now, the sight of an old, six inch, worm-eaten cork brings fragrant memories.

The whole group of hæmulons was thus brought in review; and, whether engaged upon the dissection of the internal organs, the preparation and examination of the bony framework, or the description of the various parts, Agassiz' training in the method of observing facts and their orderly arrangement was ever accompanied by the urgent exhortation not to be content with them.

"Facts are stupid things," he would say, "until brought into connection with some general law."

At the end of eight months, it was almost with reluctance that I left these friends and turned to insects; but what I had gained by this outside experience has been of greater value than years of later investigation in my favorite groups.—*Every Saturday.*

Correspondence.

The Screw Propeller.

To the Editor of the Scientific American:

Having been intimately connected with the introduction of screw propulsion in the United States, the biographical notice of Sir Francis Pettit Smith, in your issue of March 7, 1874, induces me to present the following statement:

Francis P. Smith obtained a patent in England, dated May 31, 1836, for a propeller consisting of a continuous screw, formed and applied as shown by the engraving which accompanies your biographical sketch referred to. John Ericsson obtained a patent in England, dated July 13, 1836, for a propeller consisting of several blades or segments of a screw, the twist of which was determined in accordance with the principle now universally adopted in the construction of screw propellers.

That Ericsson carried his invention into practice immediately after having obtained a patent in England will be seen from the following notice in the London *Mechanics' Magazine*, June 3, 1837, vol. xxvii., p. 130, relating to the screw steamer Francis B. Ogden;

"*Captain Ericsson's New Propeller.*—The American packet ship Toronto, of 630 tuns burden, and drawing 14 feet 6 inches water, was on Saturday last towed down the Thames at the rate of full 4½ knots an hour, against wind and tide, by an experimental steamboat called the Francis B. Ogden. We subjoin a copy, with which we were favored, of the certificate given by the pilot and mate of the Toronto, of the performance of the Francis B. Ogden on this occasion:

"'Packet ship Toronto, in the Thames, May 28, 1837:

"'We feel pleasure in certifying that your experimental steamboat, the Francis B. Ogden, has this morning towed our ship at the rate of 4½ knots an hour through the water, and against the tide.

(Signed) "E. Nashby, Pilot.
"H. R. Hovey, Mate.

"To Captain Ericsson."

Bennett Woodcroft, in his celebrated work on steam navigation, published in London, 1848, thus notices the Robert F. Stockton, the second vessel built in England propelled by Ericsson's screw propeller:

"On the 7th of July, 1838, a new iron vessel, built by Messrs. Laird & Co., of Birkenhead, and fitted with a screw propeller, was launched into the Mersey. This vessel was constructed for Captain Stockton, of the American navy, who has been already mentioned, and consequently received the name of Robert F. Stockton. To the kindness of Mr. John Laird I am indebted for the drawing of this vessel, as she was rigged for her first voyage across the Atlantic; and from one of the scientific journals already quoted the following particulars: Several experiments have been made with her (the Robert F. Stockton), the results of which appear very satisfactory, both in relation to the application of the propellers to inland and to ocean navigation; and these experiments derive additional weight from the fact of their having been performed and approved of in Liverpool, the great emporium of shipping and commerce.

"The Robert F. Stockton left England for the United States in the beginning of April, 1839, under the command of Captain Crane, of the American merchant service, a most intrepid sailor. His crew consisted of four men and a boy

"Captain Crane made a forty days' passage, under sail only; and for his daring in thus crossing the Atlantic in this small vessel, he was presented with the freedom of the city of New York.

"Prior to Captain Ericsson leaving this country for America, he had built, for Mr. John Thomas Woodhouse, an iron screw propeller vessel to run as a passenger boat on the Ashby de la Zouch canal.

"She was named the Enterprize; her length is about 70 feet, beam 7 feet, and her engines about 14 horse power; her speed, where the water is wide and deep, is from 9 to 10 miles an hour.

"She was delivered and commenced to run on that canal in the middle of the month of August, 1839; and having run during a season without being profitable, she was then used as a steam tug on the Trent and Mersey, for a certain coal traffic, with great success."

Mr. Woodcroft adds (see p. 102 of the work referred to): "It will thus be seen that Captain Ericsson accomplished for the screw propeller in America and in England what Fulton did for the paddle wheel in the former and Bell in the latter country, namely, its practical introduction."

