The elephant, of all other wild animals transported by steamer, are confined in the strongest kind of boxes, and the boxes themselves are secured in the firmest manner. In a storm the lions, tigers, and hyenas prove the greatest cowards. They also suffer a great deal from seasickness, and whine about it. The elephant utters few sounds when he is seasick, but he sways his great head from side to side, and looks "unutterable things." The horse is the most nervous and sensitive animal that goes to sea, and a hen shows the most utter disgust with life when seasick, by vomiting and eccentric movements.

THE CALAMAR.

Besides the different varieties of sepia the calamar, *Loligo vulgaris*, is the most remarkable member of the family of Decapoda. The fleshy, naked cylindrical body is somewhat elongated and conically pointed toward the back. The two fins are united on the back and impart to the animal the form of the point of an arrow. In the back is contained a flexible horny shield. The first pair of arms is shortest, next follows the fourth, then the second and third pairs. The additional two grasping arms, peculiar to all decapoda, are nearly twice as long as the body; and their thickened ends are lined with four rows of sucking disks. The predominating color of the calamar is a brilliant carmine red.

The calamar is very common throughout the Mediterranean and on the coasts of the Atlantic, and especially during the fall numerous swarms are met with, counting many thousand individuals. Sometimes large numbers are caught in the nets prepared for catching large fish.

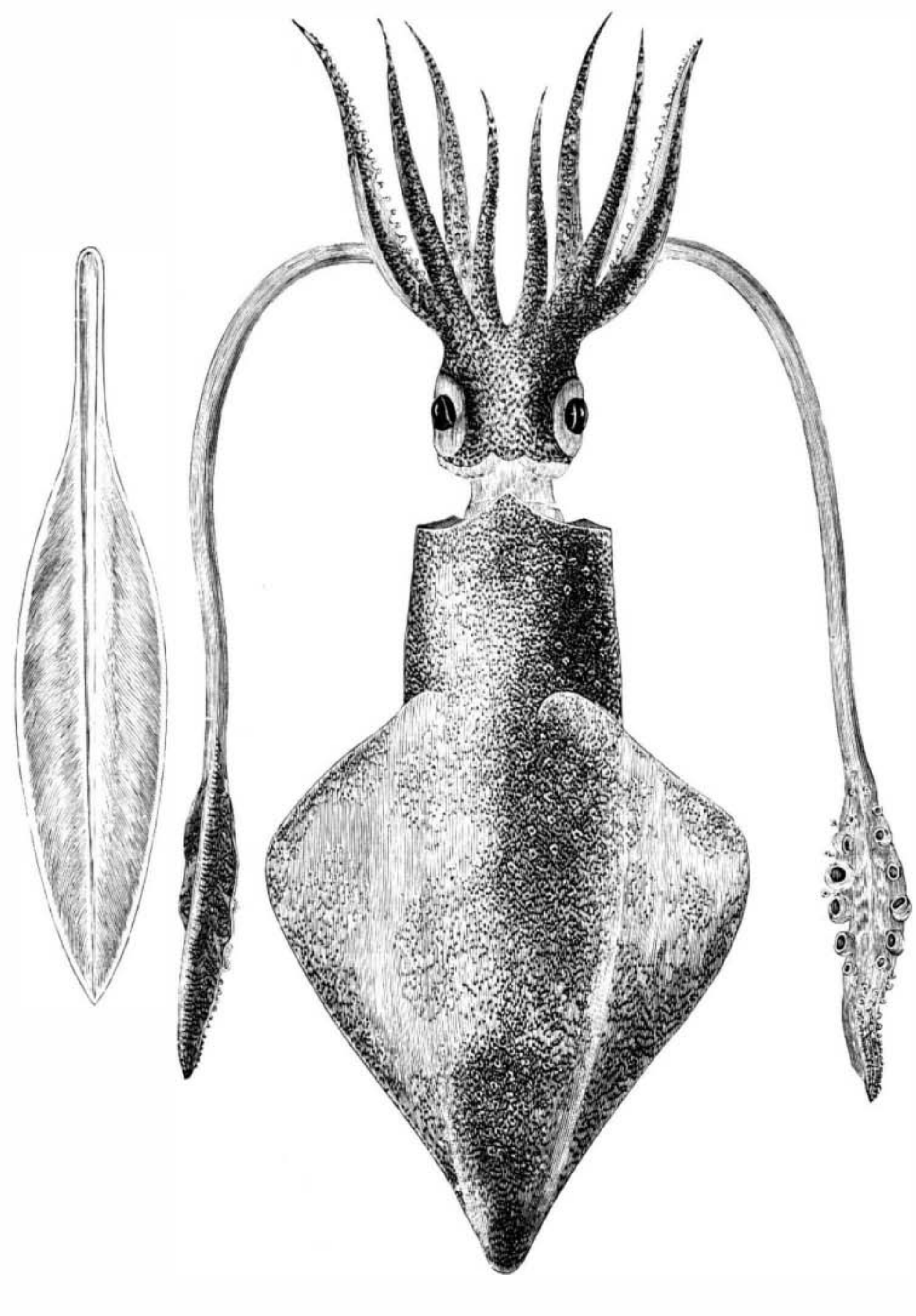
The wanderings of the calamar depend upon those of swarms of numerous small fish which form its nourishment.

