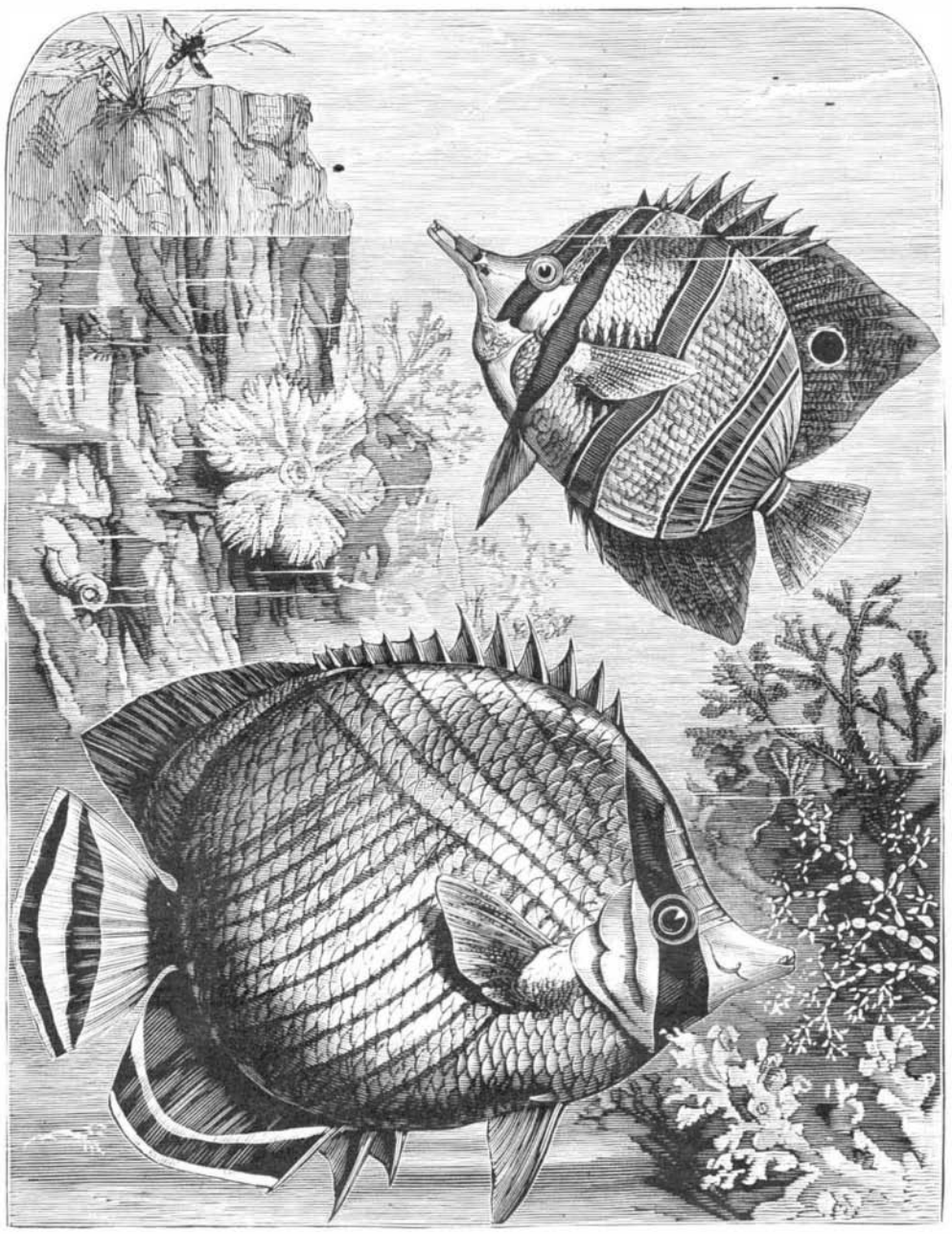
THE CHÆTODON.

The wandering chætodon is an example of a very large genus, comprising about seventy species, all of which are striking from their shape and color. Some of them are almost circular or disk like in the general contour of their figure, and the arrangement of their markings is very conspicuous. The muzzle is moderate in length, and the scales are rather large in proportion to the dimensions of the body. It is common on the southern coasts in summer and the beginning of autumn, but seems unable to endure the cold, and passes into deeper water at the first indications of winter.

