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Contents:

(Illustrated articles are marked with an asterisk.)

THE APPRECIATION OF KNOWLEDGE.

It is an old observation that man generally appreciates only that knowledge which he possesses himself, even if this possession is quite limited; and that those branches of knowledge to which he is a total stranger are considered by him as not worthy of the expenditure of his own or any body else's time. We must, of course, make exceptions to some ornamental accomplishments; a man who never danced may come into a ball room, and then appreciate the value of dancing, and wish he could dance; or a young lady without any education whatever may ardently wish she could play the piano and talk French; but such a kind of appreciation proceeds not always from any love to the knowledge itself, but often from the reasonable and natural desire to make one's self agreeable and entertaining, or, what is worse, often simply from vanity and the selfish desire to shine and eclipse others.

It is this total ignorance of everything relating to the science of the present day, of those educated in our old fashioned exclusively literary colleges, which is the chief cause of the opposition to the introduction of scientific courses in our higher educational institutions. The knowledge of the classical languages and their literature, even when it is only limted, of course increases its appreciation more and more; and if the student, by an incomplete *curriculum*, is kept exclusively in this path, he must of course become one-sided; the result is seen in the opposition of the present day, found among many professors and students, to the innovation of devoting to the scientific course as much time as to the classics. It is perhaps little known that, 300 years ago, there existed as much opposition against a reform then introduced into the classical education as there is now manifested against the modern reform. The reform then introduced was the study of the Greek language and literature. The whole scientific world was then under the tuition of the scholastic lecturers in Latin, who, under pretence of teaching the philosophy of Aristotle, taught nothing but the rubbish under which the philosophy of Pythagoras and Plato were buried. When, after the overthrow of Constantinople in 1453, by the Moslems, the learned Christian Greeks had been driven to the cities of the west, and diffused the well merited admiration for that language and literature, the scholastics and Roman Catholic theologians, comfortably seated in their universities and pulpits, opposed vehemently the attention which was then commenced to be paid to Greek. Their opposition was bitter and most violent; the Christian faith, they said, was in danger. The Greek classics would undermine Christian Roman theology. The established and well tried mode of educational training were to be superseded by worthless empirical schemes. The humanities would supersede divinity, and society would be endangered by such a change, etc.

The changes, at last established in the system of study, came then as now, not from inside appreciation, but from outside pressure. Hamilton says: "The awakened enthusiasm for classic studies did not originate in the universities; it was only after a strenuous opposition from these bodies that ancient Greek literature achieved at last its recognition as an element of academical instruction." The new philosophy, so called, was considered a fifth wheel to a wagon, abominated as a novelty that threw the ancient Latin learning into discredit, diverted the studious from the universities, emptied the schools of the *magistri* and the *bursæ* of the colleges over which they presided, and rendered contemptible the once honored distinction of a degree. Greek in particular and polite letters in general were branded as heretical, and while the academical youth hailed the first lecturers on ancient Greek literature in the universities as messengers from heaven, the academical veterans prosecuted these intruders as preachers of perversion, and winnowers of "the devil's chaff," etc.

It is curious to observe the similarity of the objections made against the educational reform of that time, and those made in our time against the introduction of scientific training. It is also now asserted by the ultra orthodox veterans that religion is in danger, that science will beget infidelity, etc.

In the meantime, science manifests so powerfully its influence on our present social condition that opposition to its study is utterly useless. Every thoughtful man is reminded almost every minute of his life of what comforts he owes to scientific research, discovery and invention. We close with a quotation of George Gore, of Birmingham, England, from an article on "The Practical Importance of Scientific Education" He says: "Every man who eats his food with an electro-plated fork is indebted for the use of that article, not only to the labors of those inventors who developed the steam engine, by means of which the metal is rolled and stamped into forks, but also to Volta, Davy, Daniell and others who produced the voltaic battery, to Gay Lussac, who discovered cyanide of potassium, and to the various inventors and practical men who applied all those means to produce the final result." And this is only a single illustration out of scores which can be easily given.

PROTECTION FROM LIGHTNING.

