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Contents:

(Illustrated articles are marked with an asterisk.)

WHAT SHALL BE DONE WITH THE MODELS AT THE PATENT OFFICE?

It is to be presumed, that, at the time the Patent Office Building was erected, and inventors were required to deposit, with their drawings, models of the devices for which they solicited patents, the steady growth and ultimate magnitude of the collection was not anticipated. A letter, published in another column, informs us that many of these models now lie about on the floors, there being no room to store them elsewhere. Others are piled on the tops of cabinets, and on each other, so that the original purpose of the collection is defeated, so far as the public is concerned, while it is difficult for the examiners to perform their duties. Many of the models are broken and thrown in heaps of promiscuous rubbish.

The head of the model department, who is represented to be very efficient, is doing all he can to bring order out of chaos; but it is painfully evident that there must, sooner or later, be a clearing out of useless and broken models. There are a great many that it is of no consequence whatever to keep. There are others so dilapidated that their inspection reveals nothing without the drawings, and the latter are sufficient to guide the examiners. The rubbish might as well be removed at once, and space made for the well preserved and important models. It is also certain that more room will be needed, if the present system is maintained; and this might well be supplied by buildings erected from the money, now in the Treasury Department, belonging to the Patent Office.

It will, however, be useless to expect that it will be possible to continuously supply space to store models. At the present rate of accumulation, to arrange and store them properly will require an addition equal to the present accommodation once in about seven years. What, then, shall be done with the models, is a question that must in some way be answered. We say, do without them; that is, do not attempt to preserve them in a public collection. It has been wisely suggested that, for purposes of general information, good perspective drawings, reproduced by photography and cheaply obtainable on application, would be far more efficient than a great central museum of models that not one in ten will ever visit, or, if they should, could ever find time to examine a tithe of its contents.

Of course, models would be needed to assist the examiners with probably about one fourth the applications made; these, after each case had been attended to, might be returned to the applicants. It is certainly folly to attempt their preservation in a collection. As the coral insect, particle after particle, builds islands of vast extent, so the constant accumulation of models will result in an enormous reef of ingenious contrivances, which will wreck the patience of any who attempt to explore it. Better at once abandon the attempt to preserve models, and only endeavor to keep the drawings and specifications. This is our view of the subject. If any one has anything better to suggest, we shall be glad to consider it.

DRYING BY COLD.

Most people have an idea that to dry anything rapidly requires the agency of artificial heat. This is a mistake. Chemists are cognizant of many methods of drying substances where heat, above the ordinary temperature, is not employed.

One of these consists in placing the substance to be dried in a close compartment, in which is also placed an open vessel containing strong sulphuric acid. Sulphuric acid has a strong affinity for water, and takes water from the air surrounding it. The air, which also has a strong affinity for water—though weaker than the acid—thus dried, takes moisture from the substance to be desiccated. This moisture is seized by the sulphuric acid, and so the air, acting as a conveyor, goes on taking water and giving it up to the acid till the desiccation is completed. In this way, substances may be dried that could never be made to yield their moisture under the action of heat in an ordinary atmosphere, or which would be injured by heating.

Moist gases may be dried by passing them through the interstices in a collection of fragments of chloride of calcium, quicklime, fused potassa, or soda, each of which has stronger affinity for water than gases have.

Whenever any substance has a greater attraction for water than the expansive force of heat can overcome, it cannot be dried by heat; and the converse is also true. In the process of evaporating a liquid in an open vessel, or in the desiccation of a solid in a common kiln or oven, the moisture driven off by the heat is seized upon and absorbed by the air. If the air has less water than it has capacity to hold in suspension, the water evaporated disappears from sight and assumes the condition of a transparent vapor intimately mingled with the gases of the atmosphere. If, however, the capacity of the air be satisfied, the moisture assumes the form of a cloud of fog or mist, or is even deposited in the form of rain, perhaps in the form of snow or hoar frost, if the temperature be sufficiently low.

The capacity of air to hold suspended water vapor increases as its temperature rises, and *vice versâ*, so that by heating it, it may be made to take from substances moisture which it will deposit on cooling, thus becoming a conveyor of moisture, as in the process mentioned above where sulphuric acid is employed.

