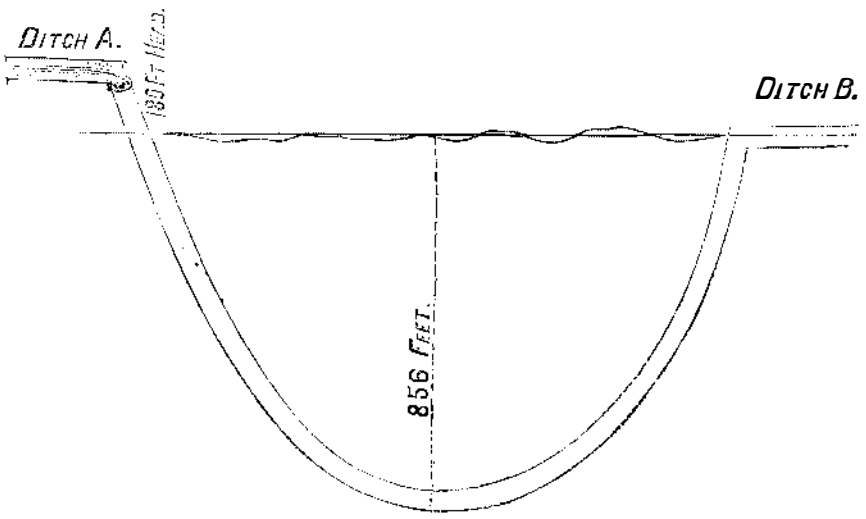
## HYDRAULIC MINING.

An excellent example of the hydraulic system of mining for gold, consisting in the washing of gravel deposits, may be seen at the works of the Spring Valley Mining and Canal Company, at Cherokee Flat, Butte county, California. The claim comprises 1,500 acres of ground, containing pay gravel to an average depth of 300 feet. The company has expended, in the works, flumes, ditches, reservoirs, and water privileges, over $1,000,000. They have on the line of their ditch about four miles of iron pipe, 30 inches in diameter.

### A GREAT SIPHON.

One section of this pipe conducts the water across the west branch of the Feather river. It is laid in the form of an inverted siphon, and has a vertical depression of 856 feet. The accompanying diagram will give an idea of the position of the pipe, which is somewhat similar to the pipe used by the company which furnishes water to Virginia City and Gold Hill. A is the ditch which leads the water to the pipe; B is a ditch on the opposite mountain which receives it. This pipe has a depression from the level of the discharging arm of 856 feet. The receiving arm has a head of 180 feet vertical pressure. The length of the inverted siphon is two and a half miles, and the pipe is 30 inches in diameter.




GREAT SIPHON OF THE SPRING VALLEY MINING COMPANY.

There are ten miles of sluices, varying from four to six feet in width, and twenty-three undercurrents from 10 to 40 feet in width. For the year ending July, 1874, the sum of $476,112 in gold was washed out and shipped. They employed 160 hands all the year round, and expended $125,000 during the same time, of which $85,534 was for labor. The quicksilver alone used by the company for the year cost $13,309. For iron pipe they paid out $8,839.

The *Mining and Scientific Press* says that the water used is brought by two ditches, 60 miles in length, from Butte Creek, and from the head waters of the west branch of the Feather river. The ditches are six feet wide at bottom and eight feet wide on top. They are four feet deep and run a constant stream of 2,200 inches of water.

This mine turned out last year the largest gold bar ever made, being valued at $71,273.15, and it has been said that they will send a bar worth double this amount to the Centennial Exhibition.

A rather peculiar feature in this claim is the fact that diamonds are found in the washings; most of them, however, by the primitive method of rocking. One diamond, worth $250, was cut in Boston in 1864, and last year several were tested in Amsterdam and Paris, and pronounced diamonds of the first water. Professor Silliman has examined these sands carefully, and enumerates the mineralogy of the Cherokee washings as yielding gold, platinum, iridosmine, diamonds, zircon, topaz, quartz in several varieties, chromite, magnetite, limonite, rutile, pyrites, garnets, epidote and almadine. One of the diamonds found weighed two and a half carats.

