THE ELECTRIC LIGHT AND ITS COST.

Nature announces that a special division of the Paris International Exhibition will be devoted to electricity, so that all the systems of electric lighting may be tested comparatively. The electric light continues to create the greatest interest in Paris. The experiments which we mentioned some time ago have been conducted during 40 consecutive days at the Lyons railway station. A force of about 40 horse-power is sufficient to keep going 28 electric lamps, each of which gives a light equal to 80 gas lamps, and works with regularity for 10½ hours. The effect is splendid, the whole of the station, except the waiting room, being lighted *a giorno*. The question of economy, however, is not yet settled. It is not known whether the company will agree to pay a somewhat higher price in order to multiply the power of its illumination. These experiments have been tried on Lontain's system, a modification of Wilde's and Siemens' principle. M. Lontain has contrived to send the current generated by an ordinary Wilde's machine into an electro-magnetic engine called a distributor. The central part being strongly magnetized by the current from a Wilde's machine, a number of electro-magnets are influenced by its rapid rotation, and in each of these an induction-current is generated. These induction-currents are powerful enough to feed three electric lamps, and as there are two series of 12 magnets a single machine could, theoretically, feed 72 lamps. Actually, however, it feeds only 28. Lontain uses a new regulator, which works very well by the dilatation of a small silver wire. By its dilatation this part of the apparatus works a lever system, and brings the carbon electrodes into contact. The French Northern railway has purchased a number of Gramme magneto-electric machines. They intend to use them at their terminus goods and stores.

The New York *Tribune*, looking toward the application of the electric light in this country, says: It appears to be difficult to arrive at the cost of using the electric light, figures of estimate in different experiments varying considerably. In many manufacturing establishments the cost of the power to drive a magneto-electric machine would scarcely be felt, as only two or three horse-power, at the most, would be required. The cost of the carbons is said to be less than five cents per hour per lamp, on the Jablochoff plan; another estimate is about twice as much, but perhaps refers to two lamps instead of one. An electric light which does not, according to accounts, appear to be constructed on the Jablochoff plan, tested in practical service at LaChalselle, France, costs, including motive power for the machine, about 12 cents per lamp per hour. Machines capable of running three lamps, cost less than $500, and perhaps that sum could be made to cover all the first outlay. The wear and tear of the machine is not estimated. A careful study of the figures thus far furnished, leads to the belief that light can be furnished by electricity, in France, at about two-fifths the cost of gas; and as the price of gas in most American cities exceeds the price in Europe, it seems probable that a similar estimate of the comparative cost of electric illumination for this country would fairly apply.

THE WATER SUPPLY OF LONDON.

Now that we are talking freely of expending millions of dollars for water rights, etc., for our city, it will be in order to contrast our amounts with those required to supply London: One of the best papers read at a late meeting of the the British Scientific Association, was that on the London water supply, by Messrs. Bramwell and Easton who have made a special study of the subject. In June of this year the population supplied by the eight London water companies was nearly 4,000,000, living in over half a million houses, and this at a gross expense of over $6,000,000, yielding a net profit at a little over 6% on the capital of $80,000,000 and over. The mere value of the property in London protected by water supply from fire is roughly estimated at $8,000,000,000, and about a fourth of this only is covered by insurance. Small in importance as this is as compared to the other requirements of a good water supply, even the modest demands of the London fire department are not met. Although, on an average, the fires of a whole year do not consume the ordinary supply of one day for other purposes, still there should be the means of concentrating at any given point about 3,000,000 gallons in the 24 hours, or one-fortieth of the entire London supply. Manchester and Liverpool have learned by hard experience the necessity of securing not only abundant supply of water for fire purposes, but such pressure as will give head enough to apply the water directly to fires without engine; in London not more than 40 feet can thus be got, and yet the engineers say that it must doubled to do any real benefit.

