POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening Nov. 16, 1865, the President, S. D. Tillman, Esq., in the chair.

A PROFITABLE INVENTION.

Mr. Pitkin read a long paper, setting forth the superiority of what is called the factory system of making boots and shoes over the hand system. This system is coming into general use among the shoe manufacturers of New England. The plan formerly practiced was to distribute the work among the farmers' families about the country, who made the shoes mostly by hand, except that portion which could be done by the sewing machine. The invention of a number of machines for fastening on of the soles and heels has led to the adoption of the factory system, by which the hands are brought together in one large building, in which the whole manufacture is conducted. One of the most valuable of these inventions is a machine for sewing the soles; one jaw enters the shoe and the other is on the outside, the thread passing through both insole and outsole, and fastening the two at one operation. The manufacturers pay the inventor the full price for his machine, and then pay him two cents per pair on all shoes sewed by it, for the privilege of using it. One machine will sew 300 pairs of shoes per day; thus yielding a revenue of $1,800 a year to the inventor for each of his machines in use.

As the necessary skill for attending these machines is acquired by very little training, the work is well adapted for boys, and large numbers of convict children are now employed in the manufacture; the profits are very heavy.

AN INFUSIBLE CRUCIBLE.

Prof. Joy, of Columbia College, exhibited the jet of a compound blow-pipe, as arranged by M. Deville, of Paris, for melting platinum and other refractory substances; a hollow cylinder of copper or platinum, about half an inch in diameter, embraces the jet, and extends about half an inch beyond. M. Deville found that fire clay was melted by the heat of the flame, and he has been trying numerous substances in the attempt to discover one that would make an infusible crucible. The best substance yet tried is quicklime, entirely free from silica and other impurities. The lime is formed into a solid cylinder, by a hydraulic press; the cylinder is sawed in two transversely; the lower part is scooped out to hold the substance to be melted, with a small channel for pouring out the molten mass, and a hole is made in the center of the cover to admit the blow pipe.

A COPPER ALLOY HARDER THAN STEEL.

Prof. Joy also exhibited some pure silicium, and said that he had seen an alloy of this metal and copper, that was harder than steel.

PHARAOH'S SERPENTS.

Finally, Prof. Joy closed his interesting experiments by the wonderful exhibition of the new Parisian toy, called Pharaoh's serpents. In 1821 Prof. Woehler, then a young man at Heidelberg University, discovered that a mass of sulpho-cyanide of mercury, if set on fire, would swell up enormously, enlarging its volume many fold. When Prof. Joy was attending lectures at Heidelberg, he saw the experiment, and has since been in the practice of exhibiting it to his class at Columbia College. Recently, a very ingenious Frenchman has adopted the plan of putting little cones of the substance into boxes, and selling them for a franc apiece. Prof. Joy bought one of these in Paris, and there was a constant stream of people buying them at the same place. The cone, about an inch in hight, was placed on a plate and lighted at the top by a match, when it began to burn slowly with a pale flame, and to swell, presenting the appearance of a serpent crawling from out the plate and writhing in painful contortions; this continued for perhaps a minute, when the crooked serpent had reached a length of about a foot, with a diameter of half an inch. In the process, nitrogen is driven off, with a very little sulphide of carbon, and the mass remaining is sulphide of mercury.

According to persons of much experience, Brahma fowls are the best for all purposes. They will lay in cold weather when no others will; are fine to eat, and profitable in all respects.

NOTES ON NEW DISCOVERIES AND NEW APPLICATIONS OF SCIENCE.

MAGNESIUM FOR VOLTAIC BATTERIES.

M. Bultinck, of Ostend, has communicated to the Academy of Sciences a note on the use of magnesium instead of zinc as the positive element of voltaic batteries. In order to compare the electromotive force of magnesium with that of zinc, he employed two pairs of wires, one pair consisting of a wire of copper and one of zinc, and the other pair of a wire of silver and one of magnesium. On plunging the first-mentioned pair of wires into distilled water, having first connected them with a multiplying galvanometer, the needle of the galvanometer, at the moment of the immersion of the wires, moved 30°, and after the immersion had lasted five minutes still marked 10°. On similarly treating the silver and magnesium pair of wires, which were of exactly the same dimensions as the copper and zinc pair, at the moment of immersion the needle of the galvanometer deviated 90°, and five minutes after immersion it remained stationary at 28°. Having thus found the electromotive force of a magnesium couple to be three times that of a copper and zinc couple, M. Bultinck became desirous to construct a large battery with magnesium as the positive element, but not being able, for the moment, to obtain magnesium in any other form than that of thin wire, he had to be content with making a "galvanic chain," of the kind associated with the name of M. Pulvermacher. Having constructed such a chain of silver and magnesium, he found that when simply moistened with pure water it would produce all the effects the production of which by an ordinary Pulvermacher's chain requires that the chain be moistened with either a saline or an acid solution. We knew previously that magnesium possesses greater electromotive force than any other known metal capable of being obtained in quantity; the new fact brought to light by M. Bultinck is that a battery in which magnesium was the positive element would not need an acid to excite it, but could be excited by water only.

CURIOUS FACTS IN DISTILLATION.

