M. PLANTE'S NEW INVESTIGATIONS ON THE EFFECTS OF HIGH TENSION CURRENTS.

We have already noted several of the more important electrical phenomena observed by M. Planté by the aid of the powerful discharges of his secondary batteries. In the annexed engravings, which we extract from *La Nature*, are represented the apparatus he uses, and some new and interesting effects of the current. Fig. 1 shows the disposition of 400 secondary elements, divided into ten batteries of forty couples each. In his recent experiments with eight hundred secondary couples, another series of batteries is placed in an adjoining room, and all the batteries are suitably connected. To charge them, two to four Bunsen couples suffice, the latter being placed outside the room to avoid the effects of acid emanations. When the batteries have not rested inoperative too long, a few hours are sufficient to charge them. Then, by adjusting the commutators, the elements previously connected for quantity may be adjusted for tension, so as to expend either in a few seconds or a longer period, at the will of the operator, the large quantity of electricity resulting from the chemical action accumulated during several hours by the Bunsen couples.

The experiments have most frequently been made in the dark, so that the details of the luminous phenomena may be studied. The voltameter is represented at the moment when the electric current acts at its surface. Steam is seen rising, due to the powerful calorific effect.

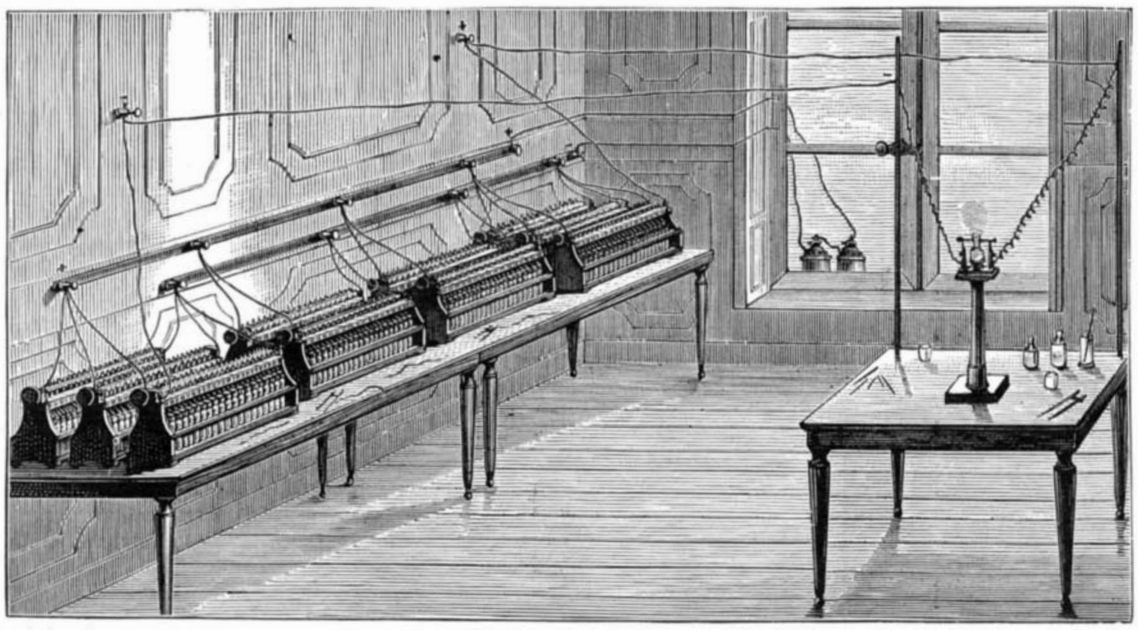


Fig. 1. PLANTE'S SECONDARY BATTERIES.

One of the most remarkable phenomena recently observed by M. Planté relates to the electric silicic light, regarding which we have already made some brief mention. If in a solution of nitrate of potash a platinum wire (inclosed in a glass tube and connected with a secondary battery of sixty elements) be placed, the pole of the battery being previously immersed, the glass melts at the end of the tube and expands with a brilliant light. The end of the wire becomes enveloped in a globe of melted glass (Fig. 2), and the light shines brilliantly while the discharge continues, until the glass, melting and cooling around the electrode, isolates it completely from the liquid. When a solution of sea salt is used in the voltameter, from two hundred and fifty to three hundred secondary couples are required to give the same effect. The saltpeter solution enables the result to be obtained with a much weaker current.

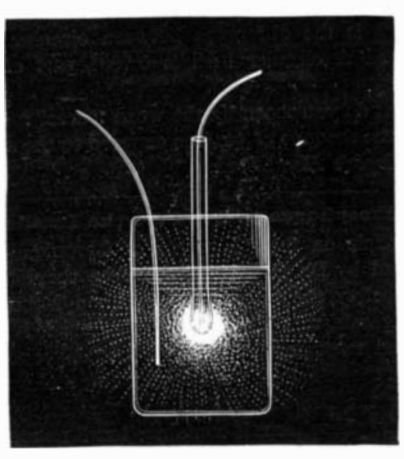


Fig. 2.

