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.

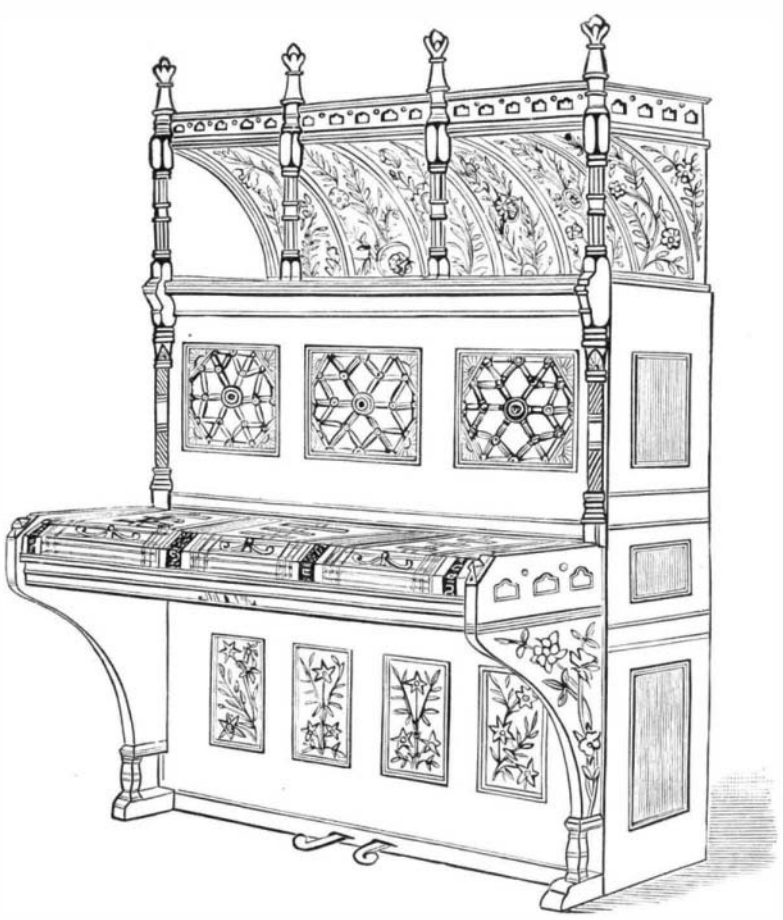
He next proceeded to show by statistics of distribution how small is the share of the annual product of industry that goes to capital, and how much smaller still is the percentage which capital can devote to luxurious uses. In a normal condition of trade, manufacturing capital may yield ten per cent. 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

for a patent for a lamp is already before the Commissioner, and is taking its regular course. According to the rules of the Patent Office nothing concerning it can be divulged. It is understood, however, that it is progressing favorably. Mr. Edison has already received seven patents bearing on the electric light, and has filed three caveats. Five more similar applications are now under way. He has had a man in the Astor Library searching the French and English patent records and scientific journals, from the earliest dates down to the past fortnight, and says nothing like his arrangements has been revealed.

Mr. Edison is making elaborate preparations to introduce and experiment with the electric light. He purposes to commence at Menlo Park with 2,000 lights, using telegraph poles with 15 lights on each arm. This experiment, including the cost of the buildings, engine, generating machines, and everything, is estimated at from $100,000 to $125,000.

SPREADING DIPHTHERIA BY KISSES.

