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Contents:

(Illustrated articles are marked with an asterisk.)

SUITABLE BUILDING MATERIAL FOR CITIES.

Recent events have turned the attention of thoughtful people to a consideration of the question of building material for large towns. It no longer appears proper to permit indiscriminate constructions, where the safety of a whole community may be endangered. We have, in large cities, superintendents of buildings, but they generally confine their attentions to the question of security against falling, and not to the character of the building material, excepting in so far as wooden structures may be prohibited in certain districts. There would now appear to be cogent reasons why commissioners should be appointed to secure greater precautions than the mere question of wood and iron. A mixed commission, composed of builders, architects, underwriters, firemen, and scientific experts could be appointed to study the whole subject and report thereon to the government. This commission could very properly decide upon the survey of streets, and the width, the kind of pavement and flagging to be used. They could lay down water pipes and establish hydrants at suitable distances, and see to proper arrangements for extinguishing any fires that might arise; but the most important duty to be assigned to them would be the control of building material in certain sections of the city.

By insisting upon the construction of a row of buildings, up and down and across town, as nearly fireproof as it is possible to make them, a wall, impervious to fire and constituting a barrier impassable to any ordinary conflagration, would arrest the flames and save whole sections of the city. A street, built up entirely of fireproof buildings, would be a novelty; but in the light of recent events, it would appear to offer great protection, and it may be worth while to designate what streets shall be of this character, and then insist upon a compliance with the prescribed style of building. Having adopted some such plan as this, the commission would have to study the kind of building material best adapted to city structures, combining security and durability with reasonable economy. This opens up the whole question of the comparative value, for building purposes, of wood, iron, and stone. They tried wood in Chicago, without having treated any of the material with the numerous agents that have been recommended to render it incombustible; and the sad consequences of this neglect ought to serve as a warning to all other cities. If the wood had been saturated with soluble glass, ior soaked first in phosphate of soda and afterwards in chlorde of barium, it could not have been set on fire. The latter mixture may be too expensive for use on a large scale; but silicate of soda, or soluble glass, can be obtained in sufficiently large quantities, and at such reasonable rates, as to admit of the preparation of the shingles, clapboards, and all exposed portions of frame buildings. Any such precaution as this has the double advantage of protecting against fire, and securing against decay; and, in the long run, would be found to be the greatest economy.

If people will insist upon constructing frame buildings in large towns, they ought to be compelled to render them essentially fireproof by the above chemical mixture. So many experiments have been tried with soluble glass that the security it affords against fire and decay may be considered as fully determined. Wood thus prepared will char and smolder, but will not burst into flame; and hence there could be no scattering of cinders or blowing about of firebrands.

Where frame buildings are tolerated, the fire marshal might justly insist upon a chemical preparation of the wood—an operation that could easily enough be done, if it were imperatively required. The scientific experts on the commissions would be apt to report in accordance with the principles laid down above, and by degrees the dealers in lumber would learn how to furnish a building material nearly as durable as iron.

In reference to the use of iron for houses, the facts, that it is employed to a large extent, and that we are constantly acquiring greater skill in its manipulation and management, are sufficient proof of its practicability. In Chicago, however, this material proved unavailing, for the reason that the wooden structures made a fire hotter far than a blast furnace constructed to melt pig iron. No iron could stand such a heat, and it melted down like wax. This was not the fault of the iron, but caused by the neglect to prepare the wood against such an emergency; and no one will be likely to condemn iron structures on account of their failure in Chicago.

A third building material is stone, and this may be divided into the native and artificial. There are a good many varieties of stone suitable for building purposes; but the cost of quarrying, transportation, and working, is so great in this country as almost to shut this material out of competition. This objection does not apply to artificial stone. The lime and sand required to make artificial stone can be found nearly everywhere. They can be mixed by simple machinery, and require no labor to cut them into shape; but the plastic material can be run into any kind of a mold, where it dries in a few hours, and one layer after another can be carried up in marvelously short time.

