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## HYDRAULIC GOLD-MINING.

MOUNTAIN streams have worn deep furrows in the granite rocks, and rivers have cut broad channels through hill and dale; but until recently, the power of water had never thus been used by man in engineering. One of the greatest developments of our times, in what is called "placer-mining," is the employment of the force of water for excavating. This enterprise had its origin, and has reached its highest attainment, in California, where hills have been leveled with the plains, in search of the golden nuggets. In that great State the first mining operations were conducted in the old way, by digging with mattock and spade, and carrying the earth or auriferous deposits in barrows to streams of water to be washed, so as to remove the clay and loam and secure the golden sands. This system was totally inapplicable to what are called the "dry diggings"—those auriferous deposits far removed from supplies of water, especially in the dry season. Our miners soon saw the defects of the old system and invented a new method, not only for economizing their labor, but also of carrying on mining operations, by obtaining a plentiful supply of water, in situations far removed from natural running streams. This plan consisted in bringing the water from a distance by artificial narrow canals or "flumes," and conducting it from a high elevation so as to use its great pressure for washing and excavating. The whole art of placer-mining in California has been revolutionized by this hydraulic process. Many square miles, in different parts of the country, have thus been made to yield up their gold, which otherwise would have remained forever untouched. It is this system which still enables the miners to pour in a large and steady stream of gold to our mint; otherwise we would now be receiving only driblets.

In Tuolumne county, Cal., there is a canal which is about 64 miles long, and capable of supplying 700 sluice streams for separate parties washing gold. It is carried over deep gulleys, it winds among rocky terraces, and it cost no less than $1,400,000. In an interesting article on the subject, by Mr. Wm. P. Blake, in the last number of the *Mining Magazine*, it is stated that there were 5,726 miles of such water courses in operation in California last year, and that the total cost of them amounted to about $13,575,000. It is also stated that most of these canals were constructed with borrowed capital; but that they have yielded large profits to those who had invested. On the other hand, some of the California papers state that many of these canals have proved a dead loss to those who furnished the funds to build them. Be this as it may, one thing is certain, that they have enriched the country in general by economizing labor and providing means of gold-washing in places where otherwise this was impossible.

For the purpose of operating in a sluice, the water is conducted from an elevated reservoir of from 60 to 100 feet in hight, and it is then ejected under the tremendous pressure (as from a fire-engine) of about 40 lbs. on each circular inch, through strong hempen hose, against the face of a bank which is rapidly undermined, and the loose earth is then washed away leaving the heavy particles of gold behind. By this mode a hundred tuns of earth and gravel can be removed, and all the gold it contains liberated and secured much quicker and with less labor than ten tuns of earth by the old method. Acre after acre of hills are now swept into the hollows without the aid of a single pick or shovel. Water, conducted from a hight of 100 feet, rushes out from a nozzle at the velocity of 80 feet per second, and at a pressure of 40 lbs. on each circular inch. Such a power is certainly a genuine "water ram," when directed against the face of a gold-hill for excavating it.

Gold-mining is only profitable when it yields higher wages than can be earned at other pursuits. By wheeling earth to great distances, to be washed for its gold, the "dry diggings" could not be worked with profit; but now, by this hydraulic system, no bounds can be set to the extent and continuance of gold-mining. A few years ago it was stated that placer-mining was "about run out," and that the returns from California would soon cease altogether. If the old system had continued, this would have been the case before the present day; but now we may reasonably expect large golden supplies for quite a number of years to come. This new engineering offspring of American genius has been extended to distant Australia, and has also been applied recently in North Carolina and in Georgia at the placers along the Chestatee river. In this manner the genius and enterprise of our people have met and subdued great natural difficulties; and the streams of the mountains have been made their willing servants, both to dig and wash, for the purpose of contributing supplies to our currency and furnishing the media of exchange between all nations.