## THE PROCEEDINGS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The following are abstracts of the various subjects discussed:

### LIVING DEATH.

A paragraph in Professor Redfern's paper on biology, read before the above Association, furnishes a curious confirmation of the axiom, "we die daily." Referring to the blood, it is said that the duration of life in any of its particles is but short; they die and their places are occupied by others, and so continues a substitution which only ends with death. After every meal an amazing number of white corpuscles are added to the blood; breakfast doubles their proportion to the colored corpuscles in half an hour; supper increases their proportion three times, and dinner makes it four times as great. They come from such solid glands as the spleen. In the blood going to this organ, their proportion is one to two thousand two hundred and sixty; in that returning from the spleen, it is as one to sixty. Perhaps the most stupendous miracle of organization is the steady maintenance of but slightly variable characters in the living and moving blood, which is every moment undergoing changes of different kinds as it circulates through each tissue and organ in the body.

### EXTRAORDINARY REFLECTION.

Professor Curtis remarks that it is a notable fact that while so much is written about extraordinary refraction of light, nothing is said about extraordinary reflection, though Huggins' theory is applicable to both alike. Of light falling upon a crystal surrounded with air, part will be reflected at the bounding surface and part refracted, the latter portion being split into two rays, whether the crystal be uniaxial or biaxial, each of which rays will suffer double reflection at the point where they again reach the bounding surface of the crystal. In the case where the bounding surfaces are parallel, the planes of polarization are the same as those of the other. This is not true of the intensities, as one of the four intensities may be zero while the others remain finite. When the incident light is not polarized, the number of reflected rays will pass from four to three, and from three to two, as the crystal is turned around a vertical axis. With polarized light, the reflected rays may be four, three, two, or one.

### PYROMETERS.

It appears from a report of a committee charged with examination of the above instruments, that, by means of the Siemens electric pyrometer, changes of resistance amounting to about $\frac{1}{1000}$ of the quantity of heat to be measured can be detected without much difficulty.

### IMPROVED TELESCOPIC LENSES.

Professor Stokes says that, if opticians can manufacture glass containing terborate of lead or titanic acid, lenses made therefrom will greatly decrease secondary dispersion. Phosphatic glass might answer the same purpose, but it has the objection of being too perishable and too soft.

### THE DECOMPOSITION OF EGGS,

according to Mr. William Thomson, is due to three agencies: First, a putrid cell capable of being developed within some eggs, no matter how effectually their shells are protected by varnished coverings. This is generated in the yolk, in which the minute granules assume a morbid vitality, absorb oxygen, and liberate carbonic acid gas. The second germ is a vibrio. If the shell of the egg be allowed to get wet, the dried bodies of these animalculæ existing in the atmosphere develope in the water, assume vitality, enter the shell, and set up putrefaction. The third cause is a fungus, also derived from the atmosphere, which, settling on the shell, sends myriads of filaments through the same, converting the white into a strong jelly. It is strange that this fungus acts on the air like animalculæ, absorbing oxygen and liberating carbonic acid gas.

### HASH.

At last Science grapples with this mysterious compound. The attention of the average New York boarding house keeper is directed to the words of Professor Redfern, who condemns "the process of cutting up meat into small blocks, and then stewing it, the effect of which is that the albumen in the outer surface of each block becomes firmly set, and the whole affords about as indigestible a mass as can well be imagined."

### RECENT EXPERIMENTS AT HIGH PRESSURES,

conducted by Professor Andrews, show that the compressibility of liquid sulphurous acid (unlike that of water) diminishes as the pressure increases. In a mixture of three volumes carbonic acid to four volumes nitrogen, even at 2° Fah., carbonic acid cannot be liquefied under any pressure. In short the critical point (a term introduced into this branch of Science by Professor Andrews) of carbonic acid becomes lowered many degrees when that gas is mixed with a non-liquefiable gas, such as nitrogen.