The importance of metallic rods as a means of protection against lightning was well illustrated during a thunderstorm at Baltimore, on the 20th ult., when an electric discharge fell upon the rod of the Washington Monument. This structure has an altitude of 185 feet, stands upon high ground in an open square, and forms a conspicuous point for the convergence of electricity. The monument was protected by a common lightning rod, put up apparently in a bungling, imperfect manner, but it unquestionably saved the structure from serious damage. The Baltimore *Sun* says that "investigation shows that the damage to the statue and monument was very slight indeed when compared with the damage to the lightning rod, and infinitesimally so when compared with the damage that would necessarily have resulted if the rod had not been there. A careful examination developed the fact that the rod received the whole charge and passed it safely to a bad connection, five feet from the point at which a lateral explosion occurred, knocking some small fragments out of the statue; from that on, it followed the rod, exploding in its way wherever inferior connections obstructed its passage, blacking the top of the base between the shaft and the outer edge as thoroughly as though a large quantity of powder had been exploded upon its surface. From there to the earth, the lightning passed without further explosion until arriving at the terminus of the rod, at which point the flag pavement was torn up and broken into fragments. It then seized upon the iron railing surrounding the base of the monument, over which it passed, fusing it where it first came in contact with the metal. Wherever the connection was good in the lightning rod, no damage was done."

In almost every example where buildings having rods upon them are damaged, it will be found that the connections or terminals of the rods are defective. One of the chief defects of lightning rods, as they are ordinarily put up, is in the ground terminals. The lightning-rod-man covers the house with neat looking rods and points, sticks the lower end four or five feet into the ground, pronounces the job a good one, receives his money and departs. But a rod thus left is almost as unsafe as it would be if its lower end were enclosed in a glass bottle and rested on the ground.

Ordinary earth is an exceedingly poor conductor of electricity as compared with iron; hence, in order to effect the safe discharge of electricity from an iron rod into the earth, the bottom of the rod should be provided with a large conducting surface, so that the electricity may be diffused and pass into the earth at many points simultaneously. The explosion at the pavement, in the example of the Baltimore monument, shows that the rod there employed was sadly deficient in the area of its ground terminal.

The necessary area of underground conducting surface for a lightning rod may be obtained in a variety of ways: (1.) Extend the rod itself for a considerable distance underground, away from the building. (2.) Connect the lower end of the rod with an iron pipe which extends in like manner underground. (3.) Provide a trench and supply it with good charcoal well packed, and imbed the rod, for some distance from the building, in the charcoal.

As an electrical conductor, well burned charcoal ranks next to the metals. Metallic ores come next to charcoal. Water and moist earth, which are so frequently recommended as terminals for lightning rods, are among the poorest of conductors.

One of the best protected dwellings that we have heard of is that of Mr. John Knox Smith, an intelligent English merchant residing at Singapore. His country house is built on a prominence, upon a bed of iron ore, with which the house lightning rods are made to communicate. The lower ends of the rods thus have a very extensive conducting surface, and the protection afforded is considered perfect. Thunderstorms and lightning strokes are very frequent, but the house has never been injured.

A PETROLEUM FIRE.

A great conflagration of petroleum occurred at Hunter's Point, opposite New York city, during the forenoon of the 30th ult. Over thirty-five thousand barrels of crude oil and thirteen thousand barrels of refined oil were consumed, together with many valuable buildings, tanks, docks, and several vessels. Property to the value of over one million dollars was consumed. The fire spread over an area of ten acres, and lasted for twenty-four hours, emitting an immense quantity of flame and smoke, which rose in a column of great hight, visible in all directions for twenty miles or more.

The Standard Oil Works, one of the largest refining and storing concerns in this vicinity, were totally destroyed. The fire broke out in a canal boat which was being loaded at the dock in front of the Standard premises, and is alleged to have been caused by the careless throwing down of a match by a workman, after lighting his pipe. The spread of the flames was so rapid, owing to the explosions of the oil barrels, that the firemen and workmen were compelled to keep at a distance, and were able to do but little in arresting the fire.

Large flocks of tame pigeons were observed to approach and whirl as though maddened around the huge column of smoke, and then dart suddenly into the midst of the flames and perish.