For rapidity of construction, for durability, for security against fire, for warmth, and ventilation, for dryness and health, for economy, for architectural effects, there is nothing like artificial stone; and we look upon this material as the most suitable for cities and as probably destined to supersede all other. It only needs the popular dissemination of information on the subject to occasion a demand for artificial stone; and as soon as such a demand is created, this material can be furnished in any quantity in all parts of the country; and we shall have it for our cellars and our ice houses, our sewers, cisterns, wells, water pipes, paths, roads, schools, churches, dwelling houses, and stores, in a way that will make us wonder how we ever performed the slow and tedious labor of hewing out stones or laying up brick, when we could have formed a whole house at one casting—as Krupp pours the melted steel into molds, and produces a cannon of any size.

In a country where labor is as dear as it is with us, where wood is becoming scarce, where iron is needed for other purposes than houses, where the native rock is difficult to work, the suitable building material would appear to be artificial stone.

DR. CROOKES AND PSYCHIC FORCE.

Dr. Crookes is a bold man, or he never would have braved the storm of ridicule he has invoked by the assertion that the manifestations, which have hitherto been ascribed to spirits or to legerdemain, are simply the result of a natural hitherto unrecognised force residing in the human organism. He is also a candid man, as is shown by the way he discusses this question with those whose insinuations must be irritating in the extreme. That he is an earnest man, none who know him through his previous labors will deny. To admit these characteristics is to admit that their possessor is entitled to a certain degree of respect, even if ability, which alone can make them valuable in scientific research, should be lacking.

But the past record of Dr. Crookes proves him no intellectual pigmy. He has been a power in the scientific world. These facts entitle every assertion he makes to the belief that we willingly accord to the asseverations of men whose veracity stands proved by years of honest record.

We therefore accept the statements, made by this investigator relative to certain results obtained in his experiments with Mr. Home and others, published in another part of this paper, as correctly describing the deflection of the mahogany board, the increased tension of the spring balance, the tracing of curves upon smoked glass, and the taps upon the parchment disk.

Some force actuated the apparatus that thus moved. Was it a force that resides in the human organism, or was it some other force or forces already known to scientists? Dr. Crookes thinks he has shown it to be what he calls "psychic force;" but we submit, that while, upon his own showing, there is some ground for inference that the persons present, called "psychics," had some connection with the effects produced, the nature of this connection is not proved by anything yet said or done, or written, by Dr. Crookes. It is merely inferred that out of the bodies of these persons proceeds a curious and inexplicable influence that fitfully acts with, or opposes, gravity, at the will of the "psychic."

Dr. Crookes seems to be surprised that his experiments are not now accepted as conclusive proof of such a force. But it would be far more surprising that they should be so accepted. All known forces act uniformly upon the establishment of known conditions. When first discovered, it was by the establishment of such conditions that their existence was demonstrated. When it has been desired to use them, the same set of circumstances, under which they first became known to man, invokes them at once.

Not so with the psychic force. Dr. Crookes arranges his apparatus, brings in his psychic, and yet often fails to obtain results. Unlike Galvani, whom he quotes, he cannot always make his frog kick. If it be objected that certain unknown conditions, in the bodies of psychics, must spontaneously, or at least independently of any external agency, be set up, in addition to the proper adjustment of apparatus, then we say that the existence of psychic force remains undemonstrated; for force only manifests itself in a specific recognizable form under certain regular conditions of its action. When we see a body moving away from the earth we know that some other force than gravity has for the time control of it, because gravity, like other forces, acts according to fixed laws, and, unopposed by adverse conditions, draws bodies towards the earth's centre. There is nothing fitful, capricious or intermittent about the action of any force by itself.

Variations appear only under conditions which always accompany apparent changes.

Thus, suppose that some one had, for the first time, felt a shock upon touching an electric eel, and, repeating his experiments, should find the shocks, after a time, discontinued. Having first attributed the sensation to the force emanating from the eel, he would now doubt that this animal was the source of the influence, and would look for other causes. Not till he found that the shocks uniformly ceased upon the exhaustion of the fish, would he satisfy himself that the force really resided in it. Variations in the manifestations of a force must, therefore, be traced to uniform conditions, as they are really a part of the characteristics which enable us to place the force in its proper category.