The weight of the calamar frequently reaches twenty-pounds; individuals weighing more are occasionally found, sometimes reaching a length of two feet and a half. The mean length is about eight inches.

During his sojourn at Naples Brehm had ample opportunity to study the habits of the calamar in the aquarium as well as in the sea, and states that the animal's habits are quite unlike those of the sepia. On several occasions from ten to sixteen individuals were placed in the tanks of the aquarium, but they invariably died in a short time, having spent their few days of imprisonment in continuous monotonous motion.

While the octopus and sepia are easily acclimatized in the aquarium and propagate themselves, the calamar seldom lives over two days in imprisonment.

Like the octopus and sepia, the calamar forms one of the principal articles of diet of the inhabitants of Italian seaports. In Naples, and in fact all the cities and villages situated on the coast, they are offered for sale in the public markets. The animals of medium size are preferred, as their meat generally has the most agreeable taste. When injured or excited, the calamar changes its beautiful red color and turns successively violet, green, and yellow, which gradually changes again into crimson. This behavior the Naples fishermen make use of to demonstrate the freshness of their fish to their customers. The calamar is not killed, but left to die gradually while being exposed for sale. When a customer calls, a small incision is made in one of the arms; the animal changes its color immediately, and the customer is satisfied.



THE CALAMAR.

Notes on the Apple Worm.

Mr. J. Savage, of Lawrence, Kansas, in a recent number of Colman's "Rural World," remarks upon the freedom of Michigan apples from the work of the apple worm (*Carpocapsa pomonella*). This same freedom was generally noticed in 1878, not only in Michigan, but in many parts of New York, and it doubtless obtained elsewhere. It will be well for us to endeavor to arrive at the reasons. To my mind the following, first stated by me in the New York *Tribune*, may very properly be urged: 1. The very general failure of the apple crop in 1877, as exemplified in the report for that year which we find both in the Proceedings of the Michigan Pomological Society and in those of the American Pomological Society. This failure was in many localities so nearly total that scarcely any apples were grown, and it follows, as a consequence, that very few codlingmoths were produced to perpetuate the species the following year. A second reason, so far as Michigan is concerned, may be found in the fact that in no State in the Union have more intelligent and persevering efforts been made to prevent its ravages. Through the columns of the agricultural and horticultural journals, as well as in the pages of their Pomological Transactions, the simple methods of fighting this pest, that have been reported and recommended in the Missouri Reports, have been persistently kept before the people, while Professor Beal, of the Agricultural College, has, perhaps, done more good than any one else by showing that it cost him no more than 4 cents per tree to keep the bands around the trunks, changing them every nine days in the warm months, from the first appearance of the worm until the end of August, in an orchard of 250 trees. I agree with him when he asserts that "if a man will not take the trouble to keep his fruit from the worms he deserves to eat wormy apples."

Missouri apple growers should take courage from these facts. Since my connection with the Department of Agriculture there have been sent to me four different kinds of patent bandages to be used as traps for this apple worm, but I can find no advantage in any of them over the simple paper bandages, first recommended by me in 1872 and since very generally employed.—*Professor C. V. Riley, before the late annual meeting of the Missouri State Hort. Soc.*

Powder Barrel Boring Insects.

Captain McGinnis, U. S. A., has recently communicated to the editors of the *American Naturalist* specimens of an insect (probably *Callidium variabile*) which have been found to injure the hickory hoops of the powder barrels in the St. Louis Powder Depot. So injurious has this gnat proved that no inconsiderable sum is now annually spent by the Government in re-coopering barrels in order to make good the damage thus done. Means have been taken to prevent the further ravages of the insect.

Tucker and Avery's Anti-friction Journal Bearing.

