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BUILDING STONES AND THEIR PRESERVATION.

It is always a subject of general regret when some well-known structure, distinguished for its beauty and the architectural purity of its style is seen going prematurely to decay. In most cities there may be seen costly buildings—such as some of the churches in New York—the most ornamental parts of which have assumed a faded and worn appearance, in a very few years after their erection. No building of the present day, however, has excited so much wide-spread attention respecting its early dilapidation as the new Houses of the British Parliament, in London. They were erected only a few years since on classic ground, and are distinguished for their imposing dimensions and ornate architecture. It was supposed that the elaborate and delicate tracery on their walls would have remained for ages, "untouched by the hand of time," as monuments of the architect's taste and the sculptor's skill; but the stones are already crumbling, and the structure "hastens to decay." To arrest, if possible, the future disintegration of this splendid pile the British government appointed a commission of scientific and experienced men to investigate the cause of decay, and ascertain, if possible, the remedies that may be applied, and report the result of their labors. The report has lately oppeared, and as some of the information which it contains is of general importance we give its substance.

Building stones are divided into two classes: first, those consisting of substances not easily acted upon by acids; second, those composed of materials which are partially or entirely acted upon by acids. To the first class belong granite, porpheries and serpentine; to the second, limestones, dolomites, and certain sandstones containing carbonate of lime as a cementing agent. The stones of which the new Houses of Parliament are built belong to the second class, and are composed almost entirely of the carbonates of lime and magnesia. Regarded from a purely chemical point of view, the resisting power of stones to the corroding action of the weather would appear to depend entirely upon their chemical composition; but there are other conditions equally important in determining the durability of building stones. Chemical substances under different conditions possess very different properties. Thus, marble and chalk are chemically identical, but one is crystalline, the other amorphous, and the former is much less readily acted upon by acids than the latter.

Stones in buildings are subject to both mechanical and chemical action. Those which are very porous and absorb moisture are liable to disintegration, when the moisture freezes in their pores, and splits their cells. There is always some carbonic acid in the atmosphere, and when rain water contains a portion of it, a powerful solvent action is exerted upon exposed magnesian limestone. In cities, where bituminous coal is used for fuel, a small quantity of sulphuric acid is found in the atmosphere, and when this is combined with rain it acts as a powerful solvent upon magnesian limestone. Two kinds of stone come under the ban of science for expensive buildings in cities, namely, very porous sandstone and magnesian limestone.

No stone should be chosen for a costly structure unless it is known to be proof against atmospheric disintegration. But this advice affords little consolation to those who have erected expensive buildings under the impression that the materials were perfectly durable, but which are now rapidly undergoing premature decay. What is the remedy to check the decay, is the all-important question. We have very little, if anything, by way of answer. The inquiry has been made of us frequently respecting the preservative character of silicate of soda (soluble glass) for such purposes. Soluble glass has been applied to stone in the form of a concentrated wash, and afterward washed with chloride of calcium, to effect double decomposition and precipitate an insoluble substance in the pores of the stone. Thus far permanent results have not been achieved with this substance. Parraffine, beeswax and resin dissolved in volatile oils have been recommended for experiment as preservative agents by distinguished professors of chemistry in London; but while these will undoubtedly close the pores of decaying stone, they are certainly not superior to prepared linseed oil and paint for this purpose. What is wanted is some chemical agent which, when applied, will render decaying building materials as durable as those of the most permanent structures. There is still an extensive field for experiment and investigation in this department of the arts.

SAND, SOAP AND GLASS.