For $20,000,000 to $30,000,000 it is estimated that London could be supplied with enough good drinking water to keep the population healthy, and with water under sufficient pressure for extinguishing fires. That in this respect London is economical is shown by the following figures: To protect the $8,000,000,000 of property, there is raised and spent by the Fire Department a little less than $500,000, and this is distributed between tax-payers, the insurance companies which pay about $200 for each $5,000,000 insured, and the government. Now all this makes an average of $100 per 1,000 of its population, while Paris spends at the rate of $250, and New York more than ten times the sum spent in London, and Chicago is not very far behind New York.

Reducing Aluminium.—According to *Dingler's Journal*, in almost the only factory for the production of this metal, in Salindres, near Alais, the mineral bauxite is heated with soda in reverberatory furnace, the resulting aluminate of soda is extracted by means of water and alumina, precipitated by a stream of carbonic acid; this is then formed into balls, with salt and coal, and heated to a white heat in vertical retorts during the introduction of chlorine gas. The double chloride of soda and alumina, which distills over, is fused with the addition of 35% of sodium and 40% of cryolite as a flux, and the metal which settles at the bottom of the crucible is poured into molds.

THE MECHANICAL TREATMENT OF METALS.

In a paper by Prof. R. H. Thurston, in the *Metallurgical Review*, under the above heading, the author states that it is perfectly obvious that means of effecting great changes for the better in the qualities of the commercial metals are available, and there is no reason why we should not have vastly more valuable materials than those with which our markets are generally supplied. He gives the following as the proper methods of preparation of metal to secure a maximum value:

1. Reduce the metal to the molten condition, flux thoroughly with such a flux as will remove: first, all deleterious substances with which the metal may be contaminated; secondly, every particle of gaseous oxygen and of oxyde, and, thirdly, all other occluded gas liable to produce "blow-holes."

2. Cast the metal under heavy pressure, in order to secure maximum density and to close up every pore as perfectly as possible. If the metal is an alloy which is liable to liquation, it should be cast in a chill of sound iron and of considerable thickness.

3. If the metal is either iron or steel, produce any considerable change of shape which may be desired by rolling, by the drop press or by hydraulic forging, at a full red heat, and permit it to remain unused as long as possible, in order that the internal strain, unavoidable to some extent with any method of treatment, may be given time to become reduced by that process of flow which will ultimately relieve it. If stiffness and a more perfect elasticity are demanded, finish by the process of cold working, taking great care not to carry it so far as to seriously injure the continuity of the metal.

4. The bronzes and other metals of the inelastic and viscous class may be given very considerable modification of form by the process of working cold. The same precaution must be taken to avoid destruction of continuity, and thus by the production of incipient fracture permanently and seriously injuring it.

GAUGING WIRE.

General dissatisfaction has been expressed with the old style of wire gauges. The subject was brought up at the last meeting of the American Institute of Civil Engineers, and a report from a committee was heard. The committee call attention to the inaccuracy of most of the gauges in use. These they divide into two general classes, first, fixed, and second, movable gauges.

The fixed gauges consist of a steel plate, either made with slots open at one end, the sides of which are intended to be parallel, with round holes and sometimes with a plug to fit the holes, or of a V, either cut into a plate of steel or of two bars placed together. These fixed gauges were found to be only approximately correct. Not only those made by different manufacturers did not agree, but in those made by the same manufacturer there were often "very perceptible and annoying differences."

Two kinds of movable gauges are described, "sliding callipers with verniers and with or without a micrometer screw for adjustment and the micrometer screw gauge." The latter is spoken of as the simplest form and is recommended for adoption as the standard gauge. The committee recommend the abandonment of the fixed gauges and the practice of designating dimensions and sizes by number—meaning number "wire-gauge," as it is often written—for commercial use, and the adoption of the system of expressing signs in thousandths of an inch or fractions of a millimeter. There is probably nothing to prevent any one from doing the latter in this country if they choose, but at present the use of doing so is not apparent.

It is to be hoped, however, says the *Railroad Gazette*, that the barbarous old wire-gauges will be condemned to the scrap-heap and that the more accurate and precise micrometer gauges will take their places, and that instead of designating wire and plates as such a number "wire-gauge," which instead of being precise is quite the reverse, the practice of expressing such dimensions in thousandths of an inch will come into universal use.