The wandering chætodon is a native of the waters extending from the Red Sea to Polynesia, and is one of the common fishes of the Ceylonese coasts. The ground color of the body is golden yellow, on which a number of purplish brown lines are drawn, as shown in the engraving. This fish rarely exceeds one foot in length.

The curiously elongated muzzle of the beaked chætodon is used as a gun or bow, a drop of water taking the place of the arrow or bullet. This fish feeds largely on flies and other insects, but is not forced to depend on the accidental fall of its prey into the water. If it sees a fly or other insect resting on a twig or grass blade that overhangs the water, it approaches very gently the greater part of its body submerged, and its nose just showing itself above the surface, the point directed toward its victim; suddenly it shoots a drop of water at the fly with such accuracy of aim that the unsuspecting insect is knocked off its perch and is snapped up by the fish as soon as it touches the water.



WANDERING CHÆTODON (lower figure).—BEAKED CHÆTODON (upper figure).

A Disagreeable Discovery.

The *Commercial Bulletin*, referring to Professor Baird's astounding assertion as to the fecundity of the eel, thinks that, considering the reckless and indecent manner in which eels have lately been imposing upon manufacturing corporations—by getting into their water wheels, clogging up their machinery, and often enforcing a shut-down of the entire establishment for half a day or more at a time—manufacturers will not be pleased to hear that a well known fish culturist has discovered the number of eggs contained in a single female eel to be 9,000,000. When Professor Baird announced to the American Piscicultural Association in February last that he had, within the six weeks previous, received eels with ripe ovaries, it started a ripple of excitement in the room, which in a few days reached every naturalist in the land, and awakened new interest in the old question of the mode by which this mysterious fish perpetuated its race, one which had baffled all inquirers since man first sought to penetrate the secrets of creation, and which has almost by common consent been relegated to the category of "things which no fellow can find out." In commenting on this discovery, writers have ransacked history from Aristotle down, and have given all the theories which have been entertained by people who framed them in order to hide their ignorance, and who had not the moral courage to confess that they did not know how the fish did breed. But since the statement made by Prof. Baird, last season, many persons have been on the lookout for the ovaries of the eel, and a New York fish dealer having recently shown them to the fishermen, dealers, and others, they all say: "Oh, yes, that is what we call 'eel fat,' it is always plenty at this time of the year." And now the wonder is that no one has discovered this before, for during all these long centuries, in which the question of the generation of eels has been an open one, the eggs have been in plain sight; in fact, right under the noses of the investigators.

It may be a source of gratification to naturalists that they have solved the difficult problem, but mill owners would be glad to have them thoroughly well assured of their facts before they make the discomforting assertion that every one of the malacopterygious serpents that have this year been tampering so maliciously with the water wheels is capable of returning next season, accompanied by nine million offspring.

Natural History Notes.

Vitality of Wheat.—The seeds of the wheat possess a vitality which resists intense cold. A sample of the wheat left by the Polaris, in 1871, in 81° 16′ north latitude, and exposed to a temperature varying from that of summer to that of winter in that position for five years, was sown last year by Dr. Schanburgh, of the Botanic Gardens and Government plantations, South Australia, and out of three hundred grains, sixty germinated and produced plants, three or four feet high, with ears containing thirty grains each.

Locusts in Mid Ocean.—Psyche records the fact that a swarm of locusts boarded the ship Harrisburg, of Boston, on the passage from Bordeaux to New Orleans, on the 2d of November, 1865, in latitude 25° 28′ north, longitude 41° 33′ west, making the nearest point of land 1,200 miles away. They came on board in a heavy rain squall, the clouds and ship's sails being full of them for two days, as certified to by the master of the vessel, E. G. Wiswell. This species appeared in Corfu, in Spain, and even in England. The Corfu swarm was composed of the variety with yellow colored hind wings, and therefore came from Northern Africa, where that form is found, while the Spanish and English swarms were of the rose colored variety, and must have originated in Senegal. The most interesting point of all, however, is the fact first pointed out by Stol, that all the other species of that group of the genus to which this species belongs are American; whence it is highly probable that *Acridium peregrinum* also is indigenous to America, from whence it has been recorded. Its occurrence in mid-ocean in such numbers is a clear indication that it originally flew from one continent to the other in sufficient numbers to establish a new home.