The history of the introduction of steam navigation in the United States shows that, several years before screw propulsion had assumed any commercial importance in England, the carrying trade on our lakes was, to a great extent, conducted by screw vessels. Already in 1843, the Errcsson line of screw steamers was in full operation between Philadelphia and Baltimore, running through the Delaware and Chesapeake canal, seriously damaging the freight business of the Philadelphia and Baltimore Railroad Company.

Permit me to add that the sum which you mention in your biographical notice, as having been awarded to Sir Francis P. Smith, was paid at a recent period, and divided, in various proportions, among several (I believe seven) patentees who had in the meantime obtained patents for modifications of detail which the Admiralty desired to avail itself of. It is scarcely necessary to mention that Captain Ericsson received a fraction of the sum paid by the British Government.

C. H. DELAMATER.

New York city.

The Attraction of the Sun and the Earth.

To the Editor of the Scientific American:

It appears that some of your correspondents are still in doubt about the exactness of the data in regard to the size and density of the sun and earth, and their consequent relative attractions, as established by astronomy. I made some remarks on this subject in your issue of February 7 (page 84, current volume) wherein I pointed out the impracticability of the proposition of Mr. Slaughter, who wished to find by the balance how much a few tuns weight would increase or diminish in gravity at certain hours, and I mentioned Herschel's method of illustrating the variation of terrestrial attraction from the equator to the poles by a spring balance. After this communication, a correspondent (Captain Ericsson) communicates that he has constructed an apparatus for measuring these changes, consisting of a heavy iron globe floating in mercury, and Mr. Slaughter now proposes a spring balance with a mirror attached. In regard to the first contrivance, I must remark that a floating object is identical with a lever scale, as the liquid balances the floating body, and any change in the gravitation will equally affect both; so that such an apparatus would show no change whatsoever, even when transported to the moon or to Jupiter. It is, therefore, not in the least surprising that Captain Ericsson, according to his own showing, had no results. In regard to a spring balance with a mirror, this might show differences of attraction, but could not possibly be delicate and reliable enough for purposes of measurement, being affected so strongly by other causes as to be unfit for such delicate measurements as the minute changes in gravitation in question.

The best method is with the pendulum, by watching the changes in the periods of its oscillations at different hours of the day and night; but with what standard can we compare it, as all pendulums will be equally affected? Fortunately we have an equivalent instrument, of which the oscillations are not affected by gravity, and which is thus independent of changes in the same. I refer to a good, well compensated chronometer, in which the mass of the balance wheel and the elasticity of the spiral spring are substituted for the weight of the pendulum and its gravitating tendency. If therefore a criterion of the solar and lunar attraction is judged desirable, all we have to do is to compare the oscillations of the pendulum of a regulator with those of the balance of a chronometer, at different hours of the day and night. At those hours when gravitation is less by solar or lunar attraction, that is, when the sun or the moon crosses the meridian, the pendulum clock must be found to move more slowly, making the seconds longer, going behind the chronometer, and indicating less than 3,600 seconds for the hour as recorded by the chronometer. When the sun or moon is in the meridian of the antipodes, the opposite effect must be observed. These results differ from the ocean tides, which rise equally at the two periods.

I intend making these observations shortly on an astronomical pendulum clock driven by electricity, of which the weight attached to the pendulum is unusually large. I will communicate the results, if any are obtained worthy of notice.

P. H. VANDER WEYDE.

New York city.

Calming the Sea by Means of Oil.

To the Editor of the Scientific American:

The communication on page 212 of the current volume of your journal interested me very much. I have read of a whale ship in distress being lightened of a part of her cargo of oil by pouring it overboard, and the sea, for some distance around the vessel, became comparatively smooth. The writer when a boy, living on a farm in Vermont, remembers that, in making maple sugar (by boiling the sap in deep cast iron kettles, as the custom then was), we had a small piece of fat pork, held in the end of a stick; and whenever the sirup foamed and would be in danger of boiling over, we dipped the pork in the sirup, and the foaming would cease instantly. Some years ago we owned a small hoisting engine that we could do no work with on account of foaming in the boiler. By advice of a boiler maker we forced a small quantity of lard oil in it and the cure was complete. It was only necessary to force in about two tablespoonfuls once or twice a day to keep things perfectly quiet inside.

Hartford, Conn. JOHN MCCLAY.

The Electro-Capillary Machine.

To the Editor of the Scientific American:

La Nature erroneously describes this motor, illustrated on page 195 of your current volume, as a French invention. The original description of the machine may be found in *Puggendorff's Annalen*, 1873, vol. 149, pp. 546 to 561. The machine was invented by Gabriel Lippmann, student in the laboratory at Heidelberg; and it was built by the instrument maker Jung, at Heidelberg.