From the report of the physicians in attendance upon the grand ducal family of Hesse-Darmstadt during the recent outbreak of diphtheria which resulted in the death of Princess Alice, the range of the disease appears to have been sharply limited. From November 6 to the 14th six of the family were attacked; on the 6th, Princess Victoria, aged 16; in the night from the 11th to the 12th Princess Alice, aged 6; on the 12th Princess Mary, aged 4; in the night from the 12th to the 13th, Princess Irene, aged 12; in the afternoon of the 13th, the Hereditary Grand Duke Ernst Ludwig, aged 10; and on the 14th, the Grand Duke himself. Of the entire family, the Grand Duchess (Princess Alice of Great Britain) and one daughter (Princess Elizabeth) only were spared at that outbreak of the disease. The Grand Duchess, however, was attacked afterward. Immediately after the first member of the family (Princess Victoria) had fallen ill she was seen by a physician and at once separated from all the others. The same caution was observed after the falling ill of the other princesses, but without preventing the outbreak of the disease in the rest of the family. In all cases there were large patches of false membrane on the tonsils, and in most of them swelling of the lymphatic glands in the angle of the jaw. All the patients recovered with the exception of Princess Mary, in whose case the disease from its very beginning had shown a very insidious character. No member of the household (in all 60 persons), no nurse, no physician was infected. It is, therefore, clear, the British *Medical Journal* asserts, that "all the cases were produced by direct infection, doubtless by kisses." The physicians ascribe the intensity and limited extension of the epidemic to three conditions: 1. To the intensity of the infection carried from outside, because the membrane in the case of the first patient (Princess Victoria) looked from their very appearance discolored and ecchymosed; 2, to the direct transference of the infectious matter by kisses; 3, to the condition of the mucous membrane of the tonsils and of the pharynx of the infected persons, all of them having suffered very frequently from acute and chronic affection of these parts.

The lesson to be derived from this not exceptional experience is very clear.

As every physician knows, it is no uncommon thing for adults to have diphtheria so mildly that it is mistaken for an ordinary sore throat resulting from cold; yet such a person can easily infect a child, and the child become a center of malignant infection. In view of the fatal prevalence of diphtheria, therefore, the kissing of a child upon the mouth by a person with a sore throat is hazardous, if not criminal; and scarcely less so is the practice of allowing children to kiss their ailing playmates. It would be wise to exercise great caution in this matter if not to discontinue the practice of kissing upon the mouth altogether.

New Agricultural Inventions.

An improved Load Binder has been patented by Mr. Henry A. Harris, of Katonah, N. Y. This is a simple and conveniently operated apparatus substituted for the pole and chains ordinarily employed for binding hay, straw, cut grain, or bales, bundles, etc., upon a rack or wagon body.

An improved Guano Distributer has been patented by Mr. James P. Lowell, of Purcellville, Va. The improvement relates particularly to the construction of the devices both for stirring the material in the hopper, and thus preventing its becoming aggregated in lumps, and also for causing its free and uniform discharge from the hopper.

Messrs. C. A. Sprague and John W. Clardy, of Weaver's Station, Ala., have patented a Cotton Chopper and Rake in which a vibrating hoe is employed to thin out the plants.

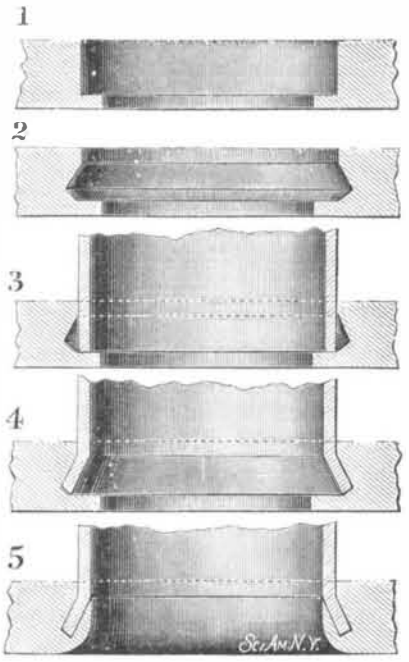
Mr. Aaron F. French, of Denison, Iowa, has patented an improved Harrow, the frame of which is fastened together by iron rods passed transversely into the ends and screwed into nuts or burrs let into the end beams. These rods serve also as draught bars, to which the whiffletrees are hooked.

An International Fish Show.

An international exhibition of the methods and products of sea and inland fisheries will be held at Berlin, Prussia, in April, 1880. Mr. R. B. Roosevelt urges the sending of exhibits from this country, confident that in several departments we could easily carry off the honors, though the Scandinavian states are far ahead of us in variety of methods of preserving fish.

A NEW METHOD OF SETTING BOILER TUBES.

