll it over without starting a joint. The tie-beams are 8x10 inches and the rafters 8x4, with braces 6x4, and supports the same—all of hewn white oak.

The town is a singular place. It has one long wide street with a cemetery at each end, and there are not more than two or three modern styled houses in it. By far the greater portion of the houses are shingled on the sides, and are unpainted.

The power used for grinding corn, etc., is the old-style windmill. There are three in the village; one was running. We said to the proprietor, "Why don't you paint your mill house, your shingles will last longer?"

"Well, it's been here as it is for over seventy years, and I guess it won't hurt much more than it has."

The town is simply a well-preserved relic of more than one hundred years ago, and as such is well worth a visit. As we were leaving, about the only man we didn't find pretty near asleep hallooed out, "Tell the folks up in New York you found one live man in East Hampton, and that's Bill Gardner." Asleep as they are, they are good farmers, good livers, and honest, hard-working people.

To this same live man we are indebted for much information about the menhaden fisheries. If the whale fishing has decreased the menhaden fishing has been found fully as profitable, and a much less dangerous substitute. The business was first commenced in Massachusetts. The first factory on Long Island was started about twenty years ago. The new style of oil did not sell well at first, but since the decay, of the whale fisheries the business has grown into enormous proportions, and is immensely profitable. There are now about twenty factories on Eastern Long Island, and several in New Jersey. These hereabouts took last season about 70,000,000 fish. One seine caught during the season 1,500,000, and there is one factory which has the ability to take care of 200,000 per day.

The fish which are used for this oil-making is called "menhaden," "porgie," and "moss-bunker," and some say it is the same as the bony shad. The fish are caught in seines. Some of the men work on shares, each owning a part in a boat, and running risk of good catch, weather, etc. Some such, thus working, we were informed, made this year \$1,000 each. Some of the factories own their boats and hire the men, others depend on buying. In the spring, when they first commence running, the fish sell for \$2 per thousand, as they are poor then, and only yield about four gallons of oil to the 1,000. As the season advances they get better, and sell for \$3 in the fall, and yield some as high as 18 gallons of oil per 1,000.

In making the oil the first are put in large tanks, and boiled with free steam; the oil and water are drawn off, and the residuum is pressed. This gives more oil of an inferior grade. The pumace is sold as fish guano for \$20 per tun. It is an excellent fertilizer, and very generally used by the farmers of this section. It is also bought by manure-makers in New York and elsewhere, and mixed with phosphates, bone, and other less valuable matters. We think that mixed with a small quantity of ashes and a greater proportion of cotton-seed cake, it would make a first-class manure for the South. One manufacturer told me that he had made this year 1,800 tons of this pumace. A great deal of it is now shipped South, and on Shelter Island there is a fertilizer factory which mixed it with Charleston phosphates.

Greenport is rather the headquarters of this fish and oil interest, and a large number of the factories are on Shelter Island opposite that place. The old frigate *Falcon* was some time ago purchased, and has been fitted up as a floating factory. The steamer *Algonquin* has lately been purchased for the same purpose. The object in having these floating factories is two-fold: if the run of fish is bad in one locality they can move; again, the smell from them is none of the pleasantest, and hence the inhabitants around the stationary factories frequently complain. That being the case near a floating factory they "up anchors" and move out of the way of injunctions.

This oil, the manufacture of which has become such a great interest to this end of Long Island, if well made, is a clear, bright-lemon color, sweet, and with but little fish smell or taste. Such oil, however, is rare, and sells at much higher figures than the ordinary grades—usual price 55 cents and 60 cents per gallon. There is, however, a great deal of very good oil made of a dark-lemon color, and from that to red. It is chiefly used for adulterating other oils and for manufacturing various patent or special lubricating oils. As an adulterant it is principally used in whale and tanner's oils. Well made it sometimes goes into low grade sperm. It has been put in linseed oil, but the cheat is there too easily detected, by simply dropping a little of the adulterated oil on hot iron.

It is one of the singular facts of our life experience, that wherever one of Nature's supplies becomes scarce, she raises up another to take its place. This fish interest is every year increasing, and we thought there might be a chance that all the little bunkers would be caught up, but some of the old fishermen told us they were more plenty than ever.

From these facts it will be seen that this business is one of considerable importance, and employs not only a large capital but many men. Greenport is the great seat of this industry, and every inhabitant is in some way interested in it. For the accommodation of the vessels engaged in it the United States Government has just ordered the erection of an iron lighthouse on the point of Shelter Island, just at the entrance of Peconic Bay. Both Great and Little Peconic and Gardiner's Bays are beautiful sheets of water, and much resorted to by yachtsmen in summer. Every island and spot of the shore is hallowed by reminiscences of our early settlers, and wild traditions of the Indian aborigines.

H. E. C.

[For the Scientific American.]

**WHAT CAUSES AURORA BOREALIS?**

BY DANIEL KNODE WINNER.

In a recent letter, Mr. Proctor, F. R. A. S., remarks that "there is no generally received theory of the aurora." This, when we take into consideration the number of theories which have been proposed, is remarkable indeed.

A review of them indicates that there has been no lack of careful observations of the phenomena, and that very many of them have been correctly interpreted; and yet no theory is found adequate to meet all the requirements of the case.

