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Our Lake Superior Copper Mines.

The substance of our planet seems at some points to be composed of layers or strata more or less regularly disposed one upon the other, while at other points the whole seems to possess an uniform character termed granite. Explorations below the surface indicate that at a certain depth, varying from a few feet to several miles, a foundation of similar material will be found, beneath which no layers or other interesting characteristics exist, so that granite more or less coarsely crystalized, and very probably (judging from the increase of heat as we descend) in a melted condition, forms the great mass of the globe. It is a fact worthy of note that all the metals whether base or precious are found among the layers or strata referred to, little or none being ever obtained in the original granite, although there are points where the granite is so far softened and decomposed by various agencies that it might be operated in with some degree of facility. Iron appears to have been, like the earthy substance of the layers among which it is found, deposited by water, but most metals generally appear to be lodged by some other agencies. In Europe, according to Overman, the great repository of metallic matters is the lowest strata, the Gneiss or Mica slate, very little ore being discovered in the layers above. In our country, however, this order of things does not prevail. Here, copper, for example, is usually found in vertical veins in the transition series, or in other secondary deposits, while in the gneiss very little can be detected. In much of the Lake Superior region, the metal lies in trap, or sandstone rock, or near their junction, in the form of injected veins. It is, according to Muspratt, a question whether copper has generally been forced up from below by some extraordinary convulsions analogous to volcanic action, or whether the metal has been deposited by more or less gradual filtrations of some fluid containing it. It is possible that copper has been introduced among the strata by both these methods.

The naturally pure copper produced from the mines of the Lake Superior region commands a price usually from one-half cent to one cent per pound higher than copper which has been reduced from an ore. A May number of the Lake Superior *News* details some of the mining operations in that vicinity, which differ from those on smaller masses found in other copper regions. It appears that the cutting up of one lump met with last year in the "Minnesota" mine is, as yet, very far from completion. Eight masses were taken off in April weighing altogether 50,601 pounds, and in performing these, and the previous operations on this mass, thirteen barrels of copper chips, weighing altogether 7310 pounds were also taken off. The total amount taken from this single lump up to May was over seventy tuns, and it was judged it would require one whole year more to cut the mass entirely up. The copper cutters had not at that date taken any piece from the second tier, but had only removed in places the edge of the mass. Several cuts had been made 4 1-2 to 5 feet deep, and its thickness was still increasing towards the center.

The means employed for separating such masses into parts small enough to be managed are quite primitive and simple. A channel is driven along the line chosen for separation by means of what is usually termed in the machine-shop a cape-chisel. It is simply a cold chisel of great thickness, but only about five-eighths of an inch wide on the cutting edge. This chisel is held in line by one man, while two others strike it with heavy hammers, usually swung overhand. The tool cuts out a chip or shaving of copper something less than one-eighth of an inch in thickness, and the operation is repeated until the channel is cut entirely through the mass The width of the channel thus cut is about thirteen-sixteenths of an inch, which is also, of course, the width of the chip taken out. It requires much skill to hold the tool so steadily as to avoid throwing it out of the copper, and at the same time to keep the line of the channel entirely straight. The copper is beaten up by the chisel so as to make the chip much shorter than the cut from which it came. It is usually two-thirds of the length of the place from which it was taken.

The product of the Minnesota mine for April was 370,550 pounds, or 185 tuns and 550 pounds. This is the largest amount of copper ever taken from a mine on Lake Superior in a single month, and probably the largest ever taken from one mine in the world during a similar period. Consolidated European companies have in but a very few instances taken out as much from several mines under their charge in as short a time.

The copper of Lake Superior lies generally quite near if not on the surface. The great copper mines of Cornwall, in England, where the average yield of the ores is only from 6 to 7 per cent, are from one to two thousand feet deep, and require a pumping power for drainage equal to lifting from 1000 to 2000 gallons of water from that depth every minute. But on Lake Superior the official reports of the "Copper Falls Company" refer to depths of 15 feet, and the "East Merryweather Company" to 12 feet, as being among those at which they are working.