During the progress of the flames, some of the burning vessels were carried by the tide into the East river and floated northward. One of them, burning at a furious rate, was thus carried through the narrow channel between Blackwell's Island and Astoria, through the fearful pass of Hell Gate, beyond Ward's Island to Port Morris, a distance of five miles, where it approached the extensive docks and storehouses at that place, threatening the whole with destruction. No escape seemed possible, as no means for preventing the collision were at the command of the inhabitants. Slowly the burning monster came on, belching forth horrible flames and smoke. At the last moment, when all hope of saving the Port Morris warehouses was abandoned, a United States steamer was observed to run in under the smoke, into the very middle of the burning vessel. Running in and backing out quickly several times, the officers of the steamer finally succeeded in casting an anchor and chain upon the flaming hulk, by which it was towed out into the stream, and Port Morris was saved. The steamer proved to be the United States revenue cutter *Bronx*, and her commander and men are entitled to great credit for the skill and courage they so successfully displayed.

We are glad to be able to state that the extensive Astra oil establishment of Charles Pratt, which was illustrated so fully in our supplement a few weeks ago, escaped all injury. The Pratt works are located next south of the Standard works, and only escaped by a sudden shift of the wind after the fire broke out.

The application of water for the purpose of extinguishing petroleum fires, appears in this, as in other examples, to have been of little service. The water simply buoys the fleming oil, and enables it to run off in different directions, carrying destruction in its course. It is evident that a more effective extinguisher than water must be brought into use before we can hope to prevent these terrible conflagrations. Whoever can discover an effectual agent for this purpose or find out some simple way of rendering the oils uninflammable while in transit or storage, will confer a great benefit upon the country.

A RAILWAY ACCIDENT EXPLAINED.

By a recent accident on the New York and Oswego Mid land Railway, a freight train was completely wrecked and much valuable property destroyed, but no lives were lost. The accident took place near Oneida, N. Y., while the train was running at a speed of from twenty to twenty-five miles an hour on a down grade. The train consisted of the locomotive and tender, two box cars, then two empty platform cars, followed by twelve or fourteen cars loaded with coal and other freight. The brakeman, a new hand, states that according to orders on down grades, he set the brakes on the box cars in front, and had just put his hand on the brake of the first platform car when he saw that the second platform car was off the track. In a moment more it was thrown athwart the track, a general crash ensued, and he jumped for his life.

Among the reasons assigned for the accident was the stereotyped one, "broken rail"; also slipping of a wheel on its axle; also dropping down of a brake. But Mr. Alfred Hawley, superintendent of the Oneida Community machine shop, who made a careful examination of the track and remains of the wreck on purpose to ascertain the correctness of these alleged reasons, gives a different report. He found the rails and road bed in perfect order, and no indications of a dropped brake or slipped wheel. "What then was the cause of the disaster? What caused the middle portion of a train to leave the track on a straight, level, well lined, well ballasted portion of the road? We are convinced, says a correspondent of the Oneida *Circular*," that the accident was caused by an improper application of the brakes to the forward part of the train when running at a high speed." He thinks that the checking of the front part of the train caused the heavy rear cars to crush against the light platform cars and lift them from the track; and with this opinion, probably most railway people will agree. The same correspondent takes occasion to observe that many of our railway accidents are due to the incompetency, carelessness or ignorance of railway employees; and with this view, almost everybody will coincide.

THE INTERNATIONAL PRISON CONGRESS.

An international congress is now in session in London, composed of representatives from all civilized countries, for the purpose of considering the questions of the repression and prevention of crime and the care of the criminal. The delegates number many distinguished persons, many of whom have made the subject of prison reform a life study.

The United States is represented by Rev. Dr. Washburne, Rev. C. L. Brace, General Pillsbury and others, of New York, Hon. Mr. Chandler of Pennsylvania, Dr. Wines and Governor Haynes of New Jersey, and Mrs. Julia Ward Howe of Boston. Among the members from the countries of Europe are Count Sollohub, director of a large prison in Russia, Count Scalia, Director of Prisons in Italy, Privy-Councillor Steinmann of Germany, Professor Marquardsen of Erlangen, Baron Von Holtzendorff, the great authority on criminal law in Prussia, and Miss Carpenter, one of the most celebrated philanthropists in England.

