Frost and Thaw.

With the single exception of water, all substances in nature expand or become larger when heated, and contract and become smaller when cooled. A church-steeple is higher in summer than in winter. Metals show this action plainer than other bodies; and, as a consequence, Southwark Bridge, (London,) being constructed entirely of iron, is shorter in cold weather than in warm. If the sun shines but for a few minutes on the great iron tubular bridge, near Bangor, its length is visibly increased. A cannon ball which would pass through a certain ring while cold, would not do so after being placed in boiling water. The tires of wheels, previously to their being fixed, are made hot, in order that, by their contraction when cold, they may bind the work the firmer. The least alteration in the temperature of any material produces a corresponding alteration in the size of it, but no modification in its *weight*. By one of those wise provisions of nature with which the universe may be illustrated, water, as we have just observed, is an exception to this rule of contraction and expansion. From a certain fixed temperature (4·44° C.) it expands either by cooling or heating. The force with which it expands is enormous. It has been calculated that a globe of water, one inch in diameter, expands in freezing with a force superior to the resistance of thirteen and one-half tuns weight. Major Williams attempted to prevent this expansion; but during the operation, an iron plug which stopped the orifice of the bombshell containing the freezing water, and which was more than two pounds in weight, was projected several hundred feet with great velocity.

A simple experiment to illustrate this fact may easily be tried on any frosty day, by filling a common ginger-beer bottle with water, corking it tightly, and afterwards tying it down. If it now be placed in a situation where the water will freeze, the bottle will be sure to be broken. It is from this cause that pipes which supply town houses with water frequently burst, showing the whereabout by leakage directly a thaw begins. This peculiar property of water is taken advantage of in splitting slate. At Colley Western, the slate is dug from the quarries in large blocks; these are placed in an opposite direction to that which they had in the quarry, and the rain is allowed to fall upon them; it soon penetrates their fissures, and the first sharp frost freezes the water, which, expanding with its usual force, splits the slate into thin layers.

With a knowledge of these facts, we can easily understand how it is that a succession of frosts and thaws so completely pulverizes and breaks up the surface soil of the farmer's field. A sharp frost, followed by a rapid thaw, plows a field in a few hours better than hands could do it in ages. In an agricultural point of view, then, the great utility of this crumbling of the soil is obvious; by this means a much larger surface of the earth is exposed to the action of the air than it otherwise would be; and it enables the plants growing upon it to extract those saline materials without which their existence would soon terminate.

Much of the cultivated land was originally produced by the action of frost and thaw upon the rocks which are now below the verdant fields. The lapse of time which it takes to break up a certain portion of rock in this way must of course vary according to the original structure of the stone. Some stone buildings have crumbled to dust within the history of the English nation; while others, erected three thousand years ago, appear the same as ever—such are the Pyramids of Egypt.

The preservation in form and shape in stone that is exposed to the atmosphere, depends entirely on climate, and whether its grain be close or open. If the climate be not subject to variations of extreme heat and cold, the stone will be very lasting if of either nature; but if, on the contrary, the climate exposes the stone to frost and thaw, and the stone is porous, so as to draw in water or rain in contact with it, the destruction of the surface is inevitable; and thus "the palaces of the proud pass away."

Philosophers consider cold, not as an abstract principle, but as an effect produced by the mere absence of heat. Few persons have any idea of the effects produced upon the ordinary substances with which we are surrounded on their being exposed to an extreme degree of cold; many gases which are only known to exist in an aeriform state in our climate, become first liquids, and then solid substances; reminding one of the various states in which water is familiar to us, namely, as a vapor, as a liquid, and as a solid. Mercury or quicksilver is always fluid in our country; but in the Arctic regions, it is frequently solidified, and in this state it can be beaten and rolled out into sheets, like tin or silver. It is certain that were it not for the counter-influence and genial warmth produced by the sun's rays, the whole of our world would become a vast sterile waste, for cold would predominate, and solidify everything therein.

