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HINTS TO INVENTORS.

The electro-deposition of metals has attracted the notice of inventors ever since the remarkable discoveries of Jacobi on the subject, and important applications of the knowledge obtained have been made; but there still remains a good deal to be done. Copper plate engravings have been, for a good many years, protected by deposits of hard nickel, but no one seemed to think of extending the application, to other purposes, until quite recently. Nickel plating has now become an important branch of industry, and we are likely to hear much more of its adaptation, to the wants of the arts, the more intimately we become acquainted with it.

There are other metals, which, although they may not promise the same brilliant results as nickel, are, nevertheless, well worthy of careful investigation; and to some of these, we propose to call attention. To begin with, there is manganese, an exceedingly abundant metal, which has been successfully deposited in the form of powder by electrolysis, and has been separated from its amalgamation with mercury, has been reduced at a high temperature, and obtained as a beautiful white metal when alloyed with copper; and yet we practically know nothing about its condition when deposited upon other metals. Some authorities say that the pure metallic manganese tarnishes readily in the air; others say that it is excessively hard, will bear a fine polish, and is not acted upon by ordinary reagents. The probabilities appear to be that it is a permanent metal, of a fine white color when perfectly pure; and, if a method could be found for depositing it in as thin layers as nickel or copper, it would have many valuable applications. Another metal, of still greater abundance, is magnesium. It is only recently that we have been able to prepare and study this metal in large pieces, and we have learned how to manipulate and use it. The next question is, how to decompose its salts in the cold by electrolysis, and plate with it. The metal tarnishes more readily than nickel, and the color is not so fine; but, as it has the remarkable property of throwing down most other metals from solutions, it may be useful as the basis for obtaining these metals for application in the arts. For example, a rod of copper, plated with magnesium, might serve as a method for reclaiming numerous metals from solutions. It is worth trying to find a cheap way of reducing magnesium, as it can be employed for the production of light in photography, and as a reducing agent, and for the preparation of chemical salts. A metal, upon which has been expended much time and research, is aluminum. This metal, as it is usually sold in commerce, is rarely pure, and hence it commonly has a dirty, tarnished appearance. We have seen specimens of it in thin leaves, which presented the white, brilliant appearance of silver, and did not readily tarnish. If aluminum in such purity could be deposited by electrolysis, it could be advantageously employed for many purposes in the arts; how to do this, is the question. It is not worth while for inventors to be discouraged, as it is only a short time since that electroplating was at all understood, and there is easy prospect of our learning much more about it. The three metals, manganese, magnesium and aluminum ought to be more easily obtained, and it is not very creditable to our science that we have not, long since, overcome the difficulty. Silicium, or silicon as it is sometimes called, the base of quartz, is the principal constituent of the crust of the earth. We tread it under foot and discard it in its elementary condition altogether; and yet it has marked properties, that suggest its use for many purposes in the arts We have seen an alloy of silicium with copper, which no steel file could scratch; and the chemist who prepared it, said that it could be cast at pleasure, in suitable molds, and he was not certain that it could not be annealed and worked the same as steel. The chloride of silicon can be easily prepared, and this is readily decomposed by sodium, yielding the silicon in pure condition. The chloride can also be reduced by aluminum, in which case the silicon appears in a crystalline form. Perhaps the best way of preparing the crystalline variety is to fuse 5 parts pulverized glass, 10 parts cryolite, and 1 part aluminum, and to wash the resulting slag in hydrochloric acid, and subsequently, in hydrofluoric acid.

Silicium in the form of powder can be obtained by fusing 15 parts silico-fluoride of natrium, 20 parts granulated zinc, and 4 parts of sodium, and washing the slag with hydrochloric and nitric acids. No way of depositing it by the battery has been invented. Silicium, according to our present imperfect knowledge, appears to occur in two conditions, amorphous and crystalline; but these forms are immaterial for our purpose. What we want is the metal, if it may be called a metal, ready for use in alloying with other metals.

The fact that silicium is not soluble in any acids, excepting a mixture of hydrofluoric and nitric acids, at once suggests its use for many chemical purposes.

