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Contents:

(Illustrated articles are marked with an asterisk.)

THE DEPENDENCE OF FUTURE MECHANICAL PROGESS UPON THE DISCOVERY OF NEW MATERIALS.

We would not, in the above heading, imply that without the discovery of new materials the triumphant march of improvement will be stayed, but we hazard nothing in asserting that such discoveries at this period would greatly accelerate mechanical progress.

We have within a few years witnessed a new impulse to the arts imparted by the discovery of nickel plating, which places in the hands of inventors a comparatively cheap material, suitable for many useful purposes.

By new materials, we mean not only those substances hitherto totally unused, but such modifications of known substances as render them practically new and capable of hitherto unknown applications.

For both the discovery of new substances and modifications of the old ones, the world must principally look to chemistry and metallurgy. The former almost daily acquaints the world with some new combination; but, for the most part, these discoveries are made in organic chemistry, and prove of little practical value to the arts. Once in a while, however, there appears an announcement of some investigation, the results of which completely revolutionize an entire industry; or, if not of so radical importance as this, still produce immense changes in various arts. As one out of many illustrations of this, we may adduce the discovery of the coloring matters contained in coal tar, which has so greatly added to the resources of the dyer's art.

The aim of metallurgists at the present time seems more directed to cheapening the methods of extracting metals from their ores, and rendering them more complete and effective than they have yet been; and there seems to be a pause in the study of the alloys. Yet, in these remarkable compounds of metals with each other, there seems to us an almost illimitable field, containing the highest promise to the patient worker. The man who could discover a new alloy as widely useful as brass, and who could secure the fruits of the discovery to himself, would have found a source of wealth richer than any gold or silver mine in this country.

What is needed is the systematic study of alloys, the putting of metals together in a great many possible proportions, with a constant record of results, and specimens of each preserved in cabinets, with minute observations of their physical and chemical properties. As this would take much time and involve great expense, it could hardly come within the means of a single individual; but if a suitable laboratory could be endowed, and provided with suitable apparatus, and properly qualified men could be induced to give up their lives to such an investigation, we feel assured the knowledge which might be gained would as fully repay its cost as that obtained in any other field of research.

It is also probable that the vegetable and animal kingdoms still hold rich stores of material, capable of extended use in the arts. It is not many years since it was known that useful paper could be made of wood and straw.

The milky juice of the "silk weed" or "milk weed," as it is called in common language, but known to botanists as the *asclepias cornuti*, is capable of abundant supply, if it can be shown to be of industrial value. It dries into a very viscid substance, as every boy who has soiled his hands with it knows. How nearly is it allied in property to the juice of the india rubber tree? Is it not capable of combining with sulphur, like rubber, to form a species of vulcanite? Who has answered these questions, and scores of others that might be propounded in regard to other plants?

If some of our inventors would now turn their attention to the utilization of new materials in the vegetable world, we think many valuable things might be discovered.

But we have said enough for our purpose, which has been to direct attention to the vast supplies of hitherto unworked materials lying idle in the great storehouse of Nature. Can any one believe that, among all these, remains nothing that can be brought successfully into the service of mankind? We have only to look back a few years to find a negative answer in the general introduction of petroleum products that were unknown to the last generation, to the development of the vulcanized rubber industry, to the employment of anæsthetics in surgery, to the adoption of new articles of food and drink, and to many other contributions to the comfort and luxury of mankind, that were, at the time of their discovery, no more within the limits of possibility than others not yet made are at this moment.

FIREPROOF BUILDING.

It may be safely said that there exists no solid material, available for building, sufficiently refractory to withstand heat, as intense as may be produced by artificial means, or generated in large fires like that which has recently visited Chicago. It is true that there are many substances which resist heat for a long time. Fire clay, plumbago, asbestos, platinum, etc., are capable of enduring very high temperatures, without perceptible damage or change, for considerable periods. Safes, made of these and other materials we could name, would scarcely burn up, though exposed even in the fiercest fires for hours or even days. It is, therefore, not difficult to make a safe that the heat of burning buildings will not destroy; but to make one that will not transmit heat to its contents, after long exposure, is quite another matter. Even the worst conductors do conduct heat somewhat, and though this conduction may be slow, it will, if long continued, be ultimately sure to char the destructible things in any safe that relies solely upon non-conductors—so called—as a protection for its contents. This has been proved in all the great fires that are on record, since the general introduction of safes.