## REPUBLICANISM AND THE FINE ARTS.

No reader of history can fail to perceive the constant relation of democratic institutions and the growth of all forms of ideal art. Among the commonwealths of ancient Greece, the most democratic of all was Athens, and it was in Athens that sculpture and architecture were carried to the highest degree of perfection. With the overthrow of freedom in Greece by the invincible power of Alexander, her arts perished; and under the dominion of a barbarian soldiery no similar growth of intellectual power took place on the earth for more than 1,500 years. At length, on the breaking up of the Roman empire, the republics of northern and central Italy made their appearance; and their story is the story of Greece re-told. We see again the same growth of manufactures, commerce, science, literature and art. Among these republics, Florence was the most democratic of all, and the Florentine school of painters is universally recognized as pre-eminent above all other painters of the world. Says Webster: "I know of no way of judging of the future, but by the past." And, judging by the past, we may predict with perfect confidence a great and rapid progress in the cultivation of the fine arts in this country. We have already far outstripped the republics of Greece and Italy in agriculture, manufactures and commerce, in all industrial arts which are of first necessity, and we are just beginning to be in a position in which our accumulated wealth enables us to support those which adorn and refine social life. We are following in the footsteps of our kindred across the Atlantic. England, though in name a monarchy, has really more democratic institutions and more equal laws than either Athens or Florence had, and her land is swarming with painters, and the whole country is being rapidly adorned with the statues of her eminent men. In painting and in lithograph and line engraving, we are probably behind older nations, though we are after them in seven-league boots; and in one kind of engraving, that upon wood, we believe our artists will bear a comparison with those of England, France or Germany. But it is in sculpture that American artists have achieved the greatest triumphs. We have heard a gentleman of exquisite and cultivated taste, who had spent years in the galleries of Europe, and who is an enthusiastic admirer of statuary, express the opinion that Powers' Greek Slave is the finest statue in the world. And in our opinion, no more faultless conception of female beauty was ever chiseled from marble than Palmer's White Captive, now on exhibition in this city.

From the lights of past history and the general principles of human nature, we have been long anticipating a great growth of the cultivation of the fine arts in this country, and several facts seem to indicate that it is just now bursting forth with a rapidity and to an extent characteristic of the age and especially of the land in which we live. We observe in the daily papers no less than eight exhibitions of paintings and statuary advertised in this city, at this time. We are informed that Church's "Heart of the Andes" has just been bought by a New York gentleman, for $10,000. This fact is particularly gratifying, for our artists are too much in the habit of dashing off unsightly daubs instead of bestowing that study and labor, both in preparation and execution, which is absolutely necessary to excel, and then, when their abortions fail of demand in the market, of raising whining complaints that art is not patronized. If any American artist who has the peculiar gift of genius, which is the first requisite in a painter, will put forth the exertion necessary to produce anything of value, and will finish his pictures with the elaborate care characteristic of Church, we believe he will obtain a price that will reward him liberally for his time. And we trust that many of our wealthy men will imitate the example of Corcoran, Fish, Belmont and many others who liberally patronize American art, and thus stimulate our artists to higher successes with the pencil, brush and chisel.