The difference between chemistry and mechanics can be very clearly explained by the changes produced on sand. Thus, if we take a piece of quartz and reduce it to powder it becomes sand. This is simply a mechanical change, the sand remaining of the same nature as it was prior to its being reduced to dust. Silica is the chemical name for quartz, and it is one of the most refractory substances known. It is perfectly insoluble in water, and neither sulphuric, hydrochloric nor nitric acid will dissolve it. It is also so infusible that it cannot be melted by any heat obtained by the blow-pipe; and yet this substance, so hard, so infusible and insoluble, can readily be converted into soap and made to melt like wax through the subtle agencies of chemistry. By taking some sand and mixing with it a portion of caustic soda—carbonate of soda and lime—and submitting these substances to a very high heat in melting pots placed in a furnace, it fuses and becomes glass. In its molten state it is blown into bottles and vessels of every variety of form, and is also converted into sheets for window panes, and molded like clay for many other purposes.

Glass contains just a sufficient quantity of alkali to render it fusible, but not soluble, as neither water nor the three acids named dissolve it; indeed, glass is the substance commonly used for containing those very corrosive acids and for this purpose it is of inestimable value to the arts. The change produced by the soda on silica is a chemical one. The molding of glass, when fused so as to change its form, is a mechanical principle; the action of the soda upon the silica in conjunction with the high heat in the furnace, whereby the silica is made fusible, is a chemical one, and the compound thus formed, which we call glass, is a silicate of soda. A still more wonderful change than this is effected if an excess of caustic alkali is combined with the silica, as it then forms what is called "soluble glass," a substance which will dissolve by being boiled in water. Soluble glass (silicate of soda) is best formed by boiling finely subdivided sand in a very caustic lye under steam pressure, so as to subject the silica to the highest possible temperature, as this tends to form more concentrated solutions of the silica. This is also a chemical change. The hard silica, formerly so insoluble, unites with the excess of alkali and really becomes a soap which is now used in Prussia and some other places for washing purposes. The silica takes the place of tallow, oil and grease, which are used for making common soap, and uniting with the alkali it becomes soluble in water, and may be used for washing as an inferior saponaceous compound. Such are some of the mysteries of chemistry.

Silica is one of the most common and useful substances in nature. It is the constituent of many rocks and composes most of the pebbles in gravel beds. Rock crystal is pure transparent quartz, and its name is derived from *krustallos*, a Greek word signifying ice. Silica is the base of a great number of precious stones, such as the carnelian and sardonyx, which are bright red; also the opal, &c. We are entirely dependent upon silica for our present advanced position in some of the arts. It forms the lenses of the telescopes by which such advances have been made in astronomy, and from it the lenses are made for our most improved system of lighthouse illumination.

Spectacles, those aids to the aged, are also formed of it, also our windows and looking-glasses; in short, silica is applied to numberless purposes in all the philosophical, useful and elegant arts. The "little grains of sand" have become mighty agents in the hands of cultivated man. It is said, however, that the ancients were acquainted with the art of making malleable glass—an art which, if it ever existed, can be re-discovered.

M'CORMICK'S EXTENSION AGAIN—PERSONAL.

Commissioner Holloway, in his decision of the McCormick extension case, published on page 295, took occasion to criticise the conduct of the attorneys, Messrs. Lee & Fisher, who conducted the opposition. Our readers will remember that in our review of the case we defended these gentlemen from the charges alleged against them, basing our remarks wholly on the premises laid down by the Commissioner. In a letter addressed to us on the 16th inst., Messrs. Lee & Fisher express their thanks that we should have defended them, especially inasmuch as they were strangers to us, and that we acted without solicitation. We are happy to find, also, that Commissioner Holloway, upon further investigation of the facts, has made the following correction, which now appears of record in the office, following his opinion, and made part thereof:—

PATENT OFFICE, Nov. 7, 1861.

Since the publication of the foregoing opinion I have received a communication from Lee & Fisher, per S. S. Fisher, in which it is declared that the letter above referred to "was the only letter of the kind written, and the expression, 'defeated in the Patent Office,' referred only to the legitimate use of the funds, under our agreement (with our clients, herewith inclosed), for the purposes therein specified." It is due to the parties named that I should give them the benefit of this their disclaimer, and, regarding it as satisfactory, I do so by making it a part of my recorded opinion.

D. P. HOLLOWAY, Commissioner.

It affords us pleasure to publish the Commissioner's correction. It is certainly creditable to his candor.