Action of Nitro-Glycerine. The temperature developed on the explosive combustion of nitro-glycerine, says the *Engineer*, has not been accurately ascertained, but as the combustion is much more perfect than is the case with gunpowder, it is probably much greater, and has been assumed to be more than twice as great. One volume of powder gives 190 volumes of gas at the ordinary temperature; in consequence of the heat developed, this gas expands to four times this volume, giving 760 volumes of gas directly after the explosion. One volume of nitro-glycerine gives 1,300 volumes of gas at the ordinary temperature, and assuming as pretty nearly correct that the heat developed is two and a half times as great, we should have the gases expanded to 10 times their volume at ordinary temperatures, of 3,000 volumes of hot gas; so that according to volume the strength of the nitro-glycerine is 17 times that of gunpowder. But in consequence of the enormous velocity of combustion of nitro-glycerine, its impact effect is still more increased. With nitro-glycerine larger masses of rock can be operated at one blasting, in consequence of the severe shattering power which its rapid combustion confers upon it. At the slate quarries in north Wales, where nitro-glycerine was for some time used, a single blast with nitro-glycerine sufficed where previously four or five blasts with gunpowder were required. Similar favorable results were obtained at Freiberg and in Belgium.

Hard Rubber Bearings.—The *Polytechnic Review* says: Hard rubber (vulcanite) on brass or any other metal will, when used under water, subject to friction, wear a dozen times longer than any two metals under the same usage, and hard rubber on hard rubber or glass is almost indestructible.

The Willamette *Farmer* advertises: "A bacon thief wanted." Is it possible that they can't do their own stealing there?

TREATY ABOUT TRADE MARKS.

A treaty has just been signed, says the *Iron Age*, by Mr. Pierrepont, our Minister to England, and the Earl of Derby, giving mutual protection to citizens in both countries against the pirating of trade marks. Each nation has its own stringent law applicable to its own people, but these statutes have done little to stop the mischief so long as they have no effect on foreign offenders. Our trade mark law, of Congress last year, makes punishable the imitation of trade marks, or dealing in trade mark goods, or selling or keeping empty packages bearing trade marks with intent to defraud. This law puts a stop to the vilest of the tricks in trade. The treaty just signed gives the same security in England. Under this convention it will only be necessary for Americans and Englishmen to register their trade marks in each other's country, paying the small fees required, and they will have all the protection which any law can give them. The operation of the treaty will be doubly beneficial to Americans, guarding consumers here against impositions from the sale of spurious products with counterfeited British trade marks, and preventing the sale of bogus American goods in British markets, by which the reputation of our manufactures and our export business are damaged. The adoption of this treaty should lead to similar agreements between the United States and other countries where these commercial villianies are tolerated.

A New Safety Dynamite.—An improved nitro-glycerine compound, says *Seward's Journal*, has been invented by Mr. Gustaf Falnehjelm, of Stockholm, the chief modification being that the second main ingredient is charcoal produced from a special wood, and selected and prepared in such manner as to be able to absorb and solidify the greatest possible quantity of nitro-glycerine. In order to render the combustion more complete, and to augment the rapidity of the explosion, a small quantity of nitrate of potash or other suitable salt, is added to the mixture of the two ingredients above named. The composition of the new sebastin depends upon the objects for which it is to be used, and the effects intended to be produced. The strongest compound, and even in this there is stated to be no risk of the separation of the nitro-glycerine, is composed of 78 parts by weight of nitro-glycerine, 14 of wood charcoal, and eight of nitrate of potass; and when less power is required the proportions are varied, the second quality consisting of 68% by weight of nitro-glycerine, 20 of charcoal, and 12 of nitrate of potass.

