actuating a small pinion. The second is a counter, revolving with greater or less speed according to the resistance to be overcome by the engine, which resistance it records in kilogrammeters or foot pounds, thus constituting a dynamometric indicator, analogous to gas and water meters. A third instrument, the "dynamograph," represents graphically, on an endless band of paper, the variations of the resistance. The first two instruments are easily distinguished in the illustrations. As regards the third, the place of the pencil only is shown at the end of the rack of the dynamometric index, the arrangement of the band of paper varying with the circumstances of each particular case. An ordinary counter is shown in the last two figures.

In order that this appliance may work with precision as governor, its action must be regulated so as to correspond exactly with that of the steam valves of the engine; that is to say, their opening must coincide with the respective positions of the slider, which may be obtained empirically, or better still, by calculation. It is not necessary that all these instruments should work constantly. Thus, in stationary engines, the dynamograph will only be used periodically in the same way as an indicator. On the other hand, for screw engines, there is every reason to cause the work of the engine and the resistance of the propellor to be traced continuously during the whole voyage, so as to retain a true record of the state of the sea. It is always useful for the dynamometric counter to work continuously, whatever be the nature of the motor to which it is applied; it will indicate the total power given out from any given instant, and will permit of comparing the effective force developed with the quantity of fuel consumed. For the determination and checking of the amount of motive power let on hire, this instrument is almost indispensable. The dynamometric index, which gives a constant indication of the resistance, and consequently the strain on the motor, is an excellent guide for the engine man and stoker, enabling them to judge of the quantity of water and fuel required. This index, indeed, records the measure of the work done in any establishment, while an exact reproduction of it in the office, by electrical or mechanical means, constitutes a valuable method of supervision which cannot fail to exert a favorable influence on the production.

### New Factory of the Edison Electric Lamp Company.

The moving of the lamp factory from Menlo Park to East Newark, N. J., affords a fitting occasion for making a brief mention of the history of the Edison Lamp Company.

The manufacture of lamps was commenced at Menlo Park, in November, 1880. Prior to that date a large number of lamps had been made, but the first regular pay roll of the Lamp Company, as an organization distinct from the laboratory and experimental department of the Light Company, was November 11, 1880, which may be taken as the date of the starting of the factory. From that time until April 1, 1882, when moving to Newark was commenced, the factory was running all the time, except about six weeks. The largest number of men employed at any one time was 135, and for the last year there has not been at any time less than 100 hands employed. Up to April 1, 80,000 lamps were shipped, and at that time there were about 50,000 unsold in stock. The reason for moving the factory to East Newark is to secure larger buildings, with increased facilities, also convenient accommodation for workmen, and to be nearer the source of supply for obtaining reliable help. The manufacturing of lamps was begun in the new factory at East Newark on June 1, 1882, and 150 men are now employed. The tools and power now in the factory are adequate for making 1,200 lamps a day, but the factory has an ultimate capacity of 40,000 lamps a day, which will require from 3,000 to 4,000 hands, according to the style of lamps made. The lamp factory has always been managed with unusual skill and intelligence, and all visitors have united in praising the perfection of the system and the economy and precision of the work. The officers of the Edison Light Company are as follows, namely: Thomas A. Edison, president; Francis R. Upton, treasurer; William Holzer, superintendent; and J. J. Bradley, master mechanic.

### Photography of Maps, etc.

The difficulty of copying a map or plan by the photographer to whom such work is only brought at rare intervals, is, it is well known, very difficult, the obtaining a perfectly true rectangular image on the ground glass being most wearisome without the aid of special appliances. One plan recommended for the purpose is to suspend a block that is perfectly square by a piece of string against the center of the picture, any departure of the axis of the lens from a true perpendicular to the plan being shown by one or other side of the square coming into view. We recently saw an improvement upon this method, says the *British Journal of Photography*. A pill box with red lining was suspended, by the aid of a piece of cotton, just over the center of the plan, and the slightest deviation was indicated by the red lining forming a sort of ribbon on the ground glass, which showed the exact direction the plan required to be moved to bring it into proper position.