We have seen the moisture so far extracted from air admitted into a chamber, the walls of which were surrounded by a refrigerating mixture, that the weight of the volume was considerably diminished.

By thus continually extracting its moisture through the agency of cold, air at low temperatures might be made the vehicle for rapidly desiccating many substances that heat would injure; and there is no doubt this principle might be applied to advantage in some industries. We have ourselves employed it with excellent results, in an experiment, using the same air over and over, as previously explained, and have thus satisfied ourselves of its utility in some delicate operations.

TO OUR READERS.

It is with pleasure that we inform our readers of the large and gratifying increase in the circulation of the SCIENTIFIC AMERICAN. During the single month of January, we received upwards of ten thousand new subscribers, and they are still pouring in upon us from all parts of the country.

This unparalleled increase has exhausted our large stock of back numbers, and of late we have been obliged to commence all subscriptions with the date of their receipt by us.

This is the best we can do under the circumstances; but if there is any considerable number of our subscribers to whom this arrangement is not satisfactory, and who really desire to receive the back numbers, we propose to have them reprinted.

To enable us to determine as to the propriety of thus reprinting, we respectfully request all persons who desire to receive the back numbers and have their subscriptions correspondently dated back, to inform us of the fact by mail without delay.

If any of our friends have any of the first five numbers of the present volume, for which they have no use, we should esteem it a favor if they will return them to this office, and we will add to their subscriptions accordingly.

THE EDUCATION OF THE DEAF AND DUMB.

In ancient times, the Hindoo pundits decreed that any one born deaf, or any one dumb from whatever cause, should be incapable of succeeding to property; though the same law arranged for the sustenance of the sufferers by making it a charge on the person who superseded them in the inheritance. It has been stated that, among the oldest nations of the East, the destruction of such children as useless burdens on society was connived at, if not authorized, by the governments. But instances of the care and sympathy of individuals for these poor creatures begin to occur after the advent of Christianity; and in the writings of the venerable Bede and elsewhere, we read of the partial success of attempts to teach the deaf and dumb to communicate by signs. The first noticeable attempt at a plan for this purpose is the publication, by a Benedictine monk named Bonet, of a treatise called "The Reduction of Letters and Arts for Teaching the Dumb to Speak." In this book, the author professes to have invented a system of finger talking or "dactylology;" and he published engravings of the one hand alphabet, now used nearly everywhere. The desirability of such means of communication subsequently caused many physicians and other scientists to bestow great attention and ingenuity on the subject; and, among many treatises publishing suggestions, one of the best was written in the year 1680, by one Dalgarno. He was a Scotchman by birth, and a school teacher in England; and his work, called "Didascalocophus, or the Deaf and Dumb Man's Tutor," even goes so far as to assert the superiority of written language and a finger alphabet over reading and talking by the organs of speech. Professor Porter republished this treatise in the year 1857, and states that it is "a work of such preëminent ability, and so replete with sound principles and important suggestions of practical value, that it ought to be familiarly known to every instructor." A German named Heinicke did good service to this cause by giving his time and attention to teaching a few deaf mute pupils; and his success was rewarded by the Saxon government inviting him, in 1772, to Leipsic, to superintend a school which is in existence and prosperity to this day. Without, however, enumerating all the various advances made in this branch of education, by mingled science and philanthropy, we come to the labors of Americans in recent days.

In the year 1815, the deprivations of all the pleasures of life, which deafness and dumbness visited on a young lady of Hartford, Conn., interested some gentlemen of the same city in the subject; and they despatched a clergyman to England, to learn the system taught by some persons named Braidwood, who had met with much success and some celebrity. With a narrowmindedness strangely out of place in such a connection, these people declined to instruct the visitor except on terms at once exorbitant and burdensome; and the clergyman journeyed to France, accomplished his mission, and returned to the United States with M. Laurent Clerc, a well educated deaf mute, and one of the best teachers, on the system of Abbé Sicard in use in his country, then to be found. In 1817, the American asylum at Hartford was opened, the Rev. Mr. Gallaudet, the clergyman above mentioned, taking the post of principal, and M. Clerc that of assistant. From this small beginning, which, like many other noble and useful works, originated in the sense and liberality of a few private individuals, has grown up an extended system for the education and improvement of these unfortunates, whose claim to our wisest, best, and most strenuous efforts needs no recapitulation. A column might be filled with the names of deaf and dumb persons who have become valuable and useful members of society, some of whom have obtained eminence in art, science and literature.