This invention was erroneously described in our issue of May 3 as Avery's anti-friction journal bearing, whereas it should have received the above title.

Mr. Avery states that it was the suggestion in the SCIENTIFIC AMERICAN of the necessity of such an invention that led him to invest in it, and that it was not invented at the suggestion of the SCIENTIFIC AMERICAN, as stated in the article referred to.

The Cotton Worm.

One of the most valuable papers read before the recent session of the National Academy of Sciences was that by Prof. C. V. Riley on the hibernations and migrations of *Aletia argillacea*, the parent of the cotton worm which has for years devastated the cotton fields of our Southern States. Professor Riley says that this foe to agriculture has received but little intelligent study, and that this is somewhat surprising considering the great losses suffered from its ravages. A careful examination of these losses, which he has lately been making from the most reliable published statements and from the returns of numerous correspondents, shows that this one insect alone, during a year when it is generally prevalent, may injure the crop to the amount of $30,000,000, and that the average actual annual loss during the fourteen years since the war has been about $15,000,000. There is good evidence, also, to show that its injuries were equally severe before the war.

The use of Paris green, recommended by Professor Riley in 1873, has, he says, partially protected the crop, but the use of arsenical preparations is too expensive and unsafe to afford general protection.

Among the other difficulties in the way of efficient protection is the lack of sufficient knowledge of the habits of the foe to be encountered. Regarding the hibernation of the species three theories are worthy of consideration. (1) That it hibernates in the chrysalis state; (2) that it hibernates as a moth; (3) that it hibernates only exceptionally in any of our cotton growing States, but comes into them on the wing from warmer climates where the cotton plant is perennial. . . .

At first blush it would seem easy enough to dispel whichever of these theories is erroneous, and settle the question under consideration by a few simple facts of observation. The trouble, however, is to get at the facts.

After detailing the observations relied on to support the various theories enumerated, Professor Riley rejects the first, and is unable to choose between the last two. He says:

"Regarding the migrating powers of the moth there is abundant and satisfactory evidence. The last brood of moths, appearing late in autumn, are especially apt to migrate beyond the cotton belt, and consequently far beyond the region where they can perpetuate their species, if, as all the facts indicate, it can live upon no other plant than *gossypium*. I have received the moths taken as far north as Racine, Wis., where they occurred in such numbers as to ruin acres of cantelopes by puncturing them with the proboscis and sucking the juices. Similarly the moth has been found on the Atlantic coast, hundreds of miles away from the nearest cotton plant. This power of extended migration being therefore proved and admitted, it is but natural to conclude that the insect comes each year from some country where the cotton plant is perennial, as, for instance, the Bahamas; and there are other facts which lead to this view. . . .

"To sum up our present knowledge bearing upon the subject, it is safe to conclude that the insect does not hibernate in the chrysalis state. The evidence would also seem to militate against the possibility of hibernation even in the moth state. Yet there are so many well attested cases of the moth being seen flying during mild winter weather that the question cannot by any means be considered as settled."

English Saddle Horses.

The requisite qualifications of an English lady's saddle horse, according to the *Agricultural Gazette*, London, are as follows: Here all the caprice of fashion and the weight of the breeder's intelligence are concentrated. The great aim being to secure an animal light in the hand, springy in his paces, with that due proportion of bone and sinew which will bear wear and tear, because ladies, once up, unless thorough horsewomen, think, "Oh, he is a horse, and he must go!" I can almost challenge the seller on the point whether the horse has carried a lady by observing the unequal wear of the forelegs. The near leg in cantering bearing all the concussion, is often very looped, if not archy, in comparison. In this class of horse length of limb and pastern joint is desirable—long pasterns, good knees, deep shoulders, deep, blood like quarters, the feet sound, hoof dark colored.

Hydraulic Gold Mining in California.

During a recent visit to this city, one of the largest hydraulic miners of California, Mr. John H. Thomas, explained quite fully the methods and prospects of the hydraulic and drift mining enterprises of that State. The business he pronounced in its infancy, though it had already yielded something like $300,000,000. "There are yet square miles of unexplored gravel, and of the gravel beds actually explored, tunneled, drifted, and opened, not one-twentieth have been worked. The Union, a drift mine, averaged over $40,000 per acre. The Down East, also drift, got over $300,000 from six acres." "This," continued Mr. Thomas, to a *Tribune* reporter, "has been about the average of our drift mines, which, working only three or four feet of the gravel nearest the bed rock, got from $2 to $13 per cubic yard, at an average expense, including improvements, of about 25 per cent of the product, when paying $3 to $4 a day for miners. Our hydraulic mines show averages of 12 cents to 60 cents a cubic yard, and there are from 10,000 to 200,000 cubic yards per acre; an average in the main channel of 80,000 to 100,000 cubic yards an acre. An inch of water, about 2,000 cubic feet, with head of 100 to 200 feet, will wash from 3 to 4 cubic yards a day, and costs from 2 cents to 10 cents an inch."