The same remarks apply to fireproof buildings. No doubt a building could be made of a material, or of materials, that will not burn under any combination of circumstances; but walls will heat, and combustible organic substances will become converted into charcoal in dry ovens, for such every really fireproof building is when its exterior walls are the sole protection of its stored wares.

Could we make walls of a substance that will only attain a moderate temperature, no matter to what degree of heat it might be exposed, and which would not melt down or volatilize, we should have found the precise thing of which to make the walls of fireproof safes and buildings. A building made of ice would preserve its contents from fire till the walls were melted. But we cannot use ice for building.

What ranks next to ice as a protector, and is available in large quantity, is water. If a building could be made in such a way that each pillar, block, lintel, and sill—each separate part of the structure—could be instantly, on an emergency, converted into a steam boiler, evaporating water at atmospheric pressure, such a structure would withstand any heat that could be brought against it, and preserve most of its contents so long as the supply of water for evaporation was maintained. More than this, the exact amount of water necessary to preserve it for a given time, under a heat that would keep the water boiling, could be accurately computed. The temperature of no part of the structure could rise much above 212°, at which few materials in common use, and stored in dwellings and warehouses, would be much injured.

As a matter of interesting computation, let us estimate the amount of water necessary to protect a building one hundred feet long, thirty feet wide, and seventy feet high, having the ordinary flat roof. The superfices of such a building exposed to fire, would be equal to the effective heating surface of a 1,927 horse power boiler, or one that will evaporate 1,927 cubic feet per hour; so that, admitting all sides to be equally exposed, that amount of water would keep building and contents down to a temperature of 212° Fah.

Practically, however, only the ends and tops of a building in the center of a block would need such protection, unless the buildings next it should take fire, so that, in most cases, only about 665 cubic feet of water per hour would be necessary, supposing the heat on the ends and top to be intense enough to keep all the water boiling.

It would be clearly impossible to burn a city made up of such buildings; and no fire could have a long duration, unless some inextinguishable substance like coal oil, alcohol, etc., should ignite; in which case, unless such a building as we have described should explode, its interior would become a boiler furnace instead of an oven, and its walls would stand, to a great extent unimpaired, after its contents were consumed.

We do not pretend to assert that precisely such a system as we have indicated, is practicable, but do not doubt that the use of the vapor of water to prevent the possibility of fire would prove far more economical than the present use of that fluid as an extinguisher. We believe the direct application of steam as a conveyer of heat rather than as a motor for engines, which are only employed to throw, in a wasteful deluge, a volume of water upon buildings for the same purpose, would be shown the more scientific and effective method.

If the hint is worth anything, we leave it for inventors to put it into practical form. The problem is to make a structure that fire cannot destroy; and to the use of water as the cheapest, most available material, in combination with those which have proved themselves, when used alone, unreliable we must look for its solution.

THE LEISURE TIME OF BOYS.

Every father of a family knows that there is a time in the life of his sons that gives him much trouble and some anxiety. We allude to the period of boyhood, when exuberance of spirits and thoughtlessness are at their hight, and when the studies imposed by school discipline are entirely insufficient to find adequate employment for their too active minds and bodies. And it is not possible, or even desirable, to increase the already considerable application of all well bred boys to the study of books and the acquirement of learning. It is not to be wished that a youth of twelve should grow up to be a conceited would-be pedant of twenty, and a bookworm of thirty, years of age. Thus the task of finding fitting occupation for the leisure hours of a boy is no inconsiderable one, as few pursuits into which a boy would plunge with eagerness are suited for putting in the way of so much impulsiveness and want of consideration as most boys possess. The question, then, of how to amuse our boys, is one of paramount importance and difficulty.