### Coal Jigging in the Schuylkill Region.

The *Coal Trade Journal* says that the Mahanoy jig house has proved such a success that another near Heckscherville will go up this summer. They will have a capacity of 200 cars per day of pea, buckwheat, and dust coal. In these houses the coal is agitated in water. Slate being the heaviest part drops to the bottom, and the coal is brought out cleaned of this objectionable part. To pick such small sizes of coal would be a tedious and unprofitable job. Under the new process pea coal will receive better treatment than by screening, and its market value will be enhanced. The company propose to treat the coal dirt at the collieries in this way, relieving it of about 18 per cent. of slate. The coal will be used in those engines of the company which are specially adapted to such fuel. The amount of dirt prepared in this way last year at a cost of 5 cents per ton, and in which there remained only 4 per cent of slate, was 60 000 tons, thus saving to the company over $120.000. When the new buildings and machinery made for treating the dirt are completed all stationary engines at the collieries and in the shops and foundries of the company will be supplied with it, and the marketable sizes of coal now used by the company will be sold to the trade.

PHOTO BASS-RELIEFS.

### BASS-RELIEFS BY PHOTOGRAPHY.

Among the interesting industries to which electricity may be applied, is the metallic reproduction of photographs in relief. Some curious specimens were exhibited at the Paris Exposition of Electricity, and our engraving represents six small bass-reliefs in metal obtained from simple photographs.

The process employed by the inventor is one of great simplicity, and differs only from those already known by employing gelatine in liquid form, instead of dry or in paste. An ordinary photographic negative is taken and placed in a printing frame. A rubber tube is put behind the negative, and bent around the edge, and over this a second glass is placed; the frame is then closed as in ordinary printing. The space between the two glasses is rendered tight by the rubber tube, and in this space, opened only on one side, a solution of bichromated gelatine is poured; then the apparatus thus prepared is exposed to an electric light of sufficient intensity. That which was employed at the Exposition was supplied by a small Siemens machine, consuming about three-horse power. A reflector conveniently arranged would certainly have given more complete and rapid results by concentrating a greater number of luminous rays upon the subject experimented upon. When the light has worked upon it sufficiently, the gelatine coagulates in layers or coatings of variable thickness, proportionate to the quantity of light which passes through the negative. The thickness is but little more than two millimeters, and thus a hollow reproduction of the photographic design is made. This hollow gelatine mould having been hardened in a suitable bath, an impression is taken by electrotypy, which will be in bass-relief.

These reliefs may be made much more pronounced by giving to the gelatine mould a slight curvature.

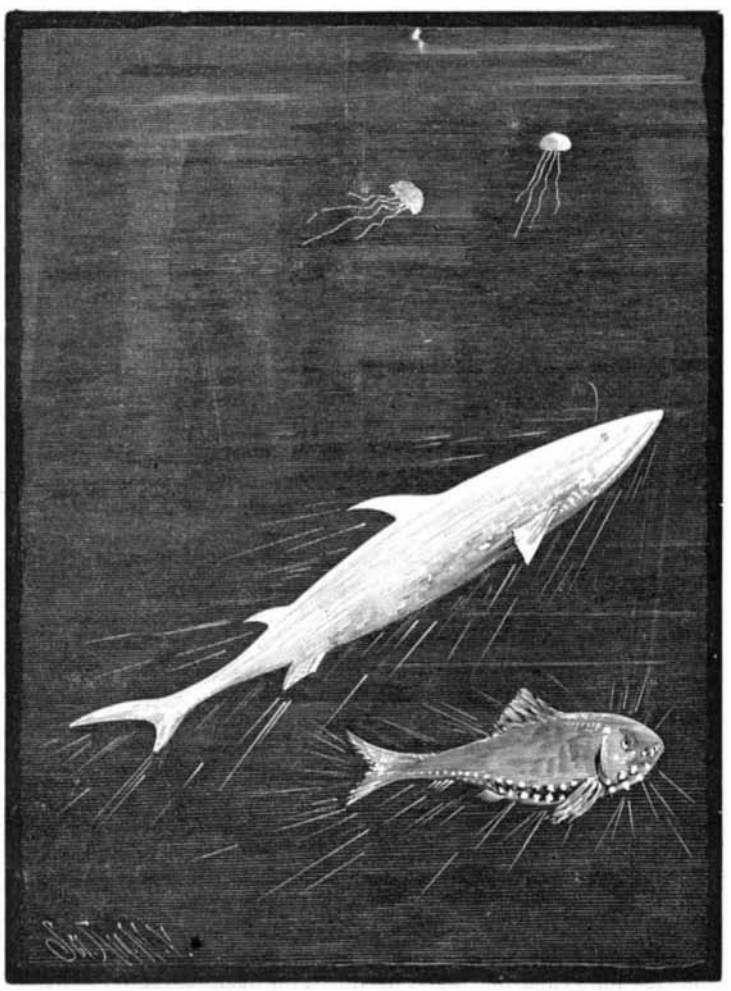
Artistic productions may be obtained by this process at very low prices.—*La Lumière Electrique.*