Professor Loomis suggested that the light is produced by a current of electricity which flows outward from the equator of the earth, and inward at its poles; and Mr. J. E. Hendricks attributes it to a similar current of ether or air; and, although both are correct, they fail to give us an explanation of the way in which these currents cause the diversified phenomena.

In a recent number of the SCIENTIFIC AMERICAN, Professor Van der Weyde has demonstrated that interplanetary space is filled with a ponderable, but exceedingly rarefied medium. This, too, is certainly an important step toward a correct interpretation of the phenomena in question.

Why is it, then, that we are still left without the long-sought-for theory that will explain all the facts connected with the Northern Light?

I think the reason is that heretofore we have failed to recognize a number of well-established facts in regard to the nature of the forces—electricity, heat, and light. Believing this to be so, I determined to bring together all known facts relating to these forces, now generally believed to be correlated—and as the learned Tyndall has shown, but modes of

motion—and having them before me to see if we should not learn more concerning their nature. With what success my labors have been rewarded, the scientific world will decide.

I am happy to say that one of the results which this letter is intended to present to the readers of the SCIENTIFIC AMERICAN, is a full explanation of the way in which electricity produces the diversified phenomena of Aurora Borealis.

Many established facts connected with the movement of electricity, heat, and light, have satisfied me that they are but one force, which is simply motion, undulating and progressive; and that the difference between them consists in the length and rapidity of their wavelets. I find, too, that force changes from waves of one length to another, and that the change results from the nature of the medium through which it is passing. The waves of electricity are shortest, those of heat longer, and those of light the longest, adapting them to the larger sizes of the molecules in a rarefied medium.

Let us now notice the changes in motion, as it passes from the sun to the earth. It exists in the body of the sun as electricity; in passing through the photosphere, owing to its insufficient conducting capacity, but a small portion retains its original form, and the excess is changed to waves of heat-length (this accounts for the heated condition of the photosphere of the sun), then, entering the rarefied medium which fills interplanetary space, it is changed to swifter and longer undulations, and in the form of light passes through space to the earth's atmosphere; there the resistance of air retards its waves to the form of heat, in proportion to the density, and passing to the earth, the force is changed (both light and heat) to the original form, electricity.

Now, I think we can explain the cause of auroral light. The currents flowing outward from the equator of the earth and inward to its poles, must increase motion in the molecules of the rarefied medium in the elevated region through which it passes; then, the property of diffusion, which force manifests, causes a flow to the surrounding molecules of atmosphere and to the earth. Now motion in that elevated region can only exist as light, and is the Aurora Borealis. But it must be remembered that it cannot be seen as luminous aurora until it enters the earth's shadow.

The upper edge of the dark bank beneath the luminous arch, in brilliant displays, marks the line along which the change from light to heat-length waves occur.

It may be said that the flow of the equatorial current being regular we should have aurora constantly. I reply that this is certainly true; but not in such quantity as to be visible, only at such times as there is more than ordinary flow of motion from the sun to the earth, which would correspondingly increase the equatorial flow of force. [The words motion and force are synonymous.] And it is the corresponding increase of the current inward at the poles of the earth that causes the agitation of the magnetic needle. Now, from this we may readily see the reason why the records of observations show a coincidence of the maxima and minima periods of sun spots, aurora, and magnetic storms.

When the auroral region is quiet, we have displays of steady light, but when disturbed by winds, or the inflowing current of air, there are dark spaces, by interruption of the flow of force, gently moving beams, or waving currents, while the grandeur is increased by reflection from masses of vapor always present during the displays.

Thus we see that the phenomena of Aurora Borealis are the results of the movement of electricity, heat, and light—the three forms of cosmical force.

Toronto, Ontario.

**Manufacture of Buttons.**

The first manufacturer of buttons in this country was Samuel Williston. While he was dragging along as a country storekeeper—his eyes having failed him while studying for the ministry—his wife bethought her that she could cover by hand the wooden buttons of the time, and thus earn an honest penny. From this the couple advanced in their ambition until they had perfected machinery for covering buttons; the first employed for the purpose in this country. From this sprang an immense factory, and then others, until Samuel Williston made half the buttons of the world. His factories are still running at Easthampton, coining wealth for the proprietors, and known to every dealer in buttons the world over. He is now between seventy and eighty years of age, is worth five or six millions, and has given \$100,000 to Easthampton for a seminary and for churches, \$200,000 to South Hadley Female Seminary, and \$200,000 to Amherst College, besides lesser gifts.

**BEET-ROOT SUGAR IN CALIFORNIA.**—The *News Letter* says: "No one article in all the notices of the California Beet Sugar Company begins to do the affair justice. We publish a few facts to correct the bungling misstatements made in the dailies during the past week. Two hundred and fifty barrels of A-1 sugar stands credited to shipment No. 1, with many more ready at mill to end over, and beets enough on hand to make two thousand barrels first-class sugar, besides second-class, sirups, etc. The mill, when running to its full capacity, will work fifty tons of beets per day: they are now running through about forty tons every twenty-four hours. They have one hundred head of cattle under cover to fatten on the pulp. The managers met with no difficulties in reaching the result they have, the parties engaged in the affair knowing their business. They owe no one, and, so far as we can learn, there is no stock for sale, except at a premium."

THE publishers of the *Shipping List*, contemplating a change in the mechanical department of their paper, offer their press, engine, etc., for sale. See advertisement in another column.