We would suggest, to the many parents who have been perplexed with this difficulty, to give their lads every possible opportunity of acquiring a mechanical trade. The industry and ingenuity of a boy of average ability may easily be made to furnish him with a never failing source of amusement of the best order. The boy who can produce or make something already begins to feel that he is somebody in the world, that achievement of a result is not a reward reserved for grown people only. And the education of mind, eye, and hand, which the use of tools and mechanical appliances furnishes, is of a great and real value, beyond the good resulting from the occupation of leisure time. Having nothing to do is as great a snare to the young as it is to the full grown; and no greater benefit can be conferred on youths than to teach them to convert time now wasted, and often worse than wasted, into a pleasant means of recreation and mental improvement.

We say, therefore, to all parents, provide your boys with mechanical apparatus and tools. There is no greater pleasure to most boys than the handling of a tool; and many great men and ingenious inventors look back with gratitude and delight to the day when they were first allowed to use the lathe, the saw, and the plane.

The expense of a visit or two to a theatre will furnish a family of boys with an occupation into which they will all enter with alacrity, and which will instruct them in two most important branches of education, namely, quickness of eye and docility of hand. And, further, it will develope any latent genius they may have for the mechanical and constructive arts, which are, now more than ever, the most important means to the progress of mankind. The boy, whose time and mind are now occupied with marbles and kites, may be a Watt, a Morse, or a Bessemer in *embryo;* and it is certainly an easy matter to turn his thoughts and musings into a channel which shall give full scope to his faculties; for, to any lad, the use of mechanical tools is the most fascinating of all occupations. And for boys whose spare hours are spent in more objectionable ways than the innocent games of childhood, it is of tenfold importance that all fathers should recognize the existence of a simple and attractive substitute.

And if the boy has not in him the germ of a great benefactor to his race, and if his tastes and morals are unexceptionable, the training of the intellect in some handicraft will have great and salutary influence on his character. As logic and mathematics have a value beyond accuracy in argument and the correct solution of problems, in that they teach men the habit of using their reflecting powers systematically, so carpentry, turning, and other arts are of high importance, even if the boxes and silk spools produced are of little value. These occupations teach boys to think, to proceed from initial causes to results, and not only to understand the nature and duty of the mechanical powers, but to observe their effects; and to acquire knowledge by actual experiment, which is the best way of learning anything. All the theories culled out of books leave an impress on the mind and memory, which is slight compared to that of the practical experience of the true mechanic.

Our advice is, to all who have the great responsibility of the charge of boys, give them a lathe, or a set of carpenter's, or even blacksmith's tools. Give their minds a turn towards the solid and useful side of life. You will soon see the result in increased activity of their thinking capabilities, and the direction of their ideas towards practical results; and, still more obviously, in the avoidance of idle mischief and nonsense (to omit all reference to absolute wickedness and moral degradation), which are, to too great an extent, the pastime of the generation which is to succeed us. The future of the world is already sown, and is springing up in our children; is it not worth while to bestow a little thought on the cultivation of a growth so important to society, and so easily influenced for good or for evil?

VALIDITY OF PATENTS ISSUED UNDER THE NEW LAW

Some anxiety has been caused to patentees by a statement, now circulating among the papers, to the effect that all patents issued between July 8, 1870 (the date of the new patent law), and July 4, 1871, are invalid by reason of a discrepancy existing, during that period, between the working of the patents issued and the wording of the new law. The difference referred to is this: Under the old law, a patent was granted to the applicant, "his executors, administrators, or assigns," but in the present law the reading is "his heirs or assigns,"

It seems that, during the interval above named, the old blank forms were used while the new ones were being prepared and engraved, the above difference in wording not being considered of any essential importance, and certainly in no manner exposing the validity of the grant. It would have been a simple matter to have changed the wording of the old forms with pen and ink, if it had been legally required, or even desirable. We understand that the chief reason for adopting a new blank form was to reduce the size. Why a change was made in the wording of this paragraph in the law itself is not apparent. Persons, therefore, who may have seen the sensational item alluded to, and have had their fears much excited thereby, can safely compose themselves on the subject. Even in case the Office had committed an error, as stated, affecting in any measure the soundness of any patent, Congress would not fail to protect the rights of the party interested.

SOMETHING ABOUT FACES.