### A LUMINOUS SHARK.

BY C. F. HOLDER.

Among the later outgrowths of scientific investigation we find the theory of abyssal light, intended to explain the presence of eyes in many of the deep sea forms, their existence supposed to be conditional upon the presence of light in the greater depths of the ocean. The Ascidians and Alcyonarians are well known as wondrous light givers. The form of the former we are most familiar with is the oval ball that seems growing upon a stem, and waves to and fro with the tide like a veritable plant; it is, however, a highly organized animal. Some of the Ascidians are free swimmers, and live in colonies; such is the Pyrosoma, one of the most remarkable of all phosphorescent creatures, as well as one of the largest. In appearance they resemble an elongated empty barrel, about five feet long as a maximum, with one end closed, the other open, a provision that insures movement in a given direction. The means of propulsion seems incomprehensible, but it is easily explained, however, upon an examination of the animal. Each individual in the colony draws in water from the outside and ejects it into the interior, where it finds a common outlet at the open end, the current rushing out forcing the aggregation of Ascidians along in the direction it happens to take. The surface is completely covered with curious filaments that appear to wave to and fro. Such is the general appearance of the creature in the day time, but in the night or abyssmal depths of the ocean it presents an entirely different sight, gleaming and glowing with a wondrous golden light, that penetrates the water for twenty or thirty feet around it, and resembling more than anything else a cylinder at white heat, vibrating waves seeming to pass over it in quick succession, producing many different tints of yellow and gold. As may be surmised, at a distance of one hundred feet or more they resemble worms three or four feet in diameter, of wavy, nebulous matter, the center burning brightly. The appearance of numbers of these wondrous creatures in the water is an extraordinary sight, and looking down into the depths we seem to be looking into space. Every break of the water is the signal for myriads of beautiful creatures to spring into life, as it were, the sea fairly igniting, the minute granules in the depths below sparkling and scintillating in the reflection. Great constellations seem revolving in erratic courses, now rising and falling, meeting each other, the lights intermingling, while smaller phosphorescent jelly fishes, like stars of lesser magnitude, revolve about them, completing the curious scene. The light given out by the Pyrosoma is not confined to the water, but is reflected above it, covering everything with a pale, ghostly light. The sails of vessels are lighted up by it, and cast dark shadows about, while within four or five feet of the animal a newspaper can be read with perfect ease.

But the most curious light-giving forms discovered are the fishes. Among the bony fishes of great depths, the families Scopelids, Sternoptychids, and Stomiatids, have long attracted attention, on account of the rows of bright spots that occur upon their sides, now found to be luminous.



LUMINOUS SHARK (*Squalus fulgens*).—FISH WITH PHOSPHORESCENT SPOTS (*Ichthyococcus ornatus*).

These are found especially upon the fishes *Chauliodus sloani, Stomias boa, Scopelus humboldti*, etc. In the *Ichthyococcus ornatus* and *Scopelus rafinesquii*, they are specially abundant. In one species of the former a large luminous spot occurs upon the front of the head.

The distinguished naturalist of the Challenger expedition, Willemoes-Suhm, now deceased, saw Scopelius phosphorescent in the night, of which he says: "One of them hung in the net like a shining star as it came out of the darkness. Possibly the seat of the light is in the peculiar side organs, and it may be that this phosphorescence is the only source of light in the great depths of the sea."