The peculiar vitreous light may be produced by applying either electrode against a plate of glass a little distance above the saline solution (Fig. 3). It is accompanied by a disengagement of white vapors, and the glass is strongly attacked. The same illumination may be produced along the sides of a porcelain cup. It seems probable that the brilliancy of the light may be attributed to the lime combining with the silex in the glass; but if, on the other hand, its spectrum be examined no appreciable lines are to be found. Nevertheless a fragment of calc spar, placed under the same conditions, gives a brilliant light and exhibits the characteristic calcium lines. The silicium lines being weak, they may not appear by reason of the luminous intensity of the spectrum formed; but the silicic origin of the light is demonstrated by the important fact that it appears on the contact of the electrode with pure silex in the state of hyaline quartz, Fig. 4.

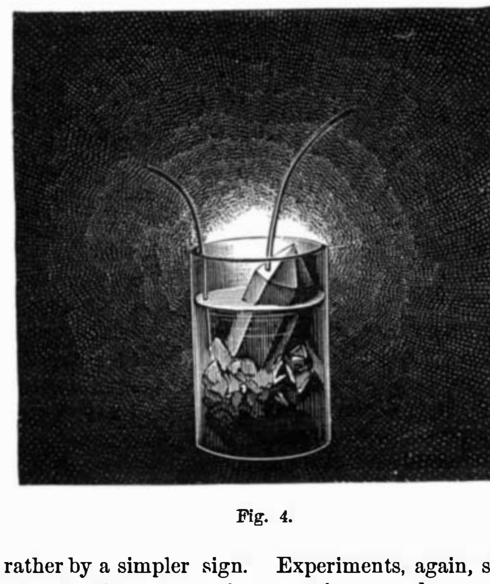


Fig. 4.

While conducting these experiments M. Planté observed that the luminous rings formed around the positive electrode of a powerful battery sometimes remained engraved on the surface of the glass voltameter. This led him to attempt to utilize the electric current as a means of engraving glass plates. The glass is covered with a saltpeter solution, and in this is plunged (along the sides of the plate) a platinum wire communicating with a fifty or sixty element secondary battery. The other electrode is also of platinum, covered with isolating material except at its extremity, and this is used to touch the glass wherever the design is to be engraved. The work is done with great rapidity and delicacy, and remarkably fine lines are produced to any desired depth.

Natural History Notes.

Poison of Snakes.—The *Transactions of the Royal Society* contain a paper by Mr. Pedler, in which he publishes the results of his elaborate experiments on snake poison, which had for their object the discovery of an antidote, but which were unsuccessful. Ammonia, as an antidote for application to the wound, he has proved to be utterly worthless. Iodide of methyl and hydrochloric acid diminish the activity of the virus, and perchloride of platinum formed with it an almost insoluble and inert compound. Neither of these substances, when injected after the poison, proved capable of preserving life. In several instances, artificial respiration caused an apparent revival of life in persons and animals that seemed to be already dead, but in no instance did it avert the fatal issue.

Sophora Speciosa.—This leguminous plant, a native of Texas, has recently attracted the attention of botanists on account of its poisonous seeds—a character very unusual, if not entirely unknown, in any other plant of the large order to which it belongs, an order that furnishes us with the pea and bean and some other nutritious foods. The seeds of the plant have been described by Mr. Bullock at a meeting of the American Pharmaceutical Society. Professor H. Wood, Jr., has analyzed them, and detected what is apparently a new alkaloid, for which he proposes the name of *sophoria*. Half of one of the seeds is said to be sufficient to produce delicious exhilaration, followed by a sleep lasting one or two days.

Habits of Ants.—Sir John Lubbock continues his observations and experiments; he finds that ants recognize old acquaintances and speedily attack strangers. He doubts their vaunted intelligence, for example, in cases where a thin circle of glycerin bars their access to honey which they have already visited by a paper bridge; for, when the latter is taken away, they do not go to work and pile up grains of the surrounding earth (as they might do) and thus easily cross the glycerin barrier. Notwithstanding the many observers of the habits of ants, and the plentifulness of their nests, it is still doubtful how the latter are commenced. As to these insects intimating to each other their discovery of food, this does not necessarily imply any power of describing localities, for it seems that co-workers accompany each other to the discovered treasure rather by a simpler sign. Experiments, again, seem to negative the idea of these insects using sounds to acquaint their fellows of any repast they may come across. As to the affection of ants for their friends, this is outbalanced by their hatred of strangers. They are guided more by scent than by sight in following up tracks of food which has been shifted in position after they have once partaken of it, returned to their nest, and then again sallied forth in search of it. They avoid light when it is thrown into their nest, and congregate in the darkest corners. Taking advantage of this habit, and by a series of ingeniously contrived experiments, wherein strips of colored glass and shallow cells containing colored solutions—such as fuchsine, bichromate of potash, chloride of copper, etc.—were used, Sir John arrives at the conclusion that ants, like bees, are influenced by the sensation of color, though in the case of ants its effects, probably, are different from those produced on the retina of man. In the ants experimented upon, a marked preference was given by them to red; green followed, yellow came next, while to blue they appear to have a decided aversion. The longevity of these insects from these series of observations would appear to be greater than most authors admit; for some specimens in the experimenter's possession are now at least five years old and still lively.