It appears from the books of the Copper Falls Mining Company that the whole of the workings on the vein (including the unproductive as well as the productive in the calculation) yielded upwards of 279 pounds of copper per superficial fathom of 36 feet. Considerable silver is also found in the vein, from which fine specimens are often extracted. The cutting up of large copper masses has now become a quite important business, and any invention which will perform this labor successfully by steam power would be rapidly adopted. Several expedients for the purpose have been tried and rejected as impracticable, or as inferior from some cause to the expensive and laborious hand labor.

Artificial Propagation of Fish.

This subject is attracting considerable attention in our country at present. In 1856, the Legislature of Massachusetts adopted a resolution, under which commissioners were appointed to examine into it and report such facts as they could obtain, to the next General Court. Three commissioners were selected —R. A. Chapman, Henry Wheatland, and N. E. Atwood—their report has been published, and is now before us. Mr. Atwood, who is a practical fisherman, and also a learned ichthyologist, was intrusted with the charge of making experiments and observations and confined his attention to trout. His experiments were conducted at Sandwich, but they turned out failures. He obtained 15,000 eggs, and they all rotted; this he attributed to the character of the water in which the experiments were conducted. November is the spawning season of trout and salmon, during which period, they are very poor, and should not be allowed to be caught or sold.

Although the experiments with the eggs of trout failed with Mr. Atwood, the commissioners believe that such fish may be profitably cultivated. They state it as their belief that there are many farms in the hilly regions of Massachusetts, containing trout streams, that, with little pains, might be made to yield a greater income than the land itself. Much might be done to increase their value without resorting to artificial breeding. The preparation of suitable ponds or pools of deep water and gravelly beds, suitable for spawning, with guards to prevent the destruction of fish by freshets, would greatly increase the stock. "But the process of artificial propagation," says the report, "is so simple and easy, that when trout become an object of care, we cannot doubt they will be multiplied and protected by this method. Many millions of fine trout may thus be produced annually, and what is now regarded as a mere temptation to waste time, may be made, not only to minister to luxury and health, but become an important branch of productive industry. In addition to this, fish ponds with borders of trees and shrubery, add to the beauty of a landscape, and increase the value of a farm."

It is stated that in England, salmon have been propagated with success, and that of 300,000 of their spawn 275,000 were hatched artificially.

It is our opinion that this subject deserves great attention, because in many of our creeks and rivers that once teemed with the finest salmon, not one is now caught. When the first settlers came to our shores, they found salmon in every running brook having easy access to the sea; now such fish are alone obtained from the "Northern Provinces."

But there is one feature connected with fish culture, which we wish to impress indelibly upon the minds of those who wish to re-stock our streams with an abundance of good fish; that is, they must keep the streams clean and pure, if they expect to succeed.

It is true that salmon and other fish have been banished from rivers and creeks in which they once abounded; but this was not owing to the great depredations of fishermen, as has generally been supposed.

The erection of saw mills on creeks and rivers destroyed the spawn of both salmon and trout, and it has been found that the former fish have been banished from all rivers on which chemical works have been established. They love clear running streams of water, and flee from saw-dust and the drainage of chemical works in rivers, as people do from a pestilence—they are sensible fish.

To Dissect the Atmosphere.

The atmosphere in which we live, that supports all animal life in respiration, and all the furnaces, fires, and decaying organic matter on the globe in combustion—fast and slow—is stated to be principally composed of two gases. How do we know this? By performing the following experiment:—Take a glass vessel containing a certain amount of water, in which is placed a cork to float a piece of phosphorus on its surface; ignite the phosphorus, then place a glass globe over it, (and into the other vessel, which must be wider than the globe.) White vapors will soon arise from the burning phosphorus, which at first burns brightly, but soon grows fainter and fainter, then goes out entirely. If when the phosphorus commenced to burn, the glass globe contained five pints of air, it will be found that it only contains four pints after it is extinguished. If a lighted candle be now placed in the four remaining pints of air in the globe it will not burn, but it would have done so freely before the phosphorus was consumed in the five pints of air. This shows that the properties of the air in the globe have become entirely changed by the act of combustion with the phosphorus, and that the gas which supported combustion—to employ a common term—has been all "used up." The gas which supports combustion is oxygen and the experiment described, by which one part of oxygen has been removed out of five volumes of air proves that the proportion of oxygen in the atmosphere is only as one to four of another gas, which cannot and does not support combustion.