Dr. Crookes takes the ground that this is no argument against the existence of psychic force. He not only—to use his own language—fails to furnish "any dynamic equivalent of psychic force, or any formulæ for the varying intensity of Mr. Home's power," but he fails to account for the sometimes total cessation of its action under circumstances apparently precisely like those under which it acts with maximum vigor.

Some more definite relations between the effects and their cause must be established before psychism will take its place in the list of physical sciences.

AMERICAN FORESTS.

What with the immense drafts made upon the store of valuable timber possessed by this country, and the terribly destructive fires that almost annually visit some portion of our wooded regions, we are fast reducing our supply, and raising the value of industrial woods in the market.

Still we seem to regard the end as something remote, and to imagine that something will turn up ere our timber shall become exhausted. We speak of the exhaustion of the English coal fields, which, at present rates of consumption, will have been reached about *Anno Domini* 2,971, as something to be dreaded, but at present rates, we may fix a much nearer date for the total denudation of our valuable forests, the annual drain upon which now far exceeds the natural growth, and is constantly increasing.

We have more than once endeavored to awaken a realization of this fact in the public mind, which, however, contents itself with present plenty, and puts away the thought of anticipated evil.

The industries employing wood, as the basis of their operations, are of a magnitude scarcely second to any on this continent. We have perfected machinery, for working timber, that is marvelous in the speed and delicacy of its operation, yet the time will come, unless our forests are preserved, when the majority of these industries will have passed away.

Now, there are vast tracts of country where scarcely anything except timber can be properly cultivated, and, by proper attention on the part of the General Government, the oftimes worthless, or comparatively worthless, timber now growing upon them, might easily be replaced by that of great value in the arts. There is no more reason why we should not cultivate oak, or hickory, or pine, than corn or wheat.

The trouble has been that we have looked upon the timber supply as practically inexhaustible, and so have overlooked a means of perpetuating and increasing this element of our national wealth.

In Europe, where the importance of a liberal supply of timber has been long felt, active measures have been taken on the part of various governments to protect existing forests and encourage the cultivation of timber. It is estimated that there yet remain in France 2,700,000 acres of State forest, the revenue of which, previous to the recent war, was $8,700,000. Bavaria has about 2,000,000 acres of forest; Prussia, as it existed before the war, had upwards of 5,000,000 acres. In each of these countries, schools of forestry, under State control, are supported, in which men are trained in the scientific and economical management of the State timber lands.

The attention of England has been turned to the preservation of the sal and teak forests in India. Of the latter, it was found that, within eight years from the time the forests of the native princes were thrown open to the public, teak timber, suitable for government use, was becoming scarce in Madras and Bombay. The opening of these forests was in 1822. The sal forests are more extensive. Those belonging to the British Government cover 3,500 square miles; but it is estimated, by good authority, that a rest of at least fifty years would be requisite to make good the inroads upon this supply.

Surely our timber is as worthy the attention of the Government as our mineral wealth, and it is high time that some means, like those adopted in Europe, be employed to save and develop it. The origin of the fires that do so much havoc ought to be investigated; and, if possible, means of prevention adopted.

As one means of protection against fire, we suggest that artificial breaks in the continuity of forests would, if they could be made practicable, aid somewhat in preventing the progress of a conflagration, especially if the cleared spaces were brought under cultivation. In extraordinarily dry weather, a fire might probably cross three or four miles of cultivated land, but in most seasons this could hardly occur. If, in placing the public lands in market, alternate sections, of sufficient width, were first sold, the intervening ones being reserved, the tendency would be to ultimately break up the forest regions in just the way indicated.

As to those reckless persons who, careless of results, fire burning wads, throw stumps of cigars or knock the fire out of their tobacco pipes, into dry leaves, regardless of the extent of damage to which their carelessness may lead, it is probably difficult to reach them by law, but something might be done toward awakening in them a sense of moral responsibility by properly circulated printed warnings, and appeals to their humanity. Such a course would tend to render the thoughtless thoughtful, and would lessen risks.

It is to be hoped that the attention of Congress will be called to the importance of this subject at its next session; and that at least some experimental attempts will be made to lessen the enormous waste which now goes on entirely unchecked by any effort to prevent it.

GENERAL REFLECTIONS SUGGESTED BY THE FAIR OF THE AMERICAN INSTITUTE.