The "Rain Tree" of Moyobamba.—A paragraph has been going the rounds of the papers describing, on the authority of the United States Consul in the province of Loreto, a tree existing in the forests near Moyobamba, in northern Peru. This tree was stated to absorb and condense the humidity of the atmosphere with such astonishing energy that the water may frequently be seen to ooze from its trunk and fall in rain from its branches in such quantities that the ground beneath was converted into a perfect swamp. Mr. Thiselton Dyer, the botanist, has investigated the subject, and in a short paper read before the Linnæan Society gives it as his opinion, based on information derived from Mr. Spruce, that the "rain tree" (*Tamia-caspi* of the natives) is the *Pithecolobium samar* of botanists, and the so-called "rain" the fluid excreta of young cicadas, which they squirt forth in slender streams as they feed on the juices of the foliage. The whole phenomenon is comparable to the production of honey dew from the lime by the agency of plant lice (*aphides*).

Fig. 3.

Effect of Growing Plants on the Air.—In a recent article, the eminent sanitarian, Professor Von Pettenkofer, of Munich, argues, from data collected by himself and others, that there is no superabundance of oxygen in the vicinity of growing vegetation; and that, as a matter of fact, so far as the supply of this gas is concerned, the country, with its boasted superiority, is not much better off than the city. This is quite the contrary of what has usually been taught.

A Self-fertilizing Cabbage.—Dr. Francis Darwin, in a recent lecture, says that "it is curious to find a plant adopting a new mode of conveying its pollen when the old one fails. Thus, a wild cabbage-like plant which grows in Kerguelen's Land is now fertilized by the wind; that is, it produces dry, dust-like pollen, which is easily carried by the wind. Now, this cabbage is the only species in the enormous order of the *Cruciferæ* which is not fertilized by insects; so that we may be certain that some change has taken place for which good reasons exist. And the reason of the change is, no doubt, that the insects in Kerguelen's Land are wingless, and therefore bad distributers of pollen. And, to go one step further back, the reason why the insects are wingless is to be found in the prevalent high winds. Those insects which attempt to fly get blown out to sea, and only those are preserved which are gradually giving up the habit of flying. Thus the pollen of the cabbage has to learn to fly because the insects will not fly for it."

Protective Mimicry in Caterpillars.—At a recent meeting of the British Entomological Society, Sir John Lubbock read a paper on the coloring of British caterpillars. Accepting the theory laid down by Darwin and others, that dull colored, green, and smooth skinned caterpillars are eaten by birds, etc., while spiny, hairy, and brightly colored species are rejected, the author stated that, by the statistical method, it was shown that no hairy caterpillars are green; while, on the other hand, a large majority of black and brightly colored species are hairy or otherwise protected.

Danger from Cats.—A writer in the *Lancet* states that it is a mistake to suppose that there is no danger in the bite or scratch of one of these animals. There have been abundant and melancholy proofs of the peril of contracting hydrophobia from cats; and the danger is scarcely less than that which attends an injury inflicted by a dog.

A New Method of Preserving the Colors of Dried Plants.—It is pretty well known that plants treated with alcohol can have their natural colors preserved for a long time; but still they begin to fade far too soon and darken. To avoid this, resort may be had to the following process, which is said to yield excellent results:

Dissolve one part of salicylic acid in 600 parts of alcohol, and heat the solution to the boiling point in an evaporating dish. Draw the plant slowly through the liquid, wave gently in the air to get rid of superfluous moisture, and dry between folds of blotting paper several times repeated. In this manner the plants dry rapidly, which is a great gain, and they thus furnish specimens of superior beauty. The addition of a drachm of red Condy's fluid to the water contained in a flower vase will preserve the freshness of cut specimens for three or four days.

A Gardener Bird.—Under this title the *Gardener's Chronicle* gives a description, with illustrative woodcuts from original sketches drawn on the spot by Signor Beccari, of a bird which is not only an expert architect—building a nest like the bower bird of Australia—but also a gardener, laying out a garden in front of it. The bird is a native of New Guinea, and makes its nest of the stems of an orchid. In front of the nest a dressed lawn of moss is formed, on which the attentive male places, day by day, for the delectation of his mate, flowers and fruits of bright colors and pleasing flavor. The orchid, which belongs to a hitherto unknown species, has been described in full by Professor Reichenbach.