Various questions relating to the subject of reform and punishment have been discussed at considerable length. Corporal punishment, and especially the use of the "cat," met with hearty condemnation from the American and continental authorities, but the English, with some exceptions, advocated it as a means of discipline. The Austrian, Bavarian, and Swiss delegates stated that corporal punishment had been totally abolished in their respective countries with the best effect. The argument on the British side took the ground that the lash was a necessary requital for crimes of brutality, such as wife beating and garrotting. The latter species of robbery, which had become alarmingly prevalent in London, had almost disappeared since its perpetrators were punished by severe castigations.

The "treadmill," a most useless and degrading penance, was found to be still in use in British prisons, although it has been abolished for over forty five years in those of America. The continental delegates affirm that it is unknown in their countries. Several English members were eloquent in its denunciation. Colonel Colvill, a prison director, states that he had been obliged to employ the mill on an average of 600 prisoners yearly for eighteen years past, and that he had never known a human being to be benefited by it. On the contrary, its only effect was to harden and depress.

The question of the prevention of crime was also brought up, several members making reports of the labors of societies for that purpose. Reformatories of different types were discussed, the general conclusion being that the "Family Reform School" was superior in every way to the "congregated" system.

It was considered that the best mode of aiding discharged prisoners was by obtaining for them co-operative employment. Thirty-four aid societies are in existence in England, which have yearly provided for about 5,500 discharged convicts. Regarding the rehabilitation of the latter, the system of placing them under the surveillance of the police was condemned.

Mr. Sergeant Cox, in reference to the repression of criminal capitalists, stated that in his opinion the receiver of stolen property should receive double the punishment imposed upon the thief.

The industrial school system of New York was fully explained, and the value of the institution shown by the fact that 2,200 children had been sent to honest employment in the West. Compulsory education was defended and generally considered a valuable auxiliary in the prevention of crime. Baron Von Holtzendorff stated that, by the law of Germany, no child could come before a magistrate for crime until above the age of twelve, but all cases of crime under that age were reported to the schoolmasters, who punished. In that country, also, the children of prisoners who are without friends are taken care of by the State in the same manner as orphans. In the United States, it is customary to consider a child as a "ward of the State," and the prisoner, when his sentence has been served, can only regain control and possession by order of court.

A correspondent of the New York *Times* says that "the British delegates were amazed to hear from General Pillsbury, of Albany, that he had carried on various prisons not only without expense to the public, but saving a handsome surplus for permanent purposes; and that, in his experience, teaching a man a trade saved him from repetition of crime. Similar experiences, from Massachusetts, of self supporting prisons, were detailed, and produced a deep impression. Count Solloherb, director of a large prison in Moscow, stated that in three months he could give a man a trade; that the prisoner became better under it, and out of the thousands he sent forth annually, less than one per cent repeated their offenses, or came under the law again."

The results of the deliberations of this congress of philanthropists, composed of men and women who are thoroughly familiar with the darkest side of life and with the statistics of crime in both the old and new worlds, cannot but be of the greatest importance. By this interchange of views, the many and grievous faults of our present system of prisons and reformatories, which in a great measure are due to adherence to old and obsolete ideas, may be clearly seen and remedied; while valuable improvements and innovations will be suggested through the contrast of our methods of repression and prevention of crime with those adopted by other nations.

NEWSPAPER BENEVOLENCE.

Among the benevolent enterprises lately put in motion in New York was a subscription to pay the expenses of giving the poor children a holiday excursion. This was set on foot by the New York *Times*, and the holidays have been very properly designated the "Times excursions." Nearly twenty thousand dollars have been contributed, and perhaps forty thousand ragged youngsters have enjoyed the luxury of a steamboat ride, a romp in the woods, and a good time generally, with refreshments.

One or two of these excursions was exclusively devoted to poor mothers and their young children. Another notable excursion was that of the newsboys, of which the *Times* says: "The party was composed entirely of newsboys and boot blacks, than whom there is not a rougher and more irrepressible class in New York. Large posters announced the picnic and called for a thousand boys. When the manager of our picnics reached the *Times* office at 6¾ o'clock A. M., he found it besieged by boys clamoring for tickets. The crowd was quickly transferred by him to the City Hall Park, where the smaller boys were all picked out and badges pinned on their jackets, if they had any, but on their shirts as a general thing. Shortly before 7½, the superintendents of the various newsboys' lodging houses with their contingents marched into the Park; and till the order for the column to march was given, a scene went on such as perhaps has never before been witnessed in New York or any other city."