In an interview with a writer for the *American Exchange*, Mr. Thomas described at greater length the geology of the gravel beds, and the manner in which they are gleaned of their stores of precious metal.

Feather, Nelson, Slate, and Onion Valley creeks and the Yubas, all head in a group in a ridge whose peaks are called Washington Hill, Pilot Peak, Mount Fillmore, Table Rock, Grizzly Mount, and others. All these are within a region of twenty miles square in Plumas and Sierra counties, Cal., and are from 6,000 to 7,000 feet high, on the western slope of the Sierra Nevada range. The parallel of latitude running through Virginia City and Gold Hill, Nevada, and through the greatest upheaval of gold and silver veins known, passes through this group of peaks about fifty miles west, and extends to the gold bluffs on the coast, where the western rim of the continent turns back to the northeast and southeast. From this group of peaks a line parallel with the coast runs southeast through the main gold leads of California, and fifty miles further east a second parallel would run through the main gold and silver leads of Nevada, Arizona, and Mexico.

The geological formation and topography of the country seem to point to this ridge between Virginia City and these groups of peaks as the mineral shed or peak of the West—or the point of main upheaval of the precious metal deposits of the Pacific mountain ranges. The main hydraulic and drift mines of California are upon what are known as the Blue, White, and Gray leads. These leads are to all appearances the channels of rivers that in past ages took their head at this group of peaks, and ran southeastward. Alluvial, glacial, and volcanic action filled these channels, first with sand and gravel, then covered them with lava, when the channels seem to have been lifted up, and even mountains tumbled upon them, while the region to the east became the higher part of the Sierras. These had their peaks, and being lower and sloping to the west, the rivers of modern times run westward nearly at right angles, cutting new channels or cañons, and leaving parts of the old channels near the tops of mountains from 200 to 3,000 feet above the beds of the rivers of to-day.

These washings from the old channels, swept down toward the Pacific, formed the deposits in the bars and gulches that enriched the "Forty-niners" and their immediate followers, who, washing up the streams to find the source of the enormous deposits of gold, ran into the mountains looking for quartz veins until at last the old channels were found. The modern deposits in bars and gulches were worked out, and the impression is prevalent abroad that the gold gravel beds of California are exhausted, when the truth is that the real gravel deposits of the State were only lately found, and, large as has been the aggregate yields of gold gravel in California, enough is now known of these old channels to show that only a very small portion of their wealth has been removed.

These three main channels—the Blue, White, and Gray—so named from the prevailing shade of the gravel, starting from the points named, extend southward to the lowlands some seventy-five miles, then on to the ocean, lying in a belt about thirty miles wide. The White and Blue, often running together, are the main channels, and are from 300 to 3,000 feet wide and from 5 to 200 feet deep, averaging from 60 to 80 feet where best defined. These channels or beds meander, are shallow and deep, narrow and wide, like the beds of running rivers, and have banks, shores, or rims of country rock, slate, and granite. These "rims" must generally be pierced with tunnels that strike the bottom of the channels and afford an outlet out of which the gravel can be carried or washed.

The bed or channel itself can only be ascertained—being covered over by mountains, lava, loam, and forests—by tunnels from rim to rim, and shafts from surface to bed rock. When the body of gravel is thus accurately determined, and its average value found by testing all parts exposed, the next thing is to decide on the manner of mining. If the gravel is covered with only a few feet of loam or lava, it can be done by hydraulic power, that is, by a stream of water with a force of 100 to 300 feet fall directed against the bank. If the bed should be covered with too much rock or lava to do this, then it is "drifted"—mined like coal, the gravel carried out and emptied into a sluice or flume, through which water washes it. The third step is to get the necessary water. Very little water is required for drift mining, but for hydraulic a vast quantity and a fall of 100 to 300 feet are necessary. The unit of water measure is a "miner's inch," or the amount of water that will flow in twenty-four hours through a hole one inch square with six inches pressure—about 2,000 cubic feet. For effective work there should be at least 1,500 inches. Each inch of water will move from 3 to 5 cubic yards of gravel per day, and as a mine uses from 1,000 to 5,000 inches, it washes down from 3,000 to 25,000 cubic yards per day. Such a bulk of detritus would soon choke up any ordinary river channel, and equally important to successful hydraulic mining is a free escape of the gravel washed, or a "dump." This provision nature has furnished in some cases, notably near the head of the great leads, in the deep ravines made by the modern rivers, which here fall for long distances at an angle of 45°, and from 500 to 2,500 feet below the beds of gravel washed.