It is a trite remark that, among all the multitude of people who inhabit this globe, no two can be found that exactly resemble each other. Even in cases of twins, where a strong similarity exists, there is always to be found some point of difference by which those most intimately acquainted with them are enabled to distinguish one from the other. And it may be further observed, that those most alike in early youth lose their resemblance, to a greater or less degree, as age advances. No face leaves this world at mature years without having undergone changes that astonish even the most intimate when comparisons are rendered possible. In this age of photographs, almost any one is able to make such comparisons, and to note how the various circumstances and trials of life carve their impress upon the features. Very few have, however, fully estimated the infinite variety and number of indirect, direct, near and remote influences that have operated through ages to work out the form and feature of every face upon earth.

A skillful physiognomist may often determine character approximately by the countenances of men; but, as a sheet of paper, printed and reprinted, must at last become a confused jumble of indistinguishable characters, so are most people's faces too much interlined and crosslined, by the confused imprint of circumstances and events, to be intelligible even to the most practiced reader of faces.

There are, indeed, some traits of character, and some passions that ordinarily stamp themselves upon faces more conspicuously than others. Of these may be mentioned cruelty, settled melancholy, and jolly good nature. As a rule, these traits are easily distinguished by a look at faces; but it is not infrequent that good faces conceal bad hearts, and sanctimonious appearances cover secret vices.

A man who was tried for and convicted of murder, and who confessed his crime before his execution, was admitted, while on trial, to be as fine looking and prepossessing in appearance as any man on the bench, in the bar, or in the jury box, yet that court room contained some men whose lives and record have been in the highest degree honorable, and whose personal appearance could scarcely be excelled by any equal number of men anywhere.

It is notorious that circumstances of easy living, the absence of business cares and worries, will do much toward smoothing away the marks of crime; while the faces of criminals that have lived in circumstances of physical hardship gather a rough brutality from which we instinctively shrink.

As the circumstances which give character to the human face at birth have been infinitely various, and have acted through long periods of time, it is not a matter of surprise that the results are so varied, but rather that they should be even as uniform as they are. Were it not that throughout nature there prevails the great law of compensation, and also the great law of reversion (admirably set forth by Darwin), there could be no two living things even approximately alike. There would be neither *genera* nor species, even if the wide difference in structure and habits thus arising should not lead to the mutual destruction of all.

As circumstances shape our birth, so they shape our lives and mold our characters. Yet, with all the thought and effort toward social improvement that marks the age, the effort of society seems to be directed to making character adapt itself to circumstances rather than to form character by controlling the circumstances through which character is developed. Thus we have failed to recognize the fact that physiological law is stronger than social law. We do not yet admit the fact that, if our habits and customs are such as to develop the animal in us at the expense of the mental and spiritual, we shall have animals to control by civil law; or if we do see this, we do not see that civil law must prove utterly inadequate to control animals, that obey only their depraved instincts.

Society, in assuming to govern not only the depraved, but the healthy, instincts of our animal nature, assumes too much when it attempts to force violations of physiological law. As well might it legislate that weights shall fall upward; they will fall downward in spite of enactments; and so will the catastrophes and crimes that have lately shocked our community continue to happen so long as the circumstances that lead to them are permitted to exist. If we feed our children upon heating diet, and place them where they are forced, like plants under glass, into premature bodily development, let us blame ourselves only, that their immature minds and wills are too weak to contend with the strength of their passions which we have taken such pains to cultivate; and if, in the temptations that beset them, they overstep the bounds of social propriety, let us not be surprised that, in their efforts to escape the disgrace society attaches to such lapses, they, some of them, resort to dangerous practices, and find a final escape in death.

DEATH OF SIR RODERICK IMPEY MURCHISON.

The death of this distinguished man is announced by telegraph to have taken place on October 22, in England, at the advanced age of seventy-nine years. It has rarely fallen to the lot of any man to contribute so largely to the advancement of science as this deceased scholar. His career was a peculiar one. In early life he was an officer in the British army, and, as such, served under Wellington in Spain. He left the army, in order to marry and settle down to quiet literary pursuits; and, in accordance with the advice of his friend, Sir Humphrey Davy, as well as the influence of his accomplished wife, and following a natural predilection, he took to scientific studies, more particularly to geology and physical geography.

