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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,"