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NEW YORK, SATURDAY, JULY 28, 1860.

NEW AMERICAN CLOCKS.

IN connection with this interesting subject, it is our intention to present some new facts which, we conceive, will be of benefit to our country if acted upon with an enterprising spirit. As an introduction having a bearing upon this topic, it will be quite appropriate to our arrangement to give a brief history of some of the most wonderful clocks.

The remote ancients were unacquainted with clocks; their only means of keeping a record of daily time was by sun-dials and hour-glasses. The first clocks of which we have anything like an authentic account were moved by drops of falling water, and were known to the Greeks in the days of Demosthenes. The Arabs—now so degenerate—were at one period the most learned and skillful people in the world; and, as far back as the ninth century, it is recorded that the famous Caliph Haroun al Rashid—the hero of the "Arabian Nights' Entertainments"—sent to Charlemagne, the conqueror of Western Europe, a water-clock which astonished all France. It was so constructed that; whenever it struck the hour of 12, a number of small figures rode out on horse-back and paraded around the dial-plate, then entered their tents. When the art of clock-making was introduced and first practiced in Europe is not very clear; but the most extraordinary clock ever made is the one now in the Strasburgh Cathedral, manufactured in the 14th century. It is furnished with a celestial globe that exhibits the motion of the moon, earth and the planets; and it has a perpetual almanac, on which the days of the month are pointed out by a figure. The first quarter of each hour is also struck by the figure of a child with an apple, the second by a youth with an arrow, the third by a man with the tip of his staff, and the last by an old man with a crutch; and the full hour is then struck by a figure representing an angel, which opens a door and salutes the Virgin Mary. Near the first angel stands a second, which holds an hour-glass that is turned in its hand as soon as the hour ceases striking. In addition to these figures and movements, there is a golden cock, which, on the arrival of every successive hour, claps his wings, stretches forth his neck, and crows twice.

American mechanics early exhibited great skill and ingenuity in clock-making. Long prior to the Revolution, the very distinguished David Rittenhouse, of Philadelphia, constructed an astronomical clock that exhibited several of the motions of the heavenly bodies; and it gained for him the highest consideration, both at home and abroad. It was presented to the college at Princeton, N. J., and for many years it was an object of wonder and admiration. The British army when they invaded that seat of learning—to their credit be it spoken—sacredly protected this contribution of American ingenuity, as was also the case with the Patent Office in Washington. It has long since ceased to perform its regular avocations, but its fame belongs to the history of our country, and will be perpetuated.

The colony of Connecticut early became somewhat noted for its steady, clock-going habits; and let it not be forgotten that John Fitch, the inventor of steamboats, was, by trade, a clock-maker. So well has Connecticut improved upon her early propensities that it may be justly asserted that no equal space on the globe produces so large a number of clocks at the present day; and here is the point to which we wish to divert from the historical to the commercial and mechanical views of the question.