One of the earliest fruits of this study was the publication, in 1834, of a work "On the Geology of the Neighborhood of Cheltenham," which was afterwards augmented by Buckman and Strickland, and republished in 1845. "The Geology of the Counties of Salop, Hereford, Radnor, etc.," appeared in 1835; and, in 1839, was published "The Silurian System, founded on geological researches in the County of Salop." By this time Murchison had become a thorough scholar, and an indefatigable investigator; and, like many previous scientists, had taken up a hobby, which he pushed with admirable zeal, and in elegant language. The ancient name of Wales was Siluria, and this served to give character to the new system of the oldest rocks. The Silurian system has become one of the recognized names in geological science, and for this we are indebted to Sir Roderick.

From the date of his first publication, in 1834, down to the time of his death, Sir Roderick Murchison was a constant contributor to the proceedings and transactions of learned societies, and the author of several popular books. The genial character of the man and his high social position at once pointed him out for the position of presiding officer over the learned societies of London, and he was for many years President of the Royal Geographical and Geological Societies; and in this double capacity he was able to aid in the organization of some of the most important exploring expeditions that have ever been fitted out in England. To his persuasion and energy, the world is indebted for much that we have learned of obscure portions of the earth.

The death of such a man will create a profound impression in the whole scientific world, for there is no part of the globe where his name has not been carried by the indefatigable explorers fitted out and sent through his influence. A thorough gentleman, a conscientious scholar, an active publisher, an elegant writer, and an eloquent speaker, he will be greatly missed from English circles, and will be mourned by lovers of scientific truth everywhere.

Death of Mr. Charles Babbage.

We have received from England the news of the death of Mr. Charles Babbage. This gentlemen gained considerable celebrity by inventing a calculating machine, which excited great public curiosity for a time, but was found to be valueless for general use. It was subsequently improved, and is now in use in England for indicating logarithms in one of the statistical departments of the Government service. The deceased was for many years the holder of the mathematical professorship at Cambridge University, a position long held by Sir Isaac Newton. Mr. Babbage's writings on the economy of manufactures and cognate subjects are numerous and valuable. He was, in the year 1832, a candidate for Parliament, but was defeated at the election. He died in his seventy-ninth year.

FAIR OF THE AMERICAN INSTITUTE.---ADDITIONAL OBJECTS OF INTEREST.

Many objects of interest have been added to this exhibition since our last visit, some of which we will notice in the present article, and which, together with what we have already noticed, render this year's fair one of the best ever held by the American Institute.

GLASS AND STONE CUTTING BY SAND BLAST.

The new process of cutting hard substances by the sand blast has, on account of its novelty and unique character and the great rapidity and exactness with which the work is performed, attracted crowds of admiring observers, so much so that it was quite difficult to get near enough to see the operation of the apparatus. When, however, we succeeded in approaching it, we were lucky enough to be in time to witness a test experiment, being the drilling of a ¾ inch hole through a solid emery wheel; this was done at the rate of a quarter of an inch per minute. Specimens of glass cutting in beautiful lace patterns, and of lettering in marble in either *intaglio* or relief, elicited unanimous commendation. Few that saw the operation of the machine failed to see that the process is destined to a high place in the useful arts. As we purpose giving an engraving of this machine, we reserve further particulars for a future article.

NAIL CUTTING.

Mr. Henry Scheurle, 64 Avenue B, New York city, has added to the attractions of the fair a nail cutting machine that cuts, from cold bar iron, 400 nails per minute. The machine is small and very compact, and its gluttonous way of satisfying its appetite for iron amuses all who see it.

GEOMETRICAL LATHE.

Mr. A. Schaefer, of 82 Forsyth street, New York city, exhibits a geometrical lathe. This wonder of mechanical art, seen for the first time by the majority of visitors to the fair, is a center of attraction to which many are drawn, and the delicacy and richness of the tracery wrought by it are marvelous to the uninitiated.

Mr. G. L. Kelty, 723 and 724 Broadway, New York, has laid the public under obligations by exhibiting the various processes in the manufacture of upholstery trimmings. The beautiful wares, growing under the practiced and skillful fingers of the trained female operatives, are very curious, and make a very instructive and interesting exhibit. The machines employed have a somewhat primitive appearance, and there is more than one operation now performed by hand that appears susceptible of being done wholly by automatic machines.