This very interesting machine works economically with feeble currents. It ran once continuously five days and nights by the current of one single Daniell. The power of any electro-capillary motor is independent of its volume, being proportional to the variation of the surface of contact of the two liquids. If S be the variation of the surface (in square meters) of contact under one Daniell, then the work of the machine will be (S÷100) kilogrammeters for each stroke.

Iowa City, Iowa. G. HINRICHS.

The Beech Blight.

To the Editor of the Scientific American:

In your issue of March 28, Mr. Jacob Stauffer calls attention to an article in the *Science Record* for 1874, on the blight recently observed on beech trees in Westphalia, and states that he had noticed the same thing as early as the summer of 1857. I can go farther back still. In the fall of 1838, I noticed the same white cotton-looking insect on beech trees in Lapeer county, Mich., presenting the wavy undulating motion mentioned by your correspondent. I asked one of the native Indians, who was present at the time, what they were; and he said that they were called "*me mes.*"

New York city. EDWIN LEACH.

The Emerald Mines of Muzo.

Within four days' journey from Bogota, a French company has been enjoying a monopoly for the last ten years of all the emeralds found in the neighboring mines, and indeed of all the emeralds found in Columbia. The lease expires shortly, and the government think they can get better terms in the open market for a fresh contract, than by granting a renewal to the present leaseholders. The annual payment now is 14,700 dollars, for which the government bound themselves to prohibit the working of any other mines, existing in the territory of the Union.

The mines were known and worked long before the discovery of America and the conquest of New Granada by the Spaniards. When an expedition arrived in that part of the country, about 1553, to reduce the tribe Los Muzos to the Spanish rule, these Indians were found to possess a large quantity of emeralds. It is, however, not easy to see how they worked the mines, as they had no tools of iron it is supposed that they found the stones in the beds of the mountain torrents; for it sometimes occurs that the winter rains produce great landslides which lay bare large veins of emeralds, in which they are washed out by the waters. But report speaks unfavorably of the quality of these gems; they resemble those which are still found in the Indian burial places, or in the lakes into which the Indians used to throw their relics during their struggle with the Spaniards. Let, however, this be as it may, the mines of Muzo were worked soon after the arrival of the Spaniards on a large scale, both in the open air and by means of subterranean galleries; but about the middle of the eighteenth century, the mines were abandoned no one knows why. And it was not until the war of independence and the expulsion of the Spaniards that working operations were again resumed. The mines were naturally taken possession of by the Republic, and let out to individuals and companies.

The principal mine now in work is pierced in every direction by galleries made by the Spaniards. Since 1825 it has been worked in the open air. An immense nnmber of gems have been found, many of them of great value. After this mine shall have been exhausted, which will not be for many years, not a thousandth part of the ground containing emeralds will have been touched.

About two days' journey from Muzo there is another mine called Lasquez, which was just touched by the Spaniards, and is evidently very rich. All this ground, including Lasquez, bears traces of the presence of the Spaniards; and as the geological formation is the same in the whole neighborhood, it is clear that the day is far distant before these mountains will be exhausted.

The mountains of Muzo belong to the lower formation of chalk. The emeralds are found in two distinct layers; the first or upper one composed of a calcareous bitumen, but hard and compact. These two layers are generaliy separated from each other by a distance of from seventeen to twenty-two yards. In the open layers are found the veins which yield the "nests" of emeralds—that is to say, a number of these gems massed together. But after one of these nests the vein disappears, being crossed by others of a different kind, which run in a different direction to those containing the emeralds. These latter veins are called "ceniceros" from their ashy color; they are generally horizontal, while the emerald veins are perpendicular. They all run from N.E. to S.W. The veins of the lower layer are more regular, and are followed for fifty or sixty yards, and even more. "Nests" of emeralds are seldom found in them, but they are more easy of extraction. When veins of fluor spar, well crystallized, are met with, the emerald is not far off; the presence of rock crystal is also a good sign, as likewise that of a pretty pyramidally shaped stone, of the color of honey.—*Iron.*

IT is hardly possible to introduce successfully an improvement in machinery of any class without the aid of a good engraving. It not only serves to show at a glance the valuable features of the machine, more effectually than the longest verbal description can do, but it also constitutes the very best method of advertising an invention, its attractive appearance securing the attention of the reader, while a column of reading matter, without illustration, might be overlooked.—*National Car Builder.*