"Protective Resemblances" in Fungi.—The eminent authority on mushrooms and toadstools, Mr. Worthington G. Smith, figures and describes, in a recent number of the *Gardener's Chronicle*, specimens of a toadstool (*Agaricus furfuraceus*) which had assumed the habit of a morel (*Morchella*). There is no doubt that these plants, which were first thought to be morels, are true specimens of *Agaricus furfuraceus*, for Mr. Smith mentions that many intermediate forms were found associated. There have recently been found many specimens of toadstools with the habit of other species, and they have generally been accounted for on the somewhat fanciful supposition of "protective resemblance;" but, unfortunately for this theory, most of the cases have been of poisonous species taking the habit of edible ones. In this case, as Mr. Smith points out, there would be little advantage to *Agaricus furfuraceus* in assuming the habit of the much sought after edible morel; there would certainly be just as little to an unskillful collector.

The Oaks of the United States.—In 1876, Dr. Englemann, after a study of the oaks of the United States, read a paper on the subject before the St. Louis Academy of Sciences, giving as the results of his investigations an entire revision of this extensive and perplexing genus. In a subsequent paper published in the *Proceedings of the Academy*, he has corrected some errors and modified his former arrangement of the genus.

The collection of oaks at the Centennial Exhibition furnished interesting facts. The black oaks grow, on an average, twice as fast as the white oaks. The heartwood of the latter is always readily distinguishable, but that of the black oaks is scarcely, if at all, darker than the sapwood. The black oaks of the present day are confined to America, principally to the Atlantic region, but in the Tertiary period they extended into the Old World. Occasionally black oaks are found with cup scales thickened at the base. Professor Sargent has collected, near Cambridge, acorns of scrub oak (*Quercus ilicifolia*), whose cups had this peculiarity, and it does not seem to be rare at all in the northern forms of red oak.

As what are considered hybrid oaks are abundantly fertile, and their acorns capable of germinating, the only test is the rarity and individuality of the form, and its character intermediate between two well established species which occur in the neighborhood. Hybrids seem to be much rarer between white oaks than among black oaks; or it may be that they are more difficult to discover. Dr. Englemann knows of only three, all of them pointing to the white oak (*Q. alba*) as one of the parents. Of black oaks he names seven hybrids, one of them, between the scarlet oak and the willow oak, being Bartram's oak (*Q. heterophylla*). He was formerly inclined to believe the latter to be a distinct species. The type specimen of Michaux was long ago destroyed, but within the last ten or fifteen years the tree has been rediscovered; and now numbers of individuals are known in low woods on both sides of the Delaware, below Philadelphia, often in groups together, probably the offspring of some few original hybrid trees.

The Jelly Fish.—The jelly fish have at length been shown to possess a nervous system, a point which had been considered doubtful; and one that was difficult to demonstrate on account of the gelatinous and deliquescent nature of the fish, which rendered microscopic examination almost impossible.

Ehrenberg had, indeed, asserted the fact, but Escholtz and others had failed to discover any traces of nerves in the largest jelly fish examined. Mr. Romanes, in a second communication to the Linnæan Society on this subject, has thrown a flood of light on the first beginnings in the animal kingdom. By a series of physiological researches, the microscope being only used as an auxiliary instead of being solely relied on, as by former inquirers, he has succeeded in proving satisfactorily that the jelly fish, or *Medusidæ*, have a nervous system. In view of the latter fact his experiments were perhaps hardly as satisfactory to the jelly fish selected for experimenting on as to himself and the scientific world. Every one knows, at least from engravings, the umbrella or mushroom form of the jelly fish. The stem part, it appears, has no tissue elements possessing a properly ganglionic function, or, to state it less scientifically, there are no nerve centers in this part of the jelly fish to exercise control over the movements of the umbrella part or swimming bell. These movements are regulated from the margin. When Mr. Romanes cut off the margin, the pulsations of the swimming bell at once ceased, and were not again renewed; but the severed margin continued its rhythmical pulsations for some time, and as regularly as the entire bell had pulsated before the operation. The whole of the muscular sheet which lines the cavity of the bell is pervaded, it seems, by a dense meshwork of nerve fibers, which serve to carry ganglionic impulses from the margin over the whole expanse of the muscular sheet.

Dreaming of Plants.—Dr. Francis Darwin, in his recent paper on the analogy between plant and animal life, says:

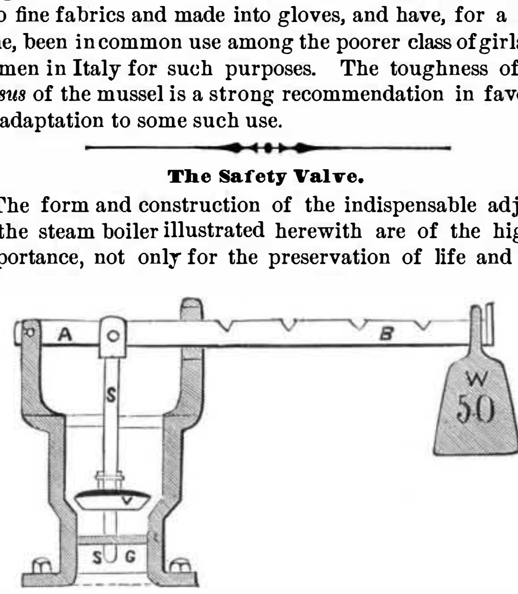
"There is one, but only a fanciful resemblance between the sleeping of plants and animals, namely, that both have the power of dreaming. I have been sitting quietly in the hothouse at night waiting to make an observation at a given hour, when suddenly the leaf of a sensitive plant has been seen to drop rapidly to its fullest extent and slowly rise to its old position. Now in this action the plant is behaving exactly as if it had been touched on its sensitive joint; thus some internal process produces the same impression on the plant as a real external stimulus. In the same way a dog dreaming by the fire will yelp and move his legs as if he were hunting a real instead of an imaginary rabbit."