But the greatest success in teaching those born deaf to speak has been recently attained, in the United States and in Germany, by the use of a system of lip talking. By this method, the language is communicated to the pupils solely by the motion of the speaker's lips; and such excellent results have followed the introduction of this method that, in an asylum at Northampton, Mass., general conversation is carried on with such rapidity and vivacity that it is at first difficult to induce a spectator to believe that the little pupils have been, many of them, stone deaf from their birth, and that the observation of the movements of the lips is the only opportunity for instruction that they have ever had. So thoroughly efficient is it that education is being carried on, through its means, up to the higher branches, many of the pupils being proficient in physiology, botany, and mental philosophy, as well as in drawing and other arts. Such results indicate the great superiority of the new system, and encourage us to hope that the terrible afflictions of deafness and dumbness may be soon deprived of their worst evils.

PRODUCTION OF STEAM IN BOILERS.

The economical and safe production of steam in iron boilers is, in this steam using age, a matter of primary importance; notwithstanding which, it is somewhat astonishing how little is generally known of the principles which must be observed to secure both safety and economy. The theories and speculations, indulged in by various authors in regard to the precise nature of the molecular motion produced in solid, liquid and gaseous bodies by the agency of heat, have—at least until they are subjected to experiment—no practical value. We must seek light alone from such facts as are demonstrated, and be guided solely by that light.

The only motion that takes place in heated water, with which the steam maker has to do, is that caused by the difference in the specific gravities of the molecules by unequal heating. The motion in steam which the steam user needs to comprehend is that caused by the mutual repulsion of the heated particles of water in a gaseous state.

When heat is first applied to water, the heated particles rise because their specific gravity is lessened. Other particles are in turn heated, and give place to others, and so successive strata of particles are heated over and over, till at last some of them arrive at the required temperature to expand into gas. In assuming this form, that portion of water so converted takes suddenly, under atmospheric pressure, a little more than four and one half times as much heat as it previously had, which heat disappears as temperature or sensible heat, and, becoming latent, imparts its expansive energy to the steam, a small part of which energy is subsequently converted into work in the engine to which the steam is supplied. In thus suddenly absorbing so much heat, it as suddenly expands to a much greater volume than it previously occupied, causing upheaval of the superstratum of fluid; and, rising to the top, it escapes with such rapidity as to cause bubbling, a state of things we call ebullition or boiling.

Now in the construction of steam boilers, we have to consider only these simple and elementary facts, with such modifications as arise from pressures above that of the atmosphere, and the expansion of metals by heat, and we must provide that the movements which take place naturally in steam generation shall not be artificially interfered with. Neglecting these provisions, we fail in economy, and increase the danger of steam production. The water must have free circulation and the steam must have ample avenues of escape from the liquid. Then if the boiler can withstand safely a given pressure and the strains caused by unequal expansion, and if the steam finds a ready escape from the boiler before that limit of pressure is reached, we have, so far as the boiler proper is concerned, the required conditions for economy and safety.

But to generate steam we must generate heat, and here the element of economy is the one most important to be considered. To get the greatest available amount of heat from the combustion of a given quantity of fuel, we must obey the law that governs all chemical combinations, the law of definite proportions in the union of substances to form other substances. Combustion is only such a chemical combination. Every pound of carbon in the coal, wood, peat, or other combustible, will require for its perfect combustion two and two thirds pounds of oxygen. Every pound of hydrogen will require eight pounds of oxygen to form nine pounds of water, and to develop in the combination all the available latent heat of the two substances. If not enough oxygen be admitted in the draft, there will be imperfect combustion and the loss of carbon in the form of smoke which passes into the uptake.