It is a poor conductor of electricity, an exceedingly incombustible substance, even in oxygen gas; and its melting point appears to be between that of iron and steel; but the point of fusion of its alloys, according to the law that obtains on this subject, would doubtless be considerably less. The combination of silicium with magnesium affords an alloy that possesses remarkable chemical properties, and may offer a new compound, to be used as an explosive agent. It is made by fusing 7 parts of the silico-fluoride of sodium, 2·5 parts of chloride of sodium, and 2·5 parts of magnesium, and afterwards washing out the slag in chloride of ammonium. It is a crystalline substance, and, when dissolved in hydrochloric acid, gives off a gas which is spontaneously combustible. If the gas be evolved in a close vessel, where there is oxygen, the combustion ensues with an explosive force, white silicic acid being deposited on the walls of the vessel. It would appear to be well worth while to experiment with a substance of this marked character. It is in the production of alloys that we must look for the chief applications of silicium; and its uses in this direction, are, as yet, very imperfectly understood.

The above are a few of the metals to which we invite the attention of inventors.

MORE ABOUT THE LABOR QUESTION.

The public must become accustomed to see many discussions upon this absorbing question. It is destined to occupy, possibly for many years to come, a prominent place among current topics of newspaper and magazine literature. To those who, as capitalists or as working men, are immediately interested in its permanent settlement upon an equitable basis, as well as to such as make social science a study, it must, until settled, possess interest second to no other likely to be agitated during the present century. Like other social and political questions that involve the welfare of the masses, it has engendered and will yet give birth to bitterness and rancor, and perhaps—though God forbid such an event—to civil and international wars. No human eye can pierce the future; but any intelligent person may read, in the constant growth of the agitation, in the organized marshalling of the two great powers in the conflict, and in the defiant attitude of each, that neither will surrender, until one or the other has obtained a victory, or such mutual concessions and compromises shall have been made as shall bring about the desired adjustment.

At present the attention, of those who have carefully watched the signs of the times, is especially called to the failure, or partial failure, of the courts of arbitration established in England, and from which so much was hoped by Mr. Hughes, their ardent promoter, whose eloquent address at the Cooper Institute, during his visit to this country last November, was quoted and commented upon in this journal at the time.

We also shared the hope that, through these courts, the difficulties and disagreements that have so long burdened the industries of the world would find amicable adjustment, and that their wholesome influence would bring precedents for the establishment of similar courts in other lands. We regret that the result has not justified our hopes. The courts have satisfied neither the capitalist nor the working man, and though they have been the means of retarding crises, they have not been efficient in preventing them.

At the last meeting of the Board of Arbitration and Conciliation for the North of England Iron District, this dissatisfaction was so apparent that Mr. Hughes deemed it necessary to make a long and eloquent address in behalf of the continuance of the system, admitting that its value had been seriously called in question, and that the method is charged with being both expensive and unsatisfactory.

In the course of his argument, that gentleman admitted that neither the working men nor the iron masters would abandon their organizations, but thought that their being brought " face to face from time to time " was not without sufficient advantage to pay for its cost. This is a virtual admission that the system has failed to meet the purpose for which it was originated, and it is not probable that it will long continue.

We need not allude to special decisions and awards that have dissatisfied both employers and employed. It is enough that the dissatisfaction exists, even under the administration of such single minded and true philanthropism as that of Mr. Hughes and Mr. Mundella. Possibly there are features of the system, that, modified or abolished, would render it more acceptable, and we sincerely wish this may be found to be the case; for if, in such deliberations as have been held under this system, the differences have been seen to be so great that peaceable arbitration is not possible, what will the end be?

The persistent blindness of many to the magnitude of this labor question is a prominent feature of journalism. There are those who either ridicule, or treat in a jocose manner, events which are of the gravest importance, while others seem to think everything will all come out right, without social revolutions; or, if the latter occur, that they are far distant. Others see that there are contingencies that may bring about a labor crisis at any moment, and who raise the voice of warning.

To prove that the demands of the trades' unions are arbitrary and unjust amounts to nothing. They have found themselves in a position to enforce compliance with unreasonable demands. Though only a few of their leaders and comparatively few of those who oppose them realize it, they are making war against the wages system. They will drive capital so hard as to either compel it to withdraw from industrial enterprises or admit the employed into partnership. The wages system, as it exists, will ultimately be compelled to yield to another, if not a better, order of things.