Purple Oysters.—Last autumn the oysters in the Bay of Arcachon (France) acquired a very remarkable violet color. M. Descoust finds that this coloration is due to the presence in the oyster basin of large quantities of one of the rhodosperm seaweeds (*Rhytiphlæa tinctoria*), the spores of which are very highly colored. He finds that the coloring matter of these spores is assimilated by the oysters, and retained by them, more or less modified, in the lobes of the mantle and the branchiæ, and that they cannot get rid of it unless the water of the oyster parks is sufficiently diluted by rains. Last summer the drought was extreme all about the basin of Arcachon; hence the oysters became gorged with the coloring matter, the water of the parks not being sufficiently diluted to dissolve the latter.

Silk from Mussels.—A German naturalist, Tulberg, suggests the industrial application of the products of the mussel. The well known *byssus*, or strong silky threads which these animals spin in order to fasten themselves to rocks and stones, is pointed out as a probable raw material to rival the somewhat similar threads spun by the silkworm. The threads of the *pinna*, a mollusk allied to the mussel, have been worked into fine fabrics and made into gloves, and have, for a long time, been in common use among the poorer class of girls and women in Italy for such purposes. The toughness of the *byssus* of the mussel is a strong recommendation in favor of its adaptation to some such use.

The Safety Valve.

The form and construction of the indispensable adjunct to the steam boiler illustrated herewith are of the highest importance, not only for the preservation of life and property, which would in the absence of this means of safety be constantly jeopardized, but also to secure the durability of the steam boiler itself. B is the lever; A, short arm of lever; S S, stem; V, valve; G, guide; W, weight.



Increasing the pressure to a dangerous degree would be impossible in any boiler, if the safety valve were what it is supposed to be—a perfect means for liberating all the steam which a boiler may produce with the fires in full blast, and all other means for the escape of steam closed. Until such a safety valve shall be devised and adopted in general use, safety from gradually increasing pressure must depend on the attention and watchfulness of the engineer.

We have decidedly too much theory on the safety valve, and most of this theory is the merest vagary, which it is impossible to harmonize with experience and sound practice. All that the safety valve needs to make it what it was intended to be, is, first, an orifice proportioned to the grate surface; second, simplicity of construction; third, directness of action.

Q. What is the object or use of the safety valve? A. It is a valve intended to relieve the boiler from extra pressure, and to prevent bursting, collapse, or explosion.

Q. What do you consider a proper proportion for the safety valve of a boiler? A. The area of the safety valve should be one half square inch to each square foot of grate surface.

Q. Will this amount of opening of safety valve be safe for any ordinary pressure? A. Yes; it will be safe for any pressure from 10 pounds to the square inch up to 100 pounds.

Q. Is an enlargement of the safety valve greatly beyond what is customary in common practice dangerous? A. Yes; if such a safety valve by any accident should be knocked or lifted suddenly from its seat, it would probably cause the destruction of the boiler.

Q. Should every steam boiler have two safety valves? A. No; one safety valve of suitable proportions, and in good order, is sufficient.

Q. How should the safety valve be kept or cared for? A. It should always be kept as free as possible from dust and ashes, and all its working parts in good order.

Q. How often should the safety valve be moved? A. At least once a day, more particularly in the morning.

Q. Why should the safety valve be moved in the morning? A. So as to be sure that it is in good working order before starting the fire.

Q. What are the most important principles to be adhered to in the construction of the safety valve? A. Simplicity of construction, directness, and freedom of action.

Q Does the safety valve become worn and leaky by the continual action of the steam? A. Yes; all safety valves become leaky, and ought to be ground carefully on their seats.

Q. What is the best material to use for grinding safety valves? A. Pulverized glass, grit of grinding stones, or fine emery.

Q. Should safety valves be constructed with loose or vibratory stems? A. Yes; as the rigid or solid stem is apt to become jammed by the canting of the lever and weight, and in such cases the higher the pressure the more difficult is the action of the valve.

Q. Is the marking on safety valves sometimes incorrect? A. Yes; decidedly so.

Q. How can you tell whether the safety valve lever is marked correctly or not? A. By calculation.

Q. How do you square a diameter? A. Any diameter multiplied by itself is squared; as, for instance, 10 squared equals 100.

Q. Why do you multiply the square by 0·7854? A. By squaring the diameter we get square inches, and if we multiply by 0·7854, we get circular inches.