### THE FLIGHT OF BIRDS.

Professor Guthrie, in relation to the hovering of birds, states that, when the bird desires to hover over a given spot, it moves by an expenditure of muscular force until it finds a region where one layer of air is moving, say, from right to left and another from left to right. Then placing its body and most of its right wing in the lower stratum, it tilts its body so that some of its left wing is in the upper layer. By altering its hight, by turning one wing in its socket, and probably also by turning some of the pen feathers on their axes, and altering the inclination of its wings, the bird so governs the pressure on the two wings that the sum of the vertical revolved parts is equal to the bird's weight, while the horizontal revolved parts are equal and opposite.

### A SELF-REGISTERING APPARATUS FOR MEASURING THE CHEMICAL ACTION OF HEAT

is described in a paper by Professor Roscoe. The tint produced by the exposure of a certain prepared sensitive paper to the sun can be measured on a self-registering principle. By this means can be determined, with a great degree of accuracy, the relative amount of chemical action falling upon the earth's surface from the sun and the variations which take place from hour to hour, day to day, and season to season in that action.

## Ether.

Physicists recognize heat as a mode of motion, and that it comes under the cognizance of our perceptions by the vibrations of atomic matter or ether: of ether, that fluid material, perfectly elastic, incoercible, imponderable, which fills all the immensity of space and the depth of all bodies. It is in this fluid that the stars describe their orbits; in this fluid atoms perform their movements and describe their trajectories. Thus the ether, the radiant messenger of heat and light, conveys and distributes their radiations through all the Universe; and that which it loses in vibratory energy when it penetrates a cold body, which it warms, it communicates to the atoms of this body and augments the intensity of their movements; and that which it gains in energy by contact with a warm body, which it cools, it withdraws from this body and diminishes the intensity of their vibratory movements. And this kind of light and heat which comes from material bodies is transmitted across space to other material bodies.—*M. Wurtz.*

## The Block System of Railway Signals.

Professor Thomson states that the latest development and application of the block system is one which has been made in Scotland, on the Caledonian Railway. It consists mainly in arranging that, along a line of railway, the semaphore arms are to be regularly and ordinarily kept up in the horizontal position for prohibiting the passage of any train, and that each is only to be put down when an approaching train is, by any electric signal from the cabin behind, announced to the man in charge of that semaphore as having entered on the block section behind, and when, further, that man has, by an electric signal sent forward to the next cabin in advance, inquired whether the section in advance of his own cabin is clear, and has received in return an electric signal meaning: "The line clear; you may put down your debarring signal, and let the train pass your cabin." The main effect of this is that, along a line of railway, the signals are to be regularly and ordinarily standing up in the debarring position against allowing any train to pass; but that just as each train approaches, and usually before it has come in sight, they go down almost as if by magic, and so open the way in front of the train, if the line is ascertained to be duly safe in front; and that, immediately on the passage of the train they go up again, and by remaining up keep the road closed against any engine or train whose approach has not been duly announced in advance, so as to be known at the first and second cabins in front of it, and kept closed, unless the entire block section between those two cabins is known to have been left clear by the last preceding engine or train having quitted it, and is sufficiently presumed not to have met with any other obstruction by shunting of carriages or wagons, or by accident, or in any other way.

## DECISIONS OF THE COURTS.

### United States Circuit Court---Eastern District of New York.

PATENT STONE BREAKER.—ELI W. BLAKE *vs.* JOHN ROBERTSON *et al.*

[Decision rendered July 8, 1874.]

Benedict, Judge.

The decision of this case must depend upon the determination of two questions. One is whether the patent issued to Eli W. Blake for an improvement in a stone breaker, dated June 15, 1858, is void for want of novelty, because of the prior invention described in letters patent issued to James Hamilton on the 3d of January, 1854, for improvement in machinery for crushing and grinding quartz and other hard substances. The other question is whether the machine described in the specification of letters patent issued to Austin H. Smith, No. 120,789, dated November 7, 1871, for improvement in stone-crushing apparatus, is an infringement upon the Blake machine above mentioned.