Mr. William Taylor, at the Congress of the British Association, stated that out of 22,704,108 people in England, 8,144,000 do the work, and that they earn in the aggregate 267,000,000 pounds sterling, which, allowing them to work constantly six days per week, is equivalent to an average wages of twenty-one pence per day. A workman takes Mr. Taylor's figures as his text, and shows that the cost for food, of bread, meat, and potatoes, with the luxuries of two and a half pence worth of butter, sugar, and tea, sufficient for the sustenance of a workingman, is eleven and one half pence, leaving, according to Mr. Taylor's statement, less than ten pence per day for clothing, shelter, medicine, and all other demands.

We think Mr. Taylor's estimate of average wages must be too small, but allowing the average to be double that given, we have in it matter for serious reflection.

When working men have the intelligence to figure out such a sum as this, and compare their pittance with the unearned wealth of the nobility and State-fed churchmen of Europe need it be a matter of surprise that they are dissatisfied? How long need we expect them to remain quiet? What can courts of arbitration, that can only feebly affect their earnings one way or the other, do to convince such men that they are justly dealt with by society? That they are unreasonable need not surprise us; that they have been kept under restraint so long is simply because they have been, as yet, a hopeless minority in numbers and intelligence.

The above figures show that in England the part of society known as the working class are only a little more than one third the entire population. The history of the world has shown, however, that to perpetually oppress even a minority requires more than the might of numbers.

On the other hand it may be shown that industrial capital is really hard pushed as well as labor. In a remarkable letter, vouched for in the London *Builder* as coming from a genuine workman, appears the following paragraph relative to the condition of English manufacturers:

" Workmen and their leaders ought to know that, in the industrial race, the manufacturers are already closely run. In iron and cotton producing countries, the people are beginning to work the raw material. Any reader of the *Times* or the statistical abstract can see for himself the steady advance in exports which a few years ago were peculiar to England. Writers in the so called people's paper may ridicule the idea that other countries are making advance in competition with England. But it is a fact which no one can deny, that some engines and other goods have been imported into this country at a much cheaper rate than English manufacturers can produce them."

So it seems both labor and capital are hard pushed to feed and supply luxuries to the drones in the British hive.

Now if capital and labor could make common cause against the drones, instead of fighting each other, their combined efforts would bring about a better state of things, and the result of the present conflict will inevitably be in time a reorganization of society, in which producers and distributers of production will take pre-eminence over those who are at present fed from the public spoon. In the latter class are included all the paupers who live on homely fare in alms houses, those other paupers who wine and dine with liberal salaries in sinecure offices, those thieves who pick pockets in by-ways as well as those who rob the public purse by legislative jobs or fraudulent administration, gamblers in secret hells or public gamblers in gold and stocks, unnecessary middle men who insist upon clutching bread on its way from the producer to the consumer and cutting off their slice from the loaf, in short, all who, without doing anything for the general welfare, make wages low by making the necessities of life dear through their demand upon the productions of the industrious. All these must be turned out to gather their own honey. Then there will be enough for all. Then will eight hours for a day's work, and even less than that, be the rule without special legislation, and strikes will become things of the past.

ANOTHER GREAT PUBLIC WORK.

The almost unknown countries which form the interior of European Russia have been, of late years, rendered accessible by long and well constructed railroads, undertakings which, in an empire to a great extent thinly populated and divided in itself by vast plains, could never have been made but for governmental authority and substantial assistance in

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the form of guarantees. The spirited policy of the Czars has been well received by the Russian people, and now a greater and more formidable scheme is announced to the public.

In another column we give the details of the project, as set forth by a valuable European cotemporary. The mountains of the Caucasus bisect the territory which lies between the two seas; and the construction of the contemplated canal will be much simplified by using the river Manitscha, which flows westward into the Sea of Azov, and the river Kooma, Kouma, or Kuma, which flows, in the other direction, into the Caspian Sea. Moreover, a considerable part of the length of the river Manitscha is a long, deep, and wide lake; and these aids to the formation of the canal, reduce the entire distance, 441 miles, to very manageable dimensions. The cost in Russia, where labor is very cheap, is estimated at the moderate figure of $60,000,000.