The thought that in the dark abysses of the deep sea every animal carries its lantern as the miner carries his lamp on his head, is a very fascinating one; and, indeed, Herr Willemoes-Suhm observed several other fishes that were provided on the smooth head and on the head-beard with a "remarkably large sense organ." Valenciennes has also remarked of the genus *Hemiramphus* that it bears a strongly glittering phosphorescent pustule on the tip of its tail.

Among the fishes discovered by the Challenger expedition was the *Echiotoma microdon*, a dark fish from two miles beneath the surface. Below its eyes were two luminous spots; a narrow elongated one above the maxillary, and a small, short organ nearer the eye.

Another species, the *Micripnus*, had long fringed barbels; luminous spots above the maxillary, small and round. This was found on the Australian coast in 2,150 fathoms.

A stomatoid fish, Bathyophis, found over three miles below the surface, had long barbels; small luminous organs above the middle of the upper jaw, and a number of others along each side of the abdomen; also on the tail and outer ventral rays.

In the Ipnops the body was long, covered with cylindrical scales, and devoid of luminous organs. The head was depressed, long, and spatulate, its entire upper surface occupied by a remarkable phosphorescent organ that was longitudinally divided into two symmetrical halves.

The most remarkable light-giving fish, however, is a shark, a species of *Scymnus*, and allied to our morse of the southern coast, discovered by Dr. Bennett in Australian waters. The light in this case was universal. In relation to his find, Dr. Bennett says: "When the larger specimen, taken at night, was removed into a dark apartment, it afforded a very extraordinary spectacle. The entire inferior surface of the body and head emitted a vivid and greenish phosphorescent gleam, imparting to the creature, by its own light, a truly ghastly and terrific appearance. The luminous effect was constant, and not perceptibly increased by agitation or friction. I thought at one time it shone brighter when the fish struggled, but I was not satisfied that such was the fact. When the shark expired (which was not until it had been out of the water more than three hours) the luminous appearance faded entirely from the abdomen, and more gradually from other parts, lingering the longest around the jaws and on the fins.

"The only part of the under surface of the animal which was free from luminosity was the black collar around the throat; and while the inferior surface of the pectoral, anal, and caudal fins shone with splendor, the superior surface (including the upper lobe of the tail fin) was in darkness, as, also were the dorsal fins, back, and summit of the head.

"I am inclined to believe that the luminous power of this shark resides in a peculiar secretion from the skin. It was my first impression that the fish had accidentally contracted some phosphorescent matter from the sea, or from the net in which it was captured, but the most rigid investigation did not confirm this suspicion, while the uniformity with which the luminous gleam occupied certain portions of the body and fins, its performance during life, and decline and cessation upon the approach and occurrence of death, did not leave a doubt in my mind that it was a vital principle, essential to the economy of the animal. The small size of the fins would appear to denote that this fish is not active in swimming; and, since it is highly predaceous, and evidently of nocturnal habits, we may perhaps indulge in the hypothesis that the phosphorescent power it possesses is of use to attract its prey, upon the same principle as the Polynesian Islanders and others employ torches in night fishing."

### Phantom Lights at Sea.

A Fulton Market fish dealer gives the following explanation of some of the strange lights, phantom vessels, and other mysterious appearances that puzzle seamen:

"Two years ago I went menhaden fishing, and one day as we were going up the Sound one of the hands said he hoped we were not going off the Point, meaning Montauk. I asked him why. He seemed kind of offish, but at last let out that he had seen ships sailing about in the dead of night in a dead calm. I laughed at him, but two nights later we came to anchor at Gardiner's Bay, and as it was a hot night we stretched out on deck. In the middle of the night I was awakened by some one giving me a tremendous jerk, and when I found myself on my feet my mate, shaking like a leaf, was pointing over the rail. I looked, and, sure enough, there was a big schooner about an eighth of a mile away, bearing down on us. There wasn't a breath of wind in the bay, but on she came at a ten-knot rate, headed right for us. 'Sing out to the skipper,' I said. 'It's no use,' said my mate, hanging on to me, 'It's no vessel.' But there she was, within a hundred yards of us. Shaking him off, I swung into the rigging, and yelled 'Schooner ahoy!' and shouted to her to bear away, but in a second the white sails were right aboard of us. I yelled to the hands, and made ready to jump, when, like a flash, she disappeared, and the skipper came on deck with all hands and wanted to know if we had the jimjams. I'd have sworn that I had seen the Flying Dutchman but for one thing. We saw the same thing about a week afterward. The light passed around us and went up the bay. I got out the men and seine and followed in the path of the phantom schooner, and as sure as you are alive, we made the biggest single haul of menhaden on record. The light, to my mind, was nothing more or less than the phosphorescence that hovered over the big shoal. The oil from so many millions of fish moving along was enough to produce a light; but you will find men all along the shores of Long Island that believe there is a regular phantom craft that comes in on and off—sort of a coaster in the spirit trade. I saw an account of something like this in the Portland papers some time after, and they thought it was very remarkable; but wherever you find menhaden you may look out for queer lights on the water—phantom ships and the like."

