

ficient to raise 956 into $9=8,614$ pounds of water 1° Fahr. Multiplying this number by 772, we have a product of 6,718,716 foot-pounds (a foot-pound is a pound raised one foot high) as the mechanical value of the mere act of condensation. The next great fall of our 9 pounds of water is from the state of liquid to that of ice, and the mechanical value of this act is equal to 993,564 foot-pounds. Thus on 9 pounds of water, in its origin and progress, falls down three great precipices; the first fall is equivalent to the descent of a ton weight, urged by gravity, down a precipice 22,320 feet high; the second fall is equal to that of a ton down a precipice 2,900 feet high; and the third is equal to the descent of a ton down a precipice 433 feet high. I have seen the wild stone-avalanches of the Alps, which smoke and thunder down the declivities with a vehemence almost sufficient to stun the observer. I have also seen snow-flakes descending so softly as not to hurt the fragile spangles of which they were composed; yet, to produce from aqueous vapor a quantity of that tender material which a child could carry, demands an exertion of energy competent to gather up the shattered blocks of the largest stone avalanche I have ever seen, and pitch them to twice the height from which they fell."—*Tyndall on Heat.*

Nitro-Glycerin.

The last number of *Le Genie Industriel* has an article by M. Alfred Noble, engineer, setting forth at length, the advantages of nitro-glycerin over gunpowder for blasting rocks. The economy claimed is in the cost of drilling the rocks, as much smaller holes suffice, owing to the greater explosive force of nitro-glycerin. M. Nobel says that this force is in hard rocks from eight to ten times that of ordinary blasting powder, and in soft rocks from twenty to thirty times.

"Four principal causes contribute to its superior explosive force:—1st, its great specific gravity, which permits the introduction into a hole of nearly double the weight of powder which the same hole will receive; 2nd, its perfect gasification, leaving no solid residue; 3rd, its richness in oxygen, which produces complete combustion; 4th its extraordinary suddenness of explosion.

"According to Regnault, gunpowder, in burning, forms, theoretically, 260 times its volume of gas, taken cold, but in practice, owing to incomplete combustion, it does not exceed 200 volumes.

"It is evident that gunpowder, the combustion of which is very incomplete, cannot produce an elevation of temperature so great as nitro-glycerin, of which all the carbon is transformed into carbonic acid, and all the hydrogen into water. This is proved in practice by the fact that a small addition of nitro-glycerin to powder communicates much more brilliancy to the flame. It is difficult to measure the heat of an explosive substance, but, in view of the above mentioned circumstance, it will be admitted that the temperature of the flame ought to be nearly double that of gunpowder. We shall have then for powder 200 volumes, which, with a quadruple expansion, will be 800 volumes, and for nitro-glycerin 1,288—in round numbers 1,300 volumes—which, with an octuple expansion, will be 10,400."

Nitro-glycerin is made by dropping glycerin into a mixture of equal parts of strong nitric and sulphuric acids. It is a heavy oily liquid, its specific gravity being 1.6. It is insoluble in water, and the usual plan is to fill the hole above it with water in place of tamping, and then to fire it with a safety fuse, having a heavily charged percussion cap at its lower end. This mode of firing has been patented in France and other countries.

According to M. Nobel, nitro-glycerin does not explode by direct fire, decomposing itself with flame by contact with an ignited body, but being extinguished so soon as the hot body is removed. He also says that it detonates under a violent blow of a hammer, but only the part that is struck explodes; the fire is not propagated to the surrounding portions. A few drops spread on an anvil may, by repeated blows, produce a series of explosions. By the gradual application of heat it explodes at 180° Cent.— 356° Fah. It is a very permanent compound, preserving itself indefinitely, and not being decomposed by either phosphorous or potassium.

He does not understand how the sample, ten pounds, which exploded at the Wyoming Hotel, could have been ignited; but he has found that organic textures charred by sulphuric acid will ignite nitro-glycerin, and thinks that may give a clue. If lighted by a match, it burns like oil; but if heated to 360° it explodes. It is less dangerous than gunpowder. Three hundred pounds were exploded close to a large building in Stockholm, and did little damage beyond breaking the glass.

A Protest Against Pharaoh's Serpents.

On the 13th of November, a meeting of the Pharmaceutical Society, of Great Britain, was held at Edinburgh, and, in the course of the proceedings, the following communication was read from Dr. Stevenson M'Adam on the poisonous ingredients in the new toy called Pharaoh's serpents:—"The chemical toy which is now sold largely in many shops in this city, at prices ranging from three pence to one shilling each, is composed of a highly dangerous and poisonous substance called the sulpho-cyanide of mercury. The material is a double-headed poisoned arrow, for it contains two poisonous ingredients, viz., mercury and sulpho-cyanic acid, either of which will kill. Experiments have been made by me upon the lower animals, and I have found that one-half of a sixpenny Pharaoh's serpent is sufficient to poison a large-sized rabbit in an hour and three-quarters. A less dose also destroys life, but takes longer to do so. The toy therefore, is much too deadly to be regarded as merely amusing; and, seeing that it can be purchased by every school-boy, and be brought home to the nursery, it is rather alarming to think that there is enough of poison in one of the serpents to destroy the life of several children; and the more so that the so-called Pharaoh's serpent is covered with bright tinfoil, and much resembles in outward appearance, a piece of chocolate or a comfit. I hope that the rage for the Pharaoh's serpents will die out in Edinburgh without any disastrous consequences, though such have occurred in other places; but it is certainly an anomaly in the law of the kingdom that a grain of arsenic cannot be purchased except under proper restrictions, and that