M. Blums, the Russian topographer, who presided over the commission mentioned elsewhere, has published, in the *Golos*, a statement that the work will require the services of 32,000 men, to complete it in the specified time, six years.

At present the navigation of the Caspian Sea is left almost entirely to Persian vessels, and the report of the trade on this great inland lake shows that 824 vessels, of a united tunnage of 68,910, entered the harbors in the year 1869.

Plans and details for the prosecution of this work were found in the Imperial archives after the death of Peter the Great, and show how entirely he was convinced of the value, of such a work, to the interests of the great empire which he regarded with a fatherly pride.

The determination and courage of the Czar's government, and the great abilities of Russian engineers, as well as the importance of the work to the material prosperity of the empire, promise a speedy execution of this last great addition to the wonders of the nineteenth century.

THE HASSLER OCEANIC EXPLORATION.

One of the most important expeditions ever fitted out in the United States is now being organized in Charlestown Navy Yard, under the control of the United States Coast Survey, to whose superintendent, Professor Pierce, the credit of originating the idea is due. The *Hassler*, a vessel 165 feet long, well fitted and of ample power, is to convey a corps of scientific men, her officers and crew being selected especially with a view to their fitness for such service. The obj ct of the voyage may be briefly described as the investigation of the greatest depths of the Atlantic and Pacific oceans, of the origin of the deep sea currents, of the varied character of the water as to temperature, weight, and chemical elements, as well as of the fish and other animal life peopling the depths of the sea.

We are informed that the party will proceed first to the South Atlantic Ocean, and afterwards to the West Indies, to discover, if possible, the origin of the Gulf Stream. The next movement will be to ascertain the greatest depth of the Atlantic, and to search out the mysteries of the bottom. Returning to Rio di Janeiro for supplies, the *Hassler* will next proceed to the Atlantic coast of Patagonia, to trace the course of the South Pole currents. Proceeding by way of Magellan's Straits to the Pacific, a similar investigation to that made in the Atlantic will take place; and the ship will then go to San Francisco, where the scientific corps will leave her. She will then be engaged in the survey of the Pacific coast, and afterwards sail to Puget Sound, and perhaps to Alaska.

We look for important discoveries and results from this expedition. The physical features and character of the oceans are little understood, and it is impossible to solve the problems of the currents unless charts of the ocean bottoms, with some approach to accuracy, can be prepared, and some knowledge of the formation of the earth under the waters be obtained. Ocean navigation is now one of the largest industries in the world, and the interests of the commercial, mechanical, and scientific classes are all involved in its prosperity. Precise and detailed information as to the movements of the tides and currents which affect the transit of ocean going vessels has long been looked for, and there seems to be a great probability that it will soon be obtainable.

The scientific members of the party will be led by Professor Agassiz, and the dredging operations will be conducted by the Count de Pourtalés. The physical experiments will be under the charge of Dr. Hill, late President of Harvard University; the chemical inquiries will be made by Dr. White, of Philadelphia; and the geological and zoölogical department is intrusted to Dr. A. Steindacher. Professor Agassiz is in hopes of obtaining a large number of specimens which will add to our information of the *fauna* and *flora* of the deep.

The *Hassler* will, in all probability, sail from Charlestown, Mass., on about the 25th of November, and we shall keep our readers informed of her movements and of any discoveries that the distinguished body of scientists may make.

USES OF GLASS IN ARCHITECTURAL DECORATION, ETC

We have been much interested in the inspection of a miniature model of a bed chamber and its furniture, which an ingenious designer and personal friend has fabricated, and the prominent feature of which is the use of glass for decoration. The effects produced are very startling, unique, and beautiful.

The mantelpiece and its brackets are of highly polished and beautifully clear glass, attached to a base of black marble. The cornices are also of glass, the curved parts being of pressed glass, and the parts which are angular in section being ground and polished. The play of prismatic colors is hightened by reflection from the curved portions of the cornice, producing an effect wholly indescribable, but, in our opinion exceedingly beautiful.

The cornice is made in short segments, held at the ends by gilded supports of ornamental design. The walls are papered with delicate lavender with fine stripes of gold, and the upper edge passing under the glass cornice is without other border.