Q. What is the difference between circular and square inches? A. A circular inch is 0·7854 part of the square inch.

Q. What do you mean by the word "area"? A. By area we mean the amount of surface exposed to the action of the steam.—*Roper's Hand Book.*

Phosphorus as Food for the Intellect.

In an article on the "Hygiene of Chronic Nervous Diseases," read by Dr. G. M. Beard before the Kings County Medical Society, the author says: Although the generalization of Agassiz, that fish feeds the intellect, is among the wildest and most unscientific ever made, yet there is little doubt that the so-called "sea food," fish and oysters, is excellent for the nervous system, and very likely in part by virtue of the phosphorus it contains; but it no more feeds the intellect than phosphorus given in any other way. A healthy brain and an intellectual brain are not synonymous. One may be perfectly well, and, at the same time, perfectly stupid; a fool may eat like a lower animal, while the great philosopher barely keeps himself alive. While food is essential to thought, yet the force in food is not converted into thought-force. Good thinkers, like good athletes, are usually liberal feeders; but thousands who eat as much or more have very little intellect or muscle. The effect of a diet largely of fish seems to be sedative, calmative, like that of bromide of potassium, or phosphorus, or electricity—like these remedies, producing dullness rather than intellectuality, and inducing a disposition to sleep more than to think; not accelerating but slowing down the wheels of the mind, and therefore excellent and adapted for the nervous, and overworked, and overworried. The mistake of Agassiz was analogous to the mistake of the Italian physician, Paggioli, who used electricity on the brains of children, in order to stimulate their intellects and help them get their lessons and take the first prizes in school.

The Late Mr. A. T. Stewart.

The millionaire, once came to the conclusion that, although advertising was a good thing as a ladder, it was of no great benefit to him, as his name sold the goods. As a test, one department only of his establishment was advertised. Its business overtopped that of the others so immediately and so largely, that Mr. Stewart concluded that to get the full power of his name it must appear in printer's ink. His advertising managers say, "from that time he advertised more largely than ever in the papers."

The Opening of the Paris Exposition.

The International Exposition of 1878 in Paris was formally opened on May 1, with the usual ceremonies attending such events. President MacMahon, accompanied by the Prince of Wales, the Prince of Orange, and many other royal personages, was received by the Minister of Commerce, amid the salutes of a large body of soldiers. The Minister delivered an address, in which he thanked the foreign countries which had responded to the appeal of France for contributions of manufactures and art treasures. President MacMahon then pronounced the Exposition open, when the fountains were opened, salutes were fired, and the flags on the buildings were hoisted. The distinguished party made a tour of the various edifices, and was received in the American section by Commissioner McCormick and a company of United States marines.

According to all accounts the show is in a very backward state. In the Swiss, Chinese, Japanese, and Russian sections most progress has been made and a fine exhibit will be displayed; but it is said that no contribution will compare with that of England and her colonies.

The New York *Tribune's* correspondent, with regard to the merit of our American display as compared with the exhibits of other nations, says that "the question can be answered better a month hence than now; but one or two things are as clear now as they will ever be. Our section is next to the British; how do the two compare? The British section is about six times as big as the American, filling quite one fourth of the whole building assigned to the non-French part of the world. We are about half as large as Belgium, two thirds as large as Austria, a little less than China and Japan together, about on a level with Russia, with Italy, and with Switzerland. We are slightly larger than the Netherlands. We occupy nearly twice the space that South America fills, but South America, re-enforced by Denmark and Greece, which are alongside, covers as much ground as the United States of North America.

"This is a rough, and, if you like, a vulgar method of comparison, but it is one a good many people will make. We have, moreover, a reputation in Europe for valuing mere bigness more than other nations, and if that be our standard, and we are to be judged by it, we certainly do not stand well. Our only chance is to surpass other nations in the general excellence of our modest contributions; to surpass them in variety, in sound workmanship, in finish, in novelty of invention, in the practical usefulness of the things we show. Perhaps we shall, but what I said about the hurry in which our things have been got together, and the utter refusal of many great houses to contribute, hardly looks like it. We shall fill all the space we have, and fill most of it well, I do not doubt. But the American who expects his country to stand anything like as well here as we did in Philadelphia, will be disappointed. To take one or two examples in a single department, that of machinery, we shall have not a single large printing press, but two sewing machines, and but one collection of machine tools, that of the Brown & Sharp Manufacturing Company, of Providence, R. I. One is almost tempted to say we had better not have come here at all than come with such a meager display. It should be understood that we could have had as much space as Great Britain if we had applied for it."

A Great Flour Mill Explosion.