## METEORS.

Meteors are masses of metal, mostly iron, varying in size from half a mile in diameter to a small pebble, which are seen rushing along in the vicinity of the earth at an immense velocity, and which on entering the atmosphere become intensely hot, sometimes throwing off scales of hot metal, and occasionally bursting with a report the loudest ever heard by man. Some fifty years ago, one burst in the neighborhood of New Haven, and some of the pieces were dug out from the ground into which they penetrated deeply from their great velocity, and were obtained before they were cold. Professor Silliman visited the place as soon as he could, and procured quite a number of the pieces. All meteoric stones yet found have essentially the same appearance and composition. They are covered with a black crust or enamel on the outside, as if they had been exposed to an external heat which had fused the surface, while the interior is a grey metallic mass. They are composed of about 57 per cent iron, 26 nickle, 14 phosphorus, with small quantities of cobalt, copper, silica, alumina, zinc, and chlorine. Though the fall of stones from the skies has been loosely observed and recorded through the whole course of history, it is only within a century that this most startling phenomenon has been subjected to the careful observation characteristic of modern science; and even now there is great room for improvement in the mode of observing these heavenly visitors. On Tuesday, April 26, 1802, at about one o'clock in the afternoon, a meteor burst in the neighborhood of Alencon in France; and a perfect shower of stones fell to the ground, the largest weighing 17½ pounds and the smallest a few grains. The space ever which they fell was seven or eight miles in length by two or three in breadth, and the number of stones was not less than 2,000. In 1804, on the 5th of April, another of these phenomena was noticed near Glasgow in Scotland. The report sounded like three or four cannon fired in succession; then followed a whizzing noise, and then a sound as of a heavy body striking the earth. One of the fragments fell into a ditch very near the place where some men were at work, and the overseer immediately dug it out. On the 13th of March, 1807, the inhabitants of Juchnow, in Russia, were alarmed by an uncommon loud clap of thunder, and two peasants saw a stone fall to ground, which it penetrated to a considerable depth beneath the snow. On digging it out it was found to weigh 10 pounds. The fall near New Haven already mentioned, occurred in 1807, at six o'clock in the morning on the 14th of December. In all parts of the earth stones have been found of the very peculiar composition characteristic of meteors, and with several of them is connected a tradition that they fell from heaven. The noise produced by the explosion is the loudest of any with which we are acquainted. The sound produced by the explosion of the meteor of 1719, at an elevation of at least 69 miles, was heard as the report of a very great cannon or broadside, shook the windows and doors of houses, and threw a looking-glass out of its frame, which was broken. The report of a meteor in 1756 threw down

several chimneys at Aix in France, and was taken for an earthquake.

There are several theories in regard to meteors, but the most plausible one is that they are small planets revolving around the sun in very elliptical orbits, and that occasionally they come so near the earth as to be drawn within the limits of the atmosphere, when they are heated by the joint action of the condensation of the atmosphere and the checking of their velocity; that this heating causes them to throw off scales from the surface which fall to the ground, while the principal body keeps on in its swift flight. Sometimes the heat becomes so great through the whole mass as to cause it to fly to pieces; one writer supposes, even into fine dust. We hope, by the time of our next issue, to collect sufficient facts in regard to the meteor which recently passed over this city, to enable us to give a pretty full account of it. It was one of the most remarkable which has ever been seen.

## GLASS-DRILLING.

MESSRS. EDITORS:—In your last issue I noticed an article entitled "To Bore a Hole through Glass;" and as a variety of opinions are supposed to be better than a single one (if based upon experience), I venture the liberty to express mine. A short time since, I had occasion to bore some holes through a piece of French crown glass, one-quarter of an inch in thickness. The glazier who cut it for me assured me that *nothing* but a round bar of lead used with emery and water would bore the desired holes. And (by the way) I think lead is preferable to iron, as emery adheres to it much better. But not fancying his slow but sure process, I determined to perform the work more expeditiously. Accordingly I procured a small Stubbs' file, and grinding the point to what I thought the proper shape, bored four holes, one-quarter of an inch in diameter, in the short space of half an hour. By trying the same thing since, I am confident that a triangular file of Stubbs' manufacture will never fail, if used with water or turpentine, either of which I consider equally good. H. W.

Jackson, Mich., Nov. 21, 1859.

## RABBITS AND TREES.

A simple and perfectly efficacious recipe for preventing rabbits and hares from barking trees, is to take as much thoroughly skimmed milk as required, and mix it up with soot, till about as thick as paint. With this, paint over the tree with a whitewash brush. It is done very quickly, at little expense and trouble. It lasts well one season.—*Agricultural Gazette.*

[As the season is at hand when trees should be treated to protect them from being girdled by rabbits and mice in winter, the above may be very useful to farmers who live in districts where they can obtain coal soot, but lampblack will answer the same purpose, to those who cannot get the former. We have been assured by those who have tried the experiment, that coal tar is excellent to prevent such animals injuring fruit and other trees. It can be applied warm, with a brush, and now is the time to put it on, before the snow falls. It should be applied close to the root and upwards, to the hight of two feet, at least.—EDS.