The ceiling has for a center piece a flat oval mirror, with an ornamental gilt frame, and from the center of this frame descends a small gas chandelier proportioned to the size of the model, profusely embellished with prismatic pendants and provided with Liliputian gas burners. The furniture is of polished black walnut, and is upholstered with lavender colored satin. The floor is furnished with a painted carpet, the colors of which harmonize with the general tone of color throughout the apartment.

The model has convinced us that for interior decoration, where expense is not regarded, a most beautiful effect can be produced on a large scale, as well as in the model, where the ornaments are somewhat out of proportion to the dimensions of the room.

Glass, when of the proper thickness, is scarcely more brittle than marble, and it has the advantage that it can be molded into the proper form, so that the greater cost of the material would be nearly or quite compensated for by the saving of labor.

The hint thus given may prove valuable to decorators, and is, we think, at least worthy of consideration.

A WORD ABOUT REPAIRS.

The inevitable waste and wear which always, in the end, necessitate the abandonment of everything in its day useful to mankind, is compensated for and retarded by repairs. But in the attempt to do this, there is often much time and money uselessly squandered.

One of the principal causes of loss is delay in making timely renovations and substitutions; another is injudicious ways of repairing; and, lastly, repairing that which it were wise to abandon altogether, Instead of at once correcting what is amiss in a tool or a machine, many will let it run as long as it is possible to work with it, when it is often found impracticable ever to make it serviceable again; or, if not so badly injured as this, that one deficiency, which it would have cost little to supply, has caused many worse than the first.

In making repairs it is often thought a poor mechanic will do just as well as better and more costly skill. No greater mistake can be committed. We assert that the mechanical ingenuity, ready command of resources, knowledge of the adaptability of means to ends, skill of eye and hand, common sense, and sound judgment—which go to make up an accomplished mechanic—are more necessary in a repair shop than anywhere else. Here it is not the same old routine, day after day, the making and putting together of forms so familiar as to require little original thought; but every job varies in some particular from every other, and each must be repaired in a different way. It requires brains as well as manual skill to do this kind of work in a creditable manner, and every manufacturer will find it policy to put a first class mechanic in his repair shop.

Lastly, in constantly stopping old machines to patch them up into make-shifts, there is often more money sunk than would supply their places with new ones. Many people estimate the cost of repairs only from the cost of material and labor; but in many cases the time lost in repairing is the largest element of expense, especially when the stoppage of one machine entails the stoppage of many others.

In repairing machines the following rules ought, therefore, to be observed: First. Repair as soon as anything gets out of order. Second. Intrust none but good mechanics with repairs. Third. Be careful not to continue repairs when machines cease to be worth them.

BOOKS FOR MECHANICS.

That sort of egotism which prompts mechanics and inventors to neglect the means of personal improvement and advance in their professions, supplied by books, has prevented many from achieving the measure of success to which their natural endowments entitle them, and is at the present day seriously affecting the condition of mechanics in general. Mechanics, as a rule, read newspapers, stories, and some history, but as a rule they neglect the books replete with technical information touching directly upon their peculiar avocations. They are wont to scoff at the idea of learning an art from books, and to place reliance upon their personal experience, in preference to any knowledge gleaned from the records of others' experience.

Now we do not deny the paramount value of personal experience. That which we have ourselves seen, we know; that which we read may at times mislead us; but when personal experience has been guided and shaped by reading, it must inevitably be more complete, its results better classified, and its value enhanced far beyond that of the knowledge of the man who has only explored his limited field of research without any guide.

A man might in time learn all about the streets, alleys, parks and suburbs of New York by unaided observation, but a well edited guide book would save him nine tenths the labor necessary to accomplish such a task without assistance.

We therefore advocate the use of books by mechanics, not as a substitute for personal experience, although they are in this way often very valuable; but we urge their use principally on the ground that they assist in enlarging and systematizing personal experience and preventing waste of time in the search for facts already discovered.

Every man engaged in any industrial occupation should gather about him a library, even though small, of works relating to his business. Verifying the facts stated in these books by his own experience, or, it may be, discovering that some things stated as facts are errors, cannot fail to enlarge his mind and supply him with practical resources for emergencies, which will not only increase his self respect but increase the pecuniary reward of his efforts. So true is this that we do not recollect a reading mechanic who did not rise in his profession, and who, though perhaps not acquiring fortune, failed to secure the respect always accorded to manifest superiority.

