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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 dribbles.

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 height, 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 tons of earth and gravel can be removed, and all the gold it contains liberated and secured much quicker and with less labor than ten tons 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 height 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 Chastate 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 prin-

ciples 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 nickel, 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 Alençon 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 over 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