Again, it is important that the carbonic acid, caused by the burning of the coal, and the steam which arises from the union of the hydrogen of the coal with the oxygen of the air should have the heat as far as possible extracted from them and passed through the shell of the boiler into the water and steam confined therein, and that as little as possible should be wasted through the uptake or by radiation from the furnace or boiler. But now a little thought renders it evident that, as heat always passes from a warmer to a colder body, if the gases in the uptake are cooled down to the temperature of the steam on the other sides of the plates over which they pass, that must be the extreme limit to which their heat can be economically extracted. Steam at 60 lbs. above atmospheric pressure has a temperature of 307° F.; therefore if a boiler carries steam at this pressure, and its circulation is perfect, it is useless to attempt to get any heat from gases at the temperature named. Practically it is impossible to work down the gases of combustion to the extreme theoretical limit at which they will pass into the chimney at the same temperature as that of the steam in a well constructed boiler.

But to insure perfect combustion, it is necessary not only to admit oxygen in the right quantity, but to give the combining materials the proper temperature, and to so commingle them that they shall combine and develop their heat before they have passed over the surfaces to be heated. Combustion in the chimney is waste, and a waste too often to be observed with ill-constructed and arranged furnaces. The oxygen entering in the usual way is cold, and, before it will support combustion, has to be heated. To effect this in the most thorough manner, it is far better that the draft should be diffused, that is, enter at many points rather than at one. This accelerates both the heating and the commingling of the air with the unconsumed gases.

Now what we have written has been, in substance, often repeated in these columns, and we have often gone into details of setting, as well as the discussion of various forms and designs, of boilers, but it seems so difficult to keep the mass of our readers educated up to the true principles of steam generation, that it is probable we shall have to repeat "line upon line and precept upon precept" so long as our paper is sought for instruction in such matters. If those young readers who of late have so often besought us to answer queries relating to boilers, will endeavor to apply the principles we have laid down, they will soon be able to decide for themselves the points upon which they solicit information.

IMPERFECTION IN LAMPS, WICKS, FLUIDS.

To those who, dwelling in cities, enjoy the blessing of paying exorbitant prices for impure gas, and who, in consequence of large bills and inferior illumination seek a refuge in the next best resource, lamps, and to that less favored portion of the human race who, beyond the reach of gas mains and monopolies, are obliged to use lamps, and to those who are struggling to devise improvements in these useful household utensils, these remarks may prove useful.

The primary object sought in the use of lamps is light. Some of them are used for heating, but of them we do not speak at present. That lamp which gives the most light with the least consumption of illuminating material will, if it be safe, cleanly, and convenient, be the best. Safety is best secured in the use of safe materials, and no consumer of petroleum oils should be without the means and knowledge requisite to determine those which are safe from those that are unsafe. Cleanliness and convenience are matters of considerable importance. Lamps for ordinary use should be portable and free from the liability to get out of proper adjustment in carrying them about. But details of this kind need not be dwelt upon at length. Of much more importance is the correct knowledge of the principle of illumination by hydrocarbon fluids consumed in lamps.

No one who has paid much attention to the subject has failed to discover that wide irregularities in efficiency exist in lamps of different construction, and even in lamps of the same general style and finish. In fact no single lamp will perform its office with perfect uniformity. The cause of these variations will appear upon an examination of the common elements of lamps which burn liquids such as animal oils, melted fats, or the products of petroleum distillation.

The essential parts of all lamps are a receptacle to hold the material which is burned, and a means of conveying this material to the place of burning as it is needed. To these essential parts may be added the chimney, which in most lamps is necessary in order to bring the air which supports the combustion to the flame in sufficient quantity to secure perfect burning.

Any known compound of hydrogen and carbon burns with a luminous flame, but, in order that the greatest illumination with the most economy may be secured, it is necessary that the amount of oxygen supplied to the flame should be nicely adjusted. If too much is given, the flame supplies too much heat and too little light; if not enough oxygen is furnished, a part of the carbon is not consumed at all, but passes off as smoke.

Now, in stoves and furnaces we make provision for regulating the amount of air supplied to the fuel; but in the majority of lamps used for lighting purposes, the amount of admission is adjusted at the outset, the only change being that caused by the clogging of air passages by dirt, oxidization, etc., so that lamps, which when new work well, often fail to give a good light after a little time, and require frequent attention to keep the draft free from obstruction. There have been some fine lamps provided with dampers, yet, notwithstanding the scientific and practical value of such an attachment, we know of no lamp in general domestic use that has it.