We illustrate herewith a novel plan for setting tubes in steam boilers, which was recently patented by Mr. John E. Jerrold, of Meadville, Pa. The engraving exhibits the successive steps in the process of setting the tubes. Fig. 1 shows the tube sheet counterbored so as to leave an internal flange on the face side of the tube sheet. Fig. 2 shows the hole enlarged to receive the flared end of the tube. In Fig. 3 the end of the tube is in position to be flared, as shown in Fig. 4. In Fig. 5 the tube setting is shown complete, the internal flange of the tube sheet having been set down upon the flaring end of the tube.



JERROLD'S METHOD OF SETTING BOILER TUBES.

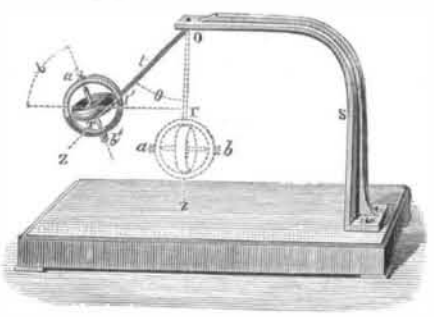
It is claimed by the inventor that a perfectly tight joint is secured without the use of an expanding tool. The surface of the tube sheet is perfectly plain and smooth, and the end of the tube is covered and protected from the fire. When this improvement is used copper thimbles will not be required.

We are informed that this method of tube setting has been thoroughly tested by some of the largest railroads in this country, and has proved very satisfactory.

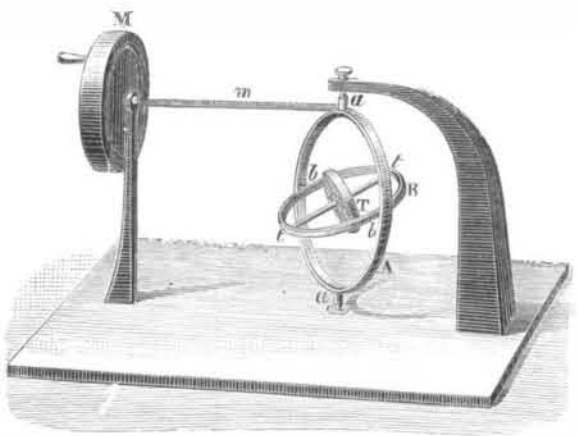
The patent is owned by the Patent Tube Setting Co., of Salamanca, N. Y. Further information may be obtained from J. F. Caldwell, secretary of the company, at Meadville, Pa.

THE GRUEY GYROSCOPE AND THE GYROSCOPIC PENDULUM.

The accompanying engravings represent two little instruments illustrating the principles involved in birotary or paradoxical motion. They were constructed by Mr. Gruey, a member of the French Academy of Sciences.



In Fig. 2, A is a brass ring suspended at *a*, so that it may swing freely around an axis, *a a*. Within this ring is suspended a second ring, B, revolving around the axis, *b b*. T is a circular disk turning with its axis, *t t*, within the second ring, B; a plane, laid through *t t*, traverses perpendicularly one laid through *b b*. At *a* the ring, A, is



connected with a rod, *m*, the other extremity of which runs smoothly in an undulating groove in the wheel, M. When the latter is turned by means of the crank an oscillating motion is imparted to the rod, *m*, and consequently to the ring, A. These oscillations are very short and unobserved by the eye; the ring, A, apparently remains at rest.

The circular disk, having received a certain initial rotary velocity, the ring, B, is struck with the finger so as to impart to it a speed of 50 revolutions per second. The speed of the ring, B, increases in the measure as the rotary motion of the disk, T, is accelerated by turning the wheel, M, more rapidly. When this operation is stopped, the apparatus gradually comes to a standstill. This simple experiment illustrates well the rotation of a body around two different axes perpendicular to each other.