OUR NAVY AND ITS GALLANT COMMODORE DUPONT.

The name of Commodore Dupont will hereafter stand side by side with those gallant worthies who have made our navy glorious in former times. He has long been regarded as a master spirit in the navy, wanting only an opportunity to show his skill, which he has done in a signal manner in his successful bombardment of Forts Walker and Beauregard at the entrance to Port Royal harbor. It is accounted a dangerous experiment for wooden-walled ships to attack forts or earthworks, as it is generally conceded that one gun on land is equal to five on shipboard. The Confederate General Ripley in his orders summed up his instructions with this declaration:—"To give up a position on shore while the enemy is afloat, is totally and absolutely inexcusable."

In spite of all the disadvantages attending such attacks the brave Dupont went resolutely to work to bombard the enemy's works, and in his letter to Capt. Fox, Assistant Secretary of the Navy, modestly declares that he "*thought his plan a clever one.*" We

have no doubt the enemy thought so too when the terrific shower of exploding shells fell upon them, knocking their guns about in the wildest confusion. Instead of anchoring his fleet and blazing away at the works, he kept his ships in motion, thus securing the use of both his broadsides, which kept the guns from heating by the alternate fire, and enabled the men to work to greater advantage in their quarters. A fort on shore is a large stationary object, and may be hit anywhere, while a ship is comparatively a small mark, and by keeping it moving the enemy's gunners were prevented from getting an accurate range, thus disappointing Gen. Ripley, who ordered the artillerists just how to fire, and where the shot would do most execution.

The report says that the enemy felt confident that he could annihilate the fleet in case it should attempt to pass the forts into the harbor. When Commodore Dupont's fleet had described the arc of a circle about the forts three times, keeping up a terrific cannonade, and was about to pass the fourth time, without showing signs of exhaustion or defeat, the Confederates thought it about time to leave, and they did so in a most precipitate manner.

Dupont's plan of the engagement was laid down after a careful reconnoissance of the enemy's works and position. It combined all the points which great commanders have endeavored to secure, viz., security and superior destructive opportunities for their own forces, with surprise, derangement of plans and inferior destructive opportunities to the enemy.

This attack and its successful results is one of the most brilliant victories ever achieved by our navy, and must tend to elevate it in the eyes of all nations.

SUBJECTS FOR INVENTION.

For the convenience of our inventive readers, we subjoin a catalogue of subjects or problems that may, we think, be advantageously conned over with a view to further discovery or improvement. We propose to publish this catalogue quite frequently, by way of reminder to our ingenious friends, and we shall also from time to time make additions to the list. We shall always be glad to receive suggestions of new subjects to be added to the column from any of our readers.

Patents for improvements connected with the subjects here indicated would no doubt prove of value.

A SMALL LOCOMOTIVE FOR FAMILY USE—suited to run on common level roads, to be light, safe, neat, convenient, easily managed by any person and not expensive to run. Great speed not essential.

AN INSTRUMENT TO INDICATE THE COMPARATIVE PURITY OF THE ATMOSPHERE—We already possess the thermometer which shows the temperature; and the hygrometer which tells us the comparative dryness or moisture of the air. We now need a simple instrument that will indicate to the eye whether the air in our rooms is pure or impure.

A POROUS SUBSTITUTE FOR LEATHER—Many excellent substitutes have been invented, but most of them involve the use of gum, paint or some water-proof substance, so that the article produced is unfit for the feet, and for other purposes to which leather is applicable.

A PULSE INDICATOR—A small instrument for the sick room, capable of application to the wrist of the patient, to show and record the number of pulse beats.

A CHEAP METHOD OF PREPARING THE METAL MAGNESIUM—This metal possesses the remarkable property of burning with a most brilliant light when held in the flame of any common lamp or candle. The light thus produced far excels that of gas or coal oil; but the great expense of producing the metal is the obstacle which stands in the way of its employment. It is believed by many persons that if some cheap method of producing the metal can be invented, the magnesium light will come into general use. Here is a fine problem for amateur chemists.