DEFECTIVE IRON STEAMERS.—The *Royal Charter*, which was recently wrecked on the coast of England, as noticed by us last week, was an iron vessel, and seems to have been constructed of very poor metal and in the most defective manner. She parted amidships so suddenly and broke to pieces so completely and rapidly after she struck, that we are confident no American wooden ship would have done so under the same circumstances. Every ship should be constructed like a bridge—capable of sustaining all the strain placed upon it, even if it were suspended by the extremities. The iron screw steamer *Indian*, belonging to the Liverpool and Canadian Steamship Company, was wrecked on the 21st ult. on the coast of Nova Scotia. She was driven on shore in a gale and broke across in the middle like the *Royal Charter*.

ALUMINA AND MERCURY.—The properties of an amalgam of aluminum are very remarkable. Under the influence of mercury it ceases to be a precious metal, and acquires the properties of an alkaline earthy metal. When exposed to the air the amalgam instantly loses its lustre, becomes heated and oxydizes rapidly, and is converted into alumina and metallic mercury. Water decomposes it with evolution of hydrogen, formation of alumina and deposition of mercury. Nitric acid attacks it with violence.—*Comptes Rendus.*

## ADULTERATED OIL OF PEPPERMINT.

The following useful information has been communicated by Dr. C. Bullock to the *American Journal of Pharmacy*, regarding adulterated oil of peppermint:—

"An article of oil of peppermint has been sold in the Philadelphia market within the past fortnight. It is of a light yellow color, but considerably darker than is usual with freshly distilled oil of mint, and presents the following characterisicts: When evaporated from a piece of white unsized paper it leaves a yellow mark. Dropped into alcohol of 95 per cent, it does not disseminate itself, but falls to the bottom of the glass in broken globules, and collects in a distinct stratum.

"Agitation produces dissolution, but the solution is turbid, with an amount of oil which should dissolve freely. It presents no re-action with chromic acid, but when dropped on a crystal of iodine, the iodine intumesces and fumes. No such reaction is produced by a pure oil of peppermint. The density of the oil is 0.870. A recent sample of Borton's oil gave a density of 0.90. These characteristics would point to turpentine as the probable adulteration. It has been suggested by a practiced distiller of oil of peppermint that the adulteration was the essential oil of fireweed. This supposition was based on the peculiar strong smell left after most of the oil was volatilized from paper.

"Recent oil of peppermint should volatilize completely from the paper without leaving a mark; when dropped into alcohol of 85 per cent, it should dissolve completely without agitation."

## WEEKLY SUMMARY OF INVENTIONS.

The following inventions are among the most useful improvements patented this week. For the claims to these inventions the reader is referred to the official list on another page:—

### IMPROVEMENT IN FLOATING BATTERIES.

This invention consists in the construction of a floating battery of circular form, with a central upright shaft, by which it is capable of being anchored in a tide-way, and around which it can be made to revolve while at anchor, to bring all its circular series of guns, in succession, to bear on any object. It also consists in a certain arrangement of screw-propellers in the circular battery, whereby provision is made for giving it a rotary motion about its central shaft when at anchor, or for propelling and steering it from place to place. Epenetus A. Willis, of Cold Spring, L. I., is the inventor.

### IMPROVED EVAPORATING APPARATUS.

This invention consists in the employment of superheated steam as the heating agent for the evaporation of brine, cane-juice, sirups or other liquids, by allowing it to circulate through pipes surrounded by the liquid in the evaporating-vessel, or through a jacket or false bottom, with which the said vessel is provided, or in any other similar manner. It further consists in superheating the steam generated from the liquid at one stage of the evaporating process, or in one part of the evaporating-apparatus, by passing it through suitable heaters and enabling it, when so superheated, to heat and evaporate the liquid which is at another stage of the process, or in another part of the apparatus. John. P. Hale, of Kanawha, Va., is the inventor of the above improvements.

### MACHINE FOR SPLITTING SHOE PEGS.

E. T. Weeks, of Franconia, N. H., is the inventor of a machine for the above purpose, which invention consists in the employment of a reciprocating knife, in connection with a peculiar means employed for clamping the bolt and feeding the same to the knife; also, in the employment of a gage, in connection with the feeding-device, for perfectly adjusting the bolt relatively with the knife.