A terrific flouring mill explosion occurred on the evening of May 2, in Minneapolis, Minn., which involved five mills adjoining the one in which the disaster originated, together with other buildings, and caused a loss estimated at a million dollars, besides the destruction of nearly a score of lives. The cause of the casualty is ascribed to an explosion of gas in the middlings purifiers, and also to the sudden combustion of the fine dust which probably pervaded all parts of the establishment. This last seems to have been the most likely cause. It is now well known that many substances, such as coal dust, saw dust, starch, and flour, when suspended in the atmosphere, in a finely comminuted state, are highly explosive, and in flouring mills especially there are numerous instances on record where sparks from the stones have ignited this dust, and produced all the effect of a gunpowder explosion. In such cases, however, it is always difficult to determine accurately the true cause of the accident, and the same, as in the example of the recent candy manufactory explosion in Barclay street in this city (probably due to ignition of fine starch), is thus left in doubt or ascribed to spontaneous combustion. The curious feature of this Minneapolis calamity is the successive explosion of a number of mills, the blowing up of the first acting upon the others, it would appear, not merely by communication of flames, but by concussion, as sometimes is true of gunpowder mills. Further details of the disaster will perhaps shed more light on this point; but it is none the less certain that improved safeguards against dust explosions might well engage the attention of inventors.

Opening of a New Elevated Steam Railway in New York City.

The first trip over the "Gilbert" Elevated Railway from Trinity Church to Central Park, in this city, was made on April 30th. The train consisted of a locomotive and four cars containing some 200 passengers. The speed, at first slow, was gradually increased to about 25 miles an hour, and the terminus in Fifty-ninth street was reached in 17 minutes. It is expected that the same distance will ordinarily be run by through trains in 12 minutes, and by way trains in 22 minutes. A failure in steam caused a delay on the return journey which occupied 32 minutes. The curves were passed easily and without jarring, and over the entire line the motion was smooth and uniform.

The new passenger cars are 37 feet 10 inches in length by 8 feet 9 inches in width, and will accommodate 48 persons each. The doors are placed at the ends, but it is intended that some of the vehicles shall be fitted with compartments. The decorations inside and out are very tasteful, and the unusually large windows will render the cars airy and comfortable for summer travel. The passage of the trial train was received with much enthusiasm by people along the route. Several trains have run over the road carrying passengers, but operations will probably not be regularly begun until the completion of the stations, now in rapid process of erection.

The Gilbert elevated road, it will be remembered, is a huge iron bridge, which, so far as completed, extends from Morris street along New Church to Church street, thence along Murray street, College place, and Chambers street to West Broadway, which it follows until it crosses Canal street and enters upon South Fifth avenue. Along this thoroughfare and West Third street, into which it turns, the road obscures the lower stories of buildings and works a great injury to private property, for which the owners receive no compensation. After leaving West Third street it turns into the splendid street known as Sixth avenue, and straddles the car tracks on that street up to Central Park at Fifty-ninth street. The distance is about 4½ miles. With the east side division, on which work has not yet begun, the total length of the line will be 22 miles, occupying and disfiguring the finest avenues in New York city.

The Natural Dissemination of Gold.

The results of recent investigations only go to confirm more and more the opinion long held by geologists as to the wide distribution of gold.

Mr. Henry G. Hanks, in a paper read by him before the California State Geological Society, on the "Divisibility of Gold" (see SCIENTIFIC AMERICAN SUPPLEMENT, No. 118), has recently added, as the result of his personal observations, many valuable facts in addition to what was already known on the subject, all tending to give further evidence as to the omnipresence of the precious metal in the earth's crust.

Of all the interesting examinations that have thus far been made to obtain information on this subject, the most curious, perhaps, were those that followed the investigations of Mr. Eckfeldt, the principal assayer of the United States mint at Philadelphia, a few years ago.

Underneath the paved city of Philadelphia there lies a deposit of clay whose area, by a probable estimate, would measure over three miles square, enabling us to figure out the convenient sum of ten square miles. The average depth is believed to be not less than fifteen feet. The inquiry was started whether gold was diffused in this earthy bed. From a central locality, which might afford a fair assay for the whole, the cellar of the new market, in Market street, near Eleventh street, some of the clay was dug out at a depth of fourteen feet, where it could not have been an artificial deposit. The weight of 130 grammes was dried and duly treated, and yielded one eighth of a milligramme of gold—a very decided quantity on a fine assay balance.

It was afterwards ascertained that the clay in its natural state loses about fifteen per cent of moisture in drying. So that, as it lies in the ground, the clay contains one part gold in 1,224,000. This experiment was repeated upon clay taken from a brickyard in the suburbs of the city, with the same result.

In order to calculate with some accuracy this body of wealth, blocks of clay were cut out, and a cubic foot (as it lies in the ground) found to weigh 120 pounds, nearly, making the specific gravity 1·92. The assay gave seven tenths of a grain of gold to the cubic foot. Assuming the data already given, it was ascertained that there were 4,180 millions of cubic feet of clay under the streets and houses, in which securely lay 126 millions of dollars; and if, as was pretty certain, the corporate limits of the city afforded eight times this bulk of clay, more gold lay therein than had as yet been brought from California and Australia.

From these figures it is apparent that, every time a cart load of clay is hauled out of a cellar, enough gold goes with it to pay for the carting; and, according to Mr. Eckfeldt's calculation, if the bricks which front the houses of the city could have brought to their surface, in the form of gold leaf, the amount of gold which they contain, there would appear a glittering star of two square inches on every brick.