It would be strange if such a display of mechanical, chemical, and general industrial improvement, as is now on exhibition at the Fair of the American Institute, should fail to suggest many valuable hints to the thoughtful mind.

There are thousands who go to such places merely for amusement, and for such there is generally plenty of food for mirth in the eccentricities of exhibitors and spectators, and the amusing incidents that are sure to take place in any large gathering of people.

There are others whose minds are ever on the alert to gather some crumbs of instruction from every thing with which they come in contact. Such will see, in many things displayed this year, that mechanical invention, asserted by some pessimists to be on the decline, is really in the full pride of its strength; that it still retains its eager scent for novelties, and that, the combinations of crude elements into new forms of beauty and usefulness being infinite, there can be no such thing as an end to invention.

One of the most striking of the features of this year's display, is the advance made in cutting and working hard materials. The diamond rock drilling and stone sawing, and, the greatest triumph of all, the process of cutting stone, glass, and even more refractory materials, by the simple agency of a sand blast, have placed resources, at the command of the engineer, the architect, and the decorator, that open an entirely new field of industry, into which an army of workers will be shortly introduced.

No one can pass through this collection without observing numerous new applications of electricity in the arts. If this force fails to give us a motor, of sufficient power and economy to propel machinery, it furnishes one of the very best means of controlling other forces, almost imparting intelligence and feeling to the performance of automatic machinery, and acting with a delicacy approaching the sense of touch. It is evident that the uses of electricity are destined to become far more widely extended than at present, and it may be that even that grandest of human achievements, the electric telegraph, may find its peer in other applications of this subtile yet docile force, that, like light and heat, pervades the universe.

The various displays of ornamental art show, strikingly, the increase of desire for luxurious living, and the endless craving of the human heart for something more and better than it already possesses. This craving has kept the demand, for everything that human ingenuity can produce, fully up to the supply, and will so continue it, no matter how many and various may be the productions which loom, forge, the sculptor's chisel and the painter's brush, throw upon the market. "The eye is never satisfied with seeing," said Solomon, and so long as inventors produce novelties, just so long will they find them absorbed into the multitude of things which taste and the means to gratify it collect in modern homes.

In the steam engineering display are to be found ample evidences of two important tendencies of the time, namely, to the increased use of sectional and safety boilers, and the employment of all attainable safeguards against neglect of boiler tenders. People have been, by numerous destructive accidents, thoroughly aroused to the importance of caution in the use of steam, and desire to enforce careful attendance by the use of tell-tale appliances, that bring carelessness into light; and the general feeling, among those who use light steam power, seems to be that safety is preferable to economy, if both cannot be secured together. For light powers, also, simple forms of engines, having few parts and complications, are preferred to those of more complicated forms, even though the latter may give more economical results.

In household and domestic appliances and utensils, there is a constant accession of new inventions; and judging from the favor many of these simple yet useful things seem to obtain, there must be always purchasers for any meritorious novelty in this line. There is a great variety of these articles at the present fair, and the interest taken in them shows that, after all, the homely things of practical utility are even more attractive to the average mind than works of art.

Of the latter, there are enough exhibited to show that, in the arts of design, the country is making rapid strides, and may hope to rival older countries in this field, as it has surpassed them in others.

Not to extend these rambling thoughts to a tedious length, we will conclude by remarking that the educational influence and power of such exhibitions, upon the public mind, can scarcely be overrated. In them are combined, in the most attractive manner, both instruction and amusement, without any objectionable features. For these reasons, they should be well encouraged. Every parent who desires to instil healthy tastes and principles into the minds of youth has an interest in their support.

USE OF SODIUM FOR BLASTING.