A Hairy Water Tortoise.—Mr. Frank Buckland, in *Land and Water*, describes a curious water tortoise from China that had been presented to him. It is a terrapin which apparently has hairs growing out from its back. These apparent hairs consist simply of some water grass, something like the weedy material growing in decaying woodwork and lock gates of rivers. Whether the growth is produced artificially by the Chinese, or whether it is natural, is not known. In the "Travels of a Pioneer of Commerce, in Pigtail and Petticoats," by T. T. Cooper (London, 1871), there is a plate of one of these tortoises from the lakes of Ha-su, above Hankow. These curious little animals were about two inches long, and covered on the back with a long confervoid growth resembling hair. The tortoise being a sacred emblem in China, the Chinese make pets of the hairy tortoise, which they keep in basins during the summer months, and bury in sand during the winter. A small lake in the province of Kiang-su is famous for these so-called hairy tortoises, and many persons earn a livelihood by the sale of these curious little pets. The figure in Mr. Cooper's book looks like an oval door mat with a tortoise head sticking out. It is a well known fact that the backs of certain species of spider crabs become adorned with a luxuriant growth of algæ, which serve to conceal the defenseless animal from its enemies: may not the presence of these marine plants on the carapax of the tortoise serve a like purpose?

The Mahwa Tree.

Mr. E. Lockwood, who was for several years a magistrate in Monghyr, India, has described in the *Journal of the Linnæan Society* the economic uses of the mahwa tree, which he speaks of as "a fountain yielding food, wine, and oil" to the inhabitants of the country where it grows. This tree (the *Bassia latifolia* of botanists) grows in the plains and forests of Bengal, and attains a height of 40 to 50 feet, with numerous spreading branches, forming a close, shady, rounded crown. Standing on the Kharakpoor hills, 250 miles northwest of Calcutta, a hundred thousand of the trees are visible in the plains below. They might be mistaken for the mango, but while the mango is uncertain in its yield, the crop of the mahwa never fails. The part eaten are the flowers, which are sweet tasting and succulent, and fall in great profusion during March and April. The natives collect these, dry them, and store them as staple articles of food. Each tree yields two or three hundred weight of the corollas; so that the total yield in the Monghyr district alone, it is estimated, cannot fall short of 100,000 tons. The nourishment is good, for the Santhals, who use it largely, are plump and happy. The mahwa had its share in alleviating the Indian famine, and during the scarcity which prevailed at Behar (1873–4) the crop, which was unusually abundant, kept thousands of poor people from starvation. The flowers are still more useful for feeding cattle; and again the same recommendation may be advanced, that while the potato, maize, and barley are uncertain in their crop, there has never been a season when these edible corollas have been known to fail. Their keeping powers are excellent; a ton, dried and put into sacks, was exported, and, examined after two years' time, was found to be undamaged. The tree furnishes a hard and strong timber used for carriage wheels, etc. The seeds yield a greenish-yellow oil, used for burning in lamps, making soap, and for culinary purposes. The flowers, in addition to their use as food, are now largely employed in the distillation of a strong-smelling spirit, resembling whisky, and which is consumed in great quantities by the natives. This liquor, when fresh, proves very deleterious to Europeans. The mahwa is considered by the Bheels as essential to their very existence, and this fact is taken advantage of by the government in dealing with refractory tribes; it is only necessary to threaten the destruction of their mahwa trees to bring them to submission.

Some of the English papers believe that there is a possible commercial future for the economic products of this tree, especially for its oil, which is said to be worth $175 per ton in India.

The Supply of Boxwood.

Sir Joseph Hooker, in his last annual report on Kew Gardens, makes the following remarks on the supply of boxwood:

"For some years past the supply of this important wood has diminished in quantity and risen in price. It is derived from the forests of the Caucasus, Armenia, and the Caspian shores. The wood of the best quality comes from the Black Sea forests, and is principally shipped from the port of Poti. The produce of the Caspian forests, known in the trade as 'Persian wood,' until last year, was also exported through the Black Sea from Taganrog. This found its way, after the commencement of the war, *via* the Volga canal, to St. Petersburg. The produce of the Caspian forests is softer and inferior in quality to that of the Black Sea. It is a matter of interest to see whether one result of the war will be to open these Black Sea forests which the Russian Government has hitherto kept rigorously closed. The falling off of the supply has led, meanwhile, to various attempts to find substitutes for boxwood for many purposes. Messrs. Joseph Gardner & Sons, of Liverpool, have introduced, with some success, the American dogwood (*Cornus florida*) and persimmon (*Diospyros Virginiana*) for shuttle making, for which purpose box has hitherto been in great demand. The diminished supply has also drawn attention to the Himalayas as a source."