The Total Eclipse of the Sun.

On the 29th of July next a total eclipse of the sun takes place under such circumstances as to present opportunities that occur scarcely once in a generation, for the study of some of the most interesting phenomena with which astronomers have to do. The path of the totality of this eclipse runs diagonally across the center of the United States from Montana to Texas, and is somewhere about 140 miles wide. Many of the best points for observing the eclipse are therefore directly accessible by railroad, and several expeditions might be sent out fully equipped to as many different points, without spending so much money upon them all as it would ordinarily take to equip a single expedition to a more distant point.

Recent discoveries have rendered it probable that most of the meteorological changes in progress upon this planet are caused by events taking place upon the sun, and many questions relating to the physical constitution of that orb, and the changes there taking place, can only be studied during a total eclipse. It is said by Admiral Rodgers, of the Naval Observatory, that the sum of the opportunities which all the astronomers of the world can get for observing such eclipses does not exceed five or six hours in a century, and it is therefore important that every advantage should be taken of the very favorable conditions for observation under which the present eclipse occurs. All the principal European governments recognize the importance of studying the phenomena attendant upon the total eclipses, and send out costly expeditions, even to their antipodes when necessary, for this purpose; and there is no doubt that there is a general impression abroad that our government would make ample provision for the study of a matter of such general interest, that is visible almost exclusively within our borders, or the different foreign governments would no doubt be preparing to organize expeditions for observation on our territory. Our government, however, has so far done nothing, and it is possible that one of the best opportunities that may occur in many years for the study of solar phenomena may pass away without any advantage being taken of it.

The Naval Observatory is awake to the importance of the occasion, and has asked Congress for an appropriation of $8,000 for the purpose of sending off seven expeditions, two of which it is designed to send to Montana, two to Texas, two to Colorado, and one to Wyoming, each to consist of three astronomers. The sum asked for was simply to pay traveling expenses and the cost of transporting and setting up the instruments in their temporary observatories, nothing being requested for salaries, as the most eminent astronomers will gladly volunteer their services for such an important occasion.

Petroleum Tanks.

Dr. Stevenson Macadam states that a lead tank will spoil the oil in a week, causing it, when burnt, to choke the wick so that the latter has to be trimmed several times in an evening. If the lead be bright the oil will be spoilt in a day. An iron tank does not much damage the oil for illuminating purposes, but it darkens the color rather considerably, and causes it to throw down a rusty-colored deposit. Zinc, ordinary tin solder, and galvanized iron, all spoil the oil. If a metallic tank must be used, let it be made of tin, copper, or tinned copper, and be sure that no common solder containing lead is used in making it. These metals do not seriously damage the oil, but if it be left in contact with them for some months, it will somewhat deteriorate. Stoneware or slate is suggested as being superior to any metal that can be used for petroleum tank making.

Singular Effect of Lightning.

Les Mondes notes a curious instance of where lightning striking frequently at the same point has gradually killed vegetation over a considerable area in the vicinity. The current after entering the earth made a deep hole some four inches in diameter. For some reason repeated strokes, during the last five or six years, have fallen at this point, and every year the circle of dead currant bushes around it has widened. At present the affected area has a diameter of over 20 feet, and a large cherry tree some twelve years old recently died. Fresh hardy bushes and shrubs planted within the boundary die within two years. It would seem that the lightning strokes have some influence in thus destroying vegetation, possibly by producing in the soil chemical compounds injurious to plants.

To Color Photographs.

Take a strongly printed photograph on paper, and saturate it from the back with a rag dipped in castor oil. Carefully rub off all excess from the surface after obtaining thorough transparency. Take a piece of glass an inch larger all round than the print, pour upon it dilute gelatin, and then "squeegee" the print and glass together. Allow it to dry, and then work in artist's oil colors from the back until you get the proper effect from the front. Both landscapes and portraits can be effectively colored by the above method without any great skill being required.

Cinders in the Eye.

To the Editor of the Scientific American:

Having noticed two communications in your journal lately under the above heading, permit me to give you a very simple remedy I have used for years with success: A small camel's hair brush dipped in water and passed over the ball of the eye on raising the lid. The operation requires no skill, takes but a moment, and instantly removes any cinder or particle of dust or dirt without inflaming the eye.

C. G. E.

New Binoxide of Manganese Element.

M. Gaiffe has recently made a new galvanic element, which consists of a carbon cylinder, perforated with numerous holes, in which grains of binoxide of manganese are placed, and a rod of amalgamated zinc. The liquid is a 20 per cent solution of neutral zinc chloride, free from lead. Oxide of zinc is formed, which falls in pulverulent state to the bottom of the containing vessel.

A HUGE BALLOON.—The dimensions of M. Giffard's captive balloon, which is being constructed in Paris, are 180 feet by 118 feet. The car will contain fifty persons, and the cable will be about 2,000 feet long.