Nearly all the clocks manufactured in this country are of a very common character, and there has not been a new principle of action added to them in a hundred years. A number of improvements have been made in several of their parts; but no very original mode of action has been applied. Besides this, most of our American parlor-clocks are what may be styled "common;" almost all the superior fancy qualities are still imported from France. We surpass the English in making clocks, but the French surpass us in beauty of design, if not in accuracy of workmanship. The London *Mechanics' Magazine* states that, during the year 1859, nearly a quarter of a million of clocks were imported from France into England. Now, if our clock-makers made more beautiful and cheaper clocks than the French, we should have all this trade in our own hands, and this would amount to a vast sum annually. Can we not do it? There is nothing new in the arrangement of the parts of a French clock; the Parisian makers have long sought for some original mode of action whereby they might be able to produce more new designs and introduce a greater variety; but they have always failed. But what has not been accomplished in France has recently been achieved in New York. Three small and neat mantel clocks have been exhibited for some time at the office of the Cooper Institute, having a principle of operation different from any that we have ever heard of, or seen. The common mantel clock is operated by the tension of an unwinding steel spring, like that of a watch; other clocks are operated by gravity in the form of a descending weight, the gradual fall of which is regulated by a pendulum. The new American clock (which is the invention of James Tuerlingx, of this city) has no operating spring, cord, pulley or pendulum. In the center of a common mantel clock vase, there is a vertical fixed steel screw extending from top to bottom. Over this is slipped a round weight with a hole in its center, but no thread cut on it. On the upper surface of this weight is a small roller, set on edge, and placed at such an angle that it takes into the thread of the screw, and the weight thus descends, revolving slowly around the screw rod, like a nut moving round by its own weight—a principle of mechanism which we have never seen carried out before in any machine. This is its principle of action; the revolving weight descends in a circuit of its own diameter. Two guide rods are attached to the descending weight, on the feet of which is the large wheel that is regulated by the escapement. It has only one wheel to connect it with the escapement and regulator, which are otherwise similar to those of a compensation chronometer. On the top of the guide rods, the motions are given to the hands of three dials by a train of gears. The length of time in which a clock is kept moving is regulated by the length of the screw, which is 14 inches for an eight-day clock, having 14 threads to the inch. We have thought that, from the very novel mode of operation embraced in these clocks, they are eminently adapted to take the place of those fancy clocks which are so extensively imported; they have attracted much attention from those who are curious in ingenious mechanism, and they may lead to the introduction of an entirely new class of American clocks.

OUR FRIENDS.—The friends of the SCIENTIFIC AMERICAN throughout the whole country have, as the politicians would say, "nobly rallied to our standard," and we take this occasion to extend to them, one and all, our warmest thanks. There are many little incidents connected with the renewal of subscriptions, which are exceedingly pleasant to us; and but for want of space, we should like to publish them. We cannot, however, forbear to mention the fact that the city of Louisville (Ky.) continues to bear off the palm; for some years past, our friends—the Messrs. Skene, of that city—have regularly obtained for us over one hundred subscribers. One appreciative subscriber—John May, residing in Yazoo City, Miss.—has just renewed his subscription, and *paid in advance for twelve years and a half!* In short, from all sections we are receiving satisfactory evidence of the value and popularity of the SCIENTIFIC AMERICAN. We hope our friends will not relax the canvass; but carry it on with enthusiasm and vigor.

ATMOSPHERIC ELECTRICITY.

The Newark *Mercury* having published a correspondence which recently took place between Seth Boyden, Esq., and the editors of this journal, in regard to certain electrical phenomena, we are induced to devote some more particular attention to the subject, with the hope of preventing the adoption or continuance of many erroneous notions in relation to it.

And, first, we entirely dissent from Mr. Boyden's theory that, in thunder-storms, the lightning never descends from the clouds to the earth, but always passes upwards from the earth to the clouds. This is contrary to the generally-received opinion, and contrary, we believe, to the unmistakable evidence of our own senses. It is true that, in most cases, the velocity of an electrical discharge is such that it is difficult, and perhaps impossible, for the eye to determine with certainty whether it is passing in the one or in the other direction; still, in some instances that difficulty does not exist. It may be that the electrical discharge is not always downwards, but, certainly, it is not always in the contrary direction. At all events, when it is impossible to say that the lightning passes downwards, it is equally impossible to say, from observation, that it passes upwards; and where a theory of this kind is sought to be established, the burden of proof is upon the theorist.

But this theory is not only disproved by common observation, but also by the deductions of science. This subject is pretty fully discussed in an article found in the Patent Office Report for the year 1859, from the pen of Professor Henry, of the Smithsonian Institute—a name which is foremost among the men of science in this or any other country, especially upon this particular subject. Professor Henry adopts the theory of Peltier, which is that the electrical phenomena of the atmosphere are entirely due to the induction of the earth, the electricity of which is constantly negative. Now it is true that the terms positive and negative are, to some extent, arbitrary and conventional, and most of the electrical phenomena can be equally well explained upon the theory of two kinds of electricity—the vitrious and the resinous; still, the scientific world has generally fallen back upon the idea of Franklin, that all the phenomena can be best explained upon the theory of one single fluid, which, when in excess or in deficiency, operates like heat and cold in producing their different effects.