The remaining four volumes or pints of air left in the globe is nitrogen, which amounts to eighty in every hundred parts of the atmosphere. (There is also a little carbonic acid gas in the air—one part to every two thousand.) The relative proportions of oxygen and nitrogen described in the atmosphere, taken from any part of the globe have been found to be constant; they are permanently elastic gases, and simple bodies. In the atmosphere they are mechanically, not chemically combined.

By burning phosphorus in the manner described we obtain nitrogen gas, which when washed, by agitating it with water in a glass vessel, may be employed for an elastic gas cushion or spring, in a vessel containing mercury, or any metal where atmospheric air cannot be employed, because of the oxygen it contains having such an affinity for the metals as to rust them and destroy their properties. Nitrogen is transparent, has no taste or smell, is a perfect non-supporter of combustion, and exhibits no tendency to combine with other substances. Although four volumes of nitrogen is inhaled into the lungs for every one of oxygen during the act of respiration, it produces no effect upon the human system.

At one period it was taught and believed by chemists that oxygen was the sole cause of combustion—that when it was not present combustion could not take place. This is true so far as it relates to combustion in the atmosphere; but some bodies will burn without oxygen being present. Thus iron and sulphur, when heated, will combine with much light and heat; and phosphorus, when introduced into chlorine gas, will take fire and burn, combining with the gas. The true definition of combustion is, "chemical combination attended with light and heat."

Although nitrogen is termed the *most inert* of gases, because it cannot be made to unite directly with any element, and only forms combinations when one or both elements are in the nascent state, yet it plays a most important part in the animal, vegetable and mineral kingdoms. It might be readily supposed that as oxygen is *vital air*, and as it alone performs a part in the act of breathing —the nitrogen being inert—that the greater the quantity of this gas mixed with nitrogen the more healthy it would be for respiration; it is not so, however. It is remarkable that the most powerful of acids, aquafortis, is composed of five parts of oxygen (vital air) and only one of nitrogen.

Volatile Gold—Deficit at a Mint.

It is reported that there have been great defalcations of gold in the Branch Mint at San Francisco. No less than 5000 ounces of gold, amounting in value to $85,000, are missing. This great loss of gold is attributed to its volatization and escape out of the chimney in the smelting process. One account says that Col. Harasythy, the assayer, caused a zig zag chimney to be erected, and in the course of two and a half months, 1180 ounces were collected in it. Another account states that the sweepings of gold from the flat roof of a house adjoining the Mint, amounted to 300 ounces per annum. The great draft in the chimney, it is alleged, carried up the gold, and in this manner, the deficit is attempted to be accounted for. Of course, if the gold has been found on the roof of the Mint and on that of an adjacent building, it can be proven by witnesses; but it appears rather singular to us, if this is true, that like deficits have not occurred at the Assay Office in this city, and at the Mint in Philadelphia. The general opinion respecting gold is, that it cannot be rendered volatile in the common furnaces of gold refineries, to be carried up the chimney in the manner attributed to the Mint at San Francisco; and even if it were liable to be thus volatilized, the assayer should have known better than to have allowed it to be thus lost, as means could have been provided to prevent it.

The Patent Office Records and Patent Claims

If our Patent Office was nothing more than a simple Hall of Records, containing specifications and descriptions of inventions—accounts of what had been accomplished by previous inventors—its beneficial character would be incalculable in preventing subsequent inventors repeating experiments, at great expense to themselves, and re-inventing old discoveries. We have not the least doubt that publications of the "Patent Claims" in our columns every week, save millions of dollars to our country, because they give information respecting what certain inventors have done; and thus they prevent other inventors from studying, laboring, and experimenting to accomplish certain results that have been previously obtained. It is notorious that numerous inventions, for which patents have been granted, are re-invented over and over again by persons who have not made themselves acquainted with what had been done before them, and these inventions cost money, time, and labor; but for one such case, there would be twenty, were it not for patent records.

Separating Bran from Starch.

A correspondent states, that in the manufacture of starch the finer particles of bran penetrate through the finest sieves, and that an improvement which would remedy this evil would be valuable.

A tunnel is about to be commenced through Mount Cenis, in Sardinia, which will not be less than six and a half miles in length.