It seems, however, that the difficulty of transit from the mountains to the seaboard is found to be the great obstacle; and, in addition thereto, the possible supply appears to be much smaller than is furnished from existing sources. Mr. R. J. Scott has presented to the Kew Museums blocks prepared for wood engraving of hawthorn, which, he states, "is by far the best wood after box that he has had the opportunity of testing."

Relative Earnings of Capital and Labor.

The *Tribune's* Washington correspondent gives the following report of a statement on the relations of labor and capital recently made by Mr. Edward Atkinson, of Boston, before the Committee on Labor, of which Mr. Abram S. Hewitt is chairman:

Mr. Atkinson presented interesting statistics obtained by the researches of Mr. Carroll D. Wright, chief of the Massachusetts Statistical Bureau, and from the returns of the assessors of State taxes, which, taken together, furnish as to Massachusetts (the richest State in the Union), the basis for a pretty close approximation to the truth in regard to the annual product of labor and the value of accumulated property. In 1875 the amount of property returned was as follows, values being expressed in currency, gold at the time being worth $1.10 to $1.12:

Real estate	$1,311,000,000
Personal property	530,000,000
Savings bank deposits	238,000,000
Property of corporations taxed directly by the State	84,000,000
Property returned under the bank tax,	31,000,000
Total	$2,194,000,000

On account of property subjected to double assessment, as in the case of mortgages, Mr. Atkinson deducted $650,000,000 from the returned value of real estate, and on account of mortgages, notes, and other paper merely representing titles to property, he deducted $544,000,000 from the aggregate amount of personal property assessed for taxes. This left $1,000,000,000 as the net accumulation of the actual product of labor during the two centuries which have elapsed since the Massachusetts colony was founded.

He next considered the product of industry in the State for 1875, which he set down as follows:

Manufactures	$592,000,000
Fisheries	7,500,000
Agriculture and mining	43,500,000
Total annual product	$643,000,000

In this amount, however, there were numerous duplications. Thus to some extent the same cloth is reported once as in possession of the manufacturers and again as clothing on the shelves of the dealer. After all deductions on account of duplications, Mr. Atkinson set down the net annual product of the industry of Massachusetts at a maximum of $500,000,000 or a minimum of $300,000,000, and pointed out that the aggregate accumulation out of the labor of two centuries is equal to the annual product of only two, or, at most, a little over three years.

As a partial explanation of the extreme slowness of the process of accretion, Mr. Atkinson pointed out the destructive character of invention in its effect upon existing capital. As an illustration of this he mentioned a cotton mill which in 1838 produced a given amount with the labor of 226 men working 13 hours a day, and in 1878 produces the same amount with the labor of 90 men working 10 hours a day. It belongs to the same corporation, is represented by the same shares of stock, and to all appearances is the same mill now as in 1838, but within the forty years from that date it has been twice rebuilt from the foundation, while its machinery has been again and again replaced by improved devices, devices which have increased the productiveness of labor in the degree indicated by the figures just given. This destruction of capital to make way for new inventions, said Mr. Atkinson, is the law of progress, and it is to the increase of production thus brought about that the working classes must look for the improvement of their condition.