### IMPROVEMENT IN STEAM PLOWS.

Joseph W. Fawkes, of Christiana, Pa., has invented and patented an additional improvement in steam plows, wherein he employs a large barrel-shaped or oilged driving-wheel for the propulsion of the machine. He avoids the sinking in the earth of the wheels hitherto employed, and is thereby enabled to employ the locomotive in the culture of soft land, or where it is desirable to pass the locomotive over plowed land, in seeding, harvesting, &c.

### GRAIN-BINDER.

This invention and improvement relates to the binding of grain into sheaves before it leaves the platform of the harvester, by a simple automatic arrangement which requires only one attendant, and which will gather the grain as it falls upon the platform of the harvester, and bundle it, and at the same time secure the band around the bundle. It consists in the arrangement of a traveling segment in a fixed frame, operated by suitable gearing so as to have an alternate circular movement. This segment carries a jointed arm around the grain, which arm has on its end a button which is fastened to one end of the band to be secured around the sheaf. It further consists in a novel arrangement of parts for operating the aforesaid jointed (button) arm with an independent movement, so that its motion will be faster than that of the traveling segment. It also consists in arranging near the end of the elevated frame, a peculiar device, which, in connection with a loop-holder and jointed arm, will retain the loop, on one end of the band, in position for receiving the button, and as the button is passed through said loop it will be properly secured around the bundle; said device being operated by a projection on the end of the traveling segment, for retaining the loop on its holder until it it is relieved at the proper time by the jointed arm. This contrivance is the invention of C. H. Durkee, of Hartford, Wis.

### APPARATUS FOR REGULATING THE PRESSURE OF WATER IN PIPES.

The object of this invention is to regulate the pressure of the water in pipes so that the latter will not be subjected to any more pressure than is actually necessary to force the water to the desired hight, thereby guarding against the bursting of the pipes and obviating the employment of those heavier and stronger than is necessary to sustain a pressure due to the requisite hight of the columns of water within them. The invention is more especially designed to be applied in certain cases to water pipes which supply buildings in cities, in which pipes the water is not required to be forced up so high as the static pressure in the service pipe will admit of; for instance, in the city of Brooklyn, which is supplied with water under a considerable head and the pipes in low buildings subjected to unnecessary pressure. It consists in the employment of an air-chamber provided with a plunger or yielding bottom to which a valve stem is attached, the air-chamber and valve being arranged in connection with suitable pipes and in such relation with the supply pipe as to effect the desired end. The credit of this invention is due to James Stratton, of Brooklyn, N. Y.

## FOREIGN SUMMARY—NEWS AND MARKETS.

It is gratifying to learn that many new American inventions are appreciated in Europe, and some of them more highly than at home. We find this to be the case with Silver's Marine Governor, illustrated and described on page 356, Vol. XI., SCIENTIFIC AMERICAN. In a paper read before the late meeting of the British Association for the Advancement of Science, by Mr. James Oldham, he stated that several of these governors were now used in steamships belonging to Hull, England, put up by John Hamilton, of Glasgow, and they were giving the highest satisfaction. They are so sensitive in their action that the slightest pitching motion is at once indicated, and the steam admitted or excluded as the case may be. "By the use of this governor," he said, "the full power of the engines is in immediate and constant requisition, producing a saving of fuel, and also the preventing of breakage from racing of the engines."

It is stated in *Cosmos*, that M. Corne and M. Demaux have discovered that plaster-of-Paris containing three per cent of coal tar is a most powerful disinfectant. M. Velpeau, a celebrated surgeon in one of the Paris hospitals, also asserts that he has applied it as a plaster for ulcers, that it is very effective, and that it renders inodorous semi-putrescent masses. It has been recommended by the Academy of Sciences for use in the military hospitals.

Excellent buttons and handsome substitutes for cameos can be made, according to a foreign periodical, of soapstone (steatite). For this purpose it is submitted for several hours to a white heat, after which it is cooled, and is said to become so hard as to resist the action of a file. Of course, the buttons and cameos are cut before they are heated. Such articles may be polished with emery, and colored with chloride of gold, which stains them purple, or nitrate of silver which makes them