We cannot conclude this cold subject without repeating an anecdote told by Bishop Watson, who relates that "at the whimsical marriage of Prince Gallitzin, in 1739, the Russians applied ice to the same purposes as stone. A house, consisting of two rooms, was built with large blocks of ice; the furniture of the apartments, even the nuptial bed, was made with ice, covered with *sheets* of the same material; and the icy cannon, which were fired in honor of the day, performed their office more than once without bursting." This is also noticed by Cowper:—

> "Thou didst hew the floods,
> And make thy marble of the glassy wave."

SEPTIMUS PIESSE.

Scientific Burglary.

During the last few months, several of the ordinary iron safes have been burglariously opened in London and Manchester, by means of a powerful instrument employed by the thieves in cutting large holes through the iron doors, whereby they have gained access to the works of the lock. The construction and operation of the instrument were unknown until a few weeks since, when, happily, one of them, with all its loose appliances, was secured by the police. It would be obviously wrong to publish a description of the apparatus; but, having inspected it minutely, and seen it in operation, we are enabled to state that great ingenuity and mechanical skill have been bestowed upon its contrivance. Of course the discovery has rendered a counter improvement in the safe itself absolutely essential to security; and it is with much pleasure that we are in a position to announce the introduction of such an improvement. By the courtesy of the Metropolitan Police authorities, Mr. Chubb, the eminent lock and safe manufacturer, of St. Paul's Churchyard, has been allowed to examine and experiment with the instrument, and he has succeeded completely in providing a simple method of baffling its operation. The improvement consists in placing throughout that portion of the door which is in front of the lock, a number of hardened screwed steel plugs, sufficiently close to each to prevent either an ordinary drill or circular hollow cutter from passing through without encountering several of the plugs. These plugs of hardened steel have the effect of utterly destroying the edge of every description of cutter which can be used with the burglar's apparatus, and consequently render the safes secure from its operation. All Chubb's fire-proof safes and "strong-room" doors are now made with the above improvement, and old safes may readily have it applied. It has been protected by Letters Patent.—*London Mechanics' Magazine.*

Grasshoppers.

A Texan correspondent informs us that the grasshoppers have already made their appearance, and unless they leave before the corn gets up, all Texan breadstuffs are ruined.

Antimony.

Antimony is a brilliant metal, having a bluish tint. It melts somewhere about 800° Fah., and does not contract much in cooling. The discoverer of this metal was Basil Valentine, in 1394. Brittleness is one of its peculiar characteristics, and when broken it exhibits a beautifully crystalline appearance, reflecting the light from myriads of facets, like the jewels in some Eastern palace. In a closed vessel it is slowly but distinctly volatile at a white heat, and can be easily distilled in a current of hydrogen gas. If placed on a piece of ignited coal, and exposed to a stream of oxygen, it burns brilliantly, and forms its oxyd, as a dense yellowish-white smoke, having an odor not unlike garlic. The atmosphere does not sensibly affect it at common temperatures, but when exposed in a fused state, it readily combines with oxygen.

When very highly heated and allowed to fall to the ground from a certain hight, it takes fire and gives off smoke—its oxyd.

Antimony is seldom found in a state of purity in commerce, being contaminated with iron, lead, arsenic, and sulphur in greater or less quantities; but all these may be separated by reducing it to a fine powder, and then fusing it in a crucible, with one-tenth its weight of niter. The fineness of the grain of the ingot is regarded as an indication of its purity. It is discovered as the oxyd and sulphide chiefly in Germany and Sweden. There is some in this country, but we never heard of any antimony veins being worked. It is used chiefly as an alloy, the most important of which is type metal. Britannia metal is an alloy of the same class. In the form of tartarate of antimony and potash, it forms the tartar emetic of medicine; and combined with lead, it forms the plates on which music is engraved.

Interesting Peculiarities of Diamonds.