Now a thunder cloud, saturated with moisture, is a tolerably good conductor of electricity, and when suspended over the earth, which is in a state of negative electricity, the lower portion of the cloud will become positive and the upper negative, in accordance with the well-known laws of induction. We might, therefore, expect that, in all cases, the discharge would be downwards.

The terms "positive" and "negative" are merely relative, like those of heat and cold; as there is no body, however cold, which is entirely destitute of heat, and which is not a warm body as compared with one which is still colder; so there is no body, how strong soever its degree of negative electricity, which is entirely destitute of that fluid, and which is not positively electrical when brought nearly in contact with another body still more negative. It follows from this that, although the earth is negatively electrical, it will be positive in regard to a cloud which, from any cause, may have become still more highly negative. Whether such a phenomenon may not sometimes present itself, we are not prepared to say; and, therefore, cannot deny that discharges may sometimes take place from the earth to the clouds. But we are fully of the opinion that the discharges are generally made in the opposite direction.

But why, if the electricity of the clouds is positive, does it not all pass to the earth in the course of a few minutes upon the rain-drops which sometimes fall so plentifully, or by means of the powerful discharges which often follow each other in such quick succession? Doubtless such would be the case were there not some means of replenishing the supply. But in all thunder storms, causes are constantly at work which develope electricity more rapidly than it can be carried down to the earth upon the falling drops. It, therefore, accumulates in the clouds until the mutual attraction between it and the negatively electrified earth causes it to burst its way through the intervening atmosphere, which

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is partially a non-conductor, and an explosion is the consequence.

The cardinal mistake with our friend, Mr. Boyden, seems to be in his regarding electricity as though it were an ordinary material substance, which might be brought down to the earth on rain-drops until it was entirely exhausted in the clouds. As well might he talk of exhausting all the heat of the clouds in the same manner. As far as we know, electricity, like heat, pervades all nature wherever there is a material substance to which it may attach itself. Whether it exists in void space, we have no means of determining.

Like heat, also, its tendency is to diffuse itself, and to become everywhere equalized. It rises from the earth with the vapor which subsequently forms the rain-cloud. If nothing takes place in that cloud to give it any new development or to disturb its equilibrum, it falls to the earth silently with the drops of the shower, still preserving its proportion to the mass of matter to which it is attached.

But, in some unascertained way, its quantity is increased in the storm-cloud and the general equilibrium is destroyed, and, when sufficiently accumulated, it bursts its way through the intervening atmosphere towards the earth or some other cloud whose electricity is negative in relation to its own, and a disruptive discharge is the result.

And now comes in the office of the lightning-conductor. To say that such a conductor exerted no inducnce at all upon the descending discharge, would be saying, in effect, that such a conductor was of no use at all; for if the rod only conveys to the earth the bolt which would otherwise have struck on the very point where the rod is located, it would be necessary to cover building with metal in order to ward off the lightning, just as completely as it needs to be covered in order to keep out the rain or the snow.

This may be said, however, in regard to lightning-rods. They do not cause a disruptive discharge when one would not have been made if the rod had not been erected; but if such a discharge would otherwise have fallen within a circle, the diameter of which is four times the hight of the rod, it is attracted to the conductor and passes harmlessly into the earth. Its attraction may even extend beyond that limit; but experience has shown that its efficacy cannot be relied upon at a greater distance, and, consequently, its protective power is limited by that rule. Suppose, then, a vertical cone, with its apex at the point of the conductor, and having for its base a circle whose diameter is four times the hight of the cone; the conductor will attract to itself any discharge which would otherwise have struck upon any point beneath the surface of that cone, and will consequently protect every such point; but nothing more, with any reliable certainty.

It is evidently a mistaken notion that there is any special attraction in the metal itself. A cast-iron pavement would attract the lightning no farther than though it were of brick. A pile of cannon balls would be as harmless as a cart load of pumpkins, as to its tendency to invite a visit from the electric messenger.