Fig. 1 represents the gyroscopic pendulum. A ring similar to the ring, A, in the gyroscope, is suspended by a thread of India rubber. Within the same a circular disk revolves freely with its axis, *a' b'*. When at rest the apparatus is in the vertical position, as indicated by the engraving. If, while in this position, the thread be twisted up and again allowed to untwist, after a rotary motion has been imparted to the disk, T, by striking it with the hand, the equilibrium is at once disturbed. As the thread twists and untwists alternately the pendulum assumes an inclined position and oscillates around a conical space with wide base, till the energy of the rotary motion of the disk, T, is exhausted and the latter is at rest.—*Les Mondes.*

Petroleum Notes.

PIPE LINES.

The United Pipe Line Company was organized in 1877 by a consolidation between the following companies, viz.: The (old) United Pipe Lines, the Antwerp and Oil City Pipe Companies, the Atlantic Pipe Company, the American Transfer Company (in Clarion and Venango counties), and the Sandy Pipe Line.

At the present time (October, 1878) the company owns, and has in active operation, over 1,500 miles of 2 inch pipe, and 300 miles of 3 and 4 inch pipe. It has connected with these pipes more than 350 iron tanks, with a capacity of over 5,200,000 barrels of 42 gallons each, of which 1,800,000 barrels are owned by the company, and 3,400,000 barrels held by them under contract with the owners. It owns over 800 miles of telegraph wire connecting all its offices and stations with each other, and with the general office of the company at Oil City, Pa. It is fully equipped with boilers, pumps, and all necessary means for receiving and transporting to delivery points at least 75,000 barrels of oil per day. It has points of delivery upon all railroads in the oil regions, at which 2,500 cars, containing 225,000 barrels, can be loaded daily; and can deliver directly to refineries at Oil City, Pa.

OIL PRODUCTION.

The total production of crude petroleum, says *Stowell's Petroleum Reporter*, in Pennsylvania in November, 1878, was 1,348,952 barrels, against 1,173,420 barrels in November, 1877. Increase in 1878, 175,532 barrels.

The total amount of crude petroleum held in the producing regions of Pennsylvania December 1, 1878, was 4,289,309 barrels, against 2,471,798 barrels on the 1st day of December, 1877. Increase, 1,817,511 barrels.

The total exports of petroleum from the United States from January 1, 1878, to November 29, was 305,444,727 gallons, against 317,064,396 gallons for the same time in 1877. Decrease in 1878, 11,619,669 gallons. The Bradford district produced during the month of November, 746,279 barrels of petroleum, being about one half of the entire production in the United States.

The amount of crude petroleum represented by outstanding certificates on the last day of November was 1,784,443.35 barrels, against 1,517,484.27 barrels on the last day of October, a reduction during November of 269,959.88 barrels.

The oil produce of Pennsylvania has been to that State of more intrinsic value than all other industries combined. Its daily output of crude oil is about $500,000, varying somewhat, of course, with market values. But for all practical purposes this estimate may be taken as correct. Now, this exceeds the daily gold and silver product of the Pacific slope. We recently gave detailed statistics on this point which prove the accuracy of our present statement.—*San Francisco Post.*

KENTUCKY.—The Carter and Alexander well, which was drilled on Renox Creek, in 1865, and never tested, has recently commenced flowing oil at the rate of 100 barrels per day. The gravity of the oil is about 41° and dark brown in color.

ONTARIO.—Exports of petroleum from the United States to the Dominion of Canada during the fiscal year ending June 30, 1877:

Crude.....	270	bbls.,	valued	at	$ 2,158
Naphtha.....	83	"	"	"	795
Illuminating.....	13,224	"	"	"	187,451
Lubricating.....	1,728	"	"	"	21,959
Residuum.....	76	"	"	"	505
	15,381	"	"	"	$162,868

JAPAN.—Crude oil is obtained in ten different provinces in Japan, and its existence has been known, according to Japanese writers, since A.D. 615, but the art of purifying it was not known till some six years ago; since which time refining establishments have been erected in five different places, with a total capacity of turning out 4,000 gallons per day.

ASIA.—The valley of the Euphrates is destined to become one of the greatest commercial and important political centers of the world. I have myself seen whole caravans traveling through this region bearing nothing but American petroleum. American petroleum now lights up the dark places of Nineveh, of Jerusalem, and all the cities of the East.—*Lecture by Dr. Newman.*