Although these gravel deposits are almost unlimited, it requires large, organized facilities to realize. While a miner with a pick, shovel, and pan or rocker was force and equipment enough for old-fashioned gulch mining, really effective hydraulic or drift mining requires a large working force and an equipment that costs many thousands of dollars. When Mr. Thomas first went to California, twenty years ago, they were just washing out the gulches next to the great leads, and some were drifting into the channels near bedrock, but found the gravel too high; then water was brought in by sluice boxes, and six-inch canvas hose with half inch nozzle, under 75 feet pressure, were thought large affairs. Soon iron pipes were introduced, first six inch, then twelve, and more recently thirty-six, and even forty-four inch pipe, and from a few hundred feet of canvas pipe we have now in one mine nearly 90,000 feet of thirty-six inch iron pipe. With the introduction of iron pipe, the nozzles were gradually enlarged, and the Little Giant, a large cast iron nozzle working on a swivel joint, was introduced.

Craig discovered that by rifling the Little Giant, the jet, instead of whirling and expanding, shot out straight, retaining its full force. Then Hoskins invented the second joint to the Little Giant, which enables the raising or lowering of the nozzle, and under several inventions a nozzle has been perfected, the largest of which can be moved in any direction by a child; one of eight inches, with 200 feet head, capable of moving 3,000 cubic yards per day, being operated by one hand with ease. Thus one man, with perfect ease, moves as much gravel in a day as 1,000 men could with shovels and cars.

But to attain this effectiveness frequently requires vast expenditures. Ditches must be run from ten to sixty-five miles, carrying from 500 to 5,000 inches of water. These ditches cost from $20,000 to over $500,000, and one is now being built by the Pioneer Company that will cost, when completed, $1,250,000. The plans of several companies have cost from $1,000,000 to $2,000,000. The most of these have been completed within the last five or eight years. Hydraulic mining has been carried on in California for twenty years, but the first ten years was mainly used in experimenting and organizing.

Mr. Thomas' operations having been chiefly about the head of the Blue lead, the largest and richest of the gravel beds, he was naturally most inclined to talk about that. This is not only the richest gold region in California, but probably in the world. This district also possesses peculiar advantages for hydraulic mining. The channels being highest there, the heavier particles of gold are found, just as the largest nuggets are the first to sink when the gravel is floated by moving water. The ravines are deeper and the descent more rapid than lower down, enabling us to build a series of grizzlies and undercurrents, through which the gravel is strained and repeatedly washed, until almost every particle of gold is freed and is caught. Undercurrents are merely sluices placed in steps, so that the gravel falls from one to the other. Grizzlies are heavy iron grates which catch the bowlders and through which the gravel is sifted; they are placed at the point where the washings fall into the sluice. The gravel miners were some years in perfecting this system, and now can save fully 30 per cent more gold than in earlier years.

A New Metallic Paint.

Mons. C. M. Jacob, of Paris, obtained a prize medal at the French Exhibition for a metallic paint which, according to our foreign contemporaries, possesses valuable qualities for a variety of purposes. There is no substance, it is claimed, requiring coloring matter to which it is not applicable.

One of the most important features of this invention is its adaptability for capsuling any kind of bottles or jars containing liquids or viands. The colors employed for the various purposes are not confined to any particular shade, and when on, the articles painted with them have all the appearance of different colored bronzes. The liquid paint having been poured into an ordinary utensil, the neck of the bottle, when properly corked, is dipped into it, and removed almost as quickly as in the waxing process; the paint appears to set instantly, is dry in three minutes from the time it is applied, and becomes quite hard in about one hour. It can be branded in the usual manner, the marks being indelible, and the most important effect claimed is that the bottle becomes hermetically sealed, which is not the case with an ordinary capsule. If the properties of this new production are not overrated, it will, no doubt, play a most important part in many other articles.

The National Academy.