Hundreds of little ragged urchins, few of them possessing shoes and stockings and many having nothing to protect their close cropped heads from the sun, were dashing about in a high state of glee if they had secured a badge, or in a state of great anxiety if they had not yet done so. Those who were too big to go would beg and pray for a ticket. The boys danced, stood on their heads, turned somersaults from pure exuberance of spirits, and many a bit of roguish satire was sent at those who could not be taken. The steps of the City Hall were crowded with interested spectators of the scene; in fact the whole of the south side of the Park was crowded. At last the boys were formed in line, in three separate divisions, wearing red, white, and blue badges respectively. At 8 o'clock the band from Governor's Island entered the Park, and taking up their position, the order to march to the steamboat was given. The scene at this moment was really exciting. As division after division, each headed by its own banner, left the Park, the crowd cheered and waved their handkerchiefs, ladies appeared at the windows of the Astor House, every store on Broadway and Park Row was emptied in a moment, and the sidewalks were thronged. As the little fellows passed the *Times* office, they sent up cheer after cheer. Every moment the number of spectators increased, so that in Chatham street and up East Broadway the little army of ragamuffins was escorted by a crowd as large as that which attends the Seventh Regiment on dress parade days. The boys were carried to a fine grove on Long Island Sound, where they had a day of most hearty enjoyment.

WAVE POWER PROPELLERS.

Some fifteen or twenty years ago, we published in the SCIENTIFIC AMERICAN the drawings of a self propelling vessel, in which the sides of the ship were provided with hinged propelling blades, so arranged that by the roll of the boat the blades would alternately open and close, giving the vessel a forward push at every lurch.

This was a novel idea at the time, but it involved the attachment of considerable mechanism to the outside of the vessel, which, under the rough usage of the billows, would be likely to breakage or disorder. It is obvious that the use of ordinary masts and sails is a much better plan of propulsion. The flapping blade system, we observe, has lately been revived, and notices thereof are circulating through the press. It makes a good newspaper item, but has no other value.

WATER VAPOR NOT VESICULAR.

A recent experiment by T. Plateau disproves the commonly received theory respecting the vesicular nature of aqueous vapor. He provided a column of water, contained in a glass tube and held therein by atmospheric pressure, the bottom of the water column being exposed; small air bubbles, on being brought from the point of a small tube into contact with the exposed water surface, immediately rose through the water column. If water vapor is vesicular, it should do the same. But experiment shows that it will not. On directing a current of ascending vapor from boiling water against the bottom of the water column, no appearance of rising vesicles through the water could be detected.

INCLINED RAILWAY IN SAN FRANCISCO.

The steep elevation of the lands immediately adjoining the city of San Francisco and the desirability of providing convenient access thereto have induced some enterprising individuals to attempt the construction of an inclined railway. The incline will be 2,800 feet in length, traversed by cars drawn by steel wire ropes and stationary engines. The cars are to be provided with clutches whereby the rope may be grasped or released at the will of the conductor. At the top of the incline, the cars are delivered over to the horse railway.

Wood Carpeting.

A correspondent recently suggested that a substitute for matting for covering floors, cheap, durable, and cleanly, was desirable. The wood carpeting, made and laid by the National Wood Manufacturing Company, 942 Broadway, New York, is the best, cheapest, and handsomest material for halls, dining rooms, and kitchens that we have ever used. The expense is not so much as that of carpeting, and but little more than that of matting; and when properly laid, it will last a number of years. We have substituted it for matting in a summer residence, and find that it possesses all the advantages of a solid hard wood floor.

THE Fourth Annual Fair of the Carroll County, Md., Agricultural Society is to be opened at Westminster, Md., on September 30, and will continue till Oc ober 5. Among the premiums to be awarded are several subscriptionr to the SCIENTIFIC AMERICAN, rewards which are always acceptable to the recipients and welcome to their homes and families.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

CINCINNATI, Ohio., July, 1872.

Cincinnati and its approaches. The great suspension bridge of Roebling. The iron railway bridge over the Ohio. The Danks puddling furnaces; interesting particulars concerning their operation. The Cincinnati water and gas works.