### French Enterprise on the Congo.

The *World's* correspondent at Paris says, in a letter dated June 23, that the French Geographical Society were making a social lion of the French explorer who claims to have stolen a march on Stanley and his Belgian company in Africa. Stanley had found that the Congo was the great waterway of Africa, though unfortunately, owing to the cataracts near its *embouchure*, it was not directly accessible from the coast. It became navigable only at Stanley Pool; but once there traders on the broad river could reach one of the richest regions in the world. How to get to Stanley Pool? Stanley could think of no better way than to cut a road of about 280 kilometers from the coast, parallel with the cataracts. M. Savergnan de Brazza, the Frenchman in question, thought of a much better way. It occurred to him that from the French station at Gaboon he might find some affluent of the Congo floating directly into the pool. He did find such a river, the Alima, which is separated from the Ogoone only by 80 kilometers of land, and the Ogoone is in direct communication with the French possession. It was a question, therefore, of a land journey of 80 kilometers, as against a land journey of 240, or a saving of two-thirds. He said nothing, but stole quietly back to France, obtained the necessary funds from his government, went back again and reached Stanley Pool by the short cut in time to welcome Stanley on his arrival. He had taken possession of it in the name of France, made treaties with the natives, and dealt out French tricolors to them for the decoration of their persons and property as lavishly as if they had been mere orders of the Legion of Honor.

### The Siemens Steel Patents.

By order of the United States Circuit Court, in the suit of the Iron City National Bank of Pittsburg, Pa., against the Siemens-Anderson Steel Company, the interest of the company in the patents of Dr. Charles W. Siemens was sold at auction by the U. S. Marshal, July 6.

The patents are valued at $500,000. They cover the celebrated Siemens patent revolving furnace, gas furnaces, and various processes and methods of making cast steel, together with numerous improvements. Although the sale had been duly advertised, there was only one bidder, and the property was sold to the attorney for the prosecutor for $1. The reason is, that under the laws of Pennsylvania, and a recent decision in the Allegheny County Court, a patent cannot be seized for debt, and nobody thought it worth while to bid. The bank, however, has taken the precaution to go through the form; and if the decision of the lower court is reversed and the sale declared legal, it will find itself in possession of the sole right to the use of the patents in the United States.

### Alcohol from Acorns.

It is said that alcohol equal to that made from grain can be produced from acorns. The acorns are freed from the shell and ground finely; then they are mashed with malt, and allowed to ferment. Acorns contain about 20 per cent of starch, and eighteen per cent of gluten. They would be a valuable article for human food if it were not for the tannic acid (about 3 per cent) which they contain. Vast quantities which go to waste every year, where hogs are not fed in the woods, might be gathered by boys, and converted into alcohol for use in the arts, thus freeing an equivalent amount of grain for use as food. Or some young student of practical chemistry might make a good thing for himself and for the world by devising an economical process of separating the starch, gluten, and tannic acid, the last for technical uses and the others for food.

### Berlin Amber.

Recent discoveries of amber in and near Berlin have been so promisingly large that predictions are made that the region will yet become a competitor of the amber fishing stations along the shores of the Baltic. Near what is called the port, a large deposit has been found, and in the Genthiner-strasse during a single week more than a hundred good-sized pieces were dug up. In the Landgrafer-strasse, in ancient alluvial soil, about twelve feet down, a systematic bed of amber was found. Not far from the city another discovery has also been made. Berlin is known to be built on sand, and considerable surprise is expressed that amber should turn up in it, and especially that its presence should have remained unknown until this late day.