The proceedings of the first two days of the annual meeting of the National Academy of Sciences were reported two weeks ago. On the morning of the third day four new members were elected, namely, Professor Cleveland Abbe, of Washington, well known by his meteorological researches and as a mathematician; Dr. Horatio C. Wood, of Philadelphia, an eminent physiologist and botanist; Professor J. W. Gibbs, of Yale College, a distinguished physicist and professor; and W. G. Farlow, of Harvard University, eminent for his scientific researches.

In the afternoon the following papers were read: "On the Stability and Instability of Drainage Lines," by G. K. Gilbert; "On a New Polariscope Method for the Detection and Estimation of Dextro-glucose in Cane Sugar and Inverted Sugar," by Professor C. F. Chandler; "On the Ignition of High-tension Fuses," by General H. L. Abbot; on "Hibernations and Migrations of Aletia Argillacea, the Parent of the Cotton Worm," by Professor C. V. Riley; on "Two New Forms of Micrometer," by Professor E. C. Pickering; "Report on Dredgings in the Caribbean Sea, on the Coast Survey Steamer Blake," by Professor Alexander Agassiz; and on "Physical Hydrography of the Gulf of Maine," by Professor Henry Mitchell.

Professor Agassiz's report of his dredging operations in the Caribbean Sea during the past year was extremely interesting. He had, he said, verified a theory held by him for some time regarding the necessity and utility of deep sea dredging—that almost all the fauna found at the greatest depths by the Challenger expedition are also to be found in a depth of not more than 2,500 fathoms. The work of the Challenger had been confined to dredging at great depths, and occupied about two and a half years, while he, on a small steamer of 350 tons, had been able, in a few months, to make a collection of deep sea fauna second only to that of the Challenger expedition, and approaching near to it in respect to completeness and variety. Professor Agassiz, therefore, concludes that it is not necessary, in order to procure most of the deep sea fauna that frequent great depths, to extend the operations of dredging much beyond 2,500 fathoms, while a great majority of the forms are found much within that limit. Professor Agassiz then discussed the question of a sunken continent once occupying a great share of the area of the present Caribbean Sea, and connecting the West India islands with the coast of Central and South America. He offered some interesting theories respecting the flow of the Gulf Stream and its causes, which differ materially from the explanations usually given.

On the fourth day (April 18) the following papers were read: "The Winds on Mount Washington Compared with the Winds near the Level of the Sea," by Professor Elias Loomis; "On a Mineral Locality in Fairfield County, Conn.," by Professor J. G. Brush; "On the Great Silver Deposits recently Discovered in Colorado, Utah, and Nevada," by Professor J. S. Newberry; "On the Influence of Jupiter upon Bodies Passing near the Planet," by Professor H. A. Newton; "On the Recurrence of Solar Eclipses," by Professor Simon Newcomb; "On Projections of the Sphere which Preserve the Angles," by Professor C. S. Peirce, and "An Account of the Geodetic Arcs Determined by the Coast Survey, in Relation to the Figure of the Earth," by Professsor J. E. Hilgard.

The Velocity of Light.

At the U. S. Naval Academy, Annapolis, Ensign A. A. Michelson has begun (under orders from the Naval Department, and with funds supplied by Mr. A. G. Heminway, of New York) the erection of apparatus for the more accurate determination of the velocity of light. The method to be employed by Ensign Michelson is described as essentially that of Foucault, with the exception that a lens of great focal length and a plane mirror are used instead of a concave mirror. This arrangement permits the use of a considerable distance, giving a longer interval of time, and insuring greater accuracy. The displacement of the image of a slit is the quantity to be measured, and this in Foucault's experiments was a fraction of a millimeter—and the velocity of light could not be determined with any greater accuracy than could this displacement—which would be a fraction of one per cent. In the experiments made at Annapolis by Ensign Michelson the displacement has been increased to over one hundred millimeters. Hence, the error introduced by this measurement would be less than one thousandth of the whole, or less than twenty miles.

Another, though not an essential feature, is the use of a tuning fork, bearing a mirror on one prong and kept in motion by a current of electricity, by means of which the speed of the revolving mirror can be ascertained with the same degree of precision. The mirror is put in motion by a blast of air furnished by a small rotary blower, which is turned by a steam engine. By this means a very steady speed is maintained. The entire apparatus is now nearly complete, and in two or three weeks the observations will be begun.

The President of the British Iron and Steel Institute, Dr. C. W. Siemens, announces that the Council of the Institute have conferred upon Peter Cooper the Bessemer gold medal of 1869, in recognition of his eminent services in the promotion of metallurgical science.