BRICK MAKING.

Mr. J. Nottingham Smith, 225 South Third street, Jersey City, N. J., claims with much reason that it is useless to press bricks when molding them, for, consisting of intimately mixed clay and water, they, at that stage of the process, form a practically unyielding mass. When, however, they have partially dried, they are susceptible of being further compacted, and he has therefore invented, and exhibits at the fair, a machine designed for this purpose, which is worthy the attention of brickmakers. The theory seems plausible, and the machine is evidently the production of a thoughtful mechanic. It is guaranteed to press one thousand bricks per hour.

AIR COMPRESSING ENGINE.

This is the exhibit of J. B. Waring, consulting engineer of the Norwalk Iron Works, 133 Center street, New York city. It is a very handsomely finished and effective machine, evidencing in its design a full comprehension of the niceties of engineering required in a first class air compressor. The air cylinder is kept cool by a water jacket. The trouble experienced in some compressers, from congelation of moisture on the chilled pipes, seems, by certain peculiarities of mechanism, to have been obviated in this machine. It supplies power to two rock drilling machines in another part of the building, of one of which we have now an engraving in process of preparation, and in describing which we find it necessary to again allude to this air compresser.

THE CAMPBELL COMBINATION PRINTING PRESS.

We have already noticed briefly this beautiful machine, and we now return to it, because its liberal exhibitor, having announced that it will be sold at the close of the fair, and the proceeds donated to the Chicago Relief Fund, we are anxious to aid in its sale for a good price by some further exposition of its merits. Said a bystander at our last visit: "That machine feels and thinks," and surely the extreme delicacy of its operation is such as to make it easy to imagine a brain and nervous system concealed in its beautiful proportions. If it has not these, it has the nearest approach to them human art has ever been able to achieve, a galvanic battery, which so acts upon the adjustment of the machinery that it is impossible to print out of register. Said its inventor to us: "When I first began to construct presses, it was impossible to print in register. I first rendered it possible, and now I have made it impossible to print out of register." As a proof of the truth of this last assertion we have now on our table a sheet, one side of which received two impressions, the form being inked the second time and the sheet fed in precisely as at first. No one in comparing it to a similar sheet printed only once could tell it had been printed twice, except that, having received double the usual quantity of ink, it is somewhat darker in general tone. There is no indistinctness of outline, and yet this sheet has upon it engravings of a character that would show the slightest discrepancy in the registering.

Unless the sheet is properly presented to the grippers, the press refuses to print it. If it is a quarter of an inch from the guide, it is thrown out perfectly blank and uninjured; if it is farther away from the guide than this, it may be rumpled, but will not be soiled. If the sheet is not printed, the press places it on the regular pile, with its edge sufficiently projecting to be easily seen and drawn out, so that it shall not be sent to the bindery. In printing the second side, unless the registering points are entirely through the paper, the sheet cannot be printed, as, these points then failing to make the battery circuit complete, a stop motion, to all the parts not necessary to throw out the sheet unprinted, acts to effect this result. Ink is only taken by the forms when the press prints; when a sheet is printed, the press runs on but takes no more ink till the next sheet is printed; and although the roller may have run many times over the form, there is to the ordinary observer no perceptible difference between the sheets printed. This results from the fact that in inking there are two distinct and complete operations, at each end of the form, that distribute the ink in, so to speak, two superimposed wedges, the thin end of one lying on the thick end of the other, and thus making the layer of ink uniform throughout. No part of the form can be over inked. This, with the new and peculiar mode of adjusting the form rollers, makes four rollers equal in efficiency to twenty of the old style, as is shown daily in the actual working of this press. All this automatic accuracy in working is accomplished through the agency of the sheet itself. It must cover, when laid, three small holes in the sheet guides, which, when so covered, establish a perfect communication between a small gravity air pump and two diaphragm bolts. These moving pieces accomplish all the varied results, and they are so simple and easy to comprehend when seen that they surprise even the best mechanics who have, after long search for something complicated, found in them the secret of the delicate working of the press. If any one wishes to see a mechanical poem, and to converse with a man who has reduced printing