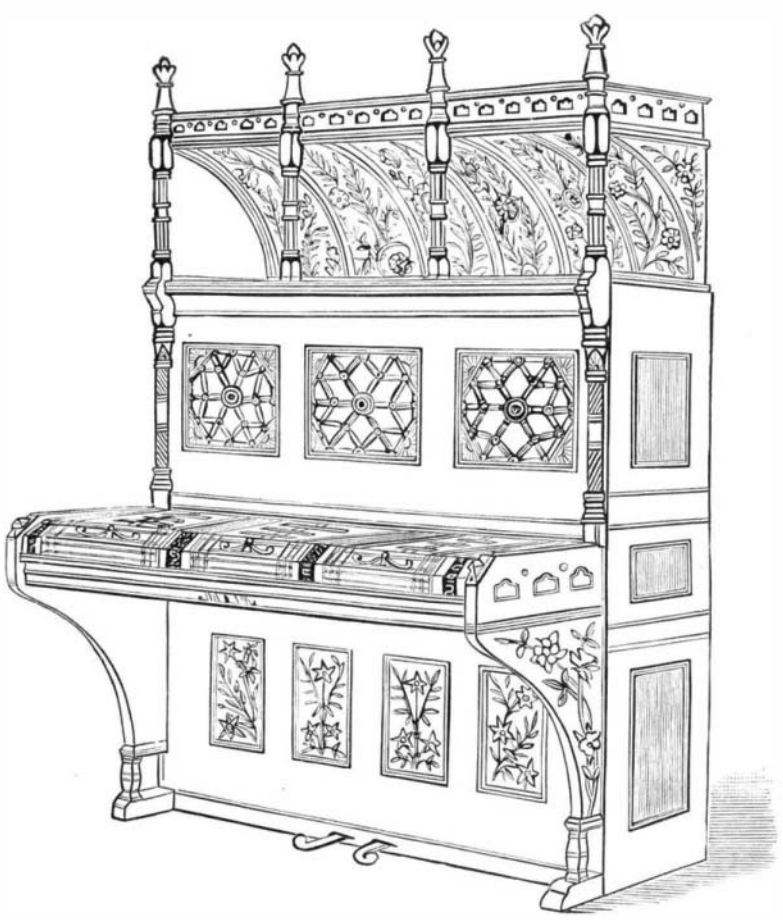
He next proceeded to show by statistics of distribution how small is the share of the annual product of industry that goes to capital, and how much smaller still is the percentage which capital can devote to luxurious uses. In a normal condition of trade, manufacturing capital may yield ten per cent. It cannot yield more, because any industry in which it yields that percentage draws so much capital into it that the profits are kept down by competition. For some years past it has yielded much less, and speaking for the cotton manufacture, it would not now be yielding anything at all except for the utilization of material formerly wasted and only saved now in consequence of services to which the wits of the manufacturers have been stimulated. Taking ten per cent as the yield of capital in ordinary times that amount has to be used to replace worn out machinery and machinery made useless by new inventions. It has also to repair building, pay insurance, and cover various other expenses, and in the aggregate the amount taken out for these several purposes reduces the ten per cent to six. Of this five per cent is used in the payment of domestic and other service employed by the capitalist and in the supply of the actual necessities of the capitalist and his family, leaving only one per cent that can possibly be devoted to the increase of capital or to luxurious indulgences.

To sum up, he declared as the result of his researches into the statistics of industry, that out of the entire annual product of industry in Massachusetts, from 95 to 98 per cent is distributed to labor, and all the remainder, except one per cent, goes to the maintenance and replacement of capital. It is out of this one per cent alone that capital can find anything to add to the percentage received by labor, and the only way in which the earnings of labor can be increased appreciably is through the increase in the efficiency of production which new mechanical inventions are continually producing.

Mr. Atkinson then went on to discuss the services which the capitalist renders to society in return for that one per cent which is the sole source of all the great fortunes made in manufactures or commerce. In reply to a question as to the present tendency of capitalists to invest in industrial enterprises, Mr. Atkinson said there is little inclination to do so, and that no improvement in this particular is to be anticipated as long as there remains any uncertainty in regard to the unit of value. He, however, anticipates a prosperous future for American industry. He disliked even to think of the difficulties in store for British industry and the distress likely to overtake the poorer classes of the British people, and he anticipated within the next five or ten years immigration from Great Britain to this country such as that which followed the Irish famine of 1846. In reply to a question from the chairman he expressed the opinion that English capital also would be transferred to this country in large amounts.

EARLY ENGLISH STYLE OF PIANO AT THE PARIS EXHIBITION.

The piano shown in the accompanying engraving is one of the exhibit of Messrs. Brinsmead, of London. It is a specimen of what this firm can do in the way of uniting beauty and novelty of exterior decoration with splendid musical effects. It is of the early English style, and is a full trichord upright iron grand, with a compass of seven octaves. It is fitted with the "perfect check repeater" action *sostenente* sounding board, and complete iron frame. The curved top part of the back is intended to act as a fenotone, collecting the sound and throwing it forward.



PIANO—EARLY ENGLISH STYLE.

Electricity in Silk Winding.