The employment of sodium for blasting rocks has been frequently proposed, and numerous experiments have been tried. The subject is again revived, and we have some of the figures upon which its use is founded. To decompose 9 parts, by weight, of water, 23 parts, by weight, of sodium, are required; and the product is 31 parts of soda and 1 part of hydrogen. If we employ 46 grammes of sodium, this will evolve, with 18 grammes of water, 2 grammes of hydrogen, which occupies a space equal to 22,471·9 cubic centimeters. If the sodium be sealed up in a glass ball of the capacity of 50 cubic centimeters (46 grammes sodium occupy 44·7 cubic centimeters), the hydrogen gas will exert an explosive force against the walls equal to 450 atmospheres. In the practical application, it is proposed to take two glass bulbs connected by a thin tube. In the upper bulb is placed the metallic sodium; in the neck between is formed a soluble salt, and in the lower bulb is drawn some water, when required for use. By filling the lower bulb with water, and inverting it, the salt will gradually dissolve and give the water access to the sodium, and the explosion follows.

The bulbs can be safely transported, as the water is put in like a charge of powder, and the length of time required for the melting away of the intervening salt can be calculated.

For submarine blasting, for employment in crevices, for hollow trees, and other purposes in which gunpowder is not easily available, a fuse of metallic sodium can be highly recommended.

PROPULSION OF STREET CARS.

The writer well recollects how, in his youth, together with other mischievous boys, he used to hang an old red flannel shirt on the fence of a pasture in which was inclosed a bull. Then hiding in an adjacent thicket, it was considered glorious fun to watch the irritated animal, as he would paw, and bellow, and finally charge at the shirt, usually going through the fence; when, before he could recover himself, the shirt was withdrawn from his sight, through the agency of a piece of strong twine, and the enraged animal would recover his temper in his supreme astonishment at his supposed complete destruction of the irritating object.

The public, like this bull, often rushes pell mell at any proposed innovation, without stopping to consider whether there is any good ground for its opposition. It is always ready with objections against anything new, whether it has reason on its side or not.

Inventors have been busy working out ways and means to propel street cars without the aid of horses. Few of them have stopped to consider, that, when they have solved their problem, they will have another to solve, namely, how to allay the foolish fear that such cars, running by steam or other power than that furnished by animals, will frighten horses.

When carriages were first introduced, they were strenuously objected to, and it was even attempted to suppress them by law. When Stephenson was endeavoring to convince the public of the practicability of steam railways, a member of parliament objected that cows would get in the way of the locomotives and be killed; yet we have now plenty of carriages and locomotives, and the world appears to have benefitted by them.

An inventor, who has been a long time experimenting on the practicability of propelling street cars by steam, remarked to us the other day that, were he to put up a brass Yankee clock on the front of one of these vehicles, and demonstrate that he could thus draw cars at the proper speed, the public would object to their use.

Now, not one man in a hundred, in any large city, owns a horse, and not one horse in a hundred is of such bad disposition that he could not readily be broken to tolerate, in the most dispassionate manner, the passage of a street car that ran without horses. So that this objection, sifted down, amounts to the assumption of the privileges of one person in ten thousand as paramount to the interests of all the rest.

There are no doubt many ways in which the application of steam could be made to street cars, which would meet the objections to smoke and ashes discharged in the street, and the puffing of the exhaust. In fact, we know of more than one invention in which these drawbacks have been obviated. Such objections can not lie against the ammonia engine of Dr. Lamm, illustrated and described in our last issue.

There are, however, some requirements in engines for this purpose that many inventors have overlooked. One of these is the ability to mount grades without carrying a surplus of steam on levels. To do the latter, is to waste fuel; and to raise steam quick enough, on the approach to short grades, if not impossible, is, to say the least, not the most scientific and mechanical way of accomplishing the desired object.

The better way is to use the minimum power, required for ordinary grades, for surmounting heavy grades, the latter being ascended slowly enough to permit this.

There are several ways in which this has already been done; the more important of which are, the use of gearing to slow down the motion of the car, while the engine makes the same number of strokes per minute; and the use of a compound engine, the large cylinder of which is worked at high pressure while ascending grades. Either of these plans accomplishes the end sought, but neither seem to provide for that nice adaptation of power to the character of the work to be performed, in a way to satisfy the ideal of nicety in the operation of an engine, as attained by the link motion on locomotives.

There is a wide field for invention in providing the means for drawing cars on city and suburban trainways, and, if we mistake not, the time is nearly ripe for their introduction. We know of several important companies that are anxious to get rid of their bondage to horse-flesh, and some of them are even now experimenting to find the invention that will emancipate them from an expensive and unsatisfactory system.