SUBSTITUTE FOR BREAD YEAST—A family instrument or machine for impregnating bread dough with carbonic acid gas, and thus avoid the necessity of using yeast.

A MUSICAL INSTRUMENT—An improvement in musical instruments, so made that by passing a sheet of paper or other object through the instrument, the desired tune will be produced. The object of this improvement would be to enable every family to enjoy the latest and best music, or such selections as might be desired, without the requirement of educated manipulation of the instrument. The sheet or object by which the changes of sound are effected must be cheap and easily produced.

A CLOTHES DRYER—A drying frame for clothes capable of being projected from the windows of dwelling houses.

AN ARMOR-CLAD WAR VESSEL—Light of draft, cheap and quick of construction. As the iron-plated ships have been thus far constructed, Sir Edward Belcher thought that even a well-constructed wooden ship, striking one fair across the bows, would cause such a shock as to sink the armor-plated vessel. And he declared that if he were hard-pressed, he should have no objection to try it. Indeed, he seemed to think that "compressed brown paper was one of the most powerful repellants of shot, and might be advantageously tried." Something better is needed in this line than has yet been brought out either in Europe or this country.

A POCKET TELEGRAPH INSTRUMENT—To be operated without connecting wires; capable of being carried in the pocket like a watch, and to be in sympathetic relation to another similar instrument possessed by a distant friend or correspondent.

AN ARMOR DRESS—Of little weight, capable of being worn under the ordinary garments, and of sufficient strength to resist musket and pistol balls.—Something better in this line than has yet been invented would sell at this time very readily.

AN ATTACHMENT TO GUNS TO CUT THE ENDS OF CARTRIDGES—At present the soldiers tear the cartridges with their teeth, but the niter and sulphur contained in the powder occasions diseases in the mouth and loss of teeth, besides causing the most acute thirst to the soldier during battle.

SUBMARINE MACHINES—A very important field for ingenuity is the discovery of an efficient method of preventing the entrance of vessels into harbors by submarine machines or explosives.

WATER PIPES—A material for making pipes for conducting water, not metallic, but pliable and capable of being bent in any direction.

A TENT FOR ARMY PURPOSES—Capable of being quickly converted into a substantial boat, for carrying troops across rivers.

A SADDLE AMBULANCE—For mules or horses, capable of ready adjustment so as to remove the wounded from the field of battle.

TRIAL TRIP OF THE STEAMER CONSTITUTION.