The Nerveless Mortal.—A perfectly impassive, emotionless man or woman is a rarity; still, such do exist, and we hardly know whether to regard them as objects of envy or pity. Those without emotion, those who do not suffer at times from over-sensitiveness or excitement, are like rocks or trees; the winds of adversity may blow, a deluge of affliction may cover them; they remain calm and happy, the sleep is sound, the appetite unimpaired. Such are certainly enviable conditions, but the law of compensation is not annulled for the benefit of these favored ones. Wherever we find them, we may be sure that we meet those devoid of the finer and more delicate instinct of human nature,—those who are incapable of enjoying the beautiful things in the natural world or in art. They suffer less in the journey of life, but they also enjoy less. Like animated statues they live, without strong friendship or affections, without pity, without generosity; and nerveless they die, with scarcely a pang. The world regards them with suspicion during life, and refuses to weep when they pass away. It is for wise reasons that but few of this class are permitted to make their advent into the world.

Transcontinental Survey.—The Hagerstown (Md.) *Mail* says that Mr. Edwin Smith, of the United States coast-survey service, detailed to make a survey of levels from the Atlantic to the Pacific, has commenced operations, making the court-house, Hagerstown, the initial point of his survey. It was the original design to follow up the National turnpike in this survey, and it was with this view that Hagerstown was selected as the base of operations; but owing to the hilly character of the country this route was changed, and Mr. Smith has determined to run his line to Williamsport, and thence along the tow-path of the canal to Cumberland. This division of his work he expects to finish this winter, and then he will carry it on to Cincinnati, St. Louis, and westward by the Kansas Pacific railway. On its completion to San Francisco it is designed to return to the initial point and then to the Atlantic, either by the way of Harrisburg and Philadelphia to tide-water, or by the way of Harper's Ferry to Washington. The work will involve several years' labor.

Elixir Eucalyptus.—The following formula has been recommended, for which we are indebted to *New Remedies*:

Eucalyptus leaves	4 troy oz.
Alcohol, 85%	9 "
Oil orange	2 drachms.
Oil cinnamon (Ceylon)	2 drachms.
Sugar	12 ounces.

Reduce the eucalyptus leaves to a coarse powder, add the oils to 1½ pints of alcohol, moisten the leaves with a portion of this menstruum, and pack it in a percolating funnel. Pour on the remainder of the alcohol and percolate 1½ pints of tincture, using, if necessary, an additional quantity of 85% alcohol. Add the sugar to the mixture and make the product measure two pints by adding more alcohol.

Christmas Cake.—For a Christmas cake that will keep, the following is very nice, from "Mrs. Bestherlin's Recipe Book:" One pound of raisins, one of currants, one-fourth of citron, one-half of butter, one teacup of sour cream, eight eggs, two coffeecups of white sugar, one of brown sugar, one molasses, one teaspoon of soda, two of cream-tartar, one of cinnamon, one of cloves, one nutmeg; mix butter, sugar, and yolks of eggs together, put soda in cream and add, then add sugar and molasses, then cream-tartar in dry flour, add spice, and stir together. Seed the raisins if desired, and dredge the raisins, currants, and citron with flour; two tablespoons of rosewater or brandy.

THE PERPETUAL FORCES OF NATURE.