An inventor in this city claims to have perfected an electrical device which will materially reduce the cost of silk reeling, and so make the production of silk commercially profitable in this country. From their exceeding fineness the silk strands are liable to break while being unwound from the cocoons, necessitating close attention on the part of the person superintending the work. The strands of silk from four cocoons are usually run out on one reel to form a single thread, and one woman cannot do more than attend at most to two reels. It has been claimed by many interested in the silk trade that no machinery could be made delicate enough to watch this work automatically. The attention of the inventor was drawn to this subject two years ago, and he has lately perfected his application of the electric current to this work. By running the strands over carefully balanced wires, when one breaks the wire drops into mercury and closes a circuit which acts on an electric stop in the reel. The work is thus stayed until the strand is spliced and the circuit broken. In this way the electricity watches the strands, and the attendant has only to notice the reels and start them when they stop. In the old way not more than six pounds of silk could be wound in a week; by this invention it is claimed that forty pounds will be wound in the same time. The promoters of this invention hope by it to increase greatly the silk industry in this country. Owing to the cost of labor cocoons are not reeled in this country to any great extent. They are raised here—none better, it is claimed, can be found elsewhere—and exported for reeling, and then much of the raw silk is imported for manufacturing. A large amount will be saved if the cocoons can be cheaply wound off here. In the South, where the mulberry is common, it is believed that the culture of silk may rival that of cotton.

New Mechanical Inventions.

Mr. Richard H. Hill, of New Haven, Conn., has patented an improved Safety Attachment for Elevators, in which a governor is employed to throw out detents or pawls when the elevator attains an unusual speed in its descent.

An improved Railroad Track and Support has been patented by Mr. G. F. Folsom, of Boston Highlands, Mass. The object of this invention is to construct the road bed of railways so as to combine the elastic feature of wooden ties with the less perishable nature of iron. The wooden parts may be renewed without disturbing the solidity of the road bed.

Early History of the Electric Light.

A telegram from Washington, to the effect that Edison's application for a patent upon a divisible electric light had been rejected at the Patent Office, was published in the daily papers of November 21. The ground alleged for the refusal of the patent, says the *Operator*, was that Edison's invention was an infringement upon that of John W. Starr, of Cincinnati, who filed a caveat for a divisible light in 1845. [Edison's patent has since been allowed.]

Starr was a maker of philosophical instruments, and resided at Cincinnati. Had he lived he might have proved as much of a genius as Edison. He experimented on his invention, and went to England to complete it, Mr. King going as his agent, and two gentlemen, Judge J. W. McCorkle, late member of Congress from California, and Mr. P. P. Love, of Dayton, Ohio, furnished the money, about $3,000. Each was to have a fourth interest in the invention. Letters of introduction were given to King and Starr to the American banker in London, George Peabody, who, when the subject was fully explained to him, agreed to furnish all the capital that would be required to promote the project to a successful and practical use, provided that the same was approved and sanctioned by the best and most celebrated electricians in Europe. Professor Faraday was chosen.

In the meantime Starr and King returned to Manchester, where Starr built what he termed a tree, called "The United States." He had on it twenty-six branches or limbs, which he called by the names of the then twenty-six States of the Union. At the end of each limb he had an electric light, covered by a glass globe, on each of which was painted or inscribed the name of each State. Having thus completed his invention, he and King took it to London and exhibited it to the electricians at the Electrical Society, Professor Faraday being present. So perfect was his invention that the Professor pronounced it a perfect success.

After the exhibition was over King and Starr went home perfectly elated with the success, and after partaking of a very frugal meal they retired to bed. The next morning Starr, not making his appearance at the morning meal, was allowed to remain in bed, but as the day advanced and he did not make his appearance, King and the landlord went to his room, and not being able to awaken him, they burst open the door, and there found poor Starr dead in his bed. The excitement and overwork of the brain are supposed to have caused his death. From that day to this nothing further has been done with this Starr invention.

Starr filed a caveat in this country in 1845. His claim may be interesting enough to quote here:

"I claim the application of continuous metallic and carbon conductors intensely heated by the passage of a current of electricity to the purposes of illumination. I do not claim the method of lighting wires by electricity, which is well known, as I have already stated, but I claim the method of heating conductors so as to apply them to illumination, the current being regulated so as to obtain the highest degree of heat without fusing the conductor. I claim the method of obtaining an intermitting light for the use of lighthouses, in the manner set forth, and for signals. I claim the mode of submarine lighting by inclosing the apparatus in a suitable glass vessel, hermetically sealed, and also the mode of lighting places containing combustible or explosive compounds or materials, as set forth."

His application for a patent was rejected, however, in 1846, on the ground that the invention was not new, and that there was too much expense in producing the electric light. Mr. Edison says his invention is different from Starr's. He says he cannot patent the divisibility of the electric light, but he can patent the means that allows it. In other words, he can patent a lamp, or any device that will make this division. His application