The quality of wicks is also a matter of no small importance; for, although most lamps provide for regulating the flow of oil by raising or lowering the wick, this alone will not insure a good result. Some wicks do not burn evenly, so that a portion will be too high while other parts will be too low, and the flame streams up from the high parts. This arises partly from unequal admission of air, and also from the want of uniformity in the texture of the wick. If the threads which, through their capillarity, convey the oil to the flame be twisted unevenly, so that some are hard while others are soft, it will be impossible to make use of them with satisfactory results. Wicks, also, which in burning throw off branches of charred material instead of burning squarely down in all parts, always give trouble.

The burning of petroleum oils in lamps without chimneys is a problem presenting many difficulties. It has been solved by the use of mechanism to produce a current of air directed to the flame, but such machinery adds so much to the cost of lamps, and is attended with so many inconveniences that it probably will never come into such general use as to supersede the old method. It is, however, so desirable to avoid the use of chimneys that, barring its difficulties, the problem is a tempting one to inventors. It is needless to say that a device which would accomplish such a result, and not add materially to the cost, or necessitate greater attention than ordinary lamps do, would be second in value to scarcely any invention ever produced.

Every year brings forth some new invention pertaining to lamps, which shows, that though the field has been long worked, there yet remains something to be gathered. The direction that any study to improve lamps must take hereafter is toward the better application of general principles of construction, as it is not probable any new principle will be developed. It is, however, very desirable that the inconveniences attending the use of most lamps in use should be obviated. Among these are the accumulation of oil upon the outer surfaces of lamps, which renders them uncleanly to the touch; the frequent trimming and cleansing required; the accumulation of soot on the chimney; the liability of lamps to smoke when left unwatched and unattended, or when carried about; the very disagreeable smells emitted, etc. While these defects remain, there will continue some desire and effort to remedy them; and we believe that, by a thorough investigation of the causes of the annoyances specified, the means to avoid them would ultimately become apparent.

RELIGION AND SCIENCE.

Genuine truth being uncontrovertible, the truths taught by religion and by science must agree in the end. Where discrepancy appears to exist, it is only because either the theologian takes the individual opinions of a certain class of scientists for the teachings of science itself, or the scientist, in his turn, takes the individual opinions of certain theologians for the teachings of religion. In this way, a kind of antagonism is cultivated, which would not exist if the training of those destined for religious teachers was less one sided, and if, in place of confining their preparation chiefly to literary pursuits, they were also trained in the knowledge of those scientific principles, the application of which, during the last half century, has produced the most stupendous changes in the relations of man to his fellow man.

On the other hand, the training of many prominent investigators of science of the present day has been not less one sided; the unwise antagonism, displayed by many religious teachers against scientific pursuits, has reacted on several of the prominent leaders of science, and, in their writings and teachings, they accordingly ignore religion; thus, a class of scientific scholars has sprung up, chiefly in Germany and France, who, to speak mildly, do not consider religious training to have any important value.

Herbert Spencer, whatever opinions many may have of him, has the merit of having clearly pointed out the demarcation line between the knowable and unknowable, between that which science can demonstrate, and that which is beyond the field of science, and which pure science can never reach. Certain minds appear to be constituted in such a manner that they can be satisfied with adhering to the knowable, to only that which science teaches, keeping that which science cannot determine out of their thoughts. But such a condition of mind is only temporary; sooner or later, there grows in them a desire for light in this direction; and happy are those who obtain it—happier in proportion that their work in obtaining it was more laborious. A simple mind may feel happy with a faith accepted without mental labor; but such an individual has no conception of the enjoyment and supreme happiness of the cultivated mind, that finds the truth by searching and working, and whose cares and doubts at last come to rest in the consciousness of having found that precious gem, which all intelligent beings are interested in searching for—*Truth*.