### George W. Hawes.

George W. Hawes, Ph.D., Curator of the National Museum of Washington, died at Colorado Springs, June 23, in the thirty-third year of his age. Dr. Hawes was born in Marion, Ind., of New England parentage, and was educated at Yale College, also studying abroad, and receiving the degree of Ph.D. from the University of Bonn. He devoted himself with zeal and success to that department of geology known as lithology, making original microscopic investigations and publishing many papers in scientific journals. He was engaged on the geological survey of New Hampshire, and was Professor in the Sheffield Scientific School at New Haven. In February, 1881, he was appointed Curator of the National Museum, where he gathered an extensive collection of all the building stones in the United States.

### William S. Vaux.

William S. Vaux, a well-known amateur mineralogist, died at Philadelphia on May 5, in his 71st year. As vice-president of the Academy of Natural Sciences, and of the Numismatic and Antiquarian Society, as president of the Zoological Society, and as treasurer of the American Association for the Advancement of Science, he showed an active interest in the progress of science.

The chief object to which he devoted his ample means was the collection of choice minerals, and as a result of extensive traveling and constant collecting throughout a lifetime, he left one of the finest collections in this country. His cabinet was remarkable for the beauty of the individual specimens, in many cases unsurpassed. He has bequeathed it to the Academy of Natural Sciences of Philadelphia.

### Pre-Indian Relics from Virginia.

Mr. M. S. Valentine, of Richmond, Va., has sent to the Anthropological Institute of London, for exhibition, a collection of very curious articles fashioned in soapstone and clay, which were found lately between the ranges of the Blue and Alleghany Mountains, near Mount Pisgah, North Carolina. The objects are said to be of a type absolutely unique, consisting partly of human, partly of animal figures, either in the round or in various degrees of relief. Some are household utensils. They appear to have been sculptured by metal instruments, so perfect is their workmanship. The human type is alike in the various objects, but is not Indian All are fully clothed in tight-fitting garments. Some are seated in arm-chairs, others on all sorts of animals—bears, prairie dogs, birds, and other shapes belonging to North America. But some also represent types of the Old World, such as the two-humped camel, rhinoceros, hippopotamus Some of the specimens were obviously made since the advent of the whites, and these are fresher-looking and of ruder workmanship. The inference hazarded is that the articles were made by an earlier and more civilized race, subjugated and partially destroyed by the Indians found in Virginia on the arrival of white men.

### Recovery from Hydrophobia.

A case of recovery from an attack of hydrophobia was related to the Académie de Médecine at the meeting of June 13, by M. G. Denis-Dumont, of Caen. The details of this case are given more fully in the letter of our Paris correspondent this week. The patient was a man, thirty-eight years of age, of strong constitution, and previous good health, who was bitten on April 16 on the forearm by a rabid dog, which had bitten the same day a woman and two children. The woman died of hydrophobia on May 20, and the news of the death profoundly impressed the patient, who became restless, anxious, affected with extraordinary thirst, and complained of sore throat and of difficulty in swallowing. He refused all drink which was offered him, manifested a tendency to bite persons and objects around him, and presented convulsive attacks of the character so frequently met with in hydrophobia. He was taken to the hospital on May 23, and none of the medical men in attendance had any doubt that he was suffering from hydrophobia. The treatment employed consisted in hypodermic injections of a centigramme of pilocarpine, which caused an abundant diaphoresis and salivation. At the same time a draught was given of two drachms of bromide of potassium, four drachms of chloral hydrate, and an ounce of sirup of codeia (whether at a single dose or in divided doses the report does not state). The symptoms presented a rapid amelioration, and on the 30th of May had entirely ceased. It seems open to question whether or not the case was one of genuine hydrophobia. When the symptoms commence with mental disturbance, distinctly excited by such intense apprehension of the disease as is excited by the news of the death of another person bitten at the same time, the case cannot be regarded as affording conclusive evidence on the therapeutical question. M. Bouley, however, announced his intention of communicating to the Académie at the next meeting another case of hydrophobia in which recovery followed the use of pilocarpine.—*Lancet.*

To render thick paper quite translucent, saturate it (while warm) with Canada balsam or castor oil.