In Mr. Milburn's valuable work on Oriental Commerce, he gives some very interesting observations on the peculiar characteristics of rough diamonds. According to this writer, the color should be perfectly crystalline, resembling a drop of clear spring water, in the middle of which will be perceived a strong light, playing with a great deal of spirit. If the coat be smooth and bright, with a little tincture of green in it, it is not the worse, and seldom proves bad; but if there is a mixture of yellow with green, it is a soft, greasy stone, and will prove bad. If the stone has a rough coat, so that the eye can hardly penetrate it, and the coat be white, and look as if it were rough by art, and clear of flaws or veins, and no blemish exist in the body of the stone—which may be discovered by holding it against the light—the stone will prove good. If a diamond appears of a greenish bright coat, resembling a piece of green glass, inclining to black, it generally proves hard, and seldom bad; such stones have been known to have been of the first water, and seldom worse than the second; but if any tincture of yellow seems to be mixed with it, it may be regarded as a very poor stone. All stones of a milky cast, whether the coat be bright or dull, if ever so little inclining to a bluish cast, are naturally soft, and in danger of being flawed in the cutting; they will prove dead and milky, and turn to no account. All diamonds of cinnamon color are dubious. A good diamond should never contain small spots of a white or grey color, of a nebulous form. It should also split readily in the direction of the cleavage; it sometimes happens, however, that the folia are curved, as is the case in twin crystals. When this happens, the stone is of inferior value.—*Philadelphia North American.*

Niles' Patent Water Meter.

We learn that Messrs. H. N. Hooper & Co., of Boston, Mass., are now manufacturing some of the above instruments for the Water Board of that city, with a view to their experimental employment for the purpose of determining the practicability of measuring the water delivered to each consumer. Last fall the Board made extended experiments with a large number of different meters, but settled upon Niles' patent as the best of any presented. It is said to be very simple in construction, and very accurate in its results. One of its prominent features consists in the employment of a differential piston which operates the valves.

We have long been of the opinion that the only way to put an end to the present wanton waste of water in our large cities is to charge each consumer a certain tariff for each gallon used. This cannot be done except by the introduction of some instrument like a gas meter, which shall indicate the exact quantity of water drawn off.

Separating and Smut Machine.

This invention combines in the simplest possible manner in one machine, the four well-known functions necessary to effectually clean wheat of all foreign substances, and render it fit for grinding; these are, first, a capability of separating all the lighter and foreign substances by blast; second, separating by screening or sieving those foreign substances whose specific gravity will not allow of their passing off by the action of a proper blast; third, of depriving the grain of all smut which may not have been blown off or separated before arriving at the scouring cylinder, and also scouring and polishing the grain; and fourth, depriving the wheat by a light suction, as fast as it passes from the scouring cylinder, of dust, &c., without lifting and interfering with its discharge. It is the invention of D. M. Donehoo, of Hookstown, Pa., and was patented this week.

Blasting Stumps.

The *Ohio Cultivator* relates the experience of W. A. Gill, of Columbus, Ohio, in clearing a field of stumps by gunpowder, which really appears to be a most powerful "stump extractor." He cleared a stumpy field of twenty acres cheaply and expeditiously, the following plan being pursued for each stump:—

"Select a solid place in a large root, near the ground, and with an inch and a quarter auger, bore in, slanting downward, to as near the heart of the base of the tap-root as you can judge; then put in a charge of one or two ounces of powder, with a safety fuse, and tamp in dry clay or ordinary tamping material, to fill the hole, some six inches above the charge; then touch fire to the fuse, and get out of the way. The blast will usually split the stump into three pieces, and make it hop right out of the ground. If the charge is put in too high up, the blast will only split the top of the stump, without lifting it."

How Corn is Preserved in Russia.

At a late meeting of the Academy of Sciences, held in Paris, a letter from M. de Semchoff—a Russian landholder—was read, describing the manner in which corn pits are made in that country. The pit is dug in a dry soil, and instead of masonry, the sides are hardened by long continued exposure to a wood fire. Before the corn is introduced, the air in the pit is rarified by burning some straw in it, after which the grain is thrown in, packed close, and the pit tightly enclosed. Corn has been preserved in such pits for forty years. Some of our western farmers, who raise large crops of wheat and corn, should try this method of preserving grain during years when there is a great yield, in order to lay up a store for seasons of an inferior yield.

Lowering Boats.

H. de Veuve, of Galveston, Texas, has invented an improved apparatus for lowering and detaching life and other boats. There are three chains attached to the sides and bottom of a boat, and terminating in a piece of iron having a head worked on to it. This head is grasped by a pair of callipers suspended by suitable tackle from the ship. When the weight of the boat is on the callipers, it holds them together, but the moment it touches the water and is fairly afloat, the callipers release themselves, and leave the boat quite free. A patent was obtained this week.