IMPROVEMENT IN PAVEMENTS----ARTIFICIAL STONE FLAGGING FOR SIDEWALKS.

Our readers will recollect an article on artificial stone, published on page 336, Vol. XXII of the SCIENTIFIC AMERICAN, in which special reference was made to an artificial stone, manufactured by Mr. Herman A. Gunther, now of the firm of H. A. Gunther & Co., 460 Broome St., New York. The basis of this stone is Portland cement and sand, which is treated in a peculiar manner by a chemical solution which greatly increases its hardness and durability. Coloring matters are added by which very exact imitations of the blue and brown stones, so popular for building purposes in this country, are produced in a very rapid and cheap manner.

Mr. Gunther has recently patented, through the Scientific American Patent Agency, an improvement in the use of this kind of stone for flagging side walks, by which stones may be manufactured *in situ*, in squares or diamonds, and still be capable of being taken up without injury, and relaid whenever desired.

The blocks being formed by the aid of suitable molding strips, which separate the stones by about three sixteenths of an inch, the interstices are filled with a peculiar elastic waterproof composition which allows the artificial flags to contract from cold or expand with heat, obviating all danger of cracking from this cause, and, at the same time, preventing the percolation of water to the substratum, thereby preventing subsequent upheaval by frost.

A large piece of sidewalk has been thus flagged, at the corner of Lexington Avenue and Fifty-seventh street, in this city, which we recently visited and examined, and we must say that it would be difficult to conceive a handsomer piece of work, of its kind.

The flags are an artificial blue stone, of great density and hardness, presenting a perfectly level surface, very much superior to the undressed natural flag-stones in common use, while they can be laid at about one fourth the cost. The flags are four inches thick, and we see no reason why they should not prove as durable as the natural stone, since we are aware of experiments extending through three years, with stone of this kind, which have tested its power to resist, to the utmost, atmospheric influences, and which it has endured perfectly.

We regard the improvement as one of much importance, as the difference in first cost will allow the artificial stone to be relaid several times, at less expense than the first cost of the natural stones.

THE HEALTH OF BARON LIEBIG.

From a private letter received in this city, we learn that Professor Liebig is by no means restored to his former state of physical and mental activity. He spent the early part of the summer at the baths of Kissingen, and was much benefitted by the treatment; later in the season, he went to meet a few choice friends, among them his life long colleague, Professor Woehler, at Reichenhall, where one of his sons is a physician; and here, in the invigorating mountain air, his bodily infirmities disappeared; but he complains of dizziness and suffering whenever he attempts the least mental exertion. We fear that the illustrious chemist will hardly be able to enrich our literature with many more of the brilliant writings which have rendered the science, to which he has devoted his best years of his life, so useful and so popular.

Liebig may be justly called the founder of modern chemistry. It was he who first organized laboratory instruction, and rendered it possible for pupils to pursue an experimental science in an experimental way. This has been his chief service, but another almost equally important contribution to the cause of learning has been the popularization of science accomplished by his writings.

Howe's Tobacco Dressing Machine.

This is a machine invented by Mr. James H. Howe, of Utica, N. Y., for loosening and separating the strings of fine cut tobacco, which adhere together, after being cut, on account of the packing of the leaves previous to cutting, and of the adhesive substance used for sweetening the tobacco.

The invention consists in a hopper with a flexible bottom, in which the cut tobacco is placed, two or more pairs of rotary beaters acting against the flexible bottoms by revolving under it, in a manner to thoroughly separate and loosen the strings from each other, and to work the adhering bunches into soft fleecy masses.

The tobacco, when cut from the thick mass of leaves packed together, adheres in thin ribbons or shavings made up of strings, connected side by side, and is commonly separated and loosened by a rapidly up and down shaking machine, which is expensive to keep in repair owing to the great wear and tear occasioned by the rapid movements necessary, and the sudden stopping and starting. Such machines are also objectionable on account of the great amount of power required to operate them.

In Mr. Howe's machine these objections are avoided. The motion being slow and the moving parts operating continually in one direction, require but little power, and the wear will be slight, while the work is claimed to be accomplished in the most satisfactory manner.