For many ages, the teachers and priests of religion constituted the most influential class of human society. With the progress of knowledge, however, this influence has grown less and less, and, at the present day, it is only very prominent where civilization is least advanced. This undeniable fact, however, must not be construed to mean that civilization is antagonistic to religion. We maintain the contrary; but it has been caused by the neglect of the priests of religion to remain at the head of civilization and in the vanguard of the searchers after positive knowledge, as was the case with the ancient Egyptian priesthood. Those men, supposing that the knowledge of the truth, by the mass of the people, would be dangerous to the maintenance of the existing order of affairs, instituted secret rites, to guard jealously, for the benefit of the few initiated, their precious knowledge; of these rites, certain degrees of the Masonic order of the present day are the degenerate descendants. In proportion as the influence of abstract religious dogmatic teachings, on the mass of the people, was growing less, the influence of the discoveries of science, of the increase of positive knowledge, concerning the material universe, grew stronger and stronger. The invention of printing has, for more than four centuries, been flooding the world with books, so that now almost every man may possess his own library, at a less cost than in ancient times a single book could be obtained for; to this is added, in our day, an unparalleled development of journalism, scientific, political, and religious. Not only our stock of knowledge has increased; its diffusion has increased in a still greater ratio; and, if our religious teachers and leaders only take this into account, and provide such measures as will cause their profession to be at the head of civilization, as well scientifically as in other respects, as was the case with the ancient Egyptian priesthood, there is no doubt that their useful and necessary influence will become greater than ever before, for the simple reason of the immense moral power which must be the necessary result of the combination of scientific knowledge with a religious mission and strict morality.

THE NAVY OF THE FUTURE.

"When the Navy estimates for 1872 3 are laid upon the table of the House of Commons, we understand it is very probable that they will be found to contain provision for the construction of a vessel the armament of which will consist of torpedo artillery carried below the water line. Some time since, trials were made with the Whitehead fish torpedo, under conditions, entered into between the inventor and the Government of this country, that if the torpedo proved to be as effective upon trial as it was asserted to be by its inventor the latter should recieve the sum of £15,000, the Government obtaining the right to the use of the torpedo as part of the national armament. Upon its trial, the torpedo exhibited powers exceeding those which had been claimed for it by its inventor, and he received from the Government the sum agreed upon. As it is to further test the torpedo as a new form of sea artillery that the new vessel will be constructed, we may presume that she will, as a test vessel, be of very limited dimensions.

The facts of the great success which attended the trials of this torpedo, that the Government has paid so large a sum for it, and that the Admiralty are about to construct a vessel to test its merits as a new form of submarine artillery for our fleets, would appear to indicate that l'ttle or no doubt is entertained of its successful application. If it should be found in practical work that a ship can thus carry her battery of torpedo guns at any required distance below her water line, or say from seven to 12 feet below her line of flotation, the nation will be committed to another reconstruction of its navy. Armor plating will have to be extended to ships' bottoms and not cease at their top sides, while chain cables, coals, provisions, etc., will then, in all seeming probability, have to be stored above the level of the ship's water line, and in about the positions where she now carries her guns."

The foregoing from the London *Times* indicates that a wide field for invention in the naval line is open for ingenious minds. The London *Engineer* in a recent number makes the following frank avowal concerning the British navy: "It is certain that we have not a single ironclad afloat that cannot be penetrated by shot and shell at close range, while the majority of our ironclads are not invulnerable save at a range of a mile and a half. Such a thing as an absolutely impregnable ship or turret has at this moment no existence."

What is true of the British navy is also true of every navy in the world.

Now, where is the new invention which, shall remedy this state of things, to come from? It can only be developed by the persevering study of ingenious persons. Not power, position, influence or riches can bring out a new discovery. Thought, persevering thought, is the true mother of progress. For the revelation of the most brilliant secrets, we most generally look to obscure persons of simple habits, humble minds, in lonely places. But the comfortably situated, well-to-do individual, having conceit of knowledge, is rarely original. The poor inventor has a clear road before him.

HOW TO SHAVE.—As you strap your razor, strap the two sides alternately, and keep the back of your razor always on the strap, as you turn it from side to side. You thus avoid cutting your strap and turning the edge of your razor. As you shave, keep your razor almost parallel with the skin, and not at a great angle with it. Give your razor also a slight lateral motion. In fact, to borrow the simile of the artist, "the more you can make your shaving like mowing grass with a scythe, the better." Do not make faces as you shave, with the object of making a better surface for your razor to act upon. The skin when strained is easily cut. Adopt these hints and you will bless the unknown giver.