The first of these questions has been heretofore determined in favor of the Blake patent by Judge Shipman, by Mr. Justice Nelson, by Judge Drummond, and by Judge Shepley, in other actions which have come before these judges; and as it does not appear that the Supreme Court has been called upon to reverse any of these decisions, it would seem a fair inference that those decisions are acquiesced in as correct by the parties to those actions. It is nevertheless true that these decisions do not bind this court, and the parties to this action have the right to a determination of the question by this court in this action. It is, however, incumbent on the party asking this court to differ upon such a subject from the learned judges above mentioned, to point out indisputable ground upon which such differences may be based. The argument presented to me based upon the Hamilton machine, although not without force, does not appear to me to justify a different conclusion from that arrived at by the other judges who have determined the same question in other cases. It may be that, with the light derived from the operation of the Blake machine, the idea embodied in that invention can now be in some sort carved out of the Hamilton machine; nevertheless, I have been unable to come to the conclusion that the patent of Blake should be declared void, as being in principle identical with the Hamilton machine; on the contrary, I incline to the opinion that the Hamilton machine was devised and constructed to operate according to a method substantially different from that found in Blake's machine. It would be a waste of time to spread on paper the grounds of my opinion, in the presence of the opinions of so many other judges learned in this branch of the law.

The remaining question is that of infringement.

The difference between the defendants' machine and that invented by Blake is that in the defendant's machine a column of water is used as the medium of communicating motion from the revolving shaft to the movable jaw. To this a safety valve is attached, and so weighted that, in the event of a substance of unusual hardness dropping between the jaws, water will escape through the valve, and breakage of the machine thus be avoided.

By the introduction of water as an element of their combination, the defendants claim to have invented a new combination different from Blake's. They insist that, used with water as described by the defendant, the function of the revolving shaft in their machine is different from the function of the revolving shaft in the Blake combination, because, in the Blake machine, the revolving shaft necessarily deprives and limits the movements of the jaw, while in the defendants' machine the revolving shaft simply imparts power without limiting or defining the movements of the jaw. The defendants' machine, therefore, they insist, presents the feature of irregularity of movement in the jaw, both in range and limit, accomplished by the use of hydraulic power. But this theory is not supported by the facts. I do not discover any irregularity of movement in the jaw of the defendants' machine produced by the use of a column of water instead of an iron rod. The revolving shaft in the defendants' machine, by the aid of the plunger and the column of water, imparts a motion to the jaw which is as certainly defined and limited by the action of the revolving shaft as it is in the Blake machine, and it is a movement not irregular but regular. Both machines present the same definite vibrating movement produced by substantially the same combination. It is true the use of a column of water in place of a rod of iron may have some advantage, and that a safety valve attached may enable the machine to stop its motion in a certain contingency, and so avoid breaking; but stopping the movements of the jaw is not giving to it an irregular movement. The character of the movement imparted to the jaw is the same in both machines. But the defendants say that water is not mechanism, and that water, as used in defendants' machine, is not a mechanical equivalent for the iron rod in Blake's machine. If this be so, then the defendants' machine without the safety valve attached would be a different machine from Blake's. And yet, as the defendants seem to concede, a column of water closely confined without a safety valve, substituted in place of an iron rod for the purpose of communicating power, would act in the same way, produce the same definite limited motion, and accomplish the same result as does the iron bar which, in Blake's machine, transmits the power from the revolving shaft to the movable jaw. It seems clear, therefore, that water so used is a mechanical equivalent. And it is none the less so when a safety valve is attached, which will in a certain contingency release the water from its confinement and thereby stop the machine. Such a machine may be an improvement on the Blake machine, but my judgment is that it contains the idea which Blake conceived and secured, and is an infringement upon his patent.

The plaintiff is entitled to a decree in his favor and for an injunction. He cannot recover damages, for he has proved no licence fee. The profit realized on the machines he sold does not fix the amount of damages here sued for, for those machines contained other patents than the one sued on, and the profits so realized may also, for anything that appears, embrace a manufacturer's profit.

Furthermore, there is no proof that the complainant stamped his machines with the word "Patent," or that he gave such notice as is required by section 88 of the patent act of July 8, 1870.

[*H. T. Blake*, for complainant.
*B. E. Valentine*, for defendants.]