Nor does a lightning-rod possess much efficacy unless its electricity communicates freely with that of the earth. When a highly-charged thunder-cloud is impending over any particular point, the positive electricity beneath it is expelled to a distance. If a lightning-rod were standing there, so arranged as to be electrically disconnected from the earth, its own electricity would be decomposed; its lower extremity would be positive and its upper negative. But the intensity of that negative electricity would be slight, in comparison with what it would have been had the electricity of the rod been enabled to pass freely into the earth, and its attraction to the descending discharge would be weaker in the same proportion. And even after the lightning shall have struck such a rod, if there is any better conductor from any point of the rod to the great reservoir of negative electricity—the earth—than is formed by following the earth farther down, it will leave the rod at that point, and take the more attractive route.

This accounts for the fact that buildings are sometimes struck by lightning, though protected with conductors, just as roofs fail to furnish protection against rain if not properly shingled. But while the rod is so arranged that it shall furnish the readiest electrical access to the earth, the lightning will no more leave the rod and pass through the building than the water will leave the gutters and flow upwards to and through the roof. The laws of electrical action are as unvarying and reliable as those of gravitation.

It follows, from what has been said, that the glass insulators generally used in supporting lightning-rods are wholly useless and unnecessary, provided the rods themselves are properly constructed and their connection with the electricity of the earth is complete. The lightning will never leave the rod to follow an iron staple into the building, unless in that way it finds a better conductor all the way to the earth's electricity than that furnished by the rod itself.

POLYTECHNIC COLLEGE COMMENCEMENT.

The annual "commencement" of the Polytechnic College was held on Thursday evening, June 28th, in the lecture room of the building on Penn Square, Philadelphia. The exercises consisted of the reading of an inaugural thesis by Mr. Charles G. Willcox, of the graduating class; an address by Dr. A. L Kennedy, President of the Faculty, and the conferring of the degrees of the college, by Matthew Newkirk, Esq., President of the Board of Trustees, upon the following gentlemen:—

Bachelors of Mechanical Engineering—Charles G. Willcox, Philadelphia; Edward S. Colwell, of Philadelphia.

Bachelors of Civil Engineering—Frank J. Firth, Germantown; Charles M. Burchard, Philadelphia; H. Harlan Carter, Texas (Lancaster county).

The Master's degree was conferred upon the following graduates of three years' standing:—

Master of Mine Engineering—Charles W. Bodey, of Norristown, Pa.

Master of Mechanical Engineering—Robert Scott, Jr., of Philadelphia.

The following are the subject of the theses presented by the candidates for graduation:—

Mr. Willcox:—Iron-works; their location, arrangement and construction, illustrated by plans and drawings. Mr. Colwell:—Plans and description of a hot-blast furnace, with a pneumatic lift and the means of using the waste gases. Mr. Burchard:—Plans and description of a single arch iron truss bridge. Mr. Carter:—Glass: its history, composition and manufacture. Mr. Firth:—Description and plans of a three-arch cast-iron bridge.

The success of an institution which thus professionally educates young men for the practice of those great scientific and industrial pursuits upon which the prosperity of our country depends, and which are among the most honorable and lucrative of human employments, is a subject of general congratulation. We have carefully examined the thesis of Mr. Willcox, and shall soon present it to our readers, with the engraved plans on an extensive scale. It is a subject which will interest many of our readers.

RECENT AMERICAN INVENTIONS.

The following inventions are among the most useful improvements patented this week. For the claims to these inventions the reader is referred to the official list on another page:—

SILK STRETCHING AND STEAMING MACHINE.

The object of this invention is to obtain a simple, compact, and portable silk-stretching and steaming machine, the manipulation of which will be simple, while the power may be increased or diminished at pleasure. This invention consists in suitably combining with a stretching and steaming box, wherein the hanks of silk are placed to be stretched, a cylinder enclosing a piston which is to be operated by steam or hydrostatic power for giving a direct action upon the stretching bars over which the hanks of silk are placed, and thus perform the operation of stretching and steaming at the same time. The inventor of this improvement is Lucius Dimock, of Hebron, Conn.

ANATOMICAL LAST.