The route to Cincinnati *viâ* the "Panhandle" line of railroad, although not presenting as many beautiful landscapes and such a panorama of picturesque scenery as the Pennsylvania railroad in crossing the Alleghanies, exhibits to the traveler not a few exceptionally fine views in the neighborhood of Pittsburgh. That of the confluence of the Alleghany and the Monongahela rivers to form the Ohio, and the long stretch of the latter river that can be seen just after leaving Pittsburgh, are especially attractive, possessing such beauty, when seen by the light of a sun just setting among gorgeously colored clouds in the west and throwing no less beautiful though quieter colors over the eastern clouds and along the further river bank, that those who have been fortunate enough to witness it will long hold it in remembrance.

En route, we pass through the city of Columbus, Ohio, a pleasant town with wide streets, having some fine public and many fine private buildings. The capitol would be a noble structure except for what seemed to us its very ugly dome. The city hall is a very neat building. There is not very much manufacturing done here, and we only remained long enough to see something of the city and to take the next train for Cincinnati.

This latter city can hardly claim to be a manufacturing place, although its manufactures, in the aggregate, employ a considerable amount of capital. The business of manufacturing furniture is becoming its leading branch of industry. The comparative low price of walnut and other kinds of wood used in the business enables it to reach profitably for its market as far east as Pittsburgh and all over the West and Southwest. Some of the furniture made here is extremely neat in design, well made and of beautiful finish, fully equal to any thing made east of the Alleghanies. Prices are not very far from New York figures.

THE GREAT SUSPENSION BRIDGE AT CINCINNATI.

In Cincinnati, we were particularly interested in the great bridges over the Ohio river and in the now well known Danks' revolving puddling furnace.

Entering the city by rail from Columbus, one of the first and most striking objects that catches the eye is the great suspension bridge stretching across the river to Covington, Kentucky. This immense structure has a greater span than any bridge yet built in the world.

It was built by the late John A. Roebling, the builder of the two suspension bridges at Pittsburgh, and of the almost equally wonderful structure at Niagara Falls. Considering the time at which it was designed and the difficulties with which he contended, its successful completion justly entitles its designer to be considered one of the boldest and most talented engineers that the world has yet known. At first view, the bridge impresses the observer by its magnitude, as well as by the neatness of its general design, and by the graceful sweep of the great wire cables which support the roadway; but a second visit is even more impressive than the first, and, after studying it from different standpoints, and after walking across it several times, one feels that, after all, the mind was quite incapable, at first sight, of appreciating this great engineering wonder of our age, or of understanding what difficulties are met in the general plans, to say nothing of those of detail, by the engineer who attempts to sustain a bridge like this between piers separated by a distance of nearly a quarter of a mile. Those who are now watching the progress of the East River bridge at New York—which was designed by the same great engineer, in the light of all the experience gained by a life time devoted to such work, and the construction of which is proceeding under the directions of a son who profits by his own special scientific and practical training as well as by his father's experience and teaching—can hardly appreciate the talent, the hard work and the mental anxiety and activity that must have been demanded of the engineer during the progress of the Cincinnati bridge, which has but about a hundred feet less span.

THE IRON RAILWAY BRIDGE.

Further up the stream is the great iron railroad bridge built by the Keystone Bridge Company. At the channel span, the bridge is 400 feet from pier to pier, and, were it not so near the great suspension bridge, it would at once awaken in the spectator the greatest interest and admiration. It is a beautifully proportioned and well made bridge. The members carrying a compressive stress are formed of the peculiarly strong and readily constructed built columns used by some of our leading constructors; and the tension members are rods and links with ends upset, to secure full strength at what are usually their weakest parts, and to distribute the extension of the metal throughout the whole length of the piece. The importance of this last advantage is too seldom understood and attended to by constructing engineers. It is a point of special consequence, in mechanical engineering and wherever structures are exposed to sudden strains and heavy shocks.

THE DANKS PUDDLING FURNACES.

A part of a day was spent at the mill of the Cincinnati Railway Iron Works Company, examining the Danks puddling furnaces and watching their operation. These furnaces have attracted the attention of iron manufacturers both here and abroad, for, although by no means the first "rotary puddlers," they are the first whose operations has been suffi-