In the course of some researches with respect to the phenomena presented during the evaporation of mixed liquids, Berthelot has lately observed some very remarkable facts, of a kind scarcely to have been anticipated. He has found, for example, that if a mixture of two liquids of different degrees of volatility, containing a preponderating proportion of the less volatile liquid, be exposed to the action of heat, it will by no means always happen that the more volatile of the mixed liquids will fly off first. Thus, if one part of alcohol be added to eleven parts of water, and the mixture be heated, the alcohol will not evaporate any more rapidly than the water, although it is much the more volatile liquid of the two. Stop the evaporation at any stage, and the residue will always contain exactly the same percentage of alcohol that was contained in the mixture before the evaporation commenced. In some cases it even happens that the less volatile constituent of a mixture of two liquids flies off first. If, for instance, a small quantity of alcohol be added to a much larger quantity of that exceedingly volatile compound, bisulphide of carbon, and the mixture submitted to distillation, in the vapors which first pass over there will be a far larger proportion of alcohol than in the mixed liquids as originally placed in the retort, and after a little while there will be left in the retort bisulphide of carbon only, the whole of the alcohol having distilled away, notwithstanding that alcohol by itself is less volatile than bisulphide of carbon, in even greater proportion than that in which water is less volatile than alcohol. Similarly, Mr. Carey Lea has found that when a mixture of ethylamine, diethylamine, and triethylamine is distilled, the last mentioned body, although, when by itself, by far the least volatile body of the three, passes over much more rapidly than either of the others. These facts are very curious, and may prove to have practical bearings of much importance, but in the present state of knowledge they are quite inexplicable.

MECHANICAL POWER FROM THE INTERNAL HEAT OF THE EARTH.

At the last meeting of the Literary and Philosophical Society of Manchester, Mr. George Greaves read a paper embodying the suggestion that the "internal heat of the earth," which he supposes will render it impossible for us to raise coal from below a depth of four thousand feet, should itself be employed in place of the fuel of which he thinks it will one day cut off our supply. He considers that the heat of the fiery ocean which he believes lies under our feet might supply us with all the mechanical power we want, and that one method of causing it to do this "might be by the direct production of steam power by bringing a supply of water from the surface in contact with sufficiently heated strata, by means of artesian borings or otherwise." He has yet to explain, however, how, supposing his "sufficiently heated strata" to really exist, we could make "artesian borings" deep enough to reach them, or how, even if we could make the borings, we could utilize at the surface the force of steam generated at such a depth below it as that at which even Mr. Greaves must suppose the "sufficiently heated strata" to lie buried.

ARTIFICIAL IVORY.

Both on the continent and in this country the manufactory of "artificial ivory" is conducted on a scale of some magnitude. The process by which the most successful imitation of natural ivory is obtained appears to consist in dissolving either india-rubber or gutta-percha in chloroform, passing chlorine through the solution until it has acquired a light yellow tint, next washing well with alcohol, and adding in a fine powder, either sulphate of baryta, sulphate of lime, sulphate of lead, alumina, or chalk, in quantity proportioned to the desired density and tint, kneading well, and finally subjecting to heavy pressure. A very tough product, capable of taking a very high polish, is obtainable in this way.—*Mechanics' Magazine.*

THE STEAMER "SAXON" AND HER SUBMARINE APPARATUS.

We have just returned from a visit to the steamer *Saxon*, now lying at the foot of Essex street, in Jersey City, with her powerful air pumps, engines, and submarine apparatus, prepared to engage in her work of raising sunken treasures from the bottom of the sea. This apparatus is protected by patents obtained through the Scientific American Patent Agency; it is so simple and practical in its character, and is to be tried on a scale so large, and under circumstances so favorable, as to give the best promise for success.

The submarine armor heretofore used consists of a complete suit of india-rubber, made in one piece for the body, limbs, and hands, and after this is put on it is secured by a water-tight joint to a metallic helmet, so as to inclose the diver in a water-tight case; glass plates are inserted in the helmet in front of the eyes, and the air for breathing is supplied by an india-rubber hose, reaching above the surface of the water. The improvement in the armor secured by one of these patents is the substitution for the hose of a metallic case containing compressed air and attached to the body of the diver, thus giving him far greater freedom of motion, and allowing him to go into parts of a wreck where he could not go if he was attached to a hose leading to the surface. The air is controlled by a valve, and the diver allows it to flow at will into his lungs, and, on being expired, it makes its exit through a valve in the helmet, passing but once through the lungs.

The other patent is for a peculiar buoy for raising sunken ships. This is simply a bag, made of india-rubber canvas, and covered with a rope netting, to be fastened securely to the wreck, and then inflated with air forced into it, by a hose leading from the surface, a sufficient number of the bags being attached to lift the wreck. These bags are made fifteen feet in length, and the netting is made of Italian hemp rope one-fourth of an inch in diameter. Each bag will lift 15 tuns.

A company, called the New York Submarine Co., has been formed for working under these patents, with a capital of $300,000. They have procured a steamer of 450 tuns burden, have fitted her out with air pumps and an abundant supply of the apparatus, and have placed her under the command of Captain Samuel H. Holbrook, a man who has devoted his life to raising sunken vessels, having a particular fancy for that work. Capt. Holbrook says that it is impossible to raise vessels from a greater depth than 100 or 120 feet; below that the pressure of the water