This invention is an improvement in constructing lasts for boots and shoes, so that shoes produced from these lasts will correspond to the bones and ligamentous structure and conformation of the sole, back, and heel of the natural foot; the invention provides for preventing distortions and deformities of the foot, or joints of the foot, callouses upon the toes, and for relieving and correcting such dislocations where they already exist. This improvement was designed by John C. Plumer, of Portland, Maine.

INDUSTRY—MANUFACTURES—COMMERCE.

The Great Eastern.—The number of visitors to this great vessel has increased steadily from the day the price of admission was reduced to 50 cents. About 10,000 have been admitted daily during the past week. It is her great mass that produces such an influence upon the mind; the funnels of small steamers which come alongside reach only to her bulwarks. The vast unoccupied space inside gives the vessel an empty appearance; and there is certainly an unfinished look about most of the apartments. There is no no grand, spacious upper saloon, like those on most of our steamships, to show-off her capacities and accommodations for passengers. It seems to be too much cut-up into separate apartments by the bulkheads being carried up so high above the water line. Giffard's feed apparatus is attached to the boilers of the paddle engines. It consists of a jet of steam carried through a narrow nozzle into an open, trumpet-mouthed tube, situated below the water line in the boiler. At the entrance of this tube, it meets with the column of feed-water, and the steam rushes into the boiler, carrying some feed-water with it. It answers very well when feeding with cold water, but not when the water is taken from the condenser in which a portion of air is set free, which retracts the necessary vacuum for this feeder. No pump whatever is required for this apparatus; it is a French invention, and is both simple and novel, and for locomotives it is beginning to be extensively applied in England. In comparing the size of the parts of the paddle-wheel engines of the *Great Eastern* with some of those on our American steamers —such as the *Adriatic*—we have been impressed with their apparent *lightness*. Thus: the shaft of the *Great Eastern* is only 24 inches in diameter; while that of the *Adriatic* is 26 inches. The piston rods, connecting rods and valve rods also appear to be very slender in proportion for such a large ship. Each paddle float on the wheel is 13 feet long and 3 feet broad; the circumference of the wheel is 150 feet. The dip of the wheels were four feet on the voyage out, but the floats were reefed-up some distance from the extremities of the arms. One thousand tuns causes a displacement of only six inches; 10,000 tuns will only sink her five feet deeper in the water. There are no less than 33 engines on board—such as donkey engines for feeding boilers, hoisting, &c.—thus making 25 for minor operations; the eight large engines being employed for propelling. Each oscillating cylinder, with its piston rod, weighs 26 tuns; thus making 104 tuns for the four cylinders. On Monday next—the 30th—the *Great Eastern* will proceed on the grandest marine excursion that has ever taken place on our waters. She will take several thousand passengers, at $10 a head, and proceed to Cape May, where she will meet with a large delegation of Philadelphians; thence she will steam down to Cape Hatteras, and return to New York on Wednesday. A splendid band of musicians has been employed for the occasion, and a *grand time* is anticipated. It is now concluded, we understand, that she will leave to return to England on the 16th of next month; therefore, all those at a distance who desire to visit her should do so at the earliest date.

Steam Plow.—The State Agricultural Society of Illinois offers a premium of $1,000 for the best steam engine that can be practically substituted for animal power in plowing and other farm work. This prize is simply for a farm locomotive which may be applied to do general work. It is expected that several of such engines will be entered for competition this year. Much dissatisfaction has been felt, heretofore, with the action of the committee of this society in not awarding the full prizes at the former exhibitions of Fawkes' plow. We hope no cause for such blame will be allowed to rest on the Committee on Premiums at the next fair.

The law has gone into force in this city forbidding any person to sell or give any poisonous substance without making a record of it in a book, taking the name and residence of the person to whom it was given, and the name and residence of a witness to the sale. This good act is applicable to all cities in New York State. The penalty for disobeying it is $50 in each case.

Darius Davidson has published a long article in the New York *World*, condemning the model and build of the *Great Eastern*. His views on the subject belong rather to the speculative than the positive in science.

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