Mr. Ralph Waldo Emerson, in a paper contributed to the *North American Review*, talks as follows about the perpetual forces of nature: There is no porter like gravitation, who will bring down any weight you cannot carry, and if he wants aid knows how to find his fellow-laborers. Water works in masses, sets his irresistible shoulder to your mill or to your ships, or transports vast bowlders of rock neatly packed in his iceberg 1,000 miles. But its far greater power depends on its talent of becoming little, and entering the smallest holes and pores. By this agency, carrying in solution elements needful to every point, the vegetable world exists. Who are the farmers' servants? Who but geology, chemistry, the quarry of the air, the water of the brook, the lightning of the cloud, the plow of the forest? Before he was born into the field, the sun of ages soaked it with light and heat, mellowed his land, decomposed the rocks, covered it with vegetable film, then with forests, and accumulated cubic acres of sphagnum whose decays make the peat of his meadow. The rocks crack like glass by inequality of contraction in heat and cold, and flakes fall constantly into the soil. The tree can draw on the whole air, the whole earth, on all the rolling main. The plant, the tree, is all suction pipe, imbibing from the ground by its roots, from the air by its twigs with all its might. Take up a spadeful or a buck load of loam; who can guess what it holds? But a gardener knows that it is full of peaches, full of oranges, and he drops in a few seeds by way of keys to unlock and combine its virtues—lets it lie in sun and rain, and by and by it has lifted into the air its full weight in golden fruit. What agencies of electricity, gravity, light, affinity, combine to make every plant what it is, and in a manner so quiet that the presence of these tremendous powers is not ordinarily suspected. Faraday said that "a grain of water is known to have electric relations equivalent to a very powerful flash of lightning." The ripe fruit is dropped at last without violence, but the lightning fell and the storm raged, and strata were deposited and upturn and bent back, and chaos moved from beneath to create and flavor the fruit on our table to-day. Go out of doors and get the air. Ah, if you knew what was in the air! See what your robust neighbor who never feared to live in it, has got from it—strength, cheerfulness, power to convince, heartiness and equality to each event. As the sea is the receptacle of all rivers, so the air is the receptacle from which all things spring, and into which they all return; an immense distillery, a sharp solvent, drinking the oxygen from plants, carbon from animals, the essence and spirit of every solid on the globe; a menstruum which melts the mountains into it. All the earths are burnt metals. One-half the avoirdupois of the rocks which compose the solid crust of the globe consists of oxygen. The adamant is always passing into smoke; nature turns her capital day by day. All things are flowing, even those that seem immovable. The earth burns, the mountains burn, slower but as incessantly as wood in the fire. The marble column, the brazen statue burn under the daylight, and would soon decompose if their molecular structure, disturbed by the raging sunlight, were not restored by the darkness of night. Plants and animals burn or perpetually exhale their own bodies into the air and earth again. While all thus burns, the universe in a blaze, kindled from the torch of the sun, it needs a perpetual tempering, a phlegm, a sleep, atmospheres of azote, deluges of water, to check the fury of the conflagration; a hoarding to check the spending, a centripetence to the centrifugence. And this is uniformly supplied. Nature is as subtle as she is strong, and like a cautious testator ties up her estate so as not to bestow it all on one generation, but has a fore-looking tenderness and equal regard to the next and the next and the fourth and the fortieth. The winds and the rains come back a thousand and a thousand times. The coal of your grate gives out in decomposing to-day exactly the same amount of light and heat which was taken from the sunshine in its formation in the leaves and boughs of the antediluvian tree. The earliest hymns of the world were hymns to these natural forces. The Vedas of India, which have a date older than Homer, are hymns to the winds, to the clouds and to fire.

Distances in the Solar System.—At a recent meeting in New York city, Prof. Stephen Alexander, in a paper, entitled "Laws of Extreme Distances in the Solar System," showed the relation of various members of the solar system and the curious proportions existing between them, the whole indicating that in their organization they have obeyed the rule of law. The ratios of the planetary distances for example he pointed out as follows: Neptune to Uranus, two-thirds; Uranus to Saturn, one-half; Saturn to Jupiter, one-half; Jupiter to Asteroid, one-half; Asteroid to Mars, two-thirds; Mars to earth, two-thirds; earth to Venus, two-thirds; and Venus to Mercury, one-half; and then he showed that the difference between the distances according to law, and in fact, were small, not exceeding in any of the preceding instances .078. Tables of relations for the systems of Jupiter and Uranus were given, which also showed remarkable approximations of theory to fact.

Fish as Brain Food.—The belief that fish is specially adapted to feed the brain, and that fish-eaters are therefore more intellectual than the average, does not find much favor with Dr. Beard, according to the *Popular Science Monthly*. He says that this "delusion is so utterly opposed to chemistry, to physiology, to history, and to common observation, that it is very naturally almost universally accepted by the American people. It was stated," he adds, "by the late Prof. Agassiz, who impulsively, and without previous consideration, apparently, as was his wont at times, made a statement to that effect before a committee on fisheries of the Massachusetts legislature. The statement was so novel, so one-sided, and so untrue, that it spread like the blue-glass delusion, and has become the accepted creed of the nation.