At 2:40 P. M., of the 16th ultimo, the steamship *Constitution*, belonging to the Pacific Mail Steamship Company, started for Boston upon a trial trip, with a select company of guests, professional and non-professional. The vessel is the largest built since the days of the *Grand Admiral* and *Adriatic*, and exceeds the former vessel in her proportions. She is intended for the Pacific trade, and has a beautiful hull, combined with great motive power. From these two specialties extraordinary results in speed were expected. The length of the *Constitution* is 364 feet, by 45 feet beam; her tunnage—carpenter's measurement—is 4,400 tuns, with capacity for 3,000 troops and their necessary baggage. Three thousand souls, exclusive of the crew required to manage the vessel, are enough to be called a respectable town in any part of the world, and to feed, transport and care for such a body of men daily requires great forethought and experienced officers. These are as follows:—Captain A. T. Fletcher, three other officers, boatswain and 22 seamen. The ship is brig-rigged, and carries ordinarily 12 life boats—on this occasion she was provided with 6 additional ones. Wind sails and ventilators are distributed liberally throughout the vessel. The comforts and convenience of the passengers have been well provided for by the proprietors. The fittings are of a luxurious character, the furniture of comfortable and elegant design, and the state rooms are commodious and cheerful. If we add to this the comforts in the way of baths and barber shops, and the light afforded at night by the mechanical lamps which light the main saloon, one sees that an able mind has superintended the building of a ship embracing such various details. The machinery of the vessel is of the most massive and powerful description. A steam cylinder, of 105 inches diameter, by 12 feet stroke of piston, furnishes the motive power to the ship through wheels 40 feet diameter by 10 feet face. There are in addition 6 auxiliary engines for various other purposes, such as pumping up water to the boilers, blowing the fires, &c. The boilers are 4 in number, and of the return-flue pattern. They contain 5 furnaces, and 3,500 feet of fire surface each. They consumed upon this trip 47 tuns and 980 pounds of coal per day, with an average steam pressure of 15 pounds per square inch, and 11 revolutions of wheels per minute, with throttle valve half open. Average vacuum, 28 inches. The speed of the vessel with wind part of the time ahead and the rest abeam, was 12 knots per hour —knots meaning nautical miles. The chief engineer is Mr. Wm. Vanderbilt, an officer of great experience; his assistants are Messrs. Sparks, Reed and Reynolds, in the order of their rank, with 36 firemen, coal heavers, &c. The main engine is of the beam variety, and furnished with an enormous Sewall surface condenser, containing upward of 5,500 brass tubes, three-fourths of an inch in diameter. The public are familiar with the capacities of this apparatus, but it is not amiss to state that this particular one is able to distill 30,000 gallons of fresh water per day from sea water, or to pump out the vessel's weight in three hours, from her hold, using, of course, her two pumps—air and circulating—to accomplish that end. In the language of Captain Fletcher, "a hole in the vessel as big as a rice tierce would be of little inconvenience." Although the engine was entirely new, and just as it came from the Novelty Works, it was never stopped or slowed from the time of leaving New York until it reached Boston Light and the vessel anchored, which fact alone is creditable. Nothing could exceed the smoothness and regularity of its performance. Steam is worked expansively upon the *Constitution*, and an ingenious and simple apparatus, devised by the Novelty Iron Works, permits the valves to drop at any required point of the stroke. It consists merely of the ordinary rock shafts and their several toes for working the valves. The steam toes, however, have a slot in their ends which permits a sickle-shaped apparatus (also working on the rock shaft, but not fixed thereto,) to run through them. From the ends of these toes project steel catches, which pick up the steam valves—the catches being disengaged from the valves by the sickles aforesaid, they having one side peculiarly shaped, and which cannot be described, for that purpose. These sickle arms can be placed at all points where it is desirable to cut off the steam. The whole apparatus worked successfully, and without causing any anxiety to the engineers. Those who are prejudiced against a surface condenser, and opposed to improvements, should have seen the Sewall condenser perform its functions; never ceasing in its duty, it condensed the whole steam admitted to it, and maintained a most extraordinary vacuum, without leak or loss. It is difficult to conceive of any opposition to a machine which can be used either as an old-fashioned jet or as a surface condenser, doing twice the duty of the former. Mr. George C. Shelley is at the head of the culinary department of this ship, and has contrived an ingenious apparatus, which cooks the rations and makes the coffee, for the 3,000 troops for which the vessel is provided, in the same space of time that this is usually done for ten men. Incredible as this statement may appear, it is true, as any one can satisfy himself by examining the fixtures. We are indebted to this gentleman for many personal attentions. Dr. Normandy's condenser, for making aerated fresh water, is in use, and was highly successful in its operation, making the drinking water for the vessel.

Through all the brisk gale which prevailed during the entire passage, not a drop of water came upon deck, nor was the motion of the vessel extraordinary under the circumstances. The powerful engine performed its revolutions with as much regularity as on the smoothest sea. At every rise and fall of the cumbrous piston the requisite lead met it and imparted successive strokes, which urged the steamer on with strong and sturdy impulses. The sound of the exhausting steam, the monstrous beat and thump of the rubber valves, and the singing of the boilers seemed like the sigh of some pent-up monster. Long ago in the Arabian Tales some eastern writer depicted the fable of the genius imprisoned in the sealed box, who gave whatsoever was required. To-day the fiction becomes fact, and the genius is safely confined in the lever which moves the world. The whole running time of