SCIENTIFIC INTELLIGENCE.

HOW TO TEST PURE GLYCERINE.

Thomas Koller gives, in a German journal, the methods for detecting the impurities of glycerin. Pure glycerin is neutral, and leaves only a slight residue when evaporated in a porcelain capsule. The adulterated article may leave considerable black residue, and react acid. Pure glycerin, when cautiously mixed with an equal volume of oil of vitriol, is not browned even after the lapse of several hours; the impure often browns immediately. A solution of oxalate of ammonia does not even produce a cloudiness when mixed with pure glycerin, but may give a precipitate with the impure. Pure glycerin, treated with nitric acid and nitrate of silver, yields no precipitate; sulphide of ammonia sometimes gives a black color in adulterated glycerin. Pure glycerin, in large and small quantity, is as clear as water; impure often shows different shades of color, according to the extent of its contamination. Pure glycerin rubbed between the fingers gives no greasy feeling, while the impure resembles fat. The freezing point of pure glycerin is near zero, while the impure may become solid at the same temperature as water. For the purification of glycerin, add ten pounds of iron filings to every 100 pounds of the impure liquid, and occasionally shake. In a few weeks, a black gelatinous sediment will settle and the supernatant liquid will be perfectly clear, and can be condensed by evaporation.

MALTIN.

A French chemist, Dubrunfaut, described, in 1868, a substance having all the properties of diastase, to which he gave the name maltin. According to his account, it possesses remarkable properties in promoting the fermentation of beer, and it has been strongly recommended in medicine. It is made by precipitating an extract of malt with tannic acid, filtering, washing well, and drying ready for use. Victor Griessmayer, reported in the Bavarian *Brewer's Gazette*, has been repeating some of the experiments of Dubrunfaut, and finds that although the aforesaid maltin possesses some of the properties attributed to it by its discoverer, it cannot be practically employed in brewing. He says: "Maltin is diastase of a decidedly platonic character." From these recent researches it would appear that the noise made about maltin is more in the nature of a trade speculation than of a genuine contribution to science, and that its medicinal character can probably be consigned to the same worthless category as its fermenting property.

"COSMOS."

Victor Meunier announces that *Cosmos*, so long conducted with such signal ability under his editorial management, and suspended during the siege of Paris, is to be discontinued, and in its place he will publish a weekly journal to be called *La France Scientifique*, the subscription price of which is to be ten francs per annum. The well known ability of the editor will ensure to subscribers a full return for the price of subscription.

A NEW ZINC PAINT.

M. Artus, connected with the Belgian Zinc Company, has prepared a zinc white, made up with silicate of potassa or soda and used to paint zinc and other objects. The material is something in the nature of a cement or artificial stone, and will withstand the action of the air, sun, and water. It can be employed to advantage on metal roofing, also on plaster, brick, and wood. Its chief value will be in rendering wood, paper, and tissues uninflammable, and for this purpose ought to be generally known. The value of the mixture for cements will also attract attention to it, and we shall probably hear of its extensive use as a constituent of artificial stone. The heat of rooms under roofs painted with this mixture was found to be 10° less than under the unpainted metal.

PRODUCTION OF BISMUTH IN SAXONY.

According to Wagner, it appears that Saxony produces 33,000 pounds of bismuth annually, and, as the yield of this metal in other countries is unimportant, Saxony rules the market of this article. A few years ago the pretended discovery of a method of making gold from bismuth led to the purchase of all there was in the market on the part of a credulous London firm. This produced considerable fluctuation in the price at the time, but as the firm were subsequently glad enough to get rid of their useless purchase at any price, the supply soon became abundant.

OXYGEN FOR PHARMACEUTICAL PURPOSES.

Dr. Baudrimont, in France, has published a lengthy paper on this subject. The author repeats the advice, long given by chemists, to calcine the black oxide of manganese previous to mixing it with the chlorate of potash, and to carefully pulverize the latter before mixing. He finds the proper proportions to be equal weights of these materials, and recommends the precaution of providing as wide tubes as possible, of washing thoroughly, of previously testing the chlorate, and of operating upon small quantities at a time.

A NEW REAGENT FOR COPPER.

The new reagent